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ENCYRTIDAE OF COSTA RICA (HYMENOPTERA: CHALCIDOIDEA), 4

Subfamily Encyrtinae: tribes Arrhenophagini, Habrolepidini, Cerapterocerini, Cheiloneurini, Trechnitini, Cercobelini, Polaszekiini, Protyndarichoidini, Gahaniellini and Syrphophagini (part), mainly primary parasitoids and hyperparasitoids of Coccoidea and Psylloidea (Hemiptera)

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SYNOPSIS

Fifty one genera known to occur in Costa Rica, belonging to ten tribes of the subfamily Encyrtinae (Encyrtidae), are characterised by means of generic diagnoses. Their biology and use in biocontrol are summarized for every genus and identification keys to the 316 Costa Rican species are provided. All species are illustrated and defined by means of brief diagnoses or full morphological descriptions, and information is provided on their known distributions, host ranges, and use in biocontrol.

Three family group names are proposed as new (Gahaniellini, Protyndarichoidini, Polaszekiini); 21genera are described as new (*Alkonia, Angebra, Arianus, Dalek, Elaxis, Esphora, Georynus, Harlarus, Hebynthus, Ludesia, Mendisa, Oodia, Orixia, Polaszekius, Prionias, Quetsira, Raquanus, Sosara, Stadima, Strigenia, Tico*); 254 species are described as new, including one *Adelencyrtus* (*plocus*), one *Alkonia* (*tiquanus*), six *Ammonoencyrtus* (*autone*, *galas*, *hyperion*, *keira*, *prosymnos*, *xanthos*), two *Angebra* (*harpalyke*, *praxadike*), five *Anicetus* (*apatos*, *arche*, *cheras*, *lysithea*, *oroso*), two *Anisophleps* (*aoedis*, *carpo*), one *Arianus* (*porusos*),

three *Caldencyrtus* (*balor*, *meresmo*, *olwen*), five *Cercobelus* (*adrastea*, *epimetheus*, *phanes*, *pleiades*, *tartarus*), 102 *Cheiloneurus* (*aesernia*, *aliphera*, *alopes*, *amadeus*, *amethes*, *argos*, *ariston*, *aunes*, *betes*, *bion*, *carita*, *castalia*, *catreta*, *ceiba*, *cero*, *dalycera*, *danessa*, *diaces*, *dipsas*, *dirce*, *dymorus*, *ection*, *exeres*, *extillus*, *fabius*, *fautrix*, *feritas*, *fidenas*, *finator*, *genua*, *genys*, *glycon*, *goldus*, *grimus*, *gyges*, *hamadryas*, *herndonia*, *herxius*, *horocles*, *idifex*, *idris*, *iphigenes*, *janzeni*, *jeroba*, *lamus*, *leda*, *leone*, *letos*, *lexovus*, *loresa*, *luceres*, *lydia*, *magnolia*, *mago*, *mantua*, *marcius*, *mardor*, *mckenziei*, *medusa*, *meryae*, *metheus*, *miklo*, *mirablel*, *miranda*, *moloch*, *mora*, *munda*, *myndus*, *nasica*, *nebucha*, *nintra*, *numida*, *numitor*, *omorus*, *onestas*, *orbona*. *origo*, *oshtan*, *paean*, *parnisa*, *perses*, *pherus*, *poeana*, *pometia*, *racidia*, *repola*, *roellus*, *rosea*, *salome*, *santaros*, *scolopax*, *seius*, *semis*, *simus*, *socrates*, *solon*, *sophocles, varablus*, *varus*, *vitara*, *zeno*, *zephyrus*), 21 *Coccidencyrtus* (*aries*, *chenoa*, *cyathus*, *fescus*, *gowanus*, *harpales*, *jacintha*, *juno*, *matias*, *pomadus*, *procris*, *quebrus*, *reshan*, *sivan*, *solivus*, *thuryus*, *tristeryx*, *umbro*, *viviana*, *xero*, *xylomus*), 14 *Dalek* (*ananke*, *arax*, *carme*, *cylcos*, *elana*, *gubrana*, *jigas*, *minerva*, *nationi*, *orthia*, *pleione*, *pomona*, *saurax*, *thanatos*), one *Elaxis* (*auster*), two *Esphora* (*cyllene*, *rhea*), two *Eusemion* (*monos*, *themisto*); one *Gahaniella* (*chaldenes*), two *Georynus* (*aitne*, *dionysus*), one *Harlarus* (*titana*), 12 *Hebynthus* (*callirhoe*, *cira*, *cleon*, *cosmus*, *erythrax*, *himalia*, *kapo*, *maros*, *menai*, *phyrra*, *solex*, *tamones*), nine *Homalopoda* (*aesira*, *aibeus*, *baunos*, *beatriz*, *carpha*, *donatos*, *onothrix*, *opsis*, *rehdera*), one *Lakshaphagus* (*arnulfoi*), two *Ludesia* (*amalthea*, *hemera*), one *Mendisa* (*gaia*), seven *Neococcidencyrtus* (*cylcope*, *dracaenas*, *grias*, *hilaria*, *mansua*, *orion*, *plinthus*), one *Oodia* (*japetus*), three *Orixia* (*demos*, *philotes*, *sirus*), one *Plagiomerus* (*calabes*), one *Polaszekius* (*nemesis*), one *Prionias* (*nodutus*), 12 *Prochiloneurus* (*abelio*, *aethus*, *akea*, *alasirus*, *armidus*, *helleria*, *lenus*, *lucetia*, *olax*, *surwaka*, *thonus*, *zunigai*), six *Protyndarichoides* (*damocles*, *elathes*, *euanthos*, *hephaestus*, *hermippe*, *isonus*), two *Pseudhomalopoda* (*festa*, *tapura*); seven *Psyllaephagus* (*alisanos*, *heles*, *kallichoa*, *korus*, *moros*, *phelys*, *xepo*), one *Quetsira* (*tinthrax*), one *Raquanus* (*hades*), five *Sectiliclava* (*arion*, *fusui*, *helikes*, *megleos*, *rojasorum*), one *Sosara* (*geras*), one *Stadima* (*moros*), one *Strigenia* (*laras*), two *Tico* (*ryaspis*, *sinabelus*) and four *Trechnites* (*kale*, *spondes*, *thelxines*, *thyones*).

One subtribe is upgraded to tribal status (Syrphophagina Trjapitzin, 1973 to Syrphophagini); one tribe is downgraded to subtribe (Thomsoniscini Hoffer, 1956 to Thomsoniscina); three family group names are proposed as junior synonyms (Thomsoniscini Hoffer, 1956 of Habrolepidini Hoffer, 1955; Comperiellina Trjapitzin, 1973 of Thomsoniscina Hoffer, 1956; Chalceryini Trjapitzin, 1973 of Cheiloneurini Hoffer, 1955); 13 genus group names are proposed as junior synonyms (*Apterencyrtus* Ashmead, 1905, *Chiloneurinus* Mercet, 1921, *Metallonoidea* Girault, 1915, *Metapterencyrtus* Tachikawa, 1963, *Richardsius* Alam, 1957, *Zaomma* Ashmead, 1900 of *Cheiloneurus* Westwood, 1833; *Athesmus* Erdös & Novicky, 1955, *Euussuria* Chumakova, 1957, *Heterencyrtus* Hoffer, 1953, *Kosztarabia* Erdös, 1957, *Pakencyrtus*, Ahmad, 1970, *Thomsoniella* Mercet, 1921, *Thomsonisca* Ghesquière, 1946 of *Coccidencyrtus* Ashmead, 1900); seven species group names are proposed as junior synonyms (*Adelencyrtus femoralis* Compere & Annecke, 1961, *Adelencyrtus miyarai* Tachhikawa, 1963, *Adelencyrtus mysorensis* Hayat, Alam & Agarwal, 1975 and *Encyrtus moderatus* Howard, 1897 with *Adelencyrtus chionaspidis* Howard, 1896; *Arrhenophagus confusus* Hayat, 2010 with *Arrhenophagus albitibiae* Girault, 1915; *Cheiloneurus elegantissimus* De Santis, 1964 with *Cheiloneurus elegans* (Dalman, 1820); *Coccidencyrtus malloi* De Santis, 1964 with *Coccidencyrtus ochraceipes* Gahan, 1927) and two species group names are reinstated as valid (*Cheiloneurus longisetaceus* De Santis, 1939; *Prochiloneurus modestus* Timberlake, 1924).

Twenty three new combinations are proposed (*Cheiloneurus abas* (Trjapitzin) (from *Apterencyrtus*); *Cheiloneurus acaciae* (Risbec) (from *Paralitomastix*); *Cheiloneurus acanthococci* (Pilipyuk & Trjapitzin) (from *Apterencyrtus*); *Cheiloneurus argentipes* (Howard) (from *Encyrtus*); *Cheiloneurus astera* (Hayat) (from *Zaomma*); *Cheiloneurus carinae* (Prinsloo) (from *Zaomma*); *Cheiloneurus cestus* (from *Zaomma*); *Cheiloneurus danzigae* (Pilipyuk & Trjapitzin) (from *Apterencyrtus*); *Cheiloneurus epytus* (Walker) (from *Encyrtus*); *Cheiloneurus eriococci* (Ferrière) (from *Apterencyrtus*); *Cheiloneurus ficusae* (Risbec) (from *Adelencyrtus*); *Cheiloneurus hirsutus* (Ratzeburg) (from *Encyrtus*); *Cheiloneurus lambinus* (Walker) (from *Encyrtus*); *Cheiloneurus sitis* (Prinsloo) (from *Zaomma*); *Cheiloneurus vix* (from *Zaomma*); *xhosa* (Prinsloo) (from *Zaomma*); *Coccidencyrtus amathus* (Walker) (from *Encyrtus*); *Coccidencyrtus indicus* (Hayat)

(from *Thomsonisca*); *Coccidencyrtus noyesi* (Japoshvili) (from *Thomsonisca*); *Coccidencyrtus pakistanensis* (Ahmad) (from *Pakencyrtus*); *Coccidencyrtus pallipes* (Chumakova) (from *Euussuria*); *Coccidencyrtus sankarani* (Subba Rao) (from *Thomsonisca*); *Coccidencyrtus shutovae* (Trjapitzin) (from *Euussuria*); *Ludesia semifacta* (De Santis) (from *Ectroma*))

Three lectotypes are designated (*Cheiloneurus compressicornis* Ashmead, 1894, *Comys cyanea* Ashmead, 1888 and *Diversinervus elegans* Silvestri, 1915).

RESUMEN

Cincuenta y un géneros que se sabe que ocurren en Costa Rica, pertenecientes a diez tribus de la subfamilia Encyrtinae (Encyrtidae), se definen por medio de caracteres diagnósticos genéricos. Se resume su biología y uso en biocontrol y se brindan claves de identificación de las 316 especies costarricenses. Todas las especies se ilustran y definen por medio de breves caracteres de diagnóstico o descripciones morfológicas completas, y se brinda información sobre sus distribuciones conocidas, rangos de hospedantes y uso en biocontrol. Se proponen como nuevos nombres de tres grupos de familias, 21 grupos de géneros y 254 grupos de especies. Una subtribu se actualiza al estado tribal; una tribu es degradada a subtribu; tres nombres de grupos de familias, 13 nombres de grupos de géneros y siete nombres de grupos de especies se proponen como sinónimos menores y dos nombres de grupos de especies se restablecen como válidos. Se proponen veintitrés nuevas combinaciones y se designan tres lectotipos.

SUMÁRIO

Cinquenta e um gêneros conhecidos de ocorrência na Costa Rica, pertencentes a dez tribos da subfamília Encyrtinae (Encyrtidae), são definidos por meio de caracteres diagnósticos genéricos. Sua biologia e uso no controle biológico são resumidos e são fornecidas chaves de identificação para as 316 espécies da Costa Rica. Todas as espécies são ilustradas e definidas por meio de breves caracteres diagnósticos ou descrições morfológicas completas, e são fornecidas informações sobre suas distribuições conhecidas, gamas de hospedeiros e uso em biocontrole. Três grupos familiares, 21 grupos de gêneros e 254 nomes de grupos de espécies são propostos como novos. Uma subtribo é elevada ao status tribal; uma tribo é rebaixada a subtribo; três nomes de grupos familiares, 13 nomes de grupos de gêneros e sete nomes de grupos de espécies são propostos como sinônimos júnior e dois nomes de grupos de espécies são restabelecidos como válidos. Vinte e três novas combinações são propostas e três lectótipos são designados.

Key Words
new taxa, identification, Encyridae, Encyrtinae, parasitoids, Hemiptera

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INTRODUCTION

This volume is the fourth in a series that will cover the taxonomy, distribution and known hosts of approximately 2,000 species of the chalcidoid family Encyrtidae that are currently known to occur in Costa Rica. The work is based largely on material resulting from an extensive programme of collecting using Malaise traps, initiated in 1985 for the purposes of surveying the Ichneumonidae of Costa Rica (see Gauld, 1997, 2000 and Gauld et al. 2002 for a summary). This was later extended to include various other groups of insects, especially microhymenoptera and incorporated the supplementary and extensive use of other suitable methods, in particular sweep-netting and yellow pan trapping. More recently (1991-2005) a systematic programme of sampling from various conservation areas, using a number of parataxonomists, was organised by the Instituto Nacional de Biodiversidad (INBio) (now part of the National Museum of Costa Rica) in Santo Domingo.

Since 1985 a representative collection of about 100,000 Costa Rican Encyrtidae has been developed and maintained at the Natural History Museum, London. This collection now forms the basis for the present work and together with material from other institutions will be used for revisionary studies of other groups within the family. Although these treatments deal only with the Costa Rican fauna, where species are known to have a wider distribution this information is also provided here. Unfortunately, for many taxa included in the current work, it has proven very difficult to assess the wider distribution of most species because this would require an unacceptable amount of time slide-mounting material to confirm the identity of species material collected in other parts of South and Central America.

As the International Commission of Zoological Nomenclature still maintains the archaic and largely impractical rule that the gender of species names must agree with that of the genus in which they are included (fourth edition – Article 31.2; see ICZN, 1999), all new species group names proposed herein are to be treated as patronyms, arbitrary combinations of letters or nouns in apposition. In this way the spelling of the names will not change should the species be transferred to a genus of different gender at any time in the future.

The Encyrtidae is one of the largest and easiest families of Chalcidoidea to recognise (see below). Including the taxa described as new herein, it currently includes about 500 valid genera and 5100 valid species and represents one of the most important groups used in the biological control of agricultural pests worldwide (Noyes, 1985a; Greathead, 1986), especially mealybugs (Hemiptera: Pseudococcidae), although their use in the control of soft scales (Hemiptera: Coccidae) and other Coccoidea has often been very successful (see Noyes & Hayat, 1994; Kapranas & Tena, 2015). Of the genera dealt with below, some (*Anicetus*, *Coccidencyrtus*, *Comperiella*, *Psyllaephagus*) include species that have been used very successfully used in the biological control of pest species of soft scales (Hemiptera: Coccidae), armoured scales (Hemiptera: Diaspididae) and jumping plant lice (Hemiptera: Psylloidea).

BIOLOGY OF ENCYRTINAE

Excluding egg parasitoids, all species of Encyrtinae, for which biologies are known, are koinobiont endoparasitoids of other arthropods. Both gregarious and solitary parasitoids are known, and it is likely that very many species are facultatively gregarious, e.g. *Metaphycus*. More than 160 arthropod families are known to include hosts of Encyrtinae, although where they have been reared, about half have been reared from scale insects, in particular Coccidae and Diaspididae. Species of *Ixodiphagus* are well known parasitoids of ticks (Acari: Ixodidae) and one species (*Globulencyrtus politus* Hoffer) has been reared from oribatid mites (Acari: Orobatidae). Most of the remaining recorded hosts belong to the holometabolous insect groups, mainly Lepidoptera, Diptera and Coleoptera. It is highly likely that encyrtids attacking these groups may be the most species-rich encyrtid groups in tropical forests. Hyperparasitoids are particularly common in the Encyrtinae with one tribe (Cheiloneurini) being largely composed of species that are hyperparasitic on encyrtids and other chalcidoid primary parasitoids of scale insects.

The biology, immature stages and development of the species of genera of Encyrtinae included in this study are dealt with in the relevant section of each genus. The host relationships of some of these genera as well as some others are summarised by Trjapitzin (1972a,b; Trjapitzin, 1989), Tachikawa (1974, 1978, 1981) and Noyes (1998, 2002, 2019).

The degree of host specificity of encyrtines is not known with any certainty but it appears that a good number of species can develop successfully in a variety of hosts. For instance, *Metaphycus flavus* (Howard) has been recorded from more than 35 species of soft scale hosts (see Guerrieri & Noyes, 2000) and *Copidosoma floridanum* (Ashmead) appears capable of parasitizing the immature stages of any species of plusiine noctuid (Lepidoptera) (see Noyes, 1988b; Guerrieri & Noyes, 2005). On the other hand, many species have been recorded from only one host species, but in most of these cases acceptance of other hosts or successful development within them has not been tested. However, it seems that most taxa of Encyrtinae have restricted host ranges with species attacking a particular group of hosts only. Groups that attack soft scales do not normally attack Lepidoptera and vice versa, although host shifts can occur in some groups. For instance, most species of *Ooencyrtus* are egg parasitoids of various groups of insects (mainly Hemiptera and Lepidoptera), but some are primary parasitoids of caterpillars (Lepidoptera) or syrphid larvae (Diptera: Syrphidae), with one species even apparently parasitizing eggs of Hemiptera and pupae of chloropids (Diptera: Chloropidae) (see Noyes, 1985b, 2010). Finally, *Syrphophagus* includes species that are primary parasitoids of syrphid (Diptera: Syrphidae) larvae and other species that are hyperparasitoids of aphelinid or braconid parasitoids of aphids (Hemiptera: Aphidae).

ECONOMIC IMPORTANCE OF ENCYRTINAE

A large number of species of Encyrtidae have been associated with classical biological control programmes throughout the world, but most successfully in warmer climates. The worldwide use of Encyrtidae in these programmes up to 1993 has been summarised in detail by Noyes & Hayat (1994), but see also Noyes (1998, 2002, 2019).

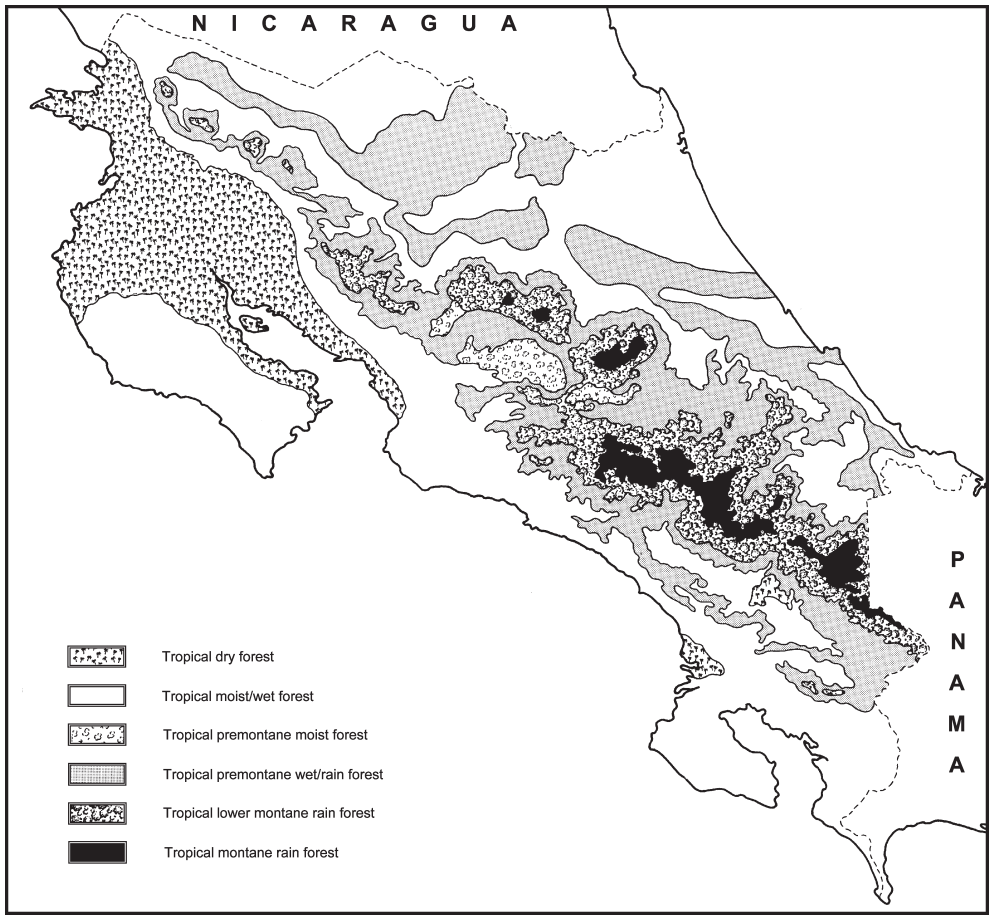
Of the 51 genera dealt with in the present volume, ten (*Adelencyrtus*, *Anicetus*, *Coccidencyrtus*, *Comperiella*, *Diversinervus*, *Neococcidencyrtus*, *Plagiomerus*, *Prionomitus*, *Psyllaephagus*, *Trechnites*) include species that have been used in biological control programmes in various parts of the World. Of these, six (*Adelencyrtus*, *Anicetus*, *Diversinervus*, *Plagiomerus*, *Prionomitus* and *Psyllaephagus*) include species that have been found in Costa Rica and have been associated with biocontrol programmes, i.e. *Adelencyrtus chionaspidis* (p. 35), *Adelencyrtus odonaspidis* (p. 39), *Anicetus annulatus* (pp. 505, 507), *Diversinervus elegans* (pp 491, 494), *Plagiomerus hospes* (p. 42, 46), *Prionomitus mitratus* (p. 555), *Psyllaephagus pilosus* (p. 578, 594) and *Psyllaephagus yaseeni* (p. 578, 595). The use of these in biocontrol programmes is outlined under each of the named species in the revisionary section below.

MATERIALS AND METHODS

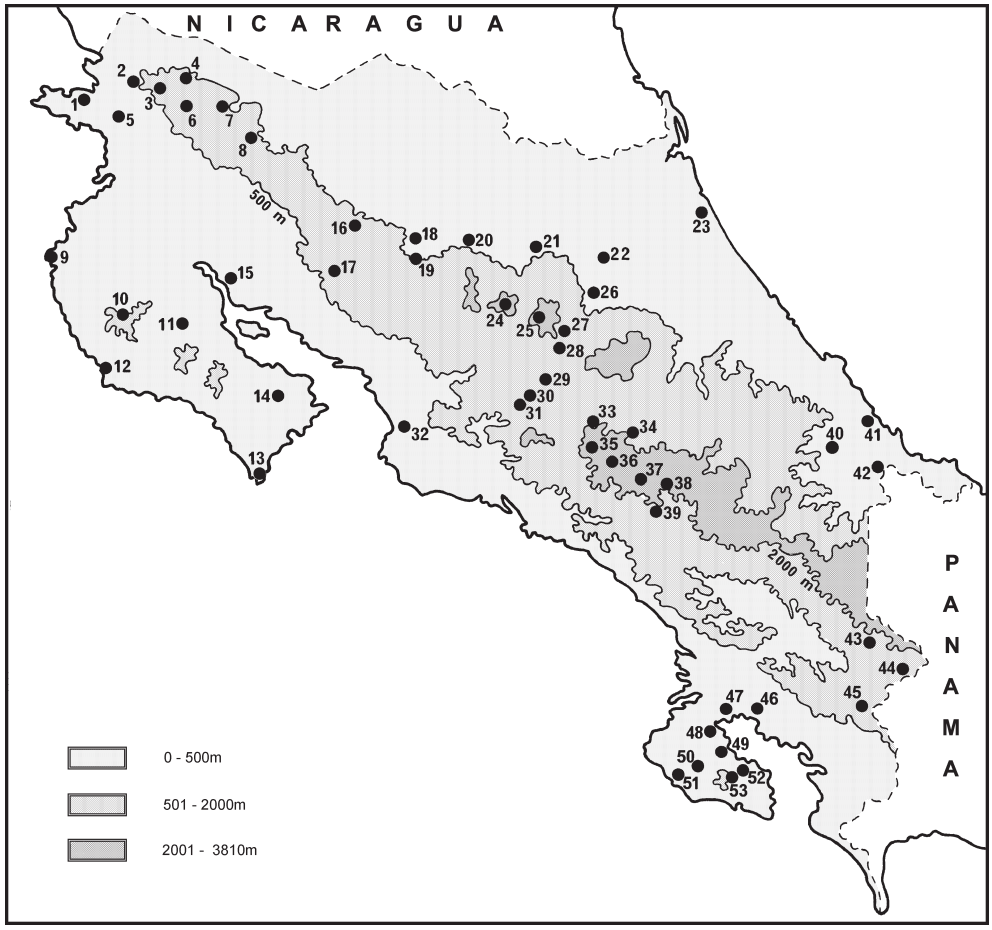
Sampling

Much of the material used in this study was obtained from an extensive Malaise trapping programme undertaken by Ian Gauld, Dan Janzen and Paul Hanson from 1985 to 1996. This material has been supplemented by numerous collecting trips, in collaboration with INBio and ACG (Area Conservación de Guanacaste), made by the author between 1990 and 2020. Other material studied includes a small collection in the NHMUK and collections loaned or donated by INBio, CNC and others (see acknowledgements). The most important collecting localities, their altitudes and the major vegetational zones represented in Costa Rica, have been dealt with previously by Hanson & Gauld (1995), Gauld (1997, 2000), Gauld, et al. (2002), Noyes (2000, 2004, 2010) and Hansson (2002, 2004, 2009, 2022). They are summarised here in Maps 1 and 2 respectively.

Material included in this revision has been collected using a variety of techniques, but most notably those outlined below.



Map 1. Costa Rica, showing approximate limits of the major Holdridge life zones (see discussion in Hanson & Gauld, 1995).



Map 2. Costa Rica showing the localities from which significant Malaise trap, yellow pan trap and sweep-net samples have been collected and processed. These are: **1.** Murcielago; **2.** Cerro el Hacha; **3.** Estación Maritza; **4.** Estación Pitilla; **5.** P.N. Santa Rosa; **6.** Estación Cacao; **7.** Finca San Gabriel; **8.** Macizo Miravalles; **9.** Marino las Baulas; **10.** Bosque Nacional Diría; **11.** Barra Honda; **12.** Zona Protectora Nosara; **13.** Reserva Absoluta Cabo Blanco; **14.** Reserva Privada Karen Mogensen; **15**. P.N. Palo Verde; **16.** Volcán Arenal; **17.** Monteverde; **18.** Jabillos; **19**. Est. Biol. San Ramon; **20.** Aguas Zarcas; **21.** Est. Biol. La Selva; **22.** Río Frio; **23.** Tortuguero; **24.** Volcán Poas; **25.** Vara Blanca; **26.** 16km W Guapiles; **27.** El Tunel (Zurqui); **28.** Zurqui de Moravia; **29**. INBio Parque; **30**. San Antonio de Escazú; **31.** Cerros de Escazú; **32.** Carara; **33**. La Cangreja; **34.** P.N. Tapanti; **35.** Mirador Quetzales; **36.** Cerro de la Muerte; **37.** Villa Mills; **38**. Est. Biol. Cuericí; **39**. 26km N San Isidro; **40.** Res. Hitoy-Cerere; **41.** Cahuita; **42.** Bribri; **43.** Est. Altamira; **44**. Las Alturas; **45.** OTS Las Cruces and Wilson Botanical Gardens, San Vito; **46.** 5km W. Peñas Blancas; **47**. Golfo Dulce; **48**. Rincon de Osa; **49.** La Palma; **50.** Est. Los Patos; **51.** Corcovado; **52**. Puerto Jimenez; **53.** Est. Agujas. (Modified from Gauld, 1997)

Sweeping - An excellent method for obtaining a large quantity of diverse material in a short time. It is especially useful when sampling grassy areas. The best apparatus for sweeping and techniques for its use have been described by Noyes (1982). Most recently all swept material has been collected directly into alcohol with remarkable results (see Noyes 2012). Data suggest that on average, an hour of sweeping will collect as many specimens as a single Malaise trap in about a month. However, the α-diversity will be very slightly lower, i.e. fewer species per equivalent sample size. Specimens may also be in slightly worse condition unless great care is taken not to sweep too violently or too long before emptying the net. As with Malaise trapping, a great deal of time must be spent separating specimens from the sample.

Malaise trapping - The most extensively used method for obtaining specimens included in the present study. It is an excellent way to obtain a diverse sample but is much less efficient than sweeping. It also requires a great deal of effort to sort specimens from a sample. A suitable malaise trap for this purpose has been described by Townes (1972). It is a particularly advantageous method for sampling areas where sweeping is difficult, e.g. where the vegetation is constantly wet.

Yellow pan trapping - Used for obtaining long series of species which may be otherwise difficult to obtain. It is an especially good method for obtaining species which may be associated with herbaceous vegetation in or at the edge of forests. It is best to use at least 50 pans to sample an area efficiently (see Noyes, 1982).

Canopy fogging - This method of collecting canopy arthropods has been developed largely as a comparative quantitative technique (Erwin, 1983) and has been described in some detail by Davis & Stork (1996) and Stork & Hammond (1997). It involves knocking down insects with a pyrethroid-based insecticide. Most recently the insecticide is applied from ground level and is carried into the canopy by convection caused by the warmer vapourised oil carrier. Insects are collected into alcohol via a series of large funnels attached to ropes about 1.5m above ground level or larger 9 sq.m collecting trays slung from trees (Erwin, 2003, pers. comm.). Canopy fogging is an excellent way of collecting encyrtids, aphelinids and eupelmids and will sample many species not encountered using other techniques.

Rearing - By far the most informative technique because it gives information on the host range of a parasitoid and, in some cases, its immature stages and their development. Rearing is best achieved by locating individuals or colonies of coccoids and isolating parasitized specimens in individual glass vials or gelatin capsules. Parasitised specimens or mummies can normally be recognised by their darker appearance, lack of mobility and generally feeling harder to the touch. On emergence the parasitoid should be allowed to live for a few hours and then killed directly into 70-80% alcohol or in an atmosphere of ethyl acetate if required.

Specimen Preparation

Where possible, specimens were prepared for study using the methods outlined by Noyes (1982, 2019). Most material was initially mounted on card rectangles. Specimens preserved in alcohol were critical-point dried to prevent collapsing (see Gordh & Hall, 1979). Specimens preserved dry were relaxed (softened), prior to mounting, in an atmosphere of glacial acetic acid in order to prevent breakage. A good proportion of material was slide-mounted to facilitate more detailed examination of certain structural features such as wing venation, segmentation of the clava and palpi, sculpture, ovipositor and male genitalia. Where only single specimens of a species were available for study, important morphological features, relative measurements and colour were noted before the specimen was slide-mounted.

Imaging

Unless otherwise stated, illustrations are of females only. Images of body parts were obtained using a Jenoptik Progres Gryphax NAOS digital camera attached to a Dialux 20 or Ziess Axiolab 5 compound microscope using bright-field illumination. From 10 to 80 images, at different focal depths, were taken of each body part to be illustrated. Habitus images were acquired using

a similar methodology, but with a Canon EOS 750D mounted on a motorised stage with synchronised flash. The stage, camera and synchronised flash were driven by Stackshot © software loaded onto a PC. The camera was fitted, depending on requirement, with a Mitutoyo 10x or 5x LWD lens with the option of also using a 70-300mm zoom lens. Up to 30 images, at different focal depths, were taken of each specimen for each orientation. Each series of images was stacked and merged into a single in-focus image using Helicon Focus ©. Where possible, extraneous micro artifacts (dust, etc.) were removed physically before imaging or the images were digitally cleaned and enhanced using PhotoShop ©.

See also comments under Notes on Images (p. 734).

A note on molecular taxonomy

Traditionally, taxonomists have integrated information from multiple datasets in order to propose and test hypotheses relating to their science. In recent years, the inclusion of molecular data has become increasingly important, and has the potential to enhance the description, identification and cataloguing of living organisms. This approach will undoubtedly prove especially useful for megadiverse groups of microhymenoptera that include a large number of morphologically similar taxa, e.g. *Aprostocetus*, *Encarsia*, *Ooencyrtus* and *Trichogramma* (see Pinto, 1999; Babcock & Heraty, 2000; Polaszek, et al., 2004), but it can be taken to extreme (Sharkey et al., 2021). Molecular data will also allow for easier association of sexes in sexually dimorphic taxa, and the identification of immature stages (Sperling, et al., 1994; Malgorn & Coquoz, 1999; Carew, et al., 2007; Antonini, et al., 2009). Molecular sequence data also have the potential to facilitate the remote identification of taxa where authentically identified material is not available. The integration of molecular data with other data should thus result in improved taxonomy, particularly if primary type specimens are connected directly to a DNA sequence (Tautz, et al., 2003).

Unfortunately, within groups of smaller insects, such as microhymenoptera, this has presented a major problem because morphological and molecular taxonomy have been virtually mutually exclusive. This is either because sampling DNA from small specimens has resulted in their complete destruction, thus precluding their future use as morphological vouchers (Babcock & Heraty, 2000; Polaszek, et al., 2004), or because their reliable identification prior to DNA extraction has required that individuals must be slide-mounted (Noyes, 1982; Noyes 2019) thus destroying any available DNA. In 2003, in collaboration with Alfried Vogler's laboratory (NHMUK), Dr Zhu Chao Dong (Chinese Academy, Beijing) and myself showed that DNA can be extracted from even the smallest specimens without damaging their appearance. Subsequent washing of the specimens in distilled water dissolves any crystals formed during lysis and they can then be transferred safely to alcohol. These specimens can be Critical Point Dried and card-mounted or directly slide-mounted. In most instances they are cleaner and easier to manipulate than before DNA extraction. Slide-mounted specimens treated in this way will require much less clearing in KOH reducing the risk of the head or antennae collapsing when they are transferred into balsam. Smaller, paler specimens can even be transferred from absolute ethanol directly into clove oil and then immediately slide-mounted without further clearing. Adaptations of this method have shown that it is possible to use even the smallest voucher specimen for both morphological and molecular study in taxonomic revisions (Polaszek et al., 2022). This is particularly important when studying a group such as Encyrtidae in a tropical area (e.g. Costa Rica) where, even after the most intensive collecting, only about 60% of species are represented by more than one specimen. It is now commonplace to extract and sequence "bar code" DNA from material that is used for taxonomic study (Ratnasingham & Hebert, 2007; Pentisaari et al., 2020; Srivathsan et al., 2018, Wang et al., 2018), but unfortunately this incredible advance in technology has come too late to be used for the present study. Most included material was collected before 2000 and had not been preserved in a way that favoured DNA preservation and subsequent extraction and sequencing. However, recent efforts of Prof. Dan Janzen (Janzen & Hallwachs, 2019; Janzen et al. 2020) to DNA barcode the entire metazoan fauna of Costa Rica will facilitate cross-referencing of at least some of the taxa included in this study with "bar code" DNA sequences.

Contrary to popular belief, experience has shown that specimens preserved in 70% alcohol are suitable for extracting bar-code DNA so long as the material is stored in cool, dark conditions as soon as possible, or for longer periods in a deep freeze at -20°C.

ABBREVIATIONS OF DEPOSITORIES

BPBM	Bernice Pauahi Bishop Museum, Honolulu, Hawaii, USA
CNC	Biosystematics Research Centre, Ottawa, Canada
DEZP	Deptartimento di Entomologia e Zoologia Agraria, Università di Napoli, Portici, Italy
INBio	Instituto Nacional de Biodiversidad, Santo Domingo de Heredia, Costa Rica (now part of Museo Nacional de Costa Rica)
INHS	Illinois Natural History Survey Insect Collection, University of Illinois at Urbana-Champaign, Illinois, USA
KYUN	Kyushu University Museum, Kyushu University, Fukuoka, Japan
LFCI	Lucian Fusu Collection, Faculty of Biology, Alexandru Ioan Cuza University, Iaşi, Romania
MLP	Facultad de Ciencias Naturales y Museo, La Plata, Argentina
MNHN	Muséum National d'Histoire Naturelle, Paris, France
MZUCR	Museo de Zoología, Universidad de Costa Rica, San Pedro, Costa Rica
NCSU	Insect Museum, North Carolina State University, Raleigh, North Carolina
NHMUK	Natural History Museum, London, England
NHRM	Naturhistoriska Riksmuseet, Stockholm, Sweden
NIAES	Insect Museum of National Institute for Agro-Environmental Sciences, Tsukuba, Japan
NZAC	New Zealand Arthropod Collection, Landcare Research, Auckland, New Zealand
PPRI	Plant Protection Research Institute, Pretoria, South Africa
QMB	Queensland Museum, Brisbane, Australia
TAMU	Texas A&M University, College Station, Texas, USA
UCR	University of California, Riverside, California, USA
USNM	National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA
ZAMU	Zoological Museum, Aligarh Muslim University, Uttar Pradesh, India
ZISP	Zoological Institute, Academy of Sciences, St Petersburg, Russia

FAUNISTIC RELATIONSHIPS

As the encyrtid fauna is so poorly known throughout all parts of the world, especially the Neotropics, it is virtually impossible to make any meaningful comments concerning the relationships between the fauna of Costa Rica and elsewhere. The majority of species (264 out of 316) that are included in this study have only been found in Costa Rica, although without doubt almost all of these will eventually be found elsewhere. For instance it is likely that many species will have a northerly distribution towards Mexico, California or elsewhere in North America as has already been noted for *Adelencyrtus chionaspidis*, *Ammonoencyrtus carolinensis*, *Ammonoencyrtus hyperion*, *Arrhenophagus albitibiae*, *Cerapterocerus phragmitis*, *Cheiloneurus argentipes*, *Cheiloneurus compressicornis*, *Cheiloneurus cupreicollis*, *Dalek arax*, *Gahaniella californica*, *Lakshaphagus arnulfoi*, *Ludesia amalthea*, *Plagiomerus hospes*, *Prionomitus mitratus*, *Prochiloneurus modestus* and *Psyllaephagus gyces*. Others will be found southwards towards Ecuador, Brazil or Argentina as have *Cheiloneurus albinotatus*, *Cheiloneurus epytus*, *Cheiloneurus longisetaceus*, *Coccidencyrtus aries*, *Coccidencyrtus cyathus*, *Coccidencyrtus umbro*, *Neococcidencyrtus drysus*, *Plagiomerus peruviensis* and *Prochiloneurus surwaka*. Some will have a Caribbean distribution as is likely for *Cheiloneurus argentipes*, *Hebynthus erythrax*, *Homalopoda cristata*, *Homosemion bennetti*, *Iceromyia flavifrons*, *Mahencyrtus nitidus* and *Plagiomerus hospes*. Three species noted in Costa Rica are cosmopolitan (*Anicetus annulatus*, *Arrhenophagus chionaspidis*, *Diversinervus elegans*).

The distribution of species within Costa Rica, and the possible influence of climate, altitude or vegetation, is difficult to assess since most are known from relatively few individuals. However, Fig. A does indicate that there is a direct relationship between higher altitude and lower species richness, although this may reflect more intensive collecting efforts at about 300m, 800m, 1200m

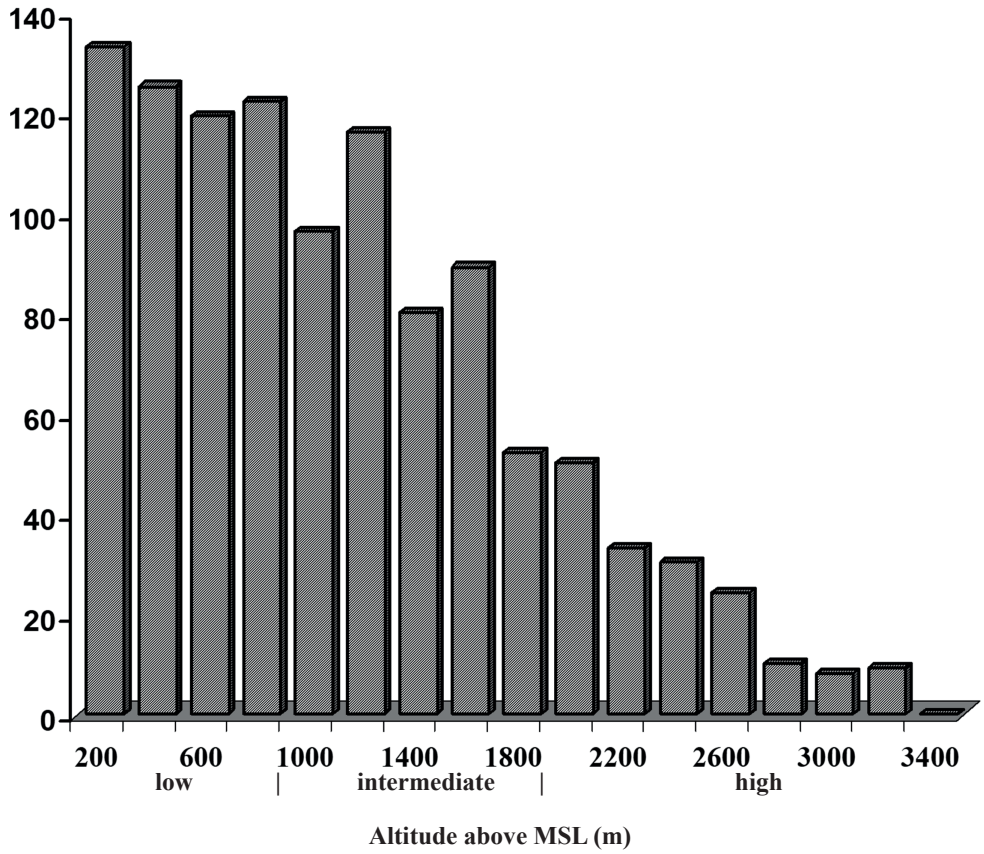


Fig. A Combined numbers of species included in this volume recorded from different altitudes in Costa Rica.

and 1600m in Guanacaste (Parque Nacional Santa Rosa – 300m, Est. Maritza and Est. Pitilla - 700m and Est. Cacao - 1100m) and Heredia (INBio Parque - 1100m, Zurqui de Moravia - 1600m). A pattern does emerge with 116 species found only below 800m, 66 only between 800m and 1800m and 32 only at 1800m or above, with 14 species occurring across all altitudinal zones. The reduction in species richness with increasing altitude probably reflects the distribution of their hosts (mostly Hemiptera, especially Coccoidea).

TERMS AND MEASUREMENTS

(see Figs 1-7)

IMPORTANT NOTE. In many cases, relative measurements can be taken directly from the images included here. However, as all images were produced from slide-mounted specimens, only relative measurements given in the descriptive text are accurate for the following: scape width, flagellar segment width, distance of antennal toruli from mouth margin, length of malar space, eye length, relative position of posterior ocelli (POL, OOL). Where given, these measurements were taken from card-mounted specimens and are more accurate. In slide-mounted specimens the

scape is rarely absolutely flat and, due to parallax affects, may appear to be much narrower than in reality. Ratios of length to maximum width obtained often have an error of about 15% and in extreme cases up to 30%. For instance, in *Gahaniella*, the scape may be actually be 3X as long as broad (measured on a card-mounted specimen) whilst it may appear to be 4X as long as broad if the same specimen is measured on a slide. The same is also true for measurements made on the head because it may not be mounted with the occiput completely flat on the slide or it may roll slightly after mounting.

The apparent shape and relative measurements of the distal funicle segments and clava if observed on a slide-mounted specimen can be especially misleading. In this case, it is important that, if possible, measurements are taken from a well-preserved, non-collapsed antenna before slide-mounting. This is because during slide mounting the funicle segments and clava may rotate ventrally slightly inwards in relation to the pedicel. The accumulated rotation from pedicel to clava may be as much as 180°. Since the flagellar segments are usually oval in cross section this will inevitably make the distal funicle segments and clava appear more slender than they actually are. On a slide, the apex of the clava may appear to be rounded, whereas in reality it is strongly obliquely truncate. This is especially true in many species of *Cheiloneurus*. For this reason many images of antennae presented in this volume are accompanied by an oval symbol that indicates that the flagellum has rotated (see comments under Notes on Images, p. 734). This symbol is accompanied by an estimate of the total rotation of the flagellum. This is estimated by carefully focusing on the margins of the sensory area of the clava. For instance, if the inner and outer margins coincide when viewed on a slide, the total rotation is estimated at 0°. On the other hand if the distance from the upper margin of the sensory area to the apparent upper margin of the clava is about the same as the lower margin of the sensory area to the apparent lower margin of the clava then the accumulated rotation is estimated at 90°. Following on from this if the upper margin of the sensory area is closer to the apparent upper margin of the clava then the rotation is greater than 90° and if it is closer to the lower margin of the clava then it is less than 90°. However, some allowance has to be made for the fact that the sensory area of the clava is usually directed slightly more inwards than directly downwards.

General

AD Air dried specimen. A reared specimen or one collected dry using a sweep-net and subsequently mounted directly on a card. In these specimens, the segments of the gaster normally telescope together and flatten from top to bottom making the specimen appear relatively shorter. The gaster also appears generally darker, especially ventrally.

CPD Critical point dried specimen. A specimen collected into alcohol and dried using a critical point dryer (see Gordh & Hall, 1979). In these specimens the gaster normally remains somewhat inflated and distended making the specimen appear relatively longer. The gaster also appears generally paler, especially ventrally.

Colour Adult encyrtids are often strongly metallic, usually blue or green, often with some distinctly coppery or shining purple areas. Whilst blue, green or copper can be relatively easy to recognise, purple is generally defined as any colour between red and blue and is also associated with violet. Within this study I have tried to limit describing a hue that is closer to red as purple and one that is closer to blue as violet. This can be very subjective and may also vary with the type of light under which the specimen is viewed and also the direction of the light. Often a specific metallic colour may appear as local "***reflections***" distributed on the surface of the cuticle or it may be "***mixed***" and come and go depending on the angle of the light. I have also used the term "***mixed***" to describe a non-metallic colour, e.g. brown, where it gradually fades from darker shades through paler shades to a similar, but paler colour, e.g. yellow.

Head (see Figs 1, 2)

Antenna. In primitive insects, the antenna is composed of only three true segments: scape, pedicel and flagellum. In some holometabolous insects the flagellum is secondarily subdivided

into false segments termed "flagellomeres". In Chalcidoidea the terminal flagellomeres are formed into a clava that is composed of one to six immovably fused flagellomeres. The remaining flagellomeres form the funicle. As terms with the suffix "-mere(s)" are somewhat cumbersome when referring to the funicle or clava, preference is given here to referring to these subdivisions of the flagellum as segments.

Antennal clava. In encyrtids, composed of one to four fused segments. The segments are separated by partial or complete sutures and are not as clearly separated as funicle segments. The sensory part of the clava is at the apex and is indicated by an area of micropilosity and/or microtubules and/or a sieve-plate structure which are only visible individually on a good slide preparation examined at high magnification. The sensory part is normally just visible in dry-mounted material and, in most species, is limited to the extreme apex of the clava although occasionally it extends along the ventral surface almost to the base which may give the clava an obliquely truncate appearance. The relative length of the sensory part of the clava can be measured in two ways. In most cases it is expressed as the relative distance it extends along the ventral surface of the clava measured from the apex of the clava along a single plane parallel to the main axis of the clava. More rarely it can be expressed as a ratio of the actual length of the sensory part of the clava to the minimum length of the ventral margin of the clava excluding the sensory part. The type of ratio used is explicitly stated in the text.

Antennal flagellum. Funicle and clava together.

Antennal funicle. The part of the antenna between the pedicel and clava. In encyrtids the funicle is composed of two to seven segments. There are usually no true anelli (extremely short, naked, ring-like segments between the pedicel and funicle) present in encyrtids.

Anterior tentorial pit. A minute depression that is formed externally where the anterior tentorial arm meets the frontovertex. The depression, or pit, delimits the clypeus dorsally and laterally and is usually visible only in larger or putatively more primitive encyrtids.

AOD Largest diameter of anterior ocellus.

AOL Minimum distance between posterior ocellus and anterior ocellus.

Dorsal tentorial arm. Correct term for "upper" tentorial arm as used previously in this series. An internal, supporting apodeme arising from the base of the anterior tentorial arm of the tentorium, near the occipital foramen, and extending to the frontovertex. In virtually all encyrtids this reaches the frontovertex between the torulus and the eye margin (see Figs 2, 28, 107, 359, 433, 1732, 1765, 1843, etc.). Frequently absent in smaller species.

EL See eye.

EW See eye.

Eye. The measurements of length (**EL**) and width (**EW**) of the compund eye are the maximum and minimum diameters respectively. The points from which the measurements are taken should be equidistant from the objective of the microscope (i.e. both in focus simultaneously). Occasionally, when stated, the length of an eye is measured in facial view from a slide-mounted specimen.

F1, F2, etc. Funicle segments one, two, etc.

FV Minimum width of the frontovertex. This is the measurement across the narrowest part of the frontovertex which is normally near the anterior ocellus and is taken either in frontal view or from above.

FVL Length of the frontovertex from occipital margin to transfacial carina or top of antennal scrobes as seen in dorsal view.

HD Depth of the head in side view, normally measured as the shortest distance from a point near the top of the antennal scrobes to the occiput.

HH Length of the head in facial view, excluding the mouth parts. The use of "head length" is avoided in this instance because this would strictly be a different measurement referring to the length of the head as seen in dorsal view.

Hypostomal area. Membranous area between the occipital foramen and labiomaxillary complex.

HW Head width measured in facial view.

Linear sensillum/a. Same as multiporous plate sensillum (MPS) of authors (e.g. Berlin & Vinson, 1981). The vast majority of species treated within this volume have the normal or

"typical" form of sensillum for Chalcidoidea, i.e. sensillum conjoined to the segment for most of its length with only the extreme apex free. A few species have a different form of sensillum, with an extreme being of similar structure to the trichoid sensillum found in Trichogrammatidae.

MS Malar space or minimum distance between the eye and the mouth margin. Measurement taken as for the eye (above). Occasionally, when stated, measured in facial view from a slide-mounted specimen.

Malar sulcus. Sulcus joining the lower margin of eye and the mouth margin, sometimes absent but usually indicated by a slight change of sculpture.

Mandible. Variable in shape, broad or relatively slender and with two or three, acute teeth. One or two teeth may be transversely or obliquely truncate.

OCL Minimum distance between the posterior ocellus and the occipital margin.

OEL Minimum distance between the eye and the occipital margin.

OD The longest diameter of an ocellus. Where two measurements are given the larger is that of anterior ocellus (**ODA**) and the smaller is that of posterior ocellus (**ODP**).

OOL Minimum distance between the eye margin and the adjacent posterior ocellus.

POL Minimum distance between the posterior ocelli.

SL Length of the scape. This excludes the radicle and is most accurately measured along the internal surface of the scape.

SW Maximum width of the scape. **NB** - The width of the scape must always be measured on card-mounted specimens because the scape is rarely perfectly flat on slide-mounts and the scape will appear to be more slender than it actually is. As a result of parallax affects, measuring the width of the scape on a slide-mounted specimen can lead to a 10-15% error in calculating the relative length of the scape to its width, but in extreme circumstances can be as much as 50%.

Upper tentorial arm. See dorsal tentorial arm.

Mesosoma (thorax and propodeum) (see Figs 3-5)

Fore wing (see Figs 3, 4)

Campaniform sensillum: small rounded sensillum, usually one of a group of four at the apex of stigmal vein (Fig. 4), or paired on the scutellum, the sensillum detects mechanical stress in the cuticle.

Cubital vein track: a line of setae on the dorsal surface of fore wing delimiting the basal cell posteriorly.

Filum spinosum: a series of peg-like structures on the distal margin of the linea calva which are clearly stouter than adjacent setae and whose function probably is to help keep the wings closed during jumping.

FWL: maximum length of the fore wing, excluding the marginal fringe, measured from the base of submarginal vein to the apex of the wing.

FWW: maximum width of the fore wing, excluding marginal fringe, normally measured along an imaginary straight line at a right angle from the anterior margin of the wing to the opposite anal angle.

Linea calva: an oblique hairless line extending from the stigmal vein to the posterior margin of the fore wing. The linea calva may be *closed* by one or more lines of setae near the posterior wing margin or *interrupted* by one or more lines of setae at about one-third of its length from the posterior wing margin, sometimes both, or completely open and not interrupted (*entire*).

Marginal vein: length measured from the subhyaline break at apex of the submarginal vein to the proximal margin of the stigmal vein where it joins the marginal vein. Occasionally the subhyaline break is obliterated but its position can be determined by the position of a single campaniform sensillum on the dorsal surface of the submarginal vein a little before it joins the marginal vein. The position of the hyaline break is immediately distad of this sensillum.

Parastigma: swollen, apical one-third of the submarginal vein (**SMV**), sometimes distinctly triangular in shape.

Postmarginal vein (**PMV**): length measured from the postmarginal part of stigmal vein where

it joins the marginal vein (**MV**) to the apex of the postmarginal vein. Its apex is occasionally indicated by a single erect seta.

Stigmal vein (**SV**): length measured from its proximal margin, where it joins the marginal vein, to its apex.

Subcubital vein track: a line of setae on the ventral surface of the fore wing delimiting basal cell posteriorly.

Uncus: "beak-like" extension at apex of stigmal vein

Hind femur. Length excludes the trochanter.

HWL Length of the hind wing, excluding the marginal fringe.

HWW Width of the hind wing, measured at the widest point, excluding the marginal fringe.

MT Length of the mid tibia.

MTS Length of mid tibial spur

Notaular lines. Superficial lines on the mesoscutum running from the antero-lateral margin of the mesoscutum to the centre of its posterior margin (Fig. 3, see also Figs 1481, 1489, 1492).

Propodeum. Length of the propodeum is measured along its mid-line in dorsal view.

Scutellum. Length of the scutellum is measured along the mid-line; the width excludes the axillae.

Sub median lines. A pair of submedian lines on the propodeum, often subcuticular, clearly seen in many genera of encyrtids and may be homologous with plicae in other chalcidoids.

Gaster (metasoma excluding the petiole) (see Figs.6, 7)

Female (Fig. 6)

GL The length of the gonostylus (see also third valvula).

Gonostylus. Ovipositor sheath or free apical part of third valvula, as seen in slide-mounted material.

Gs1, Gs2, etc. Gastral sternites one, two, etc. (see Fig. 1698)

Gt1, Gt2, etc. Gastral tergites one, two, etc. (see Figs 68, 149, 162, 163, 523, etc.)

Hypopygium. Apical, externally visible sternite.

[MT See above under Thorax.]

OL Length of the ovipositor. Measured as the combined length of second valvifer and third valvula because the ovipositor valves (1st and 2nd valvulae) are moveable in relation to the rest of the ovipositor and can be relatively longer or shorter depending on whether they are extended or retracted.

Outer plates of ovipositor. Two relatively large triangular to subrectangular sclerites that are attached on each side to the middle part of the smaller subtriangular fulcrum (1st valvifer) at one end and the syntergum at the other. They were originally part of the ninth abdominal tergite but have become separated off in Encyrtinae.

Second valvifer. The most obvious sclerite of the ovipositor. It is generally shaped like a broad hockey stick with the broadest part (semicircular sheet) to the anterior and it extends for most of the length of the ovipositor complex. It is completely immovable in relation to the remaining parts of the ovipositor against which the 1st valvifer acts to move the 1st and 2nd valvula to transport the egg during oviposition.

Semicircular sheet. The anterior and broadest part of the second valvifer loosely semicircular in shape, usually with a crescent-shaped anterior margin and is a point of attachment for muscles used in oviposition (see Copland & King, 1971). It has a posterior, dorsal, filamentous to narrowly triangular "post ramus extension" that has some taxonomic importance.

Syntergum. The fused apical tergites of the gaster (Gt7 and Gt8; abdominal tergites 9 and 10) of encyrtids. The length is measured from an imaginary line connecting the anterior margins of the cercal plates (excluding any short phragma if present) to its apex and the width is measured from the outer margins of the cercal plates.

Third valvula. This sclerite runs along the length of the inner margin of the second valvifer but the two are fused at this point and indistinguishable. Distally, it extends past the apex of the second valvifer and is free. The free part is called the gonostylus or ovipositor sheath and acts to protect the exserted part of the ovipositor proper (first and second

valvulae). The gonostylus is freely articulated with the second valvifer in *Psyllaephagus* and related genera.

VFII+GS. Combined length of the 2nd valvifer and the gonostylus (3rd valvula); the maximum width is measured across the gonostylus at its widest point.

Male (Fig. 7)

AL Length of the aedeagus, including apodemes.

Cuspis seta. A seta sometimes present on the phallobase of encyrtids near the base, and slightly outside, of each digitus that originates from a corner of the genital capsule defined as the cuspis (Sanger & King, 1971).

Digitus/i. Paired submedian, finger like processes at the external apex of the phallobase. Each digitus has from one to three apical teeth and can be splayed outwards to clasp the female internally during copulation.

Paramere(s). Paired, apical lateral lobes at the external apex of the phallobase. If present and distinct, visible as a finger-like process outside each digitus and usually with a single apical seta.

Phallobase. Part of genitalia, excluding aedeagus.

CHARACTERS OF ENCYRTIDAE

Within the Chalcidoidea, the Encyrtidae can be distinguished by six major characters:

1. Head with dorsal tentorial arms reaching the frontovertex between the inner eye margin and torulus. This character state is present in almost all Encyrtidae and has been reported elsewhere only in Eunotidae (Dzhanokmen, 2000). It may be a synapomorphy of these two families.
2. Fore wing with a well-defined linea calva (see Terms and Measurements above). A true linea calva is known only in Encyrtidae, many Aphelininae (Aphelinidae) and a few Eupelmidae.
3. Mesopleuron convex and not divided obliquely into separate parts. This character is characteristic of jumping taxa inlcuding Encyrtidae, Tanaostigmatidae, some Eupelmidae and a few Aphelinidae, e.g. *Coccobius*. Other Aphelinidae have the mesopleuron somewhat similar in appearance, but have an indistinct, posterior, transverse division, e.g. *Eutrichosomella*.
4. Mid coxa inserted level with mid-line of mesopleuron. So far as it is known, this is an autapomorphy for Encyrtidae.
5. Cerci advanced towards anterior of gaster, sometimes even into anterior half. This character state is present in all Encyrtidae except two genera, *Oriencyrtus* and *Oesol*. Some representatives of other families may have the cerci slightly advanced, but never so strongly, e.g. Aphelinidae and Eupelmidae.
6. Outer plates of the ovipositor completely separated from tergite IX of abdomen (Encyrtinae) or connected by an elongate sclerotised strip (paratergite) (Tetracneminae). Both features almost certainly result from advancement of the cerci. Outside the Encyrtidae there are no taxa where the outer plates of the ovipositor are completely separated from abdominal tergite IX. However, in some *Coccophagus* (Aphelinidae) the cerci may be slightly advanced and the connection may be very weak via a very narrow filamentous strip, similar to the paratergites of some Tetracneminae.

CLASSIFICATION OF ENCYRTIDAE

Trjapitzin (1973a,b, 1989) has discussed the different systems of classification that have been used within the Encyrtidae. He proposed a division into two subfamilies, the Encyrtinae and Tetracneminae and this classification has been largely followed by others, e.g. Trjapitzin & Gordh (1978), Noyes & Hayat (1994), Noyes (2000, 2004) and Hayat (2004, 2006). This classification is practical, and is followed here, but recent molecular work suggests that at best the Tetracneminae is a grade-level taxon and the Encyrtinae is probably paraphyletic.

All Tetracneminae have a narrow sclerotized filament (paratergite) which more or less retains the connection of the outer plates of the ovipositor with abdominal tergite IX. The shape of the outer plates (see below) and the immovable fusion of the third valvulae to the second valvifers are

diagnostic of the group. In some tetracnemines the paratergites are interrupted, but this is assumed to be secondary. A few taxa of Tetracneminae may have the third valvulae freely articulated with the second valvifers, but this is also probably secondary. In all Encyrtinae the outer plates of the ovipositor are more or less broadly triangular, separated from the ninth abdominal tergite and connected to the apical parts of the syntergum (fused abdominal tergites IX and X) only by a weak membrane. In most Encyrtinae the gonostyli (third valvulae) are articulated with the second valvifers. Where they are fused with the second valvifers this is thought to be secondarily derived, e.g. *Encyrtus* and some *Copidosoma*.

Separation of the two subfamilies by a non-expert is difficult, but the Encyrtinae can be distinguished from the Tetracneminae using the combination of characters given below.

Encyrtinae

Linea calva mostly with marginal setae differentiated with longer setae along proximal margin; filum spinosum usually present. FEMALE: outer plates of ovipositor subtriangular and apically truncate (although sometimes with an elongate tapering lateral projection, e.g. Quadrencyrtini), completely separated from syntergum; apex of hypopygium mostly not reaching apex of gaster, only in a few species extending past apex of syntergum; gonostyli, with very few exceptions, freely articulated with second valvifers.

Tetracneminae

Linea calva with marginal setae undifferentiated, more or less of equal size; filum spinosum except very rarely, not developed. FEMALE: outer plates of ovipositor relatively slender and not apically truncate, but each plate produced into a narrow filament which connects with paratergite near apex of syntergum; apex of hypopygium always reaching a little way past apex of syntergum (occasionally, if specimen has been preserved in alcohol and gaster is distorted as a result of air-drying, hypopygium may appear not to reach level with apex of syntergum); gonostyli (third valvulae), with only a few exceptions, immovably fused to second valvifers.

In the latest comprehensive treatment of Encyrtidae, Trjapitzin (1989) recognised 13 tribes within the Tetracneminae and 34 tribes within the Encyrtinae. In this classification two tribes were transferred from the Encyrtinae (Trjapitzin's 1973b classification) to the Tetracneminae, i.e. Quadrencyrtini (including *Eucoccidophagus* and *Quadrencyrtus*) and Oriencyrtini (including *Oriencyrtus*). This was supported by the apparent presence of paratergites (Sharkov, 1988b). This is not followed here because studies of slide-mounted material of these genera indicate that these so-called paratergites present are not homologous with those found in the Tetracneminae. There appears to be no doubt that the genera included in the Quadrencyrtini and Oriencyrtini are most closely related to *Aphycoides* which is retained in the Encyrtinae, tribe Microteryini by Trjapitzin (1989b) (see discussion in Noyes & Hayat, 1994).

The genera included in the current work belong in the subfamily Encyrtinae. Including the Quadrencyrtini and Oriencyrtini, Trjapitzin (1989b) recognised 36 tribes within the Encyrtinae. Hayat (2004, 2006) slightly modified this classification by adding a further three tribes and two new subtribes. In all these works, few of the tribes are clearly defined and therefore placement of taxa within their proposed tribal framework is difficult. It is likely that the number of tribes regarded as valid will be reduced for the currently described genera when a rigorous phylogenetic study of the subfamily as a whole can be undertaken.

Luckily, most genera dealt with in the present work can be placed within this tribal framework because of clear affinities with the type genera of the family groups recognised by these authors. The classification utilised here is modified from these classifications and can be summarised as follows:

Arrhenophagini Ashmead 1900

Tarsi 4-or 5-segmented; mandible pointed; antenna with anelliform, adpressed, indistinctly delimited funicle segments, clava relatively very large, much longer than funicle and

pedicel combined; fore wing with apex of venation poorly defined; mesopleuron clearly not reaching level with posterior margin of propodeum, broadly separated from base of gaster by the propodeum and hind coxa. Primary parasitoids of armoured scale insects (Hemiptera: Diaspididae).

Arrhenophagus

Habrolepidini Hoffer, 1955 (= Thomsoniscini Hoffer, 1956 **syn.nov**.)
Mandible with a socketed peg-like structure on inner surface near ventral margin (see Figs 23, 64, 155, 187, 272, 364 – arrowed); head usually strongly triangular in profile; scutellum flat, usually with deep reticulate or striate sculpture; mesopleuron clearly not reaching level with posterior margin of propodeum, separated from base of gaster by the propodeum and hind coxa. Primary parasitoids of armoured scale insects (Hemiptera Diaspididae).

Habrolepidina Hoffer, 1955
Males with 2-segmented funicle and enlarged, sausage-shaped clava.

Adelencyrtus, Plagiomerus, Caenohomalopoda, Homalopoda, Pseudhomalopoda

Thomsoniscina Hoffer, 1956 (= Comperiellina Trjapitzin, 1973 **syn.nov.**)
Males with 6-segmented funicle, usually filiform with subequal segments that are clearly longer than broad and clothed with whorls of long setae that are mostly at least 3X as long as diameter of segments.

Coccidencyrtus, *Comperiella*, *Neococcidencyrtus*, *Quetsira*, *?Orixia*

Cerapterocerini Hoffer, 1955
Submarginal vein with a conspicuous triangular expansion; females with a radiating pattern of infuscate and hyaline areas on fore wing; no conspicuous naked hyaline streak connecting postmarginal and stigmal veins; scape and flagellum strongly broadened and flattened; mesopleuron not reaching level with posterior margin of propodeum, broadly separated from base of gaster by propodeum and hind tibia. Males with filiform antennae with subequal funicle segments that are clearly longer than broad and clothed with whorls of long setae that are usually at least 3X as long as diameter of segments. Secondary parasitoids of soft scale insects (Hemiptera: Coccidae) via encyrtid primary parasitoids. Possibly should be considered as a subtribe of Cheiloneurini.

Cerapterocerus

Cheiloneurini Hoffer, 1955 (= Chalceryini Trjapitzin, 1973 **syn.nov.**)
Females often with fore wing infuscate and with a naked hyaline streak connecting apices of postmarginal veins and stigmal veins and which usually extends some way into disc past apex of stigmal vein; if fore wing infuscate then never with a radiating pattern of infuscate and hyaline areas; fore wing often either with parastigma conspicuously downcurved or occasionally with a triangular expansion; often with a subapical tuft of setae on the scutellum; scape and flagellum often strongly broadened and flattened; mesopleuron mostly extending to level of posterior margin of propodeum or beyond and touching, or nearly touching, base of the gaster, sometimes clearly not reaching posterior margin of propodeum and broadly separated from gaster by propodeum and hind coxa. Males dissimilar to females, almost always with hyaline fore wings and a filiform flagellum with subequal funicle segments that are clearly longer than broad and clothed with whorls of long setae that are usually at least 3X as long as diameter of segments. Mostly primary and secondary parasitoids of soft scale insects (Hemiptera: Coccidae), monophlebids (Hemiptera: Monophlebidae) and lac insects (Hemiptera: Kerriidae). Some species are parasitoids of Dryinidae (Hymenoptera).

Ammonencyrtus, *Angebra*, *Anicetus*, *Anisophleps*, *Cheiloneurus*, *Diversinervus*, *Eusemion*, *Helegonatopus*, *Homosemion*, *Iceromyia*, *Lakshaphagus*, *Ludesia*, *Mahencyrtus*, *Prochiloneurus*,

Possibly also the following: *Georynus*, *Oodia, Prionias*, *Stadima*, *Strigenia*, *Tico.*

Trechnitini Hoffer, 1955

Body usually with a strong metallic sheen; mandible usually modified, mostly with one or two teeth and a broad truncation, or with a very small tooth and broad oblique truncation; marginal vein of fore wing mostly not longer than broad, often absent, rarely as much as 2X as long as broad. Primary parasitoids of jumping plant lice (Psylloidea).

Trechnitina Hoffer, 1955

Hypopygium reaching apex of gaster, enclosing ovipositor; marginal vein absent to punctiform, never longer than broad.

Prionomitus, *Sectiliclava*, *Trechnites*

Metaprionomitina Hoffer, 1955

Hypopygium not reaching apex of gaster; marginal vein punctiform, sometimes slightly longer than broad.

Psyllaephagus

Cercobelini Hoffer, 1953

Gaster telescopic, all sternites with relatively long anterolateral apodemes, ovipositor strongly modified, capsule-like and relatively short, outer plates attached to distinct lateral lobes near apex of syntergum; mesopleuron clearly not reaching level with posterior margin of propodeum, separated from base of gaster by the propodeum and hind coxa. Parasitoids of jumping plant lice.

Cercobelus, *Arianus*

Polaszekiini trib.nov.

Ovipositor structure unique, exserted part very slender and almost filamentous, outer plates slender and ribbon-like; first valvifer strongly triangular, elongate, all sides virtually straight; proximal part (semicircular sheet) of second valvifer with posterior margin almost straight, not concave or C-shaped; hypopygium elongate with posterior margin W-shaped with a strong lobe either side of a distinct median mucro; mesopleuron not quite reaching level with posterior margin of propodeum, narrowly separated from base of gaster by propodeum and hind coxa.

Polaszekius

Protyndarichoidini trib.nov.

Mandible tridentate with three equal acute teeth; fore wing with marginal vein about 3X as long as broad, stigmal vein subsessile with three placoid sensilla at apex; propodeum at least 0.2X as long as scutellum; mesopleuron not reaching level with posterior margin of propodeum, broadly to narrowly separated from base of gaster by propodeum and hind coxa; ovipositor with second valvifer curved upwards towards apex and with semicircular sheet reduced, hardly broadened; outer plate of ovipositor broadly triangular, about 1.5X as long as broad.

Protyndarichoides

Gahaniellini trib.nov.

Antenna placed high on the head with lower margins of torulus about level with lower eye margin; funicle segments subquadrate, subequal and with conspicuous longitudinal sensilla; mandible with one tooth and a broad truncation, apex of stigmal vein with only 3 placoid sensilla; mesopleuron not quite reaching level with posterior margin of propodeum, narrowly separated from base of gaster by propodeum and hind coxa; ovipositor with a short flat leaf-like extension at the apex of the second valvifer that overhangs the proximal part of the gonostylus. Probably secondary parasitoids of various scale insects (Hemiptera: Coccoidea).

Gahaniella

Syrphophagini Trjapitzin, 1973 **stat.nov.**

Mandible tridentate with upper tooth transversely truncate or broadly rounded; scutellum convex, often with deeper sculpture than mesoscutum; fore wing with marginal vein at least 2.5X as long as broad (usually more than 4X as long as broad) and postmarginal vein distinct, from about half as long as stigmal vein to about as long; mesopleuron reaching about level with posterior margin of propodeum, narrowly separated from base of gaster by propodeum and hind coxa, occasionally nearly touching. Probably associated with sternorrhynchous Hemiptera as primary or secondary parasitoids or parasitoids of predators of sternorrhynchous Hemiptera. I consider the tribe to belong to a lineage of Encyrtidae that includes mainly associates of Holometabolous insects and is a possible sister group to the Copidosomatini + Bothriothoracini. It seems probable that this lineage diverged early from the main lineage of Encyrtinae that is now mostly associated with Hemiptera, especially scale insects (Coccoidea) and other sternorrhynchs.

Alkonia, *Caldencyrtus*, *Dalek*, *Elaxis, Esphora*, *Harlarus*, *Hebynthus*, *Mendisa, Raquanus*, *Sosara, Syrphophagus* [1]

Given the above definition, the Syrphophagini may also include *Diaphorencyrtus* Hayat, but not *Metablastothrix* Sugonjaev or *Aphidencyrtoides* Ishii. These genera were previously included in the subtribe Syrphophagina which was included in the Microteryini by Trjapitzin (1973, 1989).

Even though the family groups included within the present revision are difficult to define or recognise, a key is presented below which should facilitate the correct placement of females within the generic framework utilised in this study.

KEY TO COSTA RICAN GENERA INCLUDED IN THIS VOLUME

(Females)

1. Antennal funicle with not more than 5-segments 2
- Antennal funicle with 6 segments 8

2 (1) Antenna (Figs 9, 12) with funicle segments variable and closely adpressed together making them difficult to distinguish from clava; clava 1-segmented; fore wing hyaline; tarsi 4-segmented; small species about 0.5-0.6mm in length .... *Arrhenophagus* (p. 28)
- Antenna with funicle segments easy to distinguish from clava; clava 3-segmented; tarsi 5-segmented; generally larger species 0.5-2.5mm in length 3

[1] A revision of the Costa Rican species of *Syrpophagus* Ashmead will appear in the next volume of this series.

3 (2) Fore wing with stigmal vein at least slightly longer than marginal vein (e.g. Figs 1472, 1496, 1651, 1682); head not triangular in profile with frontovertex distinctly curved above top of antennal scrobes; hypopygium reaching apex of gaster; scutellum dorsally convex 4
- Fore wing with stigmal vein shorter than marginal vein (e.g. Figs 42, 58, 67, 75, 165); head strongly triangular in profile with frontovertex above antennal scrobes flat; hypopygium not reaching more than about two-thirds along gaster; scutellum dorsally very flat 5

4 (3) Funicle 5-segmented ..... *Trechnites* (p. 567)
- Funicle 4-segmented ..... *Cercobelus* (p. 608)

5 (3) Fore wing hyaline ..... *Plagiomerus* (p. 41)
- Fore wing with a pattern of infuscate and hyaline areas 6

6 (5) Pronotum triangular in dorsal view, medially about half as long as mesoscutum .... *Caenohomalopoda* (p. 80)
- Pronotum with posterior margin strongly concave, medially not more than about one-sixth as long as mesoscutum 7

7 (6) Fore wing with a distinct, single hyaline spot at apex (Figs 141, 148, 152); flagellum distinctly flattened with all funicle segments transverse .... *Pseudhomalopoda* (p. 74)
- Fore wing with a pair of opposite, subapical hyaline spots (e.g. Figs 74, 83, 98) or apex subhyaline (e.g. Figs 103, 111, 115); flagellum subcylindrical with at least one segment longer than broad ..... *Homalopoda* (p. 53)

8 (1) Scape not more than 2X as long as broad 9
- Scape more than 2X as long as broad 24

9 (8) Flagellum with segments strongly broadened and flattened (e.g. Figs 346, 372, 1240, 1252, 1261, 1262) 10
- Flagellum with segments subcylindrical 15

10 (9) Apex of clava transversely truncate, the truncation formed by an enlarged sensory area that does not extend along ventral surface of clava (Fig. 346); body dorsoventrally flattened; head distinctly triangular in profile with frontovertex forming an angle of less than 60° with face ..... *Comperiella* (p. 142)
- Apex of clava with a strong oblique truncation formed by an enlarged sensory area that extends more than half way along ventral surface of clava (e.g. Figs 372. 1240, 1252, 1261, 1262); body not dorsoventrally flattened; head not triangular in profile 11

11 (10) Fore wing with several sharply delimited triangular or subtriangular hyaline areas in apical half (Figs 373, 375); some brachypterous specimens known .... *Cerapterocerus* (p. 150)
- Fore wing generally infuscate, except for hyaline apex and sometimes base, without any sharply delimited triangular hyaline areas (e.g. Figs 1245, 1253, 1272, 1280, 1303) 12

12 (11) Infuscate area of fore wing enclosed subapically by a darker curved band (e.g. Figs 1272, 1280) ..... *Anicetus* (p. 504)
- Infuscate area of fore wing not enclosed subapically by a darker curved band (e.g. Figs 1245, 1253, 1303) 13

13 (12) Hyaline apex of fore wing more or less uniformly curved (Figs 1253, 1255) .... *Eusemion* (p. 499)
- Hyaline apex of fore wing subtriangular (e.g. Figs 1247, 1304, 1321) 14

14 (13) Frontofacial carina interrupted medially where frontovertex and interantennal prominence are more or less confluent (Figs 1305, 1319, 1332); antenna with F1 very broad and flat, more than 2X as wide as pedicel and at least as wide as F6 (e.g. Figs 1303, 1323, 1331) ..... *Ammonoencyrtus* (p. 518)
- Frontofacial carina continuous across face above antennal scrobes (Fig. 1246); antenna with F1 transverse but not conspicuously broadened, only about as wide as pedicel and less than half as wide as F6 (Figs 1240, 1244) ..... *Homosemion* (p. 497)

15 (9) Fore wing infuscate, usually with apices of postmarginal and stigmal veins connected by a conspicuous, slender, hyaline streak which continues a little way into wing disc past apex of stigmal vein (e.g. Figs 480, 486, 497, 1029, 1034, 1112) 16
- Fore wing hyaline, apices of postmarginal and stigmal veins not connected by a conspicuous, slender hyaline streak 19

16 (15) Either scutellum with a subapical tuft of setae (e.g. Figs 1028, 1036, 1121) or apical hyaline area of fore wing subtriangular, infuscate area not delimited by a darker curved band (e.g. Figs 1029, 1030, 1126); marginal vein always at least 1.3X as long as stigmal vein ..... *Cheiloneurus* (p. 197)
- Scutellum without a distinct subapical tuft of setae, sometimes with a few scale-like setae (Fig. 494); apical hyaline area of fore wing curved with infuscate area delimited by a darker band (e.g. Figs 476, 486, 497); marginal vein always at least slightly shorter than stigmal vein 17

17 (16) Fore wing with parastigma strongly downcurved and with a distinct triangular expansion proximally (Figs 486, 489); sculpture of mesoscutum and scutellum similar, both with whorls of very fine, striate sculpture (Fig. 483) ..... *Anisophleps* (p. 189)
- Fore wing with parastigma at most weakly downcurved, without a proximal triangular expansion (Figs 476, 480, 497); scutellum (Fig. 494) mostly with coarse, longitudinally elongate striate-reticulate sculpture that contrasts with the shallower imbricate-reticulate sculpture of mesoscutum 18

18 (17) Head (Fig. 492) at least 6X as wide as frontovertex; top of scrobes delimited by a strong transfacial carina; scutellum (Fig. 494) with at least two, distinctly scale-like setae; fore wing (Figs 496, 497) with differentiated scale-like setae along proximal margin of linea calva .....*Lakshaphagus* (p. 194)
- Head (Fig. 471) not more than 5X as wide as frontovertex; top of scrobes not delimited by a strong transfacial carina; scutellum with scattered, uniformly bristle-like setae; fore wing (Figs 476, 480) without differentiated scale-like setae along proximal margin of linea calva ..... *Angebra* (p. 185)

19 (15) Fore wing (Fig. 444) with basal cell more or less evenly setose; hypopygium reaching apex of gaster, extending very slightly past apex of syntergum; outer plates of ovipositor slender and ribbon-like (Fig. 443) ..... *Stadima* (p. 174)
- Fore wing with a large, distinct naked area in basal cell (e.g. Figs 1839, 1854, 1974); hypopygium not reaching more than 0.8X along gaster; outer plates of ovipositor narrowly triangular (e.g. Figs 1836, 1856, 1872) 20

20 (19) Clava (Fig. 1969) with sensory part extending more than half-way along ventral margin giving it a strong, obliquely truncate appearance ..... *Elaxis* (p. 710)
- Clava (e.g. Figs 1837, 1841, 1859, 1874) with apex rounded, transversely truncate or hardly obliquely truncate 21

21 (20) All funicle segments longer than broad (Figs 1837, 1841) 22
- At least some funicle segments quadrate or transverse (Figs 1859, 1866, 1874) 23

22 (21) Mouth less than one-third head width; scutellum (Fig. 1846) with striate sculpture; antennal funicle (Fig. 1841) with F1 conspicuously smaller than F2; ovipositor shorter than mid tibia; hypopygium (Fig. 1840) not W-shaped, lateral arms vestigial ..... *Harlarus* (p. 669)
- Mouth more than one-third head width; scutellum with cellular sculpture; antennal funicle (Fig. 1837) with F1 subequal to F2; ovipositor longer than mid tibia; hypopygium W-shaped with elongate anterior lateral arms ..... *Mendisa* (p. 666)

23 (21) Funicle (Figs 1859, 1860, 1866) with contrasting pale (white or pale yellow) and dark (brown) segments; mandible (Figs 1855, 1862) tridentate with two acute lower teeth and third transversely truncate, upper tooth ..... *Esphora* (p. 674)
- Funicle (Fig. 1874) unicolourous pale orange; mandible (Fig. 1873) with 1 sharp tooth and a broad, upper, slightly concave truncation ..... *Sosara* (p. 679)

24 (8) Brachypterous species, fore wing not reaching apex of gaster 25
- Fully winged species, fore wing extending past apex of gaster 26

25 (24) Scutellum without a subapical tuft of setae (Figs 456, 464) ..... *Ludesia* (p. 178)
- Scutellum with a subapical tuft of setae (Figs 951, 982, 985) ..... *Cheiloneurus* (p. 197)

26 (24) Scutellum with a subapical group of setae that are clearly more dense and longer than those elsewhere on scutellum and which form a distinct tuft (e.g. Figs 519, 653, 741, 868, 1150, 1233); ovipositor often clearly strongly exserted with exserted part at least about 2X as long as mid tibial spur 27
[NB - The scutellar tuft may be overlooked because setae may be lost or very sparse (e.g. Figs 520, 521) - if fore wing is strongly infuscate then apices of postmarginal and stigmal veins are usually connected by a slender, naked, hyaline streak that goes someway past the apex of the stigmal vein into the wing disc (e.g. Figs 679, 694, 714.]
- Scutellum with setae evenly distributed and not forming a subapical tuft; exserted part of ovipositor rarely longer than mid tibial spur, never more than 1.5X as long as mid tibial spur 30

27 (26) Mesoscutum with a distinct median tuft of setae (Fig. 1233); fore wing fully developed and with stigmal vein longer than marginal vein (Fig. 1231) ....*Diversinervus* (p. 490)
- Mesoscutum without a tuft of setae; if fore wing fully developed then stigmal vein much shorter than marginal vein (e.g. Figs 679, 694, 714, 1084) 28

28 (27) Fore wing evenly infuscate from level of marginal vein to wing apex except for a hyaline streak at apex of venation (Fig. 1238); marginal vein not more than 1.5X as long as stigmal vein (Fig. 1239) ..... *Iceromyia* (p. 495)
- Fore wing infuscate or hyaline, if infuscate then either with conspicuous hyaline or paler areas between level of marginal vein and wing apex (e.g. Figs 679, 694, 714) or marginal vein at least 2X as long as stigmal vein 29

29 (28) Hypopygium reaching apex of gaster; scutellum with setae forming subapical tuft arranged in distinct longitudinal rows (e.g. Figs 1160, 1173, 1214); ovipositor always conspicuously exserted with sheaths together forming a uniform, slender cylindrical tube; fore wing infuscate with distal margin of infuscation curved and subparallel to wing apex (e.g. Figs 1168, 1179, 1193, 1198) .... *Prochiloneurus* (p. 458)

- Hypopygium not reaching more than 0.8X along gaster; scutellum with setae forming subapical tuft scattered and not arranged in distinct parallel rows (e.g. Figs 884, 906, 1057); ovipositor hidden or exserted, if exserted then sheaths tapering towards apex and not forming a ovipositor slender, cylindrical tube; fore wing infuscate or hyaline, if infuscate then distal margin of infuscation rarely curved and subparallel to wing apex ..... *Cheiloneurus* (p. 197)

30 (26) Fore wing with linea calva interrupted on dorsal surface at about two-thirds across wing by about 2-4 lines of setae (e.g. Figs 174, 234, 302, 326, 1391) 31
- Fore wing with line calva not interrupted on dorsal surface, entire, although sometimes closed near posterior wing margin by one or two lines of setae 34

31 (30) Scutellum distinctly convex; antenna with funicle segments subequal in size and all with prominent linear sensilla (Figs 1390, 1396, 1399); mandible without a socketed peg near ventral margin of inner surface ..... *Gahaniella* (p. 548)
- Scutellum flat; antenna with funicle segments clearly increasing in size distally, with linear sensilla not prominent and usually not present on all segments (e.g. Figs 167, 183, 246, 288, 311); mandible with a socketed peg near ventral margin of inner surface (see Figs 187, 272, arrowed) 32

32 (31) Fore wing infuscate, or if hyaline then mid tibia is white with a pair of dark brown rings ..... *Neococcidencyrtus* (p. 126)
- Fore wing hyaline; mid tibia completely white or pale yellow at most with a single dark brown band 33

33 (32) Clava with apex rounded or pointed (e.g. Figs 224, 241, 254, 282); fore wing with postmarginal vein not longer than stigmal vein (e.g. Figs 225, 244, 255, 283) .... *Coccidencyrtus* (p. 82)
- Clava with apex obliquely truncate (Fig. 288); fore wing with postmarginal vein longer than stigmal vein (Fig. 291) ..... *Quetsira* (p. 123)

34 (30) Fore wing with marginal vein about as long as broad, rarely nearly 2X as long as broad (e.g. Figs 386, 404, 1415, 1519, 1694) 35
- Fore wing with marginal vein at least 2.5X as long as broad (e.g. Figs 25, 318, 397, 515, 1821, 1889) 40

35 (34) Fore wing with stigmal vein relatively short, not more than 2X as long as marginal vein (Figs 386, 404); mesopleuron posteriorly reaching at least level with posterior margin of propodeum, in side view clearly separating propodeum from hind coxa 36
- Fore wing with stigmal vein elongate, at least 2X as long as marginal vein (e.g. Figs 1415, 1519, 1694); mesopleuron clearly not reaching level with posterior margin of propodeum, falling short by at least diameter of propodeal spiracle so that in side view propodeum more or less touches hind coxa 37

36 (35) Scutellum hardly shiny, matt; fore wing (Fig. 406) about 2.4X as long as broad with linea calva open; stigmal vein (Fig. 404) with 3 placoid sensilla at apex; malar suture absent ..... *Tico* (p. 160)
- Scutellum strongly metallic; fore wing (Fig. 387) about 2.8X as long as broad with linea calva closed by a single line of setae; stigmal vein (Fig. 386) with 4 placoid sensilla at apex; malar suture present ..... *Helegonatopus* (p. 152)

37 (35) Apical segment of fore tarsus very enlarged, at least as long as rest of tarsus (e.g. Figs 1419, 1426, 1432); fore wing with marginal vein absent or very short, stigmal vein usually arising from submarginal vein before it reaches anterior wing margin (e.g. Figs 1413, 1422, 1436) ..... *Sectiliclava* (p. 555)

- Apical segment of fore tarsus not enlarged, shorter than rest of tarsus; fore wing with marginal vein always present 38

38 (37) Hypopygium not reaching more than about two-thirds along gaster .... *Psyllaephagus* (p. 577)
- Hypopygium reaching apex of gaster 39

39 (38) Mesoscutum laterally with a distinct depression anterior to tegula (Fig. 1409; see Hab. 206); scutellum with not more than about 30 setae (Fig. 1409); fore wing with postmarginal vein about half as long as stigmal vein (Fig. 1407) .... *Prionomitus* (p. 553)
- Mesoscutum laterally without a distinct depression anterior to tegula (Fig. 1696; see Hab. 252); scutellum densely setose, clothed with about 100 subequal setae (Fig. 1696); fore wing with postmarginal vein slightly longer than stigmal vein (Fig. 1694) ..... *Arianus* (p. 622)

40 (34) Head triangular in profile; frontovertex above antennal scrobes almost flat; mandible (Figs 23, 364, arrowed) with a socketed peg near ventral margin on inner surface (only visible on slide-mounted material) 41
- Head not triangular in profile; frontovertex above antennal scrobes distinctly convex; mandible without a socketed peg near ventral margin on inner surface 43

41 (40) Sculpture on mesoscutum and scutellum of similar depth (Figs 356, 360, 366); eye very conspicuously hairy, clothed in dark setae that are at least as long as diameter of facet (Figs 352, 359, 364; see also Hab. 56-59); clava with apical sensory area enlarged giving apex a truncate appearance (Figs 353, 358, 367); malar suture present and conspicuous (Figs 359, 364) ..... *Orixia* (p. 144)
- Sculpture on scutellum distinctly deeper than that on mesoscutum (Figs 17, 27, 37, 304, 313); eye hairy, but never very conspicuously so, setae pale and not longer than diameter of facet; clava with apex rounded or pointed (e.g. Figs 22, 34, 301, 317); malar suture absent or present and indistinct 42

42 (41) Mid tibia with a pair of dark brown bands; fore wing, if infuscate, with a hyaline band distad of venation (e.g. Figs 297, 326, 430); body frequently partly orange .... *Neococcidencyrtus* (p. 126)
- Mid tibia sometimes brown, but never with a pair of dark bands; fore wing, if infuscate, with a pair of opposite triangular areas distad of venation (Figs 29, 38); body never partly orange ..... *Adelencyrtus* (p. 32)

43 (40) Ovipositor hardly exserted, but with gonostylus distinctly upwardly curved; fore wing with stigmal vein subsessile without a distinct stalk, much shorter than marginal vein and with only 3 apical placoid sensilla (e.g. Figs 1348, 1357, 1382) .... *Protyndarichoides* (p. 535)
- Ovipositor hidden to strongly exserted, but never with gonostylus upwardly curved; fore wing with stigmal vein usually elongate with a distinct stalk, although occasionally subsessile with only 3 apical sensilla 44

44 (43) Apex of clava with a distinct oblique apical truncation, sensory area extending at least one-quarter along ventral surface of clava 45
- Apex of clava rounded, sensory area small and at apex only 49

45 (44) Apex of syntergum with a narrow tongue-like projection (see Hab. 69) .... *Prionias* (p. 168)
- Apex of syntergum acute or rounded, without a narrow tongue-like projection 46

46 (45) Scutellum with uniform polygonally reticulate sculpture composed of fine, honeycomb-like cells that extend to sides and apex (Fig. 420); head about 8X as wide as frontovertex ..... *Georynus* (p. 163)
- Scutellum with irregular polygonally reticulate to longitudinally elongate imbricate-reticulate or striate-reticulate sculpture that is often arranged in whorls, apex and sides frequently broadly completely smooth and shiny; head not more than 7X as wide as frontovertex 47

47 (46) Scutellum dorsally flat with sides and apex perpendicular and uniformly completely smooth and shiny; mandible with three acute teeth, two lower teeth relatively long and equal, upper tooth conspicuously much shorter and often vestigial (e.g. Figs 610, 620, 638, 644, 654) ..... *Cheiloneurus* (p. 197)
- Scutellum dorsally convex, sides often perpendicular but apex more gradually sloping and more broadly smooth and shiny than sides; mandible with three equal teeth, upper tooth transversely truncate or sometimes rounded (e.g. Figs 1880, 1898, 1914, 1964) 48

48 (47) Clava as long as pedicel and funicle combined (Fig. 1968); propodeum with only 2 or 3 setae near spiracle; syntergum as long as mid tibia; hypopygium (Fig. 1967) with anterior margin more or less straight without any anterolateral or anteromedian processes ..... *Alkonia* (p. 708)
- Clava shorter than pedicel and funicle combined, at most only slightly longer than funicle (e.g. Figs 1903, 1920, 1937, 1959); propodeum with at least 10 setae near spiracle; syntergum shorter than mid tibia; hypopygium with distinct anterolateral and anteromedian processes (e.g. 1890, 1910, 1935, 1956) ..... *Hebynthus* (p. 682)

49 (44) Mesoscutum and scutellum more or less matt with similar lineolate to striate-reticulate sculpture (e.g. Figs 507, 520, 539); posterior part of mesoscutum often with translucent or silvery setae that contrast with dark brown anterior setae; gaster (e.g. Figs 504, 522, 532, 541) with a pair of gland-like structures present on Gt1 and Gt5 of the gaster (only visible in slide-mounted material) .... *Cheiloneurus* (p. 197)
- Mesoscutum with imbricate or polygonally reticulate sculpture and shiny, with uniform setae (e.g. Figs 393, 439, 452, 1344, 1726, 1773, 1846); gaster without paired gland-like structures 50

50 (49) Sculpture of scutellum not deeper than that on mesoscutum (Figs. 439, 1714, 1726, 1736) 51
- Scutellum with distinctly deeper sculpture than mesoscutum (e.g. Figs 393, 452, 1344, 1758, 1796) 52

51 (50) Head (Figs 1704, 1718, 1732) slightly less than 3X as wide as frontovertex; clypeal margin distinctly protuberant and roundly convex or even biconvex; antennal toruli situated relatively high on head, separated from mouth margin by more than their own lengths .....*Caldencyrtus* (p. 625)
- Head (Fig. 436) more than 3X as wide as frontovertex; clypeal margin very slightly concave; antennal toruli situated lower on head, separated from mouth margin by less than their own lengths ..... *Strigenia* (p. 171)

52 (50) Funicle with at least F1 and F2 quadrate or transverse 53
- Funicle with all segments longer than broad, at most F6 quadrate 54

53 (52) Ovipositor strongly exserted, the exserted part at least 1.5X as long as mid tibial spur ... . *Polaszekius* (p. 532)
- Ovipositor not exserted ..... *Raquanus* (p. 671)

54 (52) Fore wing (Fig. 394) slender, at least 3.1X as long as broad, basal cell more or less evenly setose, apical half with a median, elongate, wedge-shaped infuscate area; syntergum nearly 1.5X as long as mid tibia ..... *Mahencyrtus* (p. 157)
- Fore wing (e.g. Figs 451, 1747, 1764, 1805, 1817) not more than about 2.6X as long as broad, basal cell with a distinct naked area , apical half of fore wing hyaline or weakly infuscate, but without a median, wedge-shaped mark; syntergum shorter than mid tibia 55

55 (54) Apical half of fore wing (Fig. 451) weakly infuscate with a poorly defined hyaline area at apex of venation and another opposite on hind margin of wing; malar suture present and conspicuous; propodeum (Fig. 452) virtually smooth without a posterior carina above hind coxa and without a posterolateral tooth behind spiracle ..... *Oodia* (p. 176)
- Fore wing (e.g. Figs 1747, 1764, 1779, 1805, 1817) hyaline, occasionally weakly suffused brown or with a small infuscate area below marginal vein, never as above; malar suture absent or, if present, very indistinct; propodeum with rough sculpture, almost always with a carina posteriorly above hind coxa that runs almost vertically finishing in a posterolateral tooth behind spiracle (see Figs 1773, 1775, 1796, 1804, 1812, 1820, 1825, 1828) ..... *Dalek* (p. 635)

REVISION OF SPECIES

Genus *ARRHENOPHAGUS* Aurivillius

Arrhenophagus Aurivillius, 1888:144. Type species: *Arrhenophagus chionaspidis* Aurivillius, by monotypy.

Mymariella Risbec, 1951:402. Type species: *Mymariella paralatoriae* Risbec, by monotypy. Synonymy with *Arrhenophagus* by Annecke & Insley (1971:6,37).

Female. Length about 0.5-0.6mm.

Head dark brown with weak metallic coppery purple and dark blue or green reflections; transfacial suture pale yellow; antenna with radicle and scape pale yellow, pedicel and flagellum slightly dusky pale orange; thorax mostly dark brown, but mesopleuron sometimes orange-brown; mesoscutum and scutellum with weak metallic coppery purple and dark blue or green reflections; tegula pale orange, brown apically; legs pale orange, hind femur sometimes slightly dusky dorsally in apical half; wings hyaline; gaster brown, dorsally with weak coppery purple, dark blue and brassy reflections.

Head slightly shiny, with relatively deep, slightly irregular, transversely elongate, polygonally reticulate sculpture on frontovertex of mesh size mostly conspicuously larger than eye facet; temple and gena with relatively shallow, longitudinally elongate imbricate-reticulate to striate sculpture; ocelli forming an angle of about 115°; scape about 4X as long as broad; funicle 2-to 4-segmented, septa indistinct, segments strongly transverse and indistinct; clava relatively large, entire, with a strong, oblique, apical truncation; linear sensilla on clava only, distinct; eye separated from occipital margin by very nearly diameter of facet; malar sulcus absent; mandible with a single, elongate, apical tooth.

Thorax with polygonally reticulate sculpture on mesoscutum that is of similar depth to that on frontovertex, but composed of more rounded cells; notaular lines absent; scutellum about 1.1-1.2X as broad as long and with slightly shallower, more longitudinally elongate sculpture than mesoscutum; tarsi 4-segmented; fore wing about 2.1X as long as broad, venation not reaching half way along wing, marginal vein about as long as broad, stigmal vein sessile, postmarginal vein absent, linea calva closed, filum spinosum present; tarsi 4-segmented.

Gaster with hypopygium very nearly reaching apex; ovipositor not exserted or hardly so; gonostyli freely articulated.

Male. Length about 0.5mm.

Generally very similar to female but for structure of antenna and genitalia. Antenna with a 4- to 6-segmented funicle, F6 largest, segments transverse, clava entire, flagellum clothed in long setae, longest about 3X diameter of segment; genitalia with aedeagus apically rounded, digiti varying from very short, to about 2X as long as wide, each with two teeth.

DISTRIBUTION. Cosmopolitan.

HOSTS. Primary endoparasitoids of a variety of armoured scale insects (Hemiptera: Diaspididae) and beesoniids (Hemiptera: Beesoniidae).

COMMENTS. *Arrhenophagus* is very similar to *Arrhenophagoidea*, both being structurally almost identical but can be separated by the number of tarsal segments, *Arrhenophagus* having only four whilst *Arrhenophagoidea* has five. These genera as the only members of the tribe Arrhenophagini.

IDENTIFICATION. Four species are known worldwide. Annecke & Prinsloo, 1974 (detailed treatment of *chionaspidis* and *albitibiae*); Tan & Chen, 2008 (description of *longicalcaratus*)

Key to Costa Rican species of *Arrhenophagus* (Females)

1. Head in facial view (Fig. 10) clearly higher than broad, with clypeal margin strongly emarginate at base of each mandible; truncate surface of clava (Fig. 9) less than 0.6X as long as ventral surface of clava ..... *chionaspidis* Aurivillius (p. 29)
- Head in facial view as broad as high (Fig. 11), with clypeal margin hardly emarginate at base of each mandible; truncate surface of clava (Fig. 12) at least 0.8X as long as ventral surface of clava ..... *albitibiae* Girault (p. 30)

***Arrhenophagus chionaspidis* Aurivillius**
(Figs 8-10; Hab. ♀ 1)

Arrhenophagus chionaspidis Aurivillius, 1888:146. Syntypes ♀, Sweden, USNM, PPRI, NHRM, not examined.

Coccobius diaspidis Ashmead, 1900:408. Syntypes ♀, USA (Washington), USNM, not examined. Synonymy with *chionaspidis* by Burks (1967:213).

Mymariella parlatoreae Risbec, 1951: Lectotype ♀ (designated by Annecke & Prinsloo, 1974), Senegal, MNHN, not examined. Synonymy with *chionaspidis* by Annecke & Prinsloo (1974:36).

Arrhenophagus diaspidiatus Agarwal, 1963:394. Holotype ♀, India (Uttar Pradesh), ?ZAMU, not examined. Synonymy with *chionaspidis* by Hayat (1979:315-317).

Arrhenophagus intermedius De Santis, 1964:40. Syntype ♀♀, Argentina, MLP, not examined. Synonymy with *chionaspidis* by Annecke & Prinsloo (1974:36).

Arrhenophagus parlatoreae (Risbec); Annecke & Insley, 1971:6,37.

DIAGNOSIS. *Female* (length about 0.4-0.5mm): head in facial view (Fig. 10) slightly higher than wide and about 1.7X as wide as frontovertex; scrobal area with fine, polygonally reticulate sculpture, similar to that in front of anterior ocellus but a little shallower; antenna as in Fig. 9; clava with sensory area relatively short, less than 0.6X as long as ventral surface of clava, but forming a strongly oblique truncation; mouth margin (Fig. 10) strongly emarginate at base of each mandible with clypeal margin forming a relatively narrow, strongly convex projection medially; mandible slender, chisel-like, with one acute, apical tooth; sculpture on scutellum very similar to that on mesoscutum, but more longitudinally elongate and perhaps very slightly shallower; fore wing with venation and setation as in Fig. 8. Male: very similar to female but for antenna and genitalia; antennal funicle possibly 4-segmented (see Annecke & Prinsloo, 1974).

DISTRIBUTION. Cosmopolitan (see Noyes, 2019), newly recorded below from Costa Rica (**new record**) and Philippines (new record).

HOSTS. Recorded as a parasitoid of *Aonidiella orientalis* (Newstead), *Chrysomphalus dictyospermi* (Morgan), *Duplaspidiotus tesseratus* (Grandpré & Charmoy), *Dynaspidiotus britannicus* (Newstead), and species of other genera including *Aspidiotus* Bouché, *Aulacaspis* Cockerell, *Chionaspis* Signoret, *Diaspidiotus* Berlese, *Diaspis* Costa, *Fiorinia* Targioni Tozzetti, *Hemiberlesia* Cockerell, *Pinnaspis* Cockerell, *Pseudaulacaspis* MacGillivray and *Unaspis* MacGillivray (Hemiptera: Diaspididae) (see Noyes, 1919). Recorded here from *Pinnaspis aspidistrae* Signoret on oil palm, *Elaeis* sp. (Arecales: Arecaceae) and *Aulacaspis yasumatsui* Takagi (**new record**). The record below from *Nipaecoccus vastator* (Newstead) (Hemiptera: Pseudococcidae) is unlikely and requires confirmation.

MATERIAL EXAMINED.

Non type material. **PUERTO RICO**, 4♀, Adjuntas, ex snowscale on grapefruit, 4.xii.1987 (F.D. Bennett); **COSTA RICA**, 56♀, **Guanacaste**, Santa Rosa NP, various localities and dates 17.iv.1985-6. vi.1987 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, Murcielago (ACG), 75m, MT, 24.i-4.ii.1996 (J. Ugalde); 1♀, Guanacaste, BN Diriá, Cerro Retallano, LN 239083 358610, 700m, #63999, 12.vi-9.vii.2001 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sect. Palo Verde, LN 257400 400000, 200-300m, #57717, vii-viii.2000 (I. Jiménez); 2♀, Guanacaste, PN Palo Verde, Sector Catalina, Fila Catalina, LN 257400 400000, #64151, 9.v-7.vi.2001 (I. Jiménez); 1♀, **Alajuela**, PN Arenal, Sendero Pilón, 10°27'N 84°43'W, 600m, 26.ii.2003 (J.S. Noyes); 1♀, **Heredia**, 3km S Puerto Viejo, OTS-La Selva, 100m, xii.1992 (P. Hanson); 1♀, Heredia, Est. Biol. La Selva, 10°25'N 84°01'W, iv.1994 (INBio-OET); 1♀, **San José**, Ciudad Colon, i.1990 (L. Fournier); 1♀, San José, Ciudad Colon, iv-v.1990 (P. Hanson), 1♀, **Puntarenas**, Rs. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 14-15.ii.2005 (J.S. Noyes); 2♀, Puntarenas, Puerto Jimenez, 10m, iv.1992 (P. Hanson). **BRAZIL**, 1♀, **Amazonas**, Manaus, *Eriococcus*/ snow *Pinnaspis* scales *Hibiscus roasine*, 12.x.1990 (F.D. Bennett). **CAPE VERDE ISLANDS**, 1♀, Santiago, ex *Pinnaspis strachani*, 10.x.1977 (C. Klein Koch). **NETHERLANDS**, 12♀, Wageningen, UR Greenhouse Horticulture, Bleiswijk, *Aulacaspis rosae* on *Rosa*, viii.2010 (A. Leman). **LIBERIA**, 1♀, Suakoko, ex scale on bitterball stem, 25.ii.1985 (D.S. Aindra). **MAURITIUS**, 4♀, Palmyre, parasitizing *Chionaspis* on *Fourcroya gigantea*, vii.1929 (D d'Emmerey de Charmoy). **INDIA**, 1♀, **Kerala**, Chithara, *Pinnaspis aspidistrae* fm oil palm, CIE A20854, viii.1989 (K. Dileepah); 1♀, 1♂, **Karnataka**, Mandya, V.C. Farm, ex *Chionaspis ramakrishnae* 13.i.1981 (CIBC Bangalore); 13.i.1981. **CHINA**, 4♀, **Guangdong**, ex *N. vastator* (M.) on citrus, ix.1982 (Ren Hui); 3♀, 2♂, Guangdong, Zinhui, ex diaspid on *Melia azedurae*, 26.xi.1986 (F.D. Bennett); 3♀, 3♂, Guangdong, Shenzhen, ex diaspidid on *Aglaea odorata*, 28.v.1988 (F.D. Bennett). **PHILIPPINES**, 2♀, Emita, Roxas Blvd, on petiole of *Cycas* sucker with *Aulacaspis yasumatsui,* 22.i.2014 (T. Marler). Material in MZUCR, and NHMUK.

COMMENTS. See comments under *albitibiae* (p. 30).

Arrhenophagus albitibiae Girault
(Figs 11-14; Hab. ♀ 2)

Arrhenophagus albitibiae Girault, 1915c:241-242. Syntypes ♀, Sri Lanka, USNM, not examined.
Arrhenophagus albipes Girault, 1915c:242. Syntypes ♀♂, China (Hong Kong), USNM, not examined. Synonymy with *albitibiae* by Annecke & Prinsloo (1974:38).
Arrhenophagus confusus Hayat, 2010a:41-43. Holotype ♀, India (Uttar Pradesh), NPC, not examined. **syn.nov.**

DIAGNOSIS. *Female* (length about 0.4-0.6mm): head in facial view (Fig. 11) about as high as wide and about 1.8X as wide as frontovertex; scrobal area with fine sculpture, similar to that in front of anterior ocellus but a little shallower and medially conspicuously transversely elongate and composed of few cells; antenna as in Fig. 12; clava with sensory area relatively large, at least 0.8X as long as length of ventral surface of clava, and forming a strongly oblique truncation; mouth margin (Fig. 11) hardly emarginate at base of each mandible with clypeal margin weakly

convex and virtually straight medially; mandible triangular, with one acute, finger-like, apical tooth; sculpture on scutellum finer than that on mesoscutum, of smaller mesh size and distinctly longitudinally elongate; fore wing with venation and setation as in Figs 13, 14. Male: very similar to female but for antenna and genitalia; antennal funicle possibly 6-segmented (see Annecke & Prinsloo, 1974).

DISTRIBUTION. USA (Hawaii, Florida), Sri Lanka, Russia (Primorsky Kray), India, China (Henan, Hong Kong), Japan, Samoa. Recorded below also from Costa Rica (**new record**) and Mariana Is (**new record**).

HOSTS. Recorded as a parasitoid of several species of *Aulacaspis* Cockerell, *Chionaspis* Signoret, *Fiorinia* Targioni Tozzetti, *Pseudaulacaspis* MacGillivray, *Pinnaspis* Cockerell (Hemiptera: Diaspididae) and *Limacoccus* Bondar (Beesoniidae) (see Noyes, 1919). Recorded below from an unidentified diaspidid scale (possibly *Pseudaulacaspis pentagona* (Targioni Tozzetti)) on peach (*Prunus persica* (L.) Batsch. (Rosaceae). Also recorded below from *Aleurodicus dipersus* Russell (Hemiptera: Aleyrodidae), but this association is unlikely.

MATERIAL EXAMINED.

Non type material. **USA**, 1♀, 1♂, **Hawaii**, Honolulu, ex *Phenacaspis eugeniae*, 12.x.1923 (D.T. Fullaway); 5♀, **Florida**, Alachua Co., Gainesville, *Pseudaulacaspis pentagona* on mulberry, 30.x.1987 (F.D. Bennett); 22♀, Florida, Alachua Co., Gainesville, Honey Plant, ex *Peudaulacaspis pentagona* on mulberry, 31.x.1987 (F.D. Bennett); 3♀, Florida, *Pseudaulacaspis pentagona* on undet plant, ii.1990 (Hamon); 1♀, Florida, Dade Co., Snapper Creek, *Pseudaulacaspis cockerelli* on *Strelitzia nicolas*, 791, 3.ii.1990 (F.D. Bennett); 9♀, Florida, Raving St Gard, *Pseudaulacaspis pentagona Diospyros virginiana,* 971 24.x.1990 (Hamon/Rosen/Nguyen). **COSTA RICA**, 2♀, **Guanacaste**, Maritza (ACG), 700m, MT/YPT, 20.i-24.ii.1996 (J.S. Noyes); 1♀, **Heredia**, Est. Biol. La Selva, 10°26'N 84°01'W, iii.1996 (INBio/OET); 1♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, ii.2003 (J.S. Noyes); 2♀, Heredia, Santo Domingo, INBio Parque, LN 217300 526200, 1100m, TM, 27.v-27.vi.2001 and vii.2001 (R. Zuñiga); 47♀, **Cartago**, Cartago, ex diaspidid on peach, iv.1988; 4♀, **Puntarenas**, 24km W Piedras Blancas, 8°46'N 83°24'W, 200m, ii.1992, iii.1992 and iii-iv.1993 (P. Hanson); 1♀, Puntarenas, 10km W Golfo Dulce, xii.1989-iii.1990 (P. Hanson, I.D. Gauld); 1♀, Puntarenas, Pen. Osa, 5km N Puerto Jimenez, 10m, x.1990 (P. Hanson); 4♀, **Limón**, RB Hitoy Cerere, 9°40'N 83°02'W, 100m, ii.2004 (J.S. Noyes). **JAPAN**, 2♀, 2♂, Matsuyama, ex Fiorinia vacciniae, 25.v.1962 (T. Tachikawa). **MARIANA ISLANDS**, 3♀, Guam, ex *Aleurodicus dispersus*. viii.1983 (J.R. Nechols). **SAMOA**, 10♀, **Western Samoa**, Upolu I., iii.1980 (V. Taefu); [SAMOA], 10♀, ex scales from Gainesville, Florida, USA, 11.vii.1986 (W. Liebregts); 3♀, Western Samoa, Nulu, ex *P. pentagona*, 5.viii.1986 (W. Liebregts). Material in MZUCR and NHMUK.

COMMENTS. The single best character for separating this species from *chionaspidis* is the sculpture between the transfacial suture and antennal toruli. In *chionaspidis* it is coarser and uniformly cellular whilst in *confusus* it is finer and much more transversely linear and hardly cellular. Unfortunately, this character can only be seen on very good slide-mounted material and therefore it is not used in the identification key above.

Although Hayat (2010) compared *confusus* only with *chionaspidis* it appears to be the same as *albitibiae*. In both *albitibiae* and *confusus* the clypeal margin is not strongly emarginate near the base of the mandible and, perhaps more significantly, the truncate part of the clava is nearly as long as the ventral margin of the clava, whereas in both *chionaspidis* and *longicalcaratus* Tan & Chen it is hardly more than half as long. Although I have not examined the type material of *confusus* the material listed above agrees well with the description of the species by Hayat and also with material determined as *albitibiae* in the collections of the Natural History Museum, London. Although there are a few minor discrepancies with the redescription of *albitibiae* Girault provided by Prinsloo & Annecke (1974) (in their illustration of the head of *albitibiae*, in facial view, it is slightly higher than broad and the clypeal margin is more or less not emarginate near the base of the mandible) I am confident that *confusus* is synonymous with *albitibiae*. It is likely that these differences are an artifact caused by the orientation of the head on the slide or perhaps the head may have been slightly distorted during slide mounting. Hayat (2010) compared the male

genitalia of an unidentified species from Hawaii (Oahu) with those of *confusus*. He noted that the digiti of the specimen from Oahu were short and triangular, whereas those of *confusus* were slender and elongate. The apparent differences he noted are because the digiti in the Oahu material are directed upwards on the slide giving the appearance that they are short and triangular. I have identified this specimen as *albitibiae*.

Genus *ADELENCYRTUS* Ashmead

Adelencyrtus Ashmead, 1900:401. Type species: *Encyrtus chionaspidis* Ashmead, by original designation.

Epiencyrtoides Girault, 1915a:108. Type species: *Epiencyrtoides quadridentatus* Girault, by original designation. Synonymy with *Adelencyrtus* by Mercet, 1921:698.

Epitetracnemus Girault, 1915a:164. Type species: *Epitetracnemus sexguttatipennis* Girault, by original designation. Synonymy with *Adelencyrtus* by Japoshvili *et al*., 2016:349-350.

Anabrolepis Timberlake, 1920:431. Type species: *Anabrolepis extranea* Timberlake, by original designation. Synonymy with *Epitetracnemus* by Noyes & Hayat, 1984:273. **syn.nov.**

Rotrencyrtus Risbec, 1939:59. Type species: *Rotrencyrtus depressus* Risbec, by monotypy. Synonymy with *Adelencyrtus* by Annecke & Insley, 1971:2,39.

Female. Overall length about 1.1-1.7mm.

Body dark brown with a metallic sheen.

Head acutely triangular in profile with frontovertex more or less flat and forming an angle of about 60° with the face; occipital margin sharp, not carinate; frontovertex generally about 0.20-0.25X as wide as head and with a slender, broadly oval depression adjacent to eye behind posterior ocellus near occipital margin; mandible with four teeth, lower teeth longest, upper teeth usually short, sometimes very short and almost forming a weakly denticulate truncate margin; mandible with a distinct, socketed, peg-like structure present on inner surface near lowest margin; palp formula 4-3; scape hardly broadened and flattened, about 3.5-4.5X as long as broad; flagellum subcylindrical; funicle 6-segmented with segments transverse to slightly longer than broad, sometimes all transverse or all longer than broad, proximal segments generally smallest; clava 3-segmented with sensory area small, apex rounded.

Thorax dorsally flattened; pronotum with posterior margin emarginate, broadly V-shaped; sculpture on mesoscutum polygonally reticulate to imbricate reticulate and shallower than sculpture on scutellum; scutellum about 1.2X as broad as long, with fine, regular, punctate reticulate to longitudinally elongate polygonally reticulate sculpture, side and apex smooth and shiny; mesopleuron extending to, or nearly to, posterior margin of propodeum; tarsi 5-segmented; mid tibial spur about as long as basitarsus; wings always fully developed; fore wing about 2.4-2.5X as long as broad; hyaline or infuscate with hyaline areas; marginal vein about 3.0-5.5X as long as broad, longer than stigmal vein, postmarginal vein slightly shorter than stigmal vein, rarely longer.

Gaster about as long as thorax; hypopygium reaching about half way along gaster; ovipositor with gonostylus freely articulated, exserted part usually less than length of mid tibial spur.

Male. Length about 0.8-1.0mm.

Similar to female but for wider frontovertex, hyaline fore wing and structure of antenna and genitalia; head about 2X as wide as frontovertex, antenna with 2 anelliform funicle segments and a long clava that is about 7-8X as long as broad and about as long as head width; genitalia with aedeagus slender, digiti well developed, each about 2X as long as broad with a single apical hook.

DISTRIBUTION. Cosmopolitan.

HOSTS. Almost exclusively solitary endoparasitoids of armoured scale insects (Hemiptera: Diaspididae), although possibly also of early instars of soft scale insects (Hemiptera: Coccidae) (see *A. bifasciatus* below). One species, *Adelencyrtus subapterus* (Kurdjumov), has been recorded as a parasitoid of *Rhizococcus greeni* (Newstead) (Hemiptera: Eriococcidae) on *Agropyron repens*

L. (Poales: Poaceae), but this parasitoid species does not belong to *Adelencyrtus*.

BIOCONTROL. Four species of *Adelencyrtus* (*chionaspidis* (Howard), *intersectus* (Fonscolombe), *oceanicus* (Doutt), *odonaspidis* Fullaway) have been used in biocontrol projects for the control of various species of diaspidid scales, but none of these has been successful. Most introductions failed to establish and those that did, failed to provide effective control (see Noyes & Hayat, 1994 and also below).

COMMENTS. *Adelencyrtus* is close to *Habrolepis* Förster, 1856, *Ruskiniana* Girault, 1923 and *Neococcidencyrtus* Compere, 1928, all four genera having a subcylindrical, six-segmented funicle and a distinct peg-like structure on inner surface of the mandible near the lowermost margin. *Adelencyrtus* can be separated from the three other genera by the mandible having four teeth (although the two uppermost teeth may be very short almost forming a truncate surface). In *Neococcidencyrtus* the mandible is basically tridentate, but occasionally with a single lower tooth and a broad straight, upper truncation and in *Habrolepis* and *Ruskiniana* the mandible has one acute tooth and a broad, slightly concave truncation. Most species of *Neococcidencyrtus* have some areas of the body pale orange, all have the mid tibia with two brown bands. Species of *Adelencyrtus* are mostly dark brown with a metallic sheen and they have at most one brown band on the mid tibia. *Habrolepis* and *Ruskiniana* have not yet been found in the Neotropical region, but in most cases, they can be separated from *Adelencyrtus* by having either a pair of scale-like setae at the apex of the scutellum or a line of about 15 slender, scale-like setae near the apex, whereas in *Adelencyrtus* there is at most a pair of long, very slender apical setae. In those species of *Habrolepis* that lack scale-like setae at the apex of the scutellum the fore wing has an uninterrupted hyaline, subapical fascia as well as a pair of opposite hyaline spots. No species of *Adelencyrtus* is known to have an uninterrupted, subapical, hyaline fascia.

See also comments under *Quetsira* (p. 124).

IDENTIFICATION. Worldwide, 44 described species are currently placed in *Adelencyrtus*. Keys to some of these species are provided by Hayat, 2006 (10 Indian species); Zhang & Shi, 2010 (11 Chinese species as *Adelencyrtus* and 8 species as *Epitetracnemus*) and Trjapitzin, 1989 (Palaearctic species, 4 as *Adelencyrtus* and 3 as *Epitetracnemus*).

Key to Costa Rican species of *Adelencyrtus*
(Females)

1. Fore wing completely hyaline (Figs 21, 24) 2
- Fore wing infuscate with distinct hyaline areas (Figs 29, 38)..... 3

2 (1) Clava (Figs 15, 16) longer than funicle, all funicle segments transverse .... *chionaspidis* (Howard) (p. 33)
- Clava (Fig. 22) much shorter than funicle; funicle segments quadrate or longer than broad ..... *plocus* **sp.nov.** (p. 36)

3 (1) Funicle (Fig. 30) with F1-F4 subequal; mid femur and tibia completely pale yellow (Hab. 5) .....*odonaspidis* Fullaway (p. 38)
- Funicle (Figs 34, 35) with F1-F2 subequal and clearly smaller than F3-F4; mid femur and tibia (Hab. 6) at least partially infuscate ..... *bifasciatus* (Ishii) (p. 40)

***Adelencyrtus chionaspidis* (Howard)**
(Figs 15-21; Hab. ♀ 3)

Encyrtus chionaspidis Howard *in* Howard & Ashmead, 1896:637. Syntypes ♀, Sri Lanka, USNM, image examined.

Encyrtus moderatus Howard, 1897:152. Lectotype ♀, designated by Noyes (1979:144-145), Grenada (WI), NHMUK, examined. **syn.nov.**

Adelencyrtus chionaspidis (Howard); Ashmead, 1900:401.
Adelencyrtus femoralis Compere & Annecke, 1961:53. Lectotype ♀, designated by Noyes, (1979:144-145), India, USNM, not examined. Synonymy with *moderatus* by Noyes (1979:144-145). **syn.nov.**
Adelencyrtus miyarai Tachikawa, 1963a:131. Holotype ♀, Japan, KYUN, not examined. Synonymy with *moderatus* by Noyes (1979:144-145). **syn.nov.**
Adelencyrtus mysorensis Hayat, Alam & Agarwal, 1975:82. Holotype ♀, India (Karnataka), BMNH, examined. Synonymy with *moderatus* by Hayat (1981:14). **syn.nov.**
Adelencyrtus moderatus (Howard); Noyes, 1979:144-145.

DIAGNOSIS. *Female* (length about 0.6-1.2mm): head dark brown to black with a distinct metallic lustre; frontovertex with a metallic green or blue-green sheen, generally purple anteriorly above scrobes but coppery purple immediately above scrobes and deep metallic blue between eye and scrobe; scrobes mostly metallic green mixed coppery purple, dorsal part of antennal prominence dark metallic blue; temple, gena and mouth margin with a coppery purple sheen, temple somewhat mixed metallic green; antenna mostly pale yellow, pedicel and occasionally apex of clava slightly dusky; thorax dark brown to black; pronotum with a dull, mixed coppery purple and metallic green sheen; mesoscutum and axilla with a dull, mixed coppery purple and dark blue sheen; tegula dark brown; scutellum with a dull coppery purple sheen, side and apex with a relatively strong metallic green and coppery sheen; mesopleuron with a weak, metallic blue, purple and brassy sheen; legs generally pale yellow to very pale orange, but hind coxa pale brown towards base and hind femur mostly brown; wings hyaline, venation pale yellow; propodeum dark brown with a weak brassy and purple sheen, side with a strong metallic coppery purple and dark blue to green sheen; gaster dark purple-brown, dorsally with a coppery purple sheen mixed slightly brassy and green, Gt1 with a distinct dark metallic blue or green and purple sheen, side and venter with coppery, blue, brassy and green reflections; gonostylus dark brown; head in profile about 1.3X as high as deep, in facial view about 4X as wide as frontovertex, which is narrowest a little behind posterior ocelli; a conspicuous, long setae present on margin behind each posterior ocellus; a short, oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 75°; frontovertex shiny, with relatively deep, polygonally reticulate to imbricate-reticulate sculpture of mesh size mainly subequal eye facet, deepest and more polygonally reticulate in ocellar area; temple and gena with relatively shallow, longitudinally elongate imbricate-reticulate sculpture; scrobes with relatively shallow, irregular sculpture, almost smooth; interantennal prominence and mouth margin with shallow, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, narrowly ∩-shaped; interantennal prominence dorsally rounded; antenna as in Figs 15, 16; scape hardly broadened and flattened, about 3.5X as long as broad; F1-F3 subequal and strongly transverse, F4 subequal or a little larger and transverse, F5-F6 larger, subequal and subquadrate, linear sensilla present only on F4-F6, or F5-F6 in smaller specimens; clava slightly longer than funicle, sutures parallel, sensory area small, at apex only giving it a pointed or slightly rounded appearance; eye slightly overreaching occipital margin, clothed with very conspicuous setae, each of which is a little longer than diameter of facet; malar sulcus absent; mandible with four teeth; thorax (Fig. 17) with pronotum hardly exposed behind head, its posterior margin broadly V-shaped and strongly emarginate medially; pronotum and mesoscutum with imbricate-reticulate to polygonally reticulate sculpture that is coarser than in ocellar area, but about as deep; scutellum with fine, longitudinally elongate, polygonally reticulate sculpture that is conspicuously deeper than that on mesoscutum, side and extreme apex completely smooth and shiny; visible part of mesoscutum about 2X as broad as long; scutellum about 1.2X as broad as long, fore wing about 2.7X as long as broad with venation and setation as in Figs 20, 21; costal cell with 3 or 4 dorsal setae at apex; propodeum with 4 or 5 moderately conspicuous setae outside spiracle; gaster with hypopygium reaching about 0.5X to apex; last tergite about as long as mid tibia, with apex narrowly rounded; hypopygium as in Fig. 19; ovipositor (Fig. 18) slightly exserted, the exserted part about 0.5X length of mid tibial spur or about 0.2X mid tibia. *Male* (length about 0.7-1.0mm): very similar to female but for structure of antenna and genitalia; antennal funicle with 2 anelliform segments, clava very long, slender and slightly curved, about 8X as long as broad and about as long as head width; fore wing with linea calva not interrupted; genitalia with aedeagus very slender, apex acute,

digiti well developed, each about 2X as long as broad and with a single apical hook.

DISTRIBUTION. USA (Florida); Cuba, St Kitts and Nevis, St. Vincent, Grenada, Barbados, Trinidad & Tobago, Turkmenistan, Ghana, Uganda, Tanzania, Madagascar, Mauritius, Reunion, Pakistan, India, Indonesia (Java), China, Japan, Fiji (see Noyes, 1979 and Noyes, 2019), also recorded below from Jamaica (**new record**), Nigeria (**new record**) and Costa Rica (**new record**),

HOSTS. Reared from *Lepidosaphes* Shimer on citrus, *Aspidiella sacchari* (Cockerell), *Aulacaspis takari* Takagi. *Aulacaspis tegalensis* (Zehntner), *Duplachionaspis divergens* (Green), *Duplachionaspis graminella* (Borchsenius) and *Gannaspis glomerata* (Green) (Hemiptera: Diaspidiae) (see Noyes, 2019). Recorded below from *Odonaspis ruthae* Kotinsky (**new record**) (Hemiptera: Diaspididae) on *Rhynchelytrum roseum* (Nees) Stapf & C.E. Hubb (Poales: Poaceae). Records from mealybugs are probably erroneous.

BIOCONTROL. *Adelencyrtus chionaspidis* has been introduced unsuccessfully into Barbados (Cock, 1985), Uganda (CIBC, 1971) and India (CIBC, 1973, 1974) for the control of diaspidid scales pests. In all cases the parasitoid failed to establish, or no further reports have been forthcoming.

MATERIAL EXAMINED.

Type material. Lectotype ♀ of *moderatus*, **GRENADA**, Balthazar (windward side), H.S. Smith, (BM) (18)99-331, "*Encyrtus moderatus* How Typ(e)" (NHMUK). Paratypes of *miyarai* JAPAN, 2♀, Okinawa, Miyako Is., ex *Aulacaspis takarai* Takagi, 65, 5.i.1962 (T. Miyara).

Non type material. **USA**, 1♀, **Florida**, Palm Beach Co., Cana Point, ex *Aspidiotus sacchari* on sugarcane, 26.v.1987 (F.D. Bennet); 1♀, Florida, TREC Homestead, ex *Odonaspis ruthae* on *Rhynchelytrum roseum*, 87-81, 7.xi.1987 (F.D. Bennet, A. Rueda). **JAMAICA**, Pt. Maria, Bellfield siding, off *Leucaena leucocephala*, 28.vi.2988 (D. Hollis). **ST VINCENT**, 24♀, various localities and dates, 4-13.vii.1976 (J.S. Noyes). **TRINIDAD & TOBAGO**, 7♀, **Trinidad**, Orange Grove, ex *Aspidiella sacchari* on sugarcane, CIE A.6100, i.1973 (F.D. Bennett); 4♂, Trinidad, Curepe, CIBC lab grounds, Moericke trap, 13-27.vi.1974 (M.N. Beg); 44♀, Trinidad, various localities and dates, 23.vi-4.viii.1976 (J.S. Noyes); 6♀, Trinidad, St George, St Augustine, various dates viii-ix.1976 (F.D. Bennett); 2♀, **Tobago**, St Patrick, Mount Irvine Bay, coastal grassland, 19.viii.1976 (J.S. Noyes). 1♀, Tobago, St John, Bloody Bay, 20.vii.1976 (J.S. Noyes). **COSTA RICA**, 11♀, **Guanacaste**, Santa Rosa NP, various localities and dates 14.ix.1985-21.ii.1987 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, 9km S Santa Cecilia, Estac. Pitilla, vi.1989 (I.D. Gauld); 1♀, Guanacaste, Guanacaste NP (error for Santa Rosa NP), near HQ, 1-10.iii.1990 (J.S. Noyes); 1♀, Guanacaste, 9km S. Santa Cecilia, 700m, LN 329950 380450, vi.1994 (P. Rios); 1♀, Guanacaste, Est. Pitilla, 650m, 11.ii.1995 (L. Masner); 2♀, Guanacaste, Pitilla (ACG), MT/YPT, 24.i-27.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Maritza (ACG), LN 326500 372600, 600m, 23.iv-11.v.1996 (D. Briceño); 2♀, Guanacaste, Murcielago (ACG), 75m, MT, 24.i-4.ii.1996 (J. Ugalde); 1♀, Guanacaste, 13km E. Filadelfia, Hda El Viejo, v-vi.1989 (M. Garcia); 1♀, Guanacaste, PN Palo Verde, Est. Palo Verde, LN 259050 388400, 10m, #60224, xi.2000 (I. Jiménez); 2♀, Guanacaste, PN Palo Verde, Sector Palo Verde, 150m E Estacion, LN 260952 385020, 0-50m, 4-14. ix.1999 and 2-12.xii.1999 (I. Jiménez); 2♀, Guanacaste, PN Palo Verde, Sect. Palo Verde, Estacion, LN 385020 260952, 0-50m, #57055, 10-18.vii.2000 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sector Palo Verde, Estr E. Campo Aterr, LN 260952 385020, 10m, #53260, viii-ix.1999 (I. Jiménez); 1♀, **Alajuela**, Reserva Rincon Forestal, East. Caribe, 10°53'N 85°18'W, 400m, 19-20.ii.2003 (J.S. Noyes); 1♀, Alajuela, PN Arenal, Sendero Pilón, 10°27'N 84°43'W, 600m, 26.ii.2003 (J.S. Noyes); 1♀, Alajuela, Peñas Blancas, 9.vi.1987 (E. Cruz); 1♀, **Heredia**, La Selva BS, 50m, ii.1991 (J.S. Noyes); 1♀, Heredia, La Selva Biol. Sta, 3km S Pto Viejo, 10°26'N 84°01'W, on leaves of *Alchornea costaricensis* Pax & Hoffe, 21.vii.1992 (H.A. Hespenheide); 1♀, Heredia, OTS La Selva, M.01.399, 17.vii.1995 (ALAS); 1♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, x.1995 (OET/INBio); 1♀, Heredia, 16km SSE La Virgen, 10°16'N 85°05'W, 1050-1150m, 11/M/NOTN, 9-ii-21.iv.2001 (INBio/OET – ALAS); 1♀, Heredia, Santo Domingo, INBio Parque, LN 217300 526200, 1100m, TM, #67118, 11.ii-18.iii.2002 (R. Zuñiga); 1♀, Heredia, Santo Domingo, INBio Parque, LN 217300 526200, 1100m, iii.2002 (J. Azofeifa, J.S. Noyes); 1♀, **San José**, San Pedro, Tigra Cacao, iii-iv.1990 (P. Hanson); 1♀, San José, San Antonio de Escazu, 1300m, i.1999 (W. Eberhard, P. Hanson); 2♀, San José, Ciudad Colón, xii.1989-i.1990 (L. Fournier); 2♀, **Puntarenas**, Res. Priv. Karen Mogensen,

9°52'N 85°03'W, 305m, 14-15.ii.2005 (J.S. Noyes); 5♀, Puntarenas, Manuel Antonio, 23-26.viii.1986 (L. Masner); 3♀, Puntarenas, Golfito, off bamboo with coccids (JC 161), 21.ii.1984 (error for 1990) (J.S. Noyes); 2♀, Puntarenas, Golfo Dulce, 24km W Piedras Blancas, 8°46'N 83°24'W, 200m, vi-vii.1989 and i-iii.1991 (P. Hanson, I.D. Gauld); 3♀, Puntarenas, RF Golfo Dulce, 3km SW Rincon, 10m, x.1991 and i.1992 (P. Hanson); 1♀, Puntarenas, Pen. Osa, 5km N Puerto Jimenez, 8°33'N 83°21'W, 10m, i-ii.1991 (P. Hanson, C. Godoy); 2♀, Puntarenas, Pen. Osa. Puerto Jimenez, 10m, ii.1992 and ii-iii.1993 (P. Hanson); 2♀, Puntarenas, PN Corcovado, Rio Rincon, 3km NE Los Patos, 18°33'N 83°30'W, 50m, 1-9.iii.2000 (J. Azofeifa); 4♀, Puntarenas, Est. Agujas, El Tigre, LS 529600 277800, 30-34m, 19.vii.2000 and 25.iv.2001 (J. Azofeifa); 1♀, **Limón**, 16km W Guapiles, iii-iv.1990 (P. Hanson); 1♀, Limón, RB Hitoy Cerere, Send. Bobócara, LN 184250 641800, 300m, #53498, 8.viii-10.x.1999 G. Carballo). **NIGERIA**, 1♀, Abia St., ex scales on *Zingiber officinale*, sp. 5 IIE 22163, 1991. **MADAGASCAR**, 5♀, Tamatave, Perinet, 27.iv-3.v.1983 (J.S. Noyes. M.C. Day); 1♀, Tulear, Fort Dauphin, 5.v.1983 (J.S. Noyes; M.C. Day); 3♀, Tulear, Berenty, 12 km NW Amboasary, 5-15.v.1983 (J.S. Noyes, M.C. Day); 2♀, Tulear, Bereboka, 60km NE Morondava, 18-23.v.1983 (J.S. Noyes, M.C. Day). **MAURITIUS**, 2♀, Reduit, Tamarin, ex *Aulacaspis tegalensis*, 28.v.1968 (CIE A.2500). **INDIA**, 19♀, **Maharashtra**, Kolhapur, No 6 ex scale ,1979-1980, CIE A.12003; 2♀, 2♂, **Tamil Nadu**, Madura, Sugars, Pandiarajapuram, ex *Aspidiella sacchari* on sugarcane, CIE A.17509, 28.x.1985 (R. Jayanthi). Material in MZUCR, CNC and NHMUK.

COMMENTS. The possible synonymy of *Adelencyrtus moderatus* (Howard) with *Encyrtus chionaspidis* Howard was suggested to me *in litt.* by Prof. M. Hayat (Aligarh Muslim University) in 2019. I have been able to confirm this synonymy recently by examination of a high-resolution image of a syntype housed in the USNM collections kindly provided by Dr M. Gates (United States Department of Agriculture).

Adelencyrtus plocus sp.nov.

(Figs 22-26; Hab. ♀ 4)

DIAGNOSIS. *Female* (length about 1.2-1.7mm): fore coxa orange, mid and hind coxae brown; legs mostly white to pale orange, mid and hind femora and tibiae narrowly marked brown; fore wing hyaline; frontovertex slightly narrower than one-quarter head width; antenna (Fig. 22) with clava about as long as F3-F6 combined, all funicle segments slightly longer than broad; scutellum with fine punctate-reticulate sculpture and with about 15 setae; ovipositor (Fig. 26) about 4X as long as gonostylus with exserted part slightly shorter than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.69mm; excluding ovipositor, 1.53mm (CPD).

Head with occipital margin coppery; frontovertex metallic dark green between occipital margin and posterior ocelli, metallic purple in front of posterior ocelli, metallic dark blue and purple in front of anterior ocellus and purple immediately above scrobes; purple and metallic dark green between eye and scrobe, a little brassy and coppery below lowest point of eye; temple metallic green and coppery; gena duller metallic green, coppery and brassy; scrobal area metallic dark green, mixed with some coppery areas, dark blue between dorsal margins of toruli; mouth margin coppery purple; frontovertex with a few, scattered, translucent pale brown setae; a few setae along inner eye margin, these continuing below eye on to gena as a conspicuous, almost silvery line; interantennal prominence with a line of translucent, pale brown setae down each side in a Λ-shape; maxillary palpus white; antenna with radicle, scape, pedicel and funicle mostly pale orange but proximal 0.7X of pedicel dorsally brown and funicle dorsally slightly dusky, especially F1-F4, clava dark brown; thorax dark brown to black with a metallic lustre; pronotum mostly dark coppery purple, mixed with some metallic dark green; mesoscutum bright, metallic, dark blue mixed with some purple reflections; tegula dark brown with a weak purple and brassy sheen; axilla metallic blue-green mixed coppery purple; scutellum with raised part of reticulations metallic purple and bottoms of cells metallic dark green with some coppery reflections, side and apex bright metallic dark green and blue-green mixed with a coppery sheen; dorsum of thorax clothed with dark brown setae; mesopleuron with a dull, brassy and purple sheen; fore coxa pale orange; fore femur and tibia pale orange, fore tarsus dusky pale orange; mid coxa dark brown, pale orange at apex; mid femur white proximally, pale orange distally with a ventral, subapical,

brown spot, tibia pale orange with a narrow, subbasal brown band, spur and tarsus pale orange; hind coxa dark brown; hind femur mainly pale orange, but mixed brown medially, tibia very pale yellow at base, with a narrow, subbasal brown band and apical 0.6X pale orange, tarsus white proximally, pale orange distally; wings hyaline, venation pale orange, marginal vein brown; propodeum dark brown with a weak brassy and purple sheen, side metallic green; gaster dark purple-brown, dorsally with a coppery purple sheen mixed slightly brassy and green, Gt1 with a proximal metallic purple band then a dark metallic blue band and distally coppery purple; side and venter with a mixed green, blue, coppery and brassy sheen; gonostylus dark brown.

Head in profile about 1.6X as high as deep, in facial view about 4.3X as wide as frontovertex, which is narrowest a little behind posterior ocelli; ocelli forming an angle of about 60°; occipital margin weakly angular, medially weakly carinate, a conspicuous, long seta present on margin behind each posterior ocellus; a slender, elongate depression adjacent to eye behind posterior ocellus near occipital margin; frontovertex shiny, ocellar area with relatively deep, punctate-reticulate sculpture of mesh size mainly subequal to eye facet, behind posterior ocelli shallower and more polygonally reticulate to irregular; temple and gena with relatively shallow, longitudinally elongate imbricate-reticulate sculpture; scrobes with relatively shallow, irregular sculpture, almost smooth; interantennal prominence and mouth margin with shallow, polygonally reticulate sculpture; scrobes very shallow, indistinctly margined, narrowly ∩-shaped; interantennal prominence dorsally narrowly rounded; antenna as in Fig. 22; scape hardly broadened and flattened, about 4.3X as long as broad; all funicle segments slightly longer than broad, becoming slightly larger and broader distad, F1 conspicuously smaller, subquadrate, linear sensilla present on all segments or absent from F1; clava nearly as long as F3-F6 combined, sutures parallel, sensory area small, at apex only giving it a pointed or slightly rounded appearance; eye not quite reaching occipital margin, clothed with inconspicuous, short setae, each of which is clearly shorter than diameter of facet; malar sulcus present, but very fine; clypeal margin very slightly convex medially; mandible (Fig. 23) with two acute teeth and a broad, weakly denticulate truncation. Relative measurements: HW 76.5, HH 63, FV 18, POL 9, OOL 0, OCL 10, AOL 10.5, EL 41, EW 42, MS 27, SL 32.5, SW 7.5.

Thorax with fine, transversely elongate, imbricate-reticulate to polygonally reticulate sculpture on pronotum that is a little shallower than sculpture in ocellar area, and generally of smaller mesh; mesoscutum with polygonally reticulate to imbricate-reticulate sculpture that is about as deep as that on pronotum but with conspicuously larger mesh size, especially anteriorly; axilla with similar sculpture to that on pronotum; scutellum dorsally with fine, more or less regular punctate-reticulate sculpture that is clearly deeper than that on mesoscutum, side and apex completely smooth and shiny; visible part of mesoscutum about 1.6X as broad as long; scutellum about 1.2X as broad as long with about 15 subequal setae; hind femur about 3.9X as long as broad; fore wing with venation and setation as in Figs 24, 25; costal cell with 9 or 10 dorsal setae at apex; propodeum with 5 or 6 moderately conspicuous setae outside spiracle. Relative measurements: FWL 82, FWW 34.5; HWL 54.5, HWW 14.5.

Gaster with hypopygium reaching about 0.5X to apex; last tergite about 0.8X as long as mid tibia, apex broad, weakly angular; ovipositor (Fig. 26) slightly exserted, the exserted part about 0.6X length of mid tibial spur or about 0.25X mid tibia. Relative measurements: OL 60, GL 16 [MT 46].

Variation. The overall length of the female varies from 1.26-1.70mm, otherwise very little variation noted.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, San Vito, Las Cruces, Wilson Bot. Gdns, 8°46'N 82°57'W, 1300m, 15-16.ii.2006 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, 18km N.

Liberia, Buena Vista Lodge, 10°48'N 85°24'N, 770m, 15-17.ii.2016 (J.S. Noyes); 1♀, **Alajuela**, San Ramon, Villa Blanca, 1100m, iii-v.2011 (W. Porras); 2♀, **Heredia**, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, 28-29.ii.2008 (J.S. Noyes); 5♀, Heredia, Santo Domingo, INBio Parque, 1100m, 9°59'N 84°06'W, 17.ii.2007, 16.ii.2008, 13.ii.2010 and 12.ii.2011 (J.S. Noyes). Holotype in NHMUK, paratypes in NHMUK and MZUCR.

COMMENTS. *Adelencyrtus plocus* is most similar to *funicularis* Hayat, Alam & Agarwal (1975) from India and *antennatus* Compere & Annecke (1961) from Africa, all three species having hyaline fore wings, fore coxa yellow or orange, mid and hind coxae brown, legs yellow or orange and similar antennal structure with F1 much smaller than F3-F6, which are subequal. It differs from both species in having all funicle segments longer than broad, whereas in *funicularis* F1 and F2 are small, equal and quadrate and in *antennatus* F1 is small and anelliform and all other funicle segments are transverse, albeit subquadrate.

Adelencyrtus odonaspidis Fullaway
(Figs 27-32; Hab. ♀ 5)

Adelencyrtus odonaspidis Fullaway, 1913:27. Syntypes ♀♀, Hawaii, USNM, examined.

DIAGNOSIS. *Female* (length about 1.1-1.4mm): head with frontovertex bright metallic green changing to metallic dark blue and then purple above scrobes; scrobal area, mouth margin, temple and gena metallic green mixed coppery and coppery purple; scape pale orange, pedicel pale brown proximally, otherwise pale orange, F1-F4 slightly dusky pale orange, F5-F5 pale yellow, clava mostly pale orange but slightly dusky proximally; thorax generally dark brown to black with a metallic sheen; pronotum metallic green mixed blue and coppery; mesoscutum bright metallic green, with some coppery reflections, mixed with some dark blue and brassy reflections; tegula dark brown with a slight coppery purple sheen; axilla relatively dull metallic green and coppery purple; scutellum dorsally relatively dull with coppery and dark green to blue-green reflections, side and apex bright metallic green mixed coppery; mesopleuron with a weak, coppery purple and brassy sheen; legs generally pale yellow to very pale orange, but mid coxa dark brown ventrally and hind coxa dark brown dorsally, hind femur mostly brown and hind tibia with a subbasal brown ring; fore wing weakly infuscate, more strongly so at apex, with a large triangular, hyaline area on anterior margin immediately distad of apex of venation and another on posterior margin opposite, venation pale orange with marginal vein dark brown; hind wing hyaline, venation pale orange; propodeum dark purple-brown with a weak brassy sheen, side bright metallic green mixed brassy; gaster dark purple-brown, dorsally with a coppery purple sheen mixed slightly brassy and green, Gt1 with a distinct dark metallic blue or green, brassy and purple sheen, side and venter with coppery, blue, brassy and green reflections; gonostylus slightly dusky pale orange; head in profile about 1.4X as high as deep, in facial view about 3.5X as wide as frontovertex, which is narrowest a little behind posterior ocelli; ocelli forming an angle of about 70°; a conspicuous, long seta present on margin behind each posterior ocellus; a slightly elongate, oval depression adjacent to eye near occipital margin; frontovertex shiny, with relatively deep, polygonally reticulate to imbricate-reticulate sculpture of mesh size mainly subequal to eye facet, deepest and more polygonally reticulate in ocellar area; temple and gena with relatively shallow, longitudinally elongate imbricate-reticulate sculpture; scrobes with relatively shallow, irregular sculpture, almost smooth; interantennal prominence and mouth margin with shallow, polygonally reticulate sculpture; scrobes very shallow, indistinctly margined, narrowly ∩-shaped; interantennal prominence dorsally rounded; antenna as in Fig. 30; scape hardly broadened and flattened, about 4.5X as long as broad; F1-F4 relatively small, subequal and strongly transverse, F5-F6 much larger, subequal and a little longer than broad, linear sensilla present only on F5-F6; clava about as long as funicle, sutures parallel, sensory area small, at apex only giving it a pointed or slightly rounded appearance; eye not quite reaching occipital margin, clothed with fairly conspicuous setae, each of which is about as long as diameter of facet; malar sulcus absent; mandible (Fig. 28) with four teeth; thorax (Fig. 27) with pronotum hardly exposed behind head, its posterior margin broadly V-shaped and strongly emarginate medially; pronotum and mesoscutum with imbricate-reticulate to polygonally reticulate sculpture that is coarser than in ocellar area, but

not quite as deep; scutellum with fine, punctate-reticulate sculpture that is conspicuously deeper than that on mesoscutum, side and extreme apex completely smooth and shiny; visible part of mesoscutum about 1.7X as broad as long; scutellum about 1.2X as broad as long, fore wing about 2.6X as long as broad with venation and setation as in Fig. 29; costal cell with 1 or 2 dorsal setae at apex; propodeum with 2 or 3 very inconspicuous setae outside spiracle; gaster with hypopygium (Fig. 31) reaching about 0.5X to apex; last tergite about as long as mid tibia, with apex narrowly rounded; ovipositor (Fig. 32) slightly exserted, the exserted part about 0.5X length of mid tibial spur or about 0.2X mid tibia. Male: unknown.

DISTRIBUTION. USA (Hawaii, Texas, Louisiana, Florida), Bermuda, Mexico, Cuba, Trinidad & Tobago, Brazil, South Africa, India (Karnataka), China (Hainan) and Japan (see Noyes, 2019). Newly recorded below from St. Vincent and the Grenadines (**new record**), Costa Rica (**new record**), Argentina (**new record**), Seychelles (**new record**), Madagascar (**new record**) and Kiribati (**new record**).

HOSTS. This species has been reared from *Odonaspis graminis* Bremner (Fullaway, 1913), *Duplachionaspis sansevieriae* Williams, *Odonaspis ruthae* Kotinsky and *Odonaspis saccharicaulis* (Zehnter) (Hemiptera: Diaspididae) (see Noyes 2019). Records of *Antonina graminis* (Maskell) (Hemiptera: Pseudococcidae) as a possible host (see Burks, 1958) are almost certainly erroneous as is also the record below from *Russelliana solanicola* Tuthill (Hemiptera: Psyllidae).

BIOCONTROL. *Adelencyrtus odonaspidis* was released in Bermuda in 1968 for the control of *Odonaspis ruthae* but failed to establish Cock (1985).

MATERIAL EXAMINED.

Type material. Syntypes: 2♀, on slide, "♀ Amicroterys kotynskyi Ashm. Type 9816 Parasite Odonaspis ruthae Kot. Cynodon dactylon Honolulu (Kotynsky) Aug. '05" "USNMENT 01049068" "Adelencyrtus odonaspidis Full. Type No 9816 U.S.N.M." (USNM).

Non type material. **USA**, 2♀, **Hawaii**, Oahu, Kaimuki, 3.viii.1913 (O.H. Swezey); 1♀, Hawaii, Oahu, Kawaiako, 7.iii.1916; 1♀, Hawaii, Oahu, Manua Val., 23.iii.1916 (E.M. Ehrhorn); 2♀, Hawaii, Oahu, Honolulu, ex Odonaspis ruthae, 10.vi.1919 and 23.vi.1919; 2♀, Hawaii, Honaunau, in Bermuda grass, 13.viii.1919 (Timberlake); 1♀, Hawaii, Oahu, Waipio, peninsula, 24.xi.1965 (J.W. Beardsley); 1♀, Hawaii, Honolulu, 11.xii.1965 (J.W. Beardsley); 1♀, Hawaii, Maui, Waikapura, in Bermuda grass, 23.iii.1921 (O.H. Swezey). **CUBA**, 1♀, Santiago, Santiago Jardin Botanico, 16.xii.1995 (L. Masner). **ST VINCENT**, 2♀, St George, Kingstown, wasteground, 4.vii.1976 (J.S. Noyes); 2♀, St George, Belmont, wasteground, 6.vii.1976 (J.S. Noyes). **TRINIDAD & TOBAGO**, 1♀, **Trinidad**, Curepe, CIBC lab. grounds, Moericke trap, 29.v-12.vi.1974 (M.N. Beg); 1♀, Trinidad, Curepe, Sta Margarita Circ. Rd, 29.iv-5.5.1974 (F.D. Bennett); 7♀, Trinidad, various localities and dates, 23.vi-4.viii.1976 (J.S. Noyes). **COSTA RICA**, 3♀, **Guanacaste**, Santa Rosa NP, Hacienda, 18.x-8.xi.1986 and 20.xii.1986-10.i.1987 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, Santa Rosa NP, Sn. Emilio, 14.vi-5.vii.1986 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, Santa Rosa NP, 30m, ii.1995 (L. Masner); 1♀, Guanacaste, Murcielago (ACG), 75m, MT, 24.i-4.ii.1996 (J. Ugalde); 1♀, Guanacaste, Cañas, Rio Chiquito, 410m, #74625, 25.vii.2003 (J. Azofeifa); 1♀, Guanacaste, PN Palo Verde, Sector Palo Verde, LN 260952 385020, 50m, #54949, 5.i-7.ii.2000 (I. Jiménez); 1♀, **Cartago**, Turrialba, La Isabel, 650m, coffee, viii.1994 (P. Hanson); 2♀, **Puntarenas**, RF Golfo Dulce, 5km W Piedras Blancas, 8°46'N 83°17'W, 100m, vi-vii.1992 and vi-vii.1993 (P. Hanson); 6♀, Puntarenas, Golfo Dulce, 24km W Piedras Blancas, 8°46'N 83°24'W, 200m, iii-v.1989, iv-v.1991 and vi-vii.1991 (P. Hanson); 8♀, Puntarenas, 5km N Puerto Jimenez, 8°33'N 83°21'W, 10m, i-ii.1991, i-ii.1993, iii.1993 and v-vi.1993 (P. Hanson); 1♀, Puntarenas, Pen. Osa. Puerto Jimenez, 8°32'N 83°19'W, viii.1991 (P. Hanson); 1♀, **Limón**, RB Hitoy-Cerere, 100m, 14-19.i.1991 (J.S. Noyes); 1♀, Limón, AC Amistad, Hitoy-Cerere, LN 184600 643400, 150m, 5-22.i.1994 G. Carballo). **ARGENTINA**, 1♀, Tucuman, La Madrid, ex nymph of *Russelliana solanicola*, IIE 21600 #1, 18.xi.1990 (C. Garcia). **SEYCHELLES**, 1♀, Silhouette I., coastal veg., 2-20m, 25-28.viii.2000 (J.S. Noyes). **MADAGASCAR**, 1♀, Tananarive, golf course 25km W Tananarive, 23.iv.1983 (J.S. Noyes, M.C. Day); 10♀, Tamatave, Perinet, 27.iv-3.v.1983 (J.S. Noyes, M.C. Day); 1♀, Tulear, Berenty, 12 km NW Amboasary, 5-15.v.1983 (J.S. Noyes, M.C. Day); 3♀, Tulear, Bereboka, 60km NE Morondava, 18-23.v.1983 (J.S. Noyes, M.C. Day). **KIRIBATI**, 1♀, Tarawa I., 6.xi.1983 (A.K. Walker). Material in MZUCR, and NHMUK.

COMMENTS. The two slide-mounted female syntypes of *odonaspidis* are uncleared and mounted under a single coverslip. They are in good condition and with care it may be possible to remount them so that a lectotype can be selected. As they clearly belong to the species currently understood to be *odonaspidis*, and other specimens may exist (Fullaway described the species from "several specimens"), I consider this to be presently unnecessary.

Adelencyrtus bifasciatus (Ishii)

(Figs 33-40; Hab. ♀ 6)

Anabrolepis bifasciata Ishii, 1923:106-107. Lectotype ♀, designated by Japoshvili et al., 2016:350, Japan, NIAES, not examined.
Adelencyrtus bifasciatus (Ishii); Compere & Annecke, 1961:57

DIAGNOSIS. *Female* (length about 1.1-1.5mm): head with frontovertex metallic green to blue-green; purple above scrobes and between eye and scrobe; a few setae along inner eye margin, these continuing below eye on to gena as a conspicuous line; maxillary palpus white; antenna mainly dark brown, but with F5 pale orange, mixed brown proximally and F6 pale yellow; thorax dark brown to black with a metallic lustre; mesoscutum mostly with a purple and blue-green sheen, axilla and dorsal part of scutellum similar to mesoscutum, but much less shiny, side and apex of scutellum bright, metallic blue-green; all coxae dark brown; fore femur dark brown with extreme apices very pale orange, tibia dark brown with apical one-third pale orange; mid femur white in proximal half, a broad, subapical brown band, apex very pale orange, tibia very pale orange with a subbasal, brown band, spur and tarsus very pale orange, almost white; hind femur dark brown with extreme base pale orange, tibia dark brown with apical 0.3X white; fore wing (Fig. 38) hyaline proximad of parastigma, otherwise mostly infuscate, but with a pair of opposite, subrectangular, marginal, hyaline spots distad of apex of venation and more or less hyaline apically; gaster dorsally with a coppery purple sheen mixed slightly brassy and green, Gt1 with a proximal metallic purple band then a dark metallic blue and blue-green band and distally coppery purple; gonostylus dark brown; head (Fig. 33) about 4.5-5.4X as wide as frontovertex, which is narrowest a little behind posterior ocelli and immediately above scrobes; ocelli forming an angle of about 55-75°; frontovertex with relatively deep, punctate-reticulate sculpture; antenna as in Figs 34, 35; scape hardly broadened and flattened, about 4.1-4.3X as long as broad; F1 and F2 relatively small, anelliform, subequal, F3-F4 a little larger, transverse or quadrate, F5-F6 quadrate or longer than broad, smaller specimens with F3-F4 transverse; linear sensilla present only on F3-F6; clava in smaller specimens a little longer than funicle, but in larger specimens about as long as F2-F6 combined; eye clothed with moderately conspicuous setae, each of which is very nearly as long as diameter of facet; mandible with 4 teeth, two upper teeth very short sometimes forming a truncate margin; thorax (Fig. 37) with polygonally reticulate to imbricate-reticulate sculpture on mesoscutum; scutellum dorsally with fine, more or less regular punctate-reticulate sculpture that is clearly deeper than that on mesoscutum, side and apex completely smooth and shiny; scutellum with 3 or 4 smaller setae and 4 larger setae, including a pair of longer, slender, subapical setae; fore wing with venation and setation as in Figs 38, 39; gaster with hypopygium as in Fig. 36; ovipositor (Fig. 40) slightly exserted, the exserted part about 0.8X length of mid tibial spur or about 0.3X mid tibia. *Male* (length about 0.9-1.0mm): similar to female but for wider frontovertex, hyaline fore wing and structure of antenna and genitalia; head about 2X as wide as frontovertex, antenna with 2 anelliform funicle segments and a long clava that is about 7-8X as long as broad and about as long as head width; fore wing with linea calva interrupted by 2 or 3 setae; genitalia with aedeagus slender, digiti well developed, each about 2X as long as broad with a single apical hook.

DISTRIBUTION. USA (Hawaii), Bangladesh, India, China, Taiwan, Japan (see Noyes 2019). Also recorded below from Costa Rica (**new record**).

HOSTS. Recorded from *Aonidiella aurantii* (Maskell), *Aonidiella orientalis* (Newstead), *Gannaspis glomerata* (Green), *Hemiberlesia lataniae* (Signoret), *Lepidosaphes* Shimer,

Lindingaspis setiger (Maskell), *Pinnaspis* Cockerell, *Pseudaonidia duplex* (Cockerell) and *Pseudaonidia trilobitiformis* (Green) (see Noyes, 2019). Also, apparently insectary reared on *Ceroplastes rubens* Maskell (Hemiptera: Coccidae) (see below) which suggests that the record of this species being reared once from the same host by Yasumatsu & Tachikawa (1949) may be correct, albeit unusual. A male of this species has also been reported emerging from *Ceroplastes japonicus* Green (Xu & Huang, 2004).

MATERIAL EXAMINED.

COSTA RICA, 3♀, **Alajuela**, RF Arenal, Stor Colada, LN 269900 456750, 600m, 26.x-22.xi.1999, ii.2000 and v-vi.2000 (G. Carballo); 1♀ Alajuela, PN Arenal, Sendero Ceibo, 10°27'N 84°44'W, 620m, 22-23.ii.2016 (J.S. Noyes). **CHINA**, 1♀, **Hainan**, Hengsheng Co., ex *Pseudaonidia* sp. on *Citrus* sp., 92-620-21, 17.vi.1992 (H.W. Browning). **JAPAN**, 4♂, Nagasaki, ex *Ceroplastes rubens*, 17.iii.1916 (C.P. Clausen) [USA: California, State Insectary 1224], "♂ *Adelencyrtus bifasciatus* det. Compere". Material in MZUCR and NHMUK.

COMMENTS. I have not been able to examine type material of this species, but the specimens agree well with the original description by Ishii (1923) and also material determined as this species from China. Initially I thought that the material from Costa Rica belonged to a separate species characterised by relatively longer funicle segments. However, the antenna of a smaller specimen collected in the same locality matches the description and the Chinese specimen very well. Given this range of variation it seems possible that *Adelencyrtus biannulatus* Zhang and Shi (2010), described from China, may be merely larger specimens of *bifasciatus* and thus the two may be synonymous.

Genus *PLAGIOMERUS* Timberlake

Plagiomerus Crawford, 1910:89. Type species: *Plagiomerus diaspidis* Crawford, by monotypy.
Parahomalopoda Girault, 1915b:170. Type species: *Parahomalopoda peruviensis* Girault, by monotypy. Synonymy with *Plagiomerus* by Noyes (1980:222).

Female. Length about 0.6-1.5mm.

Body generally dark with a metallic sheen; palpi white; scutellum coppery purple with some blue; legs dark brown with white, pale yellow and pale orange areas, tibiae with distinct dark brown, subbasal rings; wings hyaline.

Head in facial view about 3.0-5.3X as wide as frontovertex, in profile about 1.5-1.6X as high as deep, triangular with frontovertex moderately flat, angled at top of scrobes and face straight to mouth margin, face below top of scrobes forming and angle of about 60° with the tangent of the frontovertex; occipital margin sharp, sometimes weakly carinate, a conspicuous long seta present on margin behind each posterior ocellus; a short oval depression adjacent to each eye on occipital margin; scrobes shallow, indistinctly margined, narrowly ∩-shaped; antenna with scape about 3.5-3.8X as long as broad; funicle 4-segmented, segments strongly transverse to hardly longer than broad; clava longer than funicle, 3-segmented, sutures parallel, apically pointed or rounded, sensory area at apex only; eye slightly overreaching occipital margin, clothed with moderately conspicuous setae; malar sulcus absent; mandible with four teeth, two upper teeth short, and a distinct ventral peg (Fig. 64, arrowed), palp formula 4-3.

Thorax with pronotum hardly exposed behind head, its posterior margin broadly V-shaped and strongly emarginate medially; mesoscutum quite flat; scutellum about 1.2-1.6X as broad as long, flat, with reticulate sculpture that is much deeper than that on mesoscutum, side and apex completely smooth and shiny, apex with one or two pairs of erect, bristle-like or scale-like setae; submarginal vein with a subapical hyaline break, parastigma slightly swollen, narrowly subtriangular with a single, longer erect, backward facing seta; marginal vein about 5-6X as long as broad, about 2X as long as postmarginal or stigmal veins; filum spinosum present as a line of 4 or 5 stouter setae; mesopleuron expanded posteriorly, but not quite reaching level with posterior margin of propodeum; propodeum with some irregular sculpture surrounding spiracle extended posteriorly as troughs and ridges towards hind coxa.

Gaster with hypopygium reaching about half way to two-thirds towards apex, transverse, subrectangular; last tergite about as long as mid tibia; ovipositor slightly exserted, slightly longer than mid tibia and about 4X as long a gonostylus.

Male. Length about 0.7-0.9mm.

Generally very similar to female except for structure of antenna and genitalia, antenna with scape about 3.5X as long as broad, funicle 2-segmented, both segments anelliform and without linear sensilla; clava about 6.5X as long as broad and 3X as long as pedicel and funicle combined, apex pointed with a short finger-like projection; flagellum clothed in setae that are about half as long as diameter of segments; phallobase about 4-5X as long as broad, paramere with a very short subapical seta, cuspis seta present; digitus about 2X as long as broad with single apical hook; aedeagus slender about 12X as long as broad, about 0.5X as long as mid tibia and with apex acute.

DISTRIBUTION. Virtually cosmopolitan, but absent from higher latitudes (about 40°+). Not yet recorded from the Afrotropical region or Australia.

HOSTS. Species have been recorded as primary parasitoids of a variety of armoured scales, including species of the genera *Aonidiella* Berlese & Leonardi, *Aspidiotus* Bouché, *Aulacaspis* Cockerell, *Clavaspis* MacGillivray, *Diaspis* Costa, and *Hemiberlesia* Cockerell (Hemiptera: Diaspididae); also recorded from *Ceroplastes* Gray, *Parasaissetia* Takahashi, *Saissetia* Deplanche (Coccidae) and *Aleurothrixus* Quaintance & Baker (Aleyrodidae) and, probably erroneously, from mealybugs (Pseudococcidae) (see Noyes, 2019).

BIOCONTROL. *Plagiomerus diaspidis* Crawford was imported from Tenerife (Canary Islands, Spain) and released experimentally as a biological control agent against *Diaspis echinocacti* (Bouché) (Hemiptera, Diaspididae) within a glasshouse in south-eastern France but it failed to provide control. A second unidentified species of *Plagiomerus* (possibly *hospes*) was found in a wet tropical greenhouse in the same region of France and was thought to be a potential biocontrol agent of Diaspididae. However, it failed to control any of the three species of diaspidids present (Panis & Pinet, 2001).

COMMENTS. See comments under *Homalopoda* (p. 54).

IDENTIFICATION. Worldwide, 11 species, including the species described below as new, see: Hayat 2006 (2 species, India); Xu & Huang, 2004 (4 species, China); single species treatments: Si et al, 2010 (China); Ashmead, 1888 (USA); Girault, 1915b (Peru).

Key to Costa Rica species of *Plagiomerus*
(Females)

1. Scutellum (Figs 47, 49, 50) medially with sculpture composed of uniform, punctate-reticulate cells and with 4 bristle-like or scale-like setae at apex (these conspicuously longer than other setae and suberect, normally slightly angled forwards) 2
- Scutellum (Figs 59, 65) medially with sculpture composed of non-uniform, longitudinally elongate, polygonal cells and with only one pair of bristle-like or scale-like subapical setae (these conspicuously longer than other setae and suberect, normally slightly angled forwards) 3

2 (1) Antenna (Fig. 45) with F3 much smaller than F4 and without linear sensilla; two apical segments of clava paler than basal segment, generally yellowish, occasionally apical segment almost as dark as basal segment .... *bangaloriensis* Shafee, Alam & Agarwal (p. 43)
- Antenna (Fig. 53) with F3 subequal to F4 and with linear sensilla; clava unicolorous brown ..... *hospes* Timberlake (p. 45)

3 (1) Funicle (Fig. 56) with F2 clearly larger than F1 and with linear sensilla .... *calabes* **sp.nov.** (p. 49)
- Funicle (Fig. 62, 63) with F2 slightly smaller than F1 and without linear sensilla .... *peruviensis* (Girault) (p. 51)

Plagiomerus bangaloriensis Shafee, Alam & Agarwal
(Figs 41-47; Hab. ♀ 7)

Plagiomerus bangaloriensis Shafee, Alam & Agarwal, 1975:102-103. Holotype ♀, India (Karnataka), ZAMU, not examined.

DIAGNOSIS. *Female* (length about 0.6-1.4mm): head with frontovertex metallic green to dark blue, purple above scrobes; antenna (Fig. 45) with scape dark brown, funicle with F1-F2 mostly brown, F3 mostly pale, F4 very pale orange, clava with apical segments partially or completely yellowish, contrasting with brown basal segment; mesoscutum relatively bright metallic green or dark blue in anterior half, posterior half mostly coppery; fore coxa dark brown, rarely yellow; mid tibia with a dark brown subbasal band; head (Fig. 44) about 3.5-5.3X as wide as frontovertex, ocellar forming an angle 50-90°, smaller specimens generally having a relatively wider frontovertex and ocelli forming a larger angle; scape about 3.8X as long as broad; funicle (Fig. 45) with F1-F3 clearly transverse, without linear sensilla, F2 shortest, F1 and F3 subequal, F4 largest, subquadrate and with linear sensilla; clava longer than pedicel and funicle combined; scutellum (Fig. 47) with uniform, rounded, punctate-reticulate cells, with 4 subapical bristle-like or scale-like setae in a transverse line, separated by less than diameter of a socket; fore wing (Fig. 41) with marginal vein (Fig. 42) longer than stigmal vein; hypopygium as in Fig. 46; ovipositor (Fig. 43) about 1.2-1.3X as long as mid tibia, hardly exserted, the exserted part up to 0.4X as long as mid tibial spur. *Male*: unknown.

DISTRIBUTION. Costa Rica, India

HOSTS. Recorded in India, as a parasitoid of *Aonidiella orientalis* (Newstead), *Diaspis echinocacti* (Bouché) and *Hemiberlesia lataniae* (Signoret) (Hemiptera: Diaspididae) and also from *Phenacoccus indicus* (Avasthi & Shafee) (Hemiptera: Pseudococcidae) but this last host requires confirmation (see Noyes, 2019).

MATERIAL EXAMINED.

COSTA RICA, 19♀, **Guanacaste**, Santa Rosa NP, various localities and dates 5.x.1985-iii.1987 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, 1100m, SW side Est. Cacao, 1100m, 1988-1989; 1♀, Guanacaste, Guanacaste NP, below Cacao, 400-500m, 3.iii.1990 (J.S. Noyes); 1♀, Guanacaste, Murcielago, (ACG), 24.i-4.ii.1996 (J. Ugalde); 7♀, Guanacaste, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes); 5♀, Guanacaste, Est. Cacao (ACG) 10°55'N 85°30'W, 1100m, 19-20.ii.2005 and 22.ii.2005 (J.S. Noyes); 1♀, Guanacaste, Est. Cacao (ACG), LN 323150 375500, 1000-1150m, viii.1996 (M. Pereira); 1♀, Guanacaste, Guanacaste NP, Est. Pitilla, 700m, YPT, iii.1990 (J.S. Noyes); 2♀, Guanacaste, Guanacaste NP, below Pitilla, 7-8.iii.1990 (J.S. Noyes); 2♀, Guanacaste, 9km S. Santa Cecilia, Est. Pitilla (ACG), 700m, LN 329950 380450, v.1994 and xii.1994 (P. Rios); 1♀, Guanacaste, Pitilla (ACG), 700m, MT/YPT, 24.i-27.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Est. Pitilla (ACG) 10°59'N 85°25'W, 700m, FIT, iii.2001 (C. Moraga, P.N. Thomas); 1♀, Guanacaste, Guanacaste NP, Est. Maritza, Vn Orosi, 560m, vi.1988 (Gauld, Mitchell); 16♀, Guanacaste, Maritza (ACG), MT/YPT, 20.i-24.ii.1996 (J.S. Noyes); 3♀, Guanacaste, Est. Maritza (ACG), LN 326900 373000, 600m, iii.1996 (M. Pereira); 1♀, Guanacaste, Maritza (ACG) LN 326500 372600, 600m, 23.iv.-11.v.1996 (F.A. Quesada); 1♀, Guanacaste, Est. Maritza (ACG), LN 326900 373000, 600m, xi.1996 (C. Zuñiga); 2♀, Guanacaste, Est. Maritza (ACG), 10°58'N 85°29'W, 700m, 23.ii.2003 and 21.ii.2005 (J.S. Noyes); 1♀, Guanacaste, Las Pallas, 5km S Cerro Braun, 950m, LN 307450 388700, v.1996 (D. Espinoza, A. Masis); 1♀, Guanacaste, Santa Cruz, Vista del Mar, Torre Cocesna, LN 357490 235450, 970m, #61247, xii.2000-i.2001 (Y. Cardenas); 6♀, Guanacaste, BN Diriá, Vista del Mar, LN 233900 358750, 890m, 12.vi-9.vii.2001 and vii-viii.2001 (I. Jiménez); 5♀, Guanacaste, ZP Nosara, Fila Maravilla, LN 221350 381700, 800m, vi-vii.2001, vii-viii.2001 and viii-ix.2001 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sector Palo

Verde, LN 257400 400000, 250m, #53297, ix.1999 (I. Jiménez); 7♀, Guanacaste, PN Palo Verde, Sector Palo Verde, 150/200m NE Estación, LN 260952 385020, 0-50m, various dates viii.1999-18.i.2000 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sect. Palo Verde, Laguna Laza, LN 260952 385020, 0m, #54244, 2-11. xii.1999 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Est. Palo Verde, LN 259050 388400, 10m, #60220, x-xi.2000 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sector Palo Verde, Cerro Guayacan, MT, #53297, 15.vi.1999 (I. Jiménez); 1♀, Guanacaste, 10km NW Cañas Mojica, rice, 30,viii-12.ix.2011 (P. Hanson); 1♀, **Alajuela**, San Ramon de Dos Rios, 1.5km N Hda Nueva Zealandia, 620m, #8523, 23.viii.1996 (F.A. Quesada); 1♀, Alajuela, Reserva Rincon Forestal, Est. Caribe, 10°53'N 85°18'W, 400m, 19-20.ii.2003 (J.S. Noyes); 2♀, Alajuela, San Cristobal, LN 318056 383200, 600-620m 17.vi-18.vii.1996 (F.A. Quezada, D. Briceño); 1♀, Alajuela, PN Arenal, 10°28'N 84°45'W, 617m, 21-28.ii.2005 (C. Hansson); 1♀, Alajuela, PN Arenal, Sendero Mena, LN 454170 271800, 600m, 17.iv-19.v.2001 (G. Carballo); 3♀, Alajuela, PN Arenal, La Peninsula, 10°27'N 84°40'W, 600m, 25.ii.2003 (J.S. Noyes); 1♀, Alajuela, RF Arenal, Sendero Pilón, LN 269100 457900, 600m, #53365, 14.x-3.xii.1998 (G. Carballo); 2♀, Alajuela, PN Arenal, Sendero Pilón, 10°27'N 84°43'W, 600m, 26.ii.2003 (J.S. Noyes); 1♀, Alajuela, 5km W San Ramon, 1200m, vii.1997 (O. Castro, P. Hanson); 1♀, Alajuela, San Ramon BS, 700m, viii-ix,1995 (P. Hanson); 1♀, Alajuela, Peñas Blancas, 9.vi.1987 (E. Cruz); 1♀, Alajuela, Chiles de Aguas Zarcas, café, xii.1989 (R. Cespedes); 1♀, **Heredia**, San Joaquin de Flores, LN 220900 519700, 1200m, #5515, 2.vi-8.vii.1995 (C. Viquez); 1♀: Heredia, San Joaquin de Flores, LN 220900 519700, 1054m, #5487, 7.vi-2.ix.1995 (C. Viquez); 2♀, Heredia, La Selva BS, 50m, MT/YPT, ii.1991 (J.S. Noyes); 1♀, Heredia, OTS-La Selva, 10°26'N 84°01'W, ii.1994 (ALAS); 1♀, Heredia, La Selva BS, 10°26'N 84°01'W, FOT 21, 10.x.1994; 1♀, Heredia, RB La Selva, 10°26'N 84°01'W, 14.xii.1995 (INBio/OET ALAS); 1♀, Heredia, 11km SE La Virgen, 10°11'N 84°07'W, 450-550m, 05/M/TN, 23.ii-20.iv.2003 (INBio-OET-ALAS); 3♀, Heredia, 16km SSE La Virgen, 10°16'N 85°05'W, 1050-1150m, 11/M/NOTN, 9.ii-12.iv.2001 (INBio/OET – ALAS); 5♀, Heredia, La Selva BS, 10°26'N 84°01'W, ii.2001 and ii.2003 (J.S. Noyes); 2♀, Heredia, Puerto Viejo, Est. Biol. La Selva, LN 264463 532850, 100-200m, #67193, 30-31.iii.2002 (J. Azofeifa); 1♀, Heredia, OTS La Selva, 10°26'N 84°01'W, 75m, 23-24.ii.2005 (J.S. Noyes); 2♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, 25. ii.2016 (J.S. Noyes); 1♀, Heredia, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/TN, ii.2002 (INBio-OET-ALAS); 1♀, Heredia, Santo Domingo, INBio Parque, 1200m (error for 1100m), 19.ii.2001 (J.S. Noyes); 10♀, Heredia, Santo Domingo, INBio Parque 1100m, LN 217300 526200, various dates vi.2000-18. iii.2002 (R. Zuñiga); 5♀, Heredia, Santo Domingo, INBio Parque, LN 536250 217400, 1100m, ii.2002 (J. Azofeifa, J.S. Noyes); 1♀, Heredia, Santo Domingo, INBio Parque, LN 526250 217400, 1100m, 1-12.iv.2002 (D. Rubí, J.S. Noyes); 1♀, Heredia, Santo Domingo, INBio Parque, LN 217300 526200, 1100m, #71481, 6.x.2002 (J. Azofeifa); 1♀, Heredia, Santo Domingo, INBio Parque, 9°59'N 86°06'W, 1100m, 13.ii.2010 (J.S. Noyes); 1♀, Heredia, Santo Domingo, INBio Parque, 9°59'N 86°06'W, 1100m, 16.ii.2013 (J.S. Noyes); 1♀, Heredia, Santo Domingo, INBio Parque, 9°59'N 86°06'W, 14.ii.2015 (J.S. Noyes); 2♀, Heredia, Santo Domingo, Parque Ecológico, 9°59'N 86°06'W, 1100m, 10.ii.2017 (J.S. Noyes); 1♀, **San José**, Univ. campus, 27.ii.1990 (J.S. Noyes); 15♀, San José, Zurqui de Moravia, 1600m, various dates vii.1990- xi.1995 (P. Hanson); 1♀, San José, PN Braulio Carrillo, 9.5km E Tunel, i-iii.1990 (P. Hanson); 1♀, San José, 5km E. Villa Mills, LS 389550 500050, 8-20.i.1996 (A. Picado, B. Gamboa); 2♀, San José, Cerro de la Muerte, 26km N San Isidro, 9°34'N 83°43'W, 2100m, ii-v.1991and xi.1992-i.1993 (P. Hanson); 3♀, **Cartago**, Dulce Nombre, Vivero Linda Vista, 1300m, vi-viii.1993 and viii-x.1993 (P. Hanson); 1♀, Cartago, Braulio Carrillo NP, 25.iii.1990 (J.S. Noyes); 1♀, Cartago, PN Tapanti, 1200-1500m, 9°45'N 83°47'W, 20-iii-10.iv.2000 (C. Hansson, D. Rubí); 1♀, Cartago, PN Tapanti-Macizo de la Muerte, Send a Rio Humo, LN 188100 560500, 1400-1500m, #56624, xii.1999-i.2000 (M. Alfaro); 2♀, Cartago, Turrialba, CATIE, Reventazon, 550m, 4.ix.1986 (L. Masner); 1♀, Cartago, PN Barbilla, 2km S Rio Barbilla, Camino a Moravia, LN 212485 598200, 800m, #60332, 27.x.2000 (E. Rojas); 1♀, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 14-15.ii.2005 (J.S. Noyes); 1♀, Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 19-20.ii.2009 (J.S. Noyes); 1♀, Puntarenas, Monteverde, 21.vii.1987 (H. & A. Howden); 1♀, Puntarenas, Monteverde, Finca Canada Res., 22.viii-1.ix.1992 (D. Currie); 1♀, Puntarenas, Est. Altamira, 9°03'N 83°00'W, ii.2002 (C. Hansson, D. Rubí); 1♀, Puntarenas, Est. Altamira, Send a Casa Coca, 1900m, LS 332800 574250, #63086, 12.viii.2001 (D. Rubí); 1♀, Puntarenas, Cerro Biolley, 1700m, LS 332400 572200, #62094, 13.ii-15.iii.2001 (D. Rubí); 6♀, Puntarenas, Est. Altamira, Cerro Frantzius, LS 334150 574450, 2134m, vi.2000, 10.iv-10.v.2001 and 12.v-12.vi.2001 (D. Rubí); 1♀, Puntarenas, San Vito, 1200m, coffee, ii-iv.1996 (P. Hanson); 2♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 18-22.iii.1990 (J.S. Noyes); 4♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 8°46'N 82°57'N, 1300m, 24.ii.2002 and 15-16.

ii.2006 (J.S. Noyes); 4♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 8°46'N 82°57'N, 7-29.ii.2007 (C. Hansson); 1♀, Puntarenas, Las Tablas, 1km NE Sao Portones, 1530m, 30.viii-5.ix.1995 (M. Chinchilla); 1♀, Puntarenas, RF Golfo Dulce, 24km W Piedras Blancas, 8°46'N 83°18'W, 200m, iii-iv.1993 (P. Hanson); 1♀, Puntarenas, Pen Osa, Puerto Jimenez, 10m, vi-vii.1991 (P. Hanson, C. Godoy); 1♀, Puntarenas, Pen. Osa, Puerto Jimenez, 8°32'N 83°19'W, i.1992 (P. Hanson); 1♀, Puntarenas, Est. Agujas, C. Quebraditos, LS 521400 274300, 782m, xii.2001-ii.2002 (J. Azofeifa); 1♀, Puntarenas, PN Corcovado, Est. Agujas, Cerro Mueller, LS 521500 273200, 744m, xii.2001-ii.2002 (J. Azofeifa); 1♀, Puntarenas, PN Corcovado, Las Quebraditas, LS 275200 520100, 640m, #53263, 8-9.ix.1999 (J. Azofeifa); 1♀, Puntarenas, Coco Is., Bahia Wafer, 0m, ii.1994 (Y. Camacho); 9♀, Puntarenas, Isla del Coco, Bahia Wafer, 5°32'N 87°03'W, 2-31.iii.2002 (J. Azofeifa); 2♀, Puntarenas, Isla de Coco, Wafer-Chathan, 0°32'N 87°03'W, 0-100m, 2-31.v.2002 (J. Azofeifa); 1♀, **Limón**, 16km W Guapiles, ii-v.1990 (P. Hanson); 2♀, Limón, RB Hitoy-Cerere, 100m, 14-19.i.1991 (J.S. Noyes). **INDIA**: 1♀, **Karnataka**, Bangalore, xi,1979 (Z. Bouček); 1♀, Karanataka, Bannerghatta NP, 5.xi.1979 (Bouček, Noyes); 3♀, **Tamil Nadu**, Coimbatore, 25.ix-1.x.1979 (J.S. Noyes); 1♀, **Tamil Nadu**, Mangarai Forest, 28.ix.1979 (J.S. Noyes); 1♀, Tamil Nadu, Coimbatore, 7.xi.1979 (Bouček); 4♀, **Kerala**, Periyar A[nimal] Sanc[tuary], 5-15.x.1979 (J.S. Noyes). Material in MZUCR, NHMUK, MLP, UCR, TAMU and USNM.

COMMENTS. *Plagiomerus bangaloriensis* is very close to *cyaneus* (Ashmead) and *diaspidis* Crawford and may possibly be synonymous with *cyaneus*.

I have examined the single extant type specimen of *Plagiomerus cyaneus* (Ashmead) (USNM) which is probably the holotype because, in his original description of the species, Ashmead (1888) did not state the number of specimens from which he described the species. It is in excellent condition and therefore I hereby designate it as the LECTOTYPE of *Comys cyanea* Ashmead in order to prevent any future confusion. It is labelled: "Jacksonville Fla"; "Type"; red label "Type No 4763 U.S.N.M."; "Comys cyanea Ashm"; "Plagiomerus cyanea Ashm Timberlake det."; "Habrolepis cyanea Ashm"; Q-code label "USNM Ent 00802864". The specimen is almost certainly synonymous with *diaspidis* but it impossible to be sure as to whether or not F3 has linear sensilla. This can be ascertained only by slide-mounting the specimen.

Unfortnately, the syntype of *diaspidis* (possibly described from only one specimen) (USNM) is missing from its point. Crawford's (1910) original drawing of the antenna of the female clearly shows that F1 and F2 are subequal in size and much smaller than F3-F4 which are also subequal and the clava has the base dusky and apex pale yellow, his description also notes a cluster of flattened scales at apex of scutellum. I am therefore following the interpretation of *cyaneus* by Gordh & Lacey (1976; material examined, NHMUK) which has F3 subequal to F4 and F3 always has linear sensilla This agrees well with Crawford's original description of the species. Although otherwise almost identical to *diaspidis* sensu Gordh & Lacy, the Costa Rica specimens differ in always having F3 smaller than F4 and lacking linear sensilla. I am confident that all these specimens belong to a completely different species from *diaspidis*.

I have not examined the holotype of *Plagiomerus bangaloriensis* but the specimens listed above and collected in southern India agree well with the original description of the species and with subsequent notes on the holotype and other material by Hayat (1999). These specimens are also very similar to the lectotype of *cyaneus* (Ashmead) and material collected in Costa Rica. As I am unable to ascertain the presence or absence of linear sensilla on F3 in the lectotype of *cyaneus* I am therefore choosing to use *bangaloriensis* as the valid name for the Costa Rica species until the lectotype of *cyaneus* can be slide-mounted.

Plagiomerus magniclavus Tan & Zhao (1998) described from southern China is very probably the same as *bangaloriensis*.

***Plagiomerus hospes* Timberlake**

(Figs 48-55; Hab. ♀ 8)

Plagiomerus hospes Timberlake, 1920:428-431. Holotype ♀, Hawaii, BPBM?, not examined.

DIAGNOSIS. *Female* (length about 0.8-1.5mm): head with frontovertex metallic green to dark blue, purple above scrobes; antenna (Fig. 53) with scape dark brown, apical one-third yellow or

pale orange, funicle with F1-F2 mostly brown, F3-F4 mostly pale orange, clava unicolourous dark brown; mesoscutum usually predominantly coppery, rarely much of anterior half fairly dull metallic dark green; fore coxa dark brown; mid tibia with a dark brown subbasal band; head (Fig. 48) about 3.3-4.5X as wide as frontovertex, ocelli forming an angle 65-85°, smaller specimens generally having a relatively wider frontovertex and ocelli forming a larger angle; scape about 3.7-3.8X as long as broad; funicle (Fig. 53) with F1-F2 clearly transverse, without linear sensilla, F3-F4 larger, subequal, subquadrate with linear sensilla; clava about as long as pedicel and funicle combined; scutellum (Figs 49, 50) medially with uniform, rounded, punctate-reticulate cells, with 4 subapical bristle-like or scale-like setae (occasionally a mixture) in a transverse line, separated by less than diameter of a socket; fore wing (Fig. 51) with marginal vein (Fig. 52) longer than stigmal vein; gastral tergites as n Fig. 54; hypopygium as in Fig. 55; ovipositor about 1.1-1.5X as long as mid tibia, slightly exserted, the exserted part 0.2-0.75X as long as mid tibial spur. *Male*: unknown.

DISTRIBUTION. Hawaii, Bermuda, Trinidad & Tobago (see Noyes, 2019); Costa Rica (**new record**).

HOSTS. Recorded as a parasitoid of *Diaspis bromeliae* (Kerner) (Hemiptera: Diaspididae) (De Santis, 1979) and recorded below from an unknown scale on Myrtaceae.

BIOCONTROL. An unidentified species of *Plagiomerus* (possibly *hospes*) was found in a wet tropical greenhouse in south-eastern France and was thought to be a potential biocontrol agent of Diaspididae. However, it failed to control *Diaspis boisduvalii* Signoret, *D. coccois* (Lichtenstein) or *D. bromeliae* (Kerner) that were present in the greenhouse (Panis & Pinet, 2001).

MATERIAL EXAMINED.

USA, 1♀, **Hawaii**, Molokai, Kawela, Gulch, 3500' (=1069m), 22.iii.1966 (J.W. Beardsley); 1♀, Oahu, Mt Tantalus, 4.vii.1956 (J.W. Beardsley); 1♀, Oahu, Mt Kaala, 14.iv.1966 (J.W. Beardsley). **COSTA RICA**, 1♀, **Guanacaste**, Santa Rosa NP, Sn. Emilio 6-C, 16.xi-7.xii.1985 (D. Janzen, I.D. Gauld); 4♀, Guanacaste, Santa Rosa NP, Hacienda, various dates 2.iii-15.vii.1986 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, Santa Rosa NP, Hacienda 4-C, 2-23.iii.1986 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, Santa Rosa NP, BH10C, 27.ix-18.x.1986 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, Santa Rosa NP, BH11C, 4-25.iv.1987 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, Guanacaste NP (error for Santa Rosa NP), near HQ, MT/YPT, 2-10.iii.1990 (J.S. Noyes); 1♀, Guanacaste, Guanacaste NP, Est. Pitilla, YPT, iii.1990 (J.S. Noyes); 1♀, Guanacaste, 9km S Santa Cecilia, Est. Pitilla (ACG), LN 330200 280200, 700m, vi.1995 (C. Moraga, P. Rios); 6♀, Guanacaste, Est. Pitilla (ACG), 700m, 10°59'N 85°25'W, 700m, 4-7.i.2001 and 4-9.ii.2001 (C. Moraga, P.N. Thomas); 3♀, Guanacaste, Guanacaste NP, below Pitilla, 500m, 7-8.iii.1990 (J.S. Noyes); 1♀, Guanacaste, 12km SE La Cruz, Cerro El Hacha, LN 329200 238000, Malaise #7499, no date (GNP Biodiv. Inv.); 1♀, Guanacaste, Volcan Cacao, Estac. Cacao, 1100m, 1988-1989; 1♀, Guanacaste, Guanacaste NP, Est. Mengo Vn Cacao, 1000m, v.1988 (Gauld, Janzen); 2♀, Guanacaste, Guanacaste NP, Cacao Est. xi-xii.1990 (P. Hanson); 2♀, Guanacaste, Guanacaste NP, below Cacao, 400-600m, 3.iii.1990 (J.S. Noyes); 3♀, Guanacaste, Guanacaste NP, Est. Cacao, xi-xii.1990 (INBio Team); 20♀, Guanacaste, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Cacao (ACG), LN 323160 375800, 6-26.ii.1996 (J.S. Noyes); 3♀, Guanacaste, Est. Cacao (ACG), 2km SW Cerro Cacao, LN 323100 375800, 1000-1400m, iv.1996 (R. Moraga); 1♀, Guanacaste, Est. Cacao (ACG), LN 323150 375500, 1000-1150m, vii.1996 (A. Masis); 1♀, Guanacaste, Est. Cacao (ACG), LN 323150 375500, 1000-1150m, viii.1996 (M. Pereira); 2♀, Guanacaste, Cacao (ACG), 1100m, 10°55'N 85°30'W, 26.i-24.ii.1996 and 22.ii.2003 (J.S. Noyes); 1♀, Guanacaste, Maritza (ACG), 700m, MT/YPT, 20.i-24.ii.1996 (J.S. Noyes); 10♀, Guanacaste, Est. Cacao (ACG), 10°55'N 85°30'W, 1100m, 13.ii.1995, ii.2000, 22.ii.2003 and 19-20.ii.2005 (J.S. Noyes); 4♀, Guanacaste, Maritza (ACG) 700m, MT/YPT, 20.i-24.ii.1996 (J.S. Noyes); 2♀, Guanacaste, Est. Maritza (ACG), LN 326900 373000, 600m, iii.1996 (M. Pereira); 2♀, Guanacaste, Est. Maritza, (ACG), LN 326900 373000, 600m, i.1997 (C. Zuñiga); 4♀, Guanacaste, Est. Maritza (ACG), 10°58'N 85°29'W, 700m, 12.ii.1995, 23.ii.2003 and 21. ii.2005 (J.S. Noyes); 1♀, Guanacaste, San Cristobal, #51905, 17.viii-17.ix.1996 (F.A. Quezada); 1♀, Guanacaste, San Ramon, 5km WSW Dos Rios de Upala, LN 318500 381200, 17.v-17.vi.1996 (D. Briceño); 2♀, Guanacaste, Las Pallas, 5km S Cerro Braun, LN 307450 388700, 950m, 10-24.ii.1996 (J. Ugalde); 2♀,

Guanacaste, Las Pallas, 4km S Cerro Braun, LN 308400 388800, 1100m, 10-24.ii.1996 (J. Ugalde); 1♀, Guanacaste, Santa Maria, 25km N Liberia, LN 304700 393450, 1250m, 15.x-15.xii.1996 (D. Briceño); 1♀, Guanacaste, RF Monte Alto, Cerro Romo, LN 220700 382545, 883m, 27-29.x.2001 (I. Jiménez); 1♀: Guanacaste, Macizo Miravalles, Est. Cabro Muco, LN 299769 411243, 1100m, 13.iii-3.iv.2003 (J. Azofeifa, et al.); 2♀, Guanacaste, Macizo Miravalles, Est. Cabro Muco, LN 299769 411243, 1100m, 18-24.iii.2003 and 15.iii-3.ix.2003 (J. Azofeifa); 2♀, Guanacaste, Tierras Morenas, ZP Tenorio, Rio San Lorenzo, LN 287800427600, 1050m, vii.1994 (G. Rodriguez); 1♀, Guanacaste, BN Diriá, Vista del Mar, LN 233900 358750, 890m, #64074, 12.vi-9.vii.2001 (I. Jiménez); 1♀, Guanacaste, Santa Cruz, Vista del Mar, Torre Cocesna, LN 235350 357500, 972m, #71769, 20.x.2002 (W. Porras); 3♀, Guanacaste, PN Palo Verde, Sect. Palo Verde, LN 385020 260952, 0-50m, 2-12.xii.1999 and 8-18.iii.2000 (I. Jiménez); 2♀, Guanacaste, PN Palo Verde, Sect. Palo Verde, 0.4km E. Puente, LN 385020 260952, 10m, #59288, 8-ix.1999 and 10.x.2000 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sector Palo Verde, Cerro Guayacán, LN 259350 389600, #53255, vii-viii.1999 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Laguna. 200m S Estación, LN 260952 385020, YPT, #52763, 13-17.i.1999 (I. Jiménez); 2♀, Guanacaste, PN Palo Verde, Sect. Palo Verde, LN 385020 260952, 250m, viii-ix.1999 and 10-18.viii.2000 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sect. Palo Verde, LN 385020 260952, 50m, #54943, 8-9.ii.2000 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sector Palo Verde, 0.5km NW Estacion, LN 259300 3879000, 40m, #52849, MT, vi.1999 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Est. Palo Verde, 10m, #60220, x-xi.2000 (I. Jiménez); 4♀, Guanacaste, PN Palo Verde, Sector Catalina, Fila Catalina, LN 257400 400000, 250m, 8.i-8.ii.2000 and 13.iii-19.vi.2001 (I. Jiménez); 2♀, Guanacaste. PN Palo Verde, Sector Palo Verde, Campo Aterrizaje, LN 388400 259050, 10m, 9.ii-12.iii.2001 (I. Jiménez); 1♀, **Alajuela**, PN Volcán Tenorio, Sect. El Pilón, La Catarata, LN 298212 427913, 700m, #67163, 8.ii-9.iii.2002 (G. Carballo); 1♀, Alajuela, R. Peñas Blancas, 28.vii.1986 (L. Masner); 2♀, Alajuela, Peñas Blancas, 9.v.1987 (E. Cruz); 2♀, Alajuela, PN Arenal, Sect. la Peninsula, LN 271500 453800, 600m, #54382, i.2000 (G. Carballo); 1♀, Alajuela, PN Arenal, La Peninsula 10°27'N 84°40'W, 600m, 25.ii.2003 (J.S. Noyes); 2♀, Alajuela, PN Arenal, Sendero Pilón, LN 453800 271500, 600m, 6.viii-5.ix.2000 and 14-23.i.2001 (G. Carballo); 1♀, Alajuela, PN Arenal, Send. Pilón, LN 269200 458050, 650m, #55392, xii.1999-i.2000 (G. Carballo); 1♀, Alajuela, PN Arenal, Send. Pilón, LN 269100 457900, 650m, #59233, 16.x.2000 (G. Carballo); 1♀, Alajuela, PN Arenal, 10°26'N 84°45'W, 617m, 21-28.ii.2005 (C. Hansson); 1♀, Alajuela, San Ramon BS, 700m, YPT, 24-26.iii.1996 (L. Masner); 1♀, Alajuela, Volcán Poas, Lagunillas, 2400m, ex scale on Myrtaceae, vi.2003 (P. Hanson); 1♀, **Heredia**, La Selva Biol. Sta., 3km S Pto Viejo, 10°26'N 84°01'W, on leaves of *Alchornea costaricensis* Pax & Hoffm., 31.iii.1987 (H.A. Hespenheide); 1♀, Heredia, OTS La Selva, 10°26'N 86°05'W, canopy fog *Pentaclethra*, FPM/08, no date; 1♀, Heredia, 3km S. Puerto Viejo, OTS La Selva, 100m, ii-iv.1993 (P. Hanson); 4♀, Heredia, La Selva BS, 10°26'N 84°01'W, 50-150m, fog *Carapa guianensis*, FOT/02, 5.iii.1993 (INBio-OET); 1♀, Heredia, 3km S Puerto Viejo, OTS-La Selva, 100m, canopy fog, *Carapa* sp., FOT/02, 15.iii.1993; 2♀, Heredia, La Selva BS, 10°26'N 84°01'W, fog *Pentaclethra macroloba*, 50-150m, FPM/03, 6.iii.1993 (INBio-OET); 1♀, Heredia, La Selva BS, 10°26'N 84°01'W, 100m, fog *Virola*, FVK/09, 5.vii.1993 (INBio-OET); 1♀, Heredia, OTS La Selva, 100m, canopy fog *Pentaclethra*, FPM/12, 5.ix.1993; 1♀, Heredia, La Selva BS, 10°26'N 84°01'W, FOT 29, 23.x.1994; 1♀, Heredia, OTS-La Selva, 10°26'N 84°01'W, 100m, vii.1995 (ALAS project); 1♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, 50-150m, canopy fog, FOT/42/01-40, 29.xii.1999 (INBio/OET); 1♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, 50-150m, canopy fog *Eugenia* sp., FOT/76/1-49, 5.i.2000 (INBio/OET); 1♀, Heredia, Puerto Viejo, Est. Biol. La Selva, LN 264463 532850, 100-200m, #67193, 30-31.iii.2002 (J. Azofeifa); 1♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, ii.2003 (J.S. Noyes); 1♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, 25.ii.2016 (J.S. Noyes); 1♀, Heredia, 11km SE La Virgen, 10°20'N 84°04'W, 450-550m, 05/N/TN, 22.ii-20.iv.2003 (INBio - OET - ALAS); 1♀, Heredia, 16km SSE La Virgen, 10°16'N85°05'W, 1050-1150m, 11/TN/ALL, 11.ii-21.iv.2001 (INBio/OET – ALAS); 2♀, Heredia, 16km SSE La Virgen, 10°16'N85°05'W, 1050-1150m, 11/M/TN, 10.ii-21.iv.2001 (INBio/OET – ALAS); 2♀, Heredia, 16km SSE La Virgen, 10°16'N85°05'W, 1050-1150m, 11/M/NOTN, 9.ii-21.iv.2001 (INBio/OET – ALAS); 4♀, Heredia, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/NOTN, ii.2002, iii.2002 and iv.2002 (INBio-OET-ALAS); 5♀, Heredia, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/TN, ii.2002, iii.2002 and iv.2002 (INBio-OET-ALAS); 1♀, Heredia, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/TN/ALL, ii.2002 (INBio-OET-ALAS); 1♀, Heredia, Est. La Esperanza, 2500m, 24.iii.2002 (M. Gates); 3♀, Heredia, Est. La Esperanza, 2500m, 24.iii.2002 (J. Azofeifa); 2♀, Heredia, Santo Domingo, INBio Parque, 1200m [error for 1100m], 19.ii.2001 (J.S. Noyes); 5♀, Heredia, Santo Domingo, INBio Parque, LN 217300 526200, 1100m, TM, 1-iii.2001, v.2001, vii.2001

and 4.ix-4.x.2001 (R. Zuñiga); 3♀, Heredia, Santo Domingo, INBio Parque, 9°59'N 84°06'W, 1100m, 11-26.ii.2006 (J.S. Noyes); 2♀, San José, Braulio Carrillo NP, 18.ii.2001 (J.S. Noyes); 4♀, Heredia, Santo Domingo, INBio Parque, LN 526250 217400, 1100m, iii.2002 (J.A. Azofeifa, J.S. Noyes); 3♀, Heredia, Santo Domingo, INBio Parque, LN 526250 217400, 1100m, 1-12.iv.2002 (D. Rubí, J.S. Noyes); 1♀, Heredia, Santo Domingo, INBio Parque, 9°59'N 94°06'W, 1100m, 11-26.ii.2006 (J.S. Noyes); 1♀, Heredia, Est. La Esperanza, 2500m, 24.iii.2002 (J. Azofeifa); 1♀, Heredia, Braulio Carrillo NP, 1400-1500m, 11.iv.1985 (L. Masner); 3♀, **San José**, San Antonio de Escazu, 1300m, ix.1997 and vii.1998 (W. Eberhard); 2♀, San José, San Antonio de Escazu, 1300m, i.1989 (W. Eberhard, P. Hanson); 10♀, San José, Zurqui de Moravia, 1600m, various dates vii.1990-iii.1996 (P. Hanson); 1♀, San José, Zurqui de Moravia, 1600m, 12.i.1991 (J.S. Noyes); 2♀, San José, 5km N San Gerardo, 2800m, xii.1992-ii.1993 (P. Hanson); 2♀, San José, 2km W Empalme, 2300m, ii-iii.1995 and vii.1995 (P. Hanson); 2♀, San José, Cerro de la Muerte, 19km S, 3km W Empalme, 9°39'N 83°52'W, 2600m, iv-vii.1992 and iv-v.1993 (P. Hanson, C. Godoy); 1♀, San José, Carret. Interamer., Villa Mills, 3000m, i-ii.1989 (P. Hanson); 1♀, San José, Est. Cuereci, El Mirador, 4km E Villa Mills, LS 390450 500100, 2900m, #44767, 26.x-29.xi.1998 (R. Gamboa); 1♀, Hwy 2 km 93, 9°36'N 83°45'W, 3200m, 3.iv.1986 (H. Goulet, L. Masner); 2♀, San José, 26km N San Isidro, 9°30'N 83°43'W, vi-viii.1992 and 11.iv.1993 (P. Hanson); 3♀, Cartago, Madreselva, Finca Los Lagos, LN 184650 550050, 2600m, 10-30.viii.1993, ii.1995 and vii-viii.1995 (M.M. Chavarria); 1♀, **Cartago**, Madreselva, Finca Los Lagos, LN 184450 550050, 2600m, xii.1994-16.i.1995 (M.M. Chavarria, A. Solano); 3♀, Cartago, PN Tapanti, 1200-1500m, 9°45'N 83°47'W, 20.iii-10.iv.2000 (C. Hansson, D. Rubí); 1♀, Cartago, PN Tapanti, Torre ICE #32, LN 561600 187400, 1700m, viii-ix.2000 (D. Rubí); 1♀, Cartago, Gran de Oro, Chirripo, LN 200250 595900, 1120m, #2597, xi.1993 (P. Campos); 1♀, Cartago, Turrialba, CATIE, 22.ii.1991 (J.S. Noyes); 1♀, Puntarenas, San Gerardo, 2200m, 7-10.viii.1995 (J.M. Cumming); 4♀, Cartago, 12.5km SE Turrialba, Ranch Naturalista, 9°50'N 83°34'W, 1000m, 12-14.ii.2017 (J.S. Noyes); 4♀, Cartago, 8km SW Pejibaye, Res. Biol. El Copal, 9°47'N 83°45'W, 1100m, 19-20.ii.2017 (J.S. Noyes); 1♀, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 11-21.ii.2005 (C. Hansson); 1♀, Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 19-20.ii.2016 (J.S. Noyes); 1♀, Puntarenas, Monteverde, 15-16.vii.1986 (L. Masner); 3♀, Puntarenas, Monteverde, St Louis Valley, 1400m, 17.viii.1986 (L. Masner); 1♀, Puntarenas, Monteverde, 21.vii.1987 (H.& A. Howden); 1♀, Puntarenas, Monteverde, 1650m, viii.1987 (H. Howden); 2♀, Puntarenas, Monteverde Res. 1.vi.1993 and 2.vi.1993 (Michalski); 2♀, Puntarenas, Monteverde, Finca Canada Res. 22.viii-1.ix.1992 (D.C. Currie); 1♀, Puntarenas, Monteverde, "Ecological farm", 1350m, 10°18N 84°49'W, 16-17.iii.2003 (J.S. Noyes); 1♀, Puntarenas, Est. Biol. Monteverde, 10°20'N 84°49'W, 1540m, 18-24.ii.2004 (C. Hansson); 2♀, Puntarenas, Est. Biol. Monteverde, 10°19'N, 84°49'W, 1540-1890m, 19.ii.2013 (J.S. Noyes); 1♀, Puntarenas, Las Tablas, 3km N Escuela el Progresso, 1520m, ii-iii.1996 (M. Chinchilla); 1♀, Puntarenas, Zona Protectora Tablas, 1520m, #7467, 1.ii-27.iii.1996 (M. Chinchilla Diaz); 1♀, Puntarenas, Buenos Aires, Est. Altamira, Send. Los Gigantes, LS 572100 331800, 1460m, xi-xii.2000 (D. Rubí); 2♀, Puntarenas, Est. Altamira, Send. Los Gigantes, LS 572200 331700, 1460m, 8.vi-10.viii.2000 and 9.v-9.vi.2001 (D. Rubí); 1♀, Puntarenas, Est. Altamira, 9°03'N 83°00'W, 1450m, ii.2002 (C. Hansson, D. Rubí); 1♀, Puntarenas, Est. Altamira, Valle de Silencio, Jardin Natural, LS 572200 342300, 2450m, #64111, vi-vii.2001 (D. Rubí); 5♀, Puntarenas, Est. Altamira, Cerro Frantzius, LS 334150 574450, 2134m, vi.2000, i.2001, vii-viii.2001 and 12.vi-12.vii.2002 (D. Rubí); 1♀, Puntarenas, Est. Altamira, Send a Casa Coca, LS 331750 574400, 1700m, #62124, 12.iii-12.iv.2001 (D. Rubí); 1♀, Puntarenas, Est. Altamira, Send a Casa Coca, LS 332800 574250, 1900m, #63986, 12.vii-12.viii.2001 (D. Rubí); 1♀, Puntarenas, Est. Altamira, 1km S. Cerro Biolley, LS 331700 572100, 1300-1350m, 26.ix-30.x.1995 (R. Villalobos); 2♀, Puntarenas, Est. Altamira, Cerro Quemado, LS 336200 575560, 2279m, 16.vii-16.viii.2001 and 13.xii.2001 (D. Rubí); 1♀, Puntarenas, Albergue Cerro de Orro, LS 279650 518450, 150-170m, iii.1996 (L. Anguilo); 1♀, Puntarenas, Las Alturas BS, 8°57'N 82°50'W, 2000m, i-iii.1995 (P. Hanson); 1♀, Puntarenas, San Vito, 1200m, coffee, iii-iv.1996 (P. Hanson); 1♀, Puntarenas, San Vito, Las Cruces, Wilson Bot Gdns, 1500m, 18-22.iii.1990 (J.S. Noyes); 1♀, Puntarenas, RF Golfo Dulce, 24km W Piedras Blancas, 8°46'N 83°24'W, 200m, i-ii.1993 (P. Hanson); 1♀, Puntarenas, Pen. Osa, 23km N Puerto Jimenez, La Palma, ii-iii.1993 (P. Hanson); 2♀, Puntarenas, Golfo Dule, 24km W Piedras Blancas, 200m, xii.1989-iii.1990 and iii-vi.1990 (P. Hanson); 1♀, Puntarenas, Pen. Osa, Puerto Jimenez, 8°32'N 83°19'W, xii.1990 (P. Hanson); 1♀, Puntarenas, Pen. Osa, Puerto Jimenez, 10m, xii.1991 (P. Hanson); 1♀, Puntarenas, PN Corcovado, Los Patos/Sirena, La Cansona, LS 514200 276500, 100m, #61695, 13.ii.-18.iii.2001 (J. Azofeifa); 1♀, Puntarenas, PN Corcovado. Est. Agujas, LS 275200 520100, 640m, #55204, 15.i-15.ii.2000 (J. Azofeifa); 1♀, Puntarenas, Golfito, Est. Agujas, Cerro Quebraditos, LS 521400 274300, 782m, xi-xii.2000 (J. Azofeifa); 1♀, Puntarenas, Golfito, Est. Agujas, LS

526550 276750, 300m, #61195, 8-22.xii.2000 (J. Azofeifa); 1♀, Puntarenas, Golfito, Est. Agujas, LS 526650 276750, 300m, canopy fog, #61183, 15.iii.2000 (A. Solis); 2♀, **Limón**, RB Hitoy-Cerere, 100m, 14-19.i.1991 (J.S. Noyes); 1♀, Limón, P.I.L.A., Valle del Silencio, Alr. del Refugio, LS 340258 577465, 2480m, #74308, 19-27.vi.2003 (R. González, et al.); 3♀, Limón, PI Amistad, Valle del Silencio, Zona de Acampar, LS 341250 577200, 2400m, 17.iv-17.v.2001 and 14.xi.2001-14.i.2002 (D. Rubí); 2♀, Limón, PI Amistad, Ref. Valle del Silencio, LS 341400 577250, 2450m, #64569, 17.vii-17.ix.2001 (D. Rubí); 2♀, Limón, PI Amistad, Valle del Silencio, Jardin Natural, LS 342300 577200, 2400m, #66673, i-ii.2002 (D. Rubí); 2♀, Limón, PI Amistad, Valle del Silencio, sendero al Jardin Natural, LS 342300 577200, 2400m, #62338, iv-v.2001 (D. Rubí); 1♀, Limón, P.I.L.A., Sendero Toma de Agua, LN 340258 577465, 2460m, 17.iii-2.ix.2003 (R. González, et al.). Material in MZUCR, NHMUK, MLP, UCR, USNM and CNC.

COMMENTS. There is significant variation in the shape of the subapical seta on the scutellum of this species (see Figs 49, 50). In some specimens there are 4 bristle-like setae (Fig. 49) whereas in the majority there are 4 slender, scale-like setae (Fig. 50) with a few specimens having the outer pair bristle-like and the inner pair scale-like or even 1 bristle-like seta and 3 scale-like setae. Larger specimens tend to have slightly broader fore wings, the apical scutellar setae broader and more scale-like and more extensive rounded, polygonal, cellular sculpture on the scutellum (compare Figs 49 and 50).

Plagiomerus aulacaspis Tan & Zhao (1998) described from southern China may the same as *hospes* Timberlake.

***Plagiomerus calabes* sp.nov.**

(Figs 56-61; Hab. ♀ 9)

DIAGNOSIS. *Female* (length about 1.1-1.4mm): antenna (Fig. 56) with clava unicolourous dark brown; fore coxa white to pale yellow; mid tibia with a dark brown subbasal band; funicle (Fig. 56) with F1 relatively small, and without linear sensilla, F2 clearly larger with linear sensilla, F3-F4 subequal, slightly larger than F2, also with linear sensilla; clava hardly longer than funicle, clearly shorter than pedicel and funicle combined; scutellum (Fig. 59) medially with fine, coarse, longitudinally elongate, polygonally reticulate to lineolate-reticulate sculpture, with 2 bristle-like apical setae that are separated by a little more than the diameter of their own sockets; fore wing (Fig. 57) with marginal vein (Fig. 58) longer than stigmal vein; exserted part of ovipositor about 0.5-1X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.25mm; excluding ovipositor, 1.16mm (CPD).

Head dark brown to black with a distinct metallic lustre; coppery along occipital margin, relatively bright, mixed coppery, metallic green and blue between occipital margin and posterior ocelli, relatively dull, metallic dark blue in front of posterior ocelli, dull metallic purple above scrobes; a narrow, metallic blue and green line across frontovertex immediately above scrobes; coppery and metallic between eye and scrobe; area immediately below eye relatively shiny coppery, brassy and metallic green; temple and gena with a relatively dull coppery and brassy sheen, mixed metallic dark blue on temple; scrobes generally with a mixed, relatively dull, dark coppery purple and metallic green sheen, interantennal prominence with a dull coppery purple and dark blue sheen, mouth margin with a dull coppery purple sheen; frontovertex with a few, conspicuous, scattered, dark brown setae; a few setae along inner eye margin, these continuing below eye on to gena; gena and interantennal prominence with scattered, inconspicuous, translucent, brown setae; maxillary palpus white; radicle dark brown; scape pale orange with extreme base dark brown; pedicel brown, apex pale orange; F1 and F2 brown, F3 and F4 pale orange, slightly darker dorsally; clava brown; thorax dark brown to black with a metallic lustre; pronotum mainly with a coppery and brassy sheen, with some dark blue reflections; mesoscutum mainly coppery, but mixed with a dark blue sheen, especially laterally; axilla with a relatively weak coppery purple and brassy sheen; scutellum dorsally with a relatively dull coppery sheen, side bright, dark blue, mixed with some olive green; mesopleuron with a dull, dark blue and purple sheen; fore coxa very pale orange, virtually white; fore femur and tibia pale orange, tarsus dusky pale orange, apical tarsomere brown; mid coxa dark brown; mid femur proximally white, apex pale orange and a

broad, dark brown subapical band, tibia white with a narrow subbasal brown ring to 0.4X, spur and tarsus pale yellow; hind coxa dark brown; hind femur dark brown, extreme base white, tibia white at extreme base, a fairly broad subbasal brown ring to about 0.6X, apical 0.3X very pale orange, tarsus white, slightly dusky towards apex; propodeum dark brown with a weak brassy and purple sheen, side with a metallic green sheen; gaster dark purple-brown, dorsally with a coppery purple sheen mixed slightly brassy and green, Gt1 with a distinct blue-green sheen, side and venter with coppery, blue, brassy and green reflections; gonostylus dark brown.

Head about 3.9X as wide as frontovertex, in profile about 1.6X as high as deep; occipital margin weakly carinate; frontovertex narrowest a little behind posterior ocelli; ocelli forming an angle of about 75°; ocellar area with relatively deep, polygonally reticulate sculpture of mesh size mainly subequal to eye facet, sculpture shallower and more imbricate-reticulate behind posterior ocelli and on anterior parts of frontovertex; temple and gena with relatively shallow, longitudinally elongate imbricate-reticulate sculpture; scrobes with relatively shallow, irregular sculpture, almost smooth; interantennal prominence and mouth margin with shallow, polygonally reticulate sculpture; antenna (Fig. 56) with scape about 3.7X as long as broad; F1 relatively small and transverse, F2 clearly and slightly longer than broad, F3 and F4 relatively large, subequal and clearly longer than broad, linear sensilla present only on F2-F4; clava slightly longer than funicle, sutures parallel; eye slightly overreaching occipital margin, clothed with dense, very conspicuous setae, each a little longer than diameter of facet. Relative measurements: HW 61, HH 52, FV 15.5, POL 7.5, OOL 1, OCL 8.5, AOL 6.5, EL 34, EW 33, MS 22.5, SL 26, SW 7.

Thorax (Fig. 59) with imbricate-reticulate to polygonally reticulate sculpture on pronotum that is about as deep as that in ocellar area, but generally of larger mesh; mesoscutum with imbricate-reticulate sculpture that is slightly shallower than that on pronotum and with conspicuously larger mesh size, especially anteriorly; axilla with relatively shallow, fine, transversely elongate, polygonally reticulate sculpture; scutellum with fine, non-uniform, longitudinally elongate, polygonally reticulate sculpture of similar depth to that in ocellar area and conspicuously deeper than that on mesoscutum, side and apex completely smooth and shiny; visible part of mesoscutum about 1.7X as broad as long; scutellum about 1.3X as broad as long, apex with only a single pair of long, slender, bristle-like setae; hind femur about 3.8X as long as broad; fore wing with venation and setation as in Figs 57, 58; costal cell with 2 or 3 dorsal setae at apex; propodeum medially about 0.06X as long as scutellum. Relative measurements: FWL 63.5, FWW 24.5; HWL 44, HWW 10.

Gaster with hypopygium (Fig. 61) reaching about 0.6X to apex; last tergite about 0.7X as long as mid tibia, with apex rounded; ovipositor (Fig. 60) slightly exserted, the exserted part about 0.6X length of mid tibial spur or about 0.2X mid tibia.

Paratype. Relative measurements: OL 45.5, GL 12 [MT 35, MTS 11.5].

Variation. Females vary in overall length from 1.13-1.41mm, the head varies from about 3.5-3.9X as wide as the frontovertex and the exserted part of the ovipositor may be very nearly as long as the mid tibial spur or 0.3X as long as the mid tibia.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, BN Diriá, Ret. Alr. Torre Control de Incedio, LN 238559 358650, 600-700m, #65102, 18.ix-18.x.2001 (I. Jiménez). Paratypes. **COSTA RICA**, 2♀, **Guanacaste**, same data as holotype; 1♀, same data as holotype but #64578, viii-ix.2001; 2♀, Guanacaste, BN Diriá, Cerro Retallano, LN 238550 358650, 600-700m, 18.x-15.xi.2001 (I. Jiménez); 1♀, **Puntarenas**, ACOSA, Cerro de Oro, LS 280000 518500, 200m, 6.v.1995 (M. Chinchilla). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

***Plagiomerus peruviensis* (Girault)**
(Figs 62-71; Hab. ♀ 10, ♂ 11)

Parahomalopoda peruviensis Girault, 1915b:171. Holotype ♀, Peru, USNM, examined
Plagiomerus peruviensis (Girault); Noyes, 1980:222.

DIAGNOSIS. *Female* (length about 0.8-1.3mm): head with frontovertex metallic green to dark blue, purple above scrobes; scape pale orange, extreme base dark brown, sometimes almost completely dark brown with only apex pale orange; funicle with F1-F2 brown, F-F4 mostly pale orange, funicle rarely completely pale brown; clava brown; fore coxa dark brown, rarely yellow; the mid femur with a broad, pale brown, subapical band, this sometimes dark brown, relatively broad and distinct; mid tibia with a dark brown subbasal band; fore wing often with a very weakly infuscate area adjacent to marginal vein; the head (Fig. 64) varies from 3.0-3.7X as wide as the frontovertex, with smaller specimens having a relatively wider frontovertex; ocelli forming an angle of about 75-85°; antenna (Figs 62, 63) with scape about 3.5X as long as broad, funicle with F1 and F2 anelliform, clearly smaller than F3-F4 and without linear sensilla, F3-F4 subequal, subquadrate and with very prominent linear sensilla; clava very nearly as long as pedicel and funicle combined; scutellum (Fig. 65) medially with longitudinally elongate polygonally reticulate to lineolate-reticulate cells, with 2 apical bristle-like setae separated by slightly more than diameter of their own sockets; fore wing (Fig. 66) with marginal vein (Fig. 67) longer than stigmal vein; gastral tergites as in Fig. 68; hypopygium as in Figs 70, 71; ovipositor as in Fig. 69, exserted part about 0.3-1.2X as long as mid tibial spur. *Male* (length about 0.7-0.9mm): generally very similar to female but for structure of antenna or genitalia, antenna (Hab. 11) with scape slightly broadened about 3.5X as long as broad, pedicel about 1.5X as long as broad, funicle 2-segmented, both segments strongly transverse, anelliform and without linear sensilla; clava very long, about 6.5X as long as broad and 3X as long as pedicel and funicle combined, apex pointed, with a short finger-like projection; flagellum clothed in setae that are a little shorter than 0.5X diameter of segments; phallobase about 4-5X as long as broad, paramere with a very short subapical seta, cuspis seta present; digitus about 2X as long as broad with single apical hook; aedeagus slender about 12X as long as broad, about 0.5X as long as mid tibia and with apex acute.

DISTRIBUTION. Peru, Costa Rica (**new record**).

HOSTS. Recorded below from *Diaspis boisduvalii* Signoret (Hemiptera: Diaspididae) on banana, *Musa* sp. (Zingiberales: Musaceae) and from *Diaspis* sp. (Hemiptera: Diaspididae) on pineapple, *Ananas comosus* (Poales: Bromeliaceae), Also collected off *Pentaclethra macroloba* (Willd.) Kuntze (Fabales: Fabaceae) and *Meliosoma vernicosa*. (Liebm). Griseb. (Proteales: Sabiaceae).

MATERIAL EXAMINED.

Type material. Holotype ♀ (on slide): "1144° 3ª Gen 1 sp 2 ?Encyrt Corcomba May 27. 10"; red label "19403" "Parahomalopoda peruviensis Girault ♀ type" (USNM).

Non type material. **COSTA RICA**, 1♀, **Guanacaste**, Santa Rosa NP, Sn Emilio 6-C, 27.iv-11.v.1985 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, Santa Rosa NP, SE8C, 25.iv-16.v.1987 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, Cacao (ACG), 1100m, 26.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Est. Cacao (ACG), 2km SW Cerro Cacao, LN 323100 375800, 1000-14000m, iv.1996 (C. Moraga); 1♀, Guanacaste, Est. Cacao, (ACG), 10°55'N 85°30'W, 1100m, 19-20.ii.2005 (J.S. Noyes); 1♀, Guanacaste, Maritza (ACG), 700m, 20.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, PN Guanacaste, San Cristobal, #51848, 25.iii-16.iv.1996 (F.A. Quezada); 1♀, Guanacaste, San Cristobal, 51849, 17.iv-17.v.1996 (F.A. Quezada); 1♀, Guanacaste, RF Monte Alto, Fila Maravilla, LN 221350 381700, 800m, 23.x-24.xi.2001 (I. Jiménez); 1♀, Guanacaste, PN Volcán Tenorio, Est. El Pilón, LN 298212 427913, 700m, #69218, 15-22.v.2002 (G. Carballo); 1♀, Guanacaste, BN Diriá, Cerro Retallano, 600-700m, #65437, 18.x-15.xi.2001 (I. Jiménez); 1♀, Guanacaste, ZP Nosara, Fila Maravilla, LN 221350 381700, 800m, #66663, 24.xi-21.xii.2001 (I. Jiménez); 1♀, La Ceiba, LN 221100 382950, 600m, #65008, 21.ix-22.x.2001 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, La Espuela, Q. Mula, LN 386300 260779, 10m, #61362, 10-20.i.2001 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sect. Palo Verde, LN 260952 385020, 0-50m, #55156, 8-18.iii.2000 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sector Palo

Verde, Cerro Guayacán, LN 259350 389600, 140m, #53255, vii-viii.1999 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sector Catalina, Puente Espuela, LN 385020 260952, 0m, #58295, 9.viii-8.ix.2002 (I. Jiménez); 1♀, **Alajuela**, Fa Sn Gabriel, 2km W Dos Rios, 600m, vii.1988 (Gauld, Mitchell); 1♀, Alajuela, RF Arenal, Sendero Pilón, LN 269100 457900, 600m, #53365, 14.x-3.xii.1998 (G. Carballo); 1♀, Alajuela, RF Arenal, Sect. la Peninsula, LN 27150000 453800, 600m, #54382, i.2000 (G. Carballo); 3♀, Alajuela, PN Arenal, Sect. La Peninsula, LN 453800 271500, 600m, i.2000, 17.vi.2000 and 15-25.iv.2001 (G. Carballo); 1♀, Alajuela, PN Arenal, Sect. la Peninsula, 10°27'N 84°40'W, 600m, 25.ii.2003 (J.S. Noyes); 1♀, Alajuela, PN Arenal, 10°26'N 84°45'W, 617m, 21-28.ii.2005 (C. Hansson); 1♀, Alajuela, PN Arenal, Sendero Ceibo, 10°27'N 84°44'W, 620m, 22-23.ii.2016 (J. S. Noyes); 1♀, Alajuela, Aguas Zarcas, Las Chiles, cafe, iii.1990 (P. Hanson);2♀, Heredia, La Selva BS, 50m, 22.i-3.ii.1991 (J.S. Noyes); 9♀, Alajuela, San Carlos, Sarapiqui, ex *Diaspis* on *Ananas comosus*, 17.ii.2007 (A Zuñiga); 2♀, **Heredia**, La Selva BS, 50m, 22.i-3.ii.1991 (J.S. Noyes); 1♀, Heredia, OTS La Selva, 10°26'N 84°01'W, 50-150m, 15-30.ix.1993; 1♀, Heredia, OTS La Selva, 10°26'N 84°01'W, 100m, canopy fog *Pentaclethra*, FPM/03, 6.iii.1993 (INBio/OET); 1♀, Heredia, La Selva BS, 10°26'N 84°01'W, 50-150m, fog *Pentaclethra macroloba*, FPM/04, 6.v.1993 (INBio-OET);1♀, Heredia, OTS La Selva, 10°26'N 84°01'W, 100m, canopy fog *Pentaclethra macroloba*, vii.1993 (ALAS project); 3♀, Heredia, OTS La Selva, 10°26'N 84°01'W, ix.1995, xi.1993 and iii.1996 (ALAS); 1♀, Heredia, Est. Biol. La Selva, 10°25'N 84°01'W, canopy fog *Meliosoma vernicosa*, FOT/44/01-40, 8.i.2000 (INBio-OET); 3♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, ii.2003 (J.S. Noyes); 1♀, Heredia, Estación Biologica La Selva, 10°26'N 84°01'W, 26-29.ii.2008 (J.S. Noyes); 2♀, Heredia, Estación Biologica La Selva (OTS), 10°26'N 84°01'W, 75m, 22-23.ii.2017 (J.S. Noyes); 1♀, Heredia, 11km SE La Virgen, 10°20'N 84°04'W, 450-550m, 05/N/TN, 22.ii-20.iv.2003 (INBio- OET – ALAS); 1♀, Heredia, 16km SSE La Virgen, 10°16'N 85°05'W, 1050-1150m, 11/M/NOTN, 9.ii-21.iv.2001 (INBio/OET – ALAS); 2♀, Heredia, 16km SSE La Virgen, 10°16'N 85°05'W, 1050-1150m, 11/M/TN, 10.ii-27.iv.2001 (INBio/OET – ALAS); 2♀, Heredia, 9km NE Vara Blanca, 10°14'N 84°06'W, 1450-1550m, 15/M/TN, ii-iv.2005 (INBio/OET – ALAS); 6♀, Heredia, Sarapiquí, San Julián, ex *Diaspis boisduvalii* on banana, 14.iii.2018 (M. Solano); 5♀, 1♂, Heredia, Sarapiquí, San Julián, ex *Diaspis boisduvalii* on banana, 22.iii.2018 (M. Solano); 11♀, Heredia, Sarapiquí, San Julián, Finca Altamira, Muestro 1, ex *Diaspis boisduvalii* on banana, 5.iv.2018 (M. Solano); 1♀, Heredia, Santo Domingo, INBio Parque, LN 217300 526200, 1100m, TM, #65446, vii.2001 (R. Zuñiga); 1♀, Heredia, Santo Domingo, INBio Parque, 1100m, 9°59'N 84°06'W, 13.ii.2016 (J.S. Noyes); 1♀, **Cartago**, Turrialba, CATIE, 22.ii.1991 (J.S. Noyes); 1♀, Cartago, 12.5km SE Turrialba, Rancho Naturalista, 9°50'N 83°334'W, 1000m, 12-14.ii.2017 (J.S. Noyes); 1♀, **Puntarenas**, Est. Altamira, Send. Los Gigantes, LS 331800 572100, 1460m, ii.2002 (C. Hansson, D. Rubí); 1♀, Puntarenas, Monteverde, Finca Canada Res., 22.viii-1.ix.1992 (D.C. Currie). 5♀, Puntarenas, 13km NE Dominical, RB Rio Magnolia, 9°20'N 83°47'W, 800m, 22-24. ii.2015 (J.S. Noyes); 1♀: Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 1300m, 24.ii.2002 (J.S. Noyes).2♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdn, 8°46'N 82°57'W, 1300m, 15-26.ii.2006 (J.S. Noyes); 1♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 8°46'N 82°57'W, 7-19.ii.2007 (C. Hansson); 4♀, Puntarenas, 10km W Golfo Dulce, xii.1989-iii.1990 (Hanson, Gauld); 12♀, Puntarenas, 24 km W Piedras Blancas, 8°46'N 83°24'W, 200m, various dates vii.1990-iv.1993 (P. Hanson); 3♀, Puntarenas, Golfito, Est. Agujas, Cerro Rincón, LS 275500 521950, 645-745m, #56675, 15.iv-5.v.2000 (J. Azofeifa); 1♀, Puntarenas, RF Golfo Dulce, 3km SW Rincon, 10m, x-xii.1990 (P. Hanson); 1♀, Puntarenas, PN Corcovado, Est. Agujas, LS 526550 276750, 300m, 11.ii.2002 (J. Azofeifa); 1♀, Puntarenas, PN Corcovado, Est. Agujas, La Tigrilla, LS 274500 523600, 600m, #62423, 15.iii-28.iv.2001 (J. Azofeifa); 1♀, Puntarenas, PN Corcovado, Los Patos, 8°33'N 83°30'W, 200m, ii.2000 (J.S. Noyes, J. Azofeifa); 1♀, **Limón**, PN Braulio Carrillo, Est. Queb. Gonzalez, 10°09'N 93°57'W, 450m, 15.ii.2003 (J.S. Noyes); 2♀, Limón, PN Cahuita, 5m, 1.iii.1991 (J.S. Noyes); 2♀, Limón, RB Hitoy-Cerere, 14-19.i.1991 (J.S. Noyes); 1♀, Limón, RB Hitoy Cerere, 9°40'N 83°02'W, 100m, ii.2004 (J.S. Noyes); 1♀, Limón, RB Hitoy Cerere, 9°40'N 83°02'W, 100m, 24-26.ii.2008 (J.S. Noyes); 24♀, Limón, Valle de Estrella, ex *Diaspis boisduvalii* Sign. on banana, 9.xi.1995 (J. Hernandez); 3♀, Limón, RB Hitoy-Cerere, 100m, 14-19.i.1991 (J.S. Noyes); 1♀, Limón, RB Hitoy Cerere, Valle de la Estrella, Send. Toma de Agua, LN 184300 643500, 140m, #54234, 4.v.1999 (F. Umaña); 1♀, Limón, RB Hitoy Cerere, Send. Toma de Agua, LS 643400 184600, 100m, #59085, viii-xi.2000 (F. Umaña); 1♀, Limón, RB Hitoy Cerere, Send Espavel, LS 569800 401200, 500m, #59087, 17.viii-19.ix.2000 (F. Umaña); 1♀, Limón, RB Hitoy Cerere, Est. Hitoy Cerere, LN 184600 643400, 140m, #52861, 17.vi-17. vii.1999 (F. Umaña); 11♀, Limón, Pococí, La Rita, Cordobana, ex *Diaspis boisduvalii* on banana, 22.iii.2018 (M. Solano); 2♀, 1♂, Limón, Talamanca, Sixaola, ex *Diaspis boisduvalii* on banana, 22.iii.2018 (M. Solano). Material in MZUCR, MLP, UCR, USNM, CNC and NHMUK.

COMMENTS. The holotype of *Parahomalopoda peruviensis* is uncleared and mounted upside down under a single coverslip on a slide. The body is flattened and the antennae and one pair of wings are separated under the same coverslip. At some point the slide has been badly cracked and the whole thing then reinforced by being mounted onto a second slide. This makes examination of the dorsal parts at high magnification quite difficult, but I am confident that the material listed above from Costa Rica belongs to this species. Some larger specimens from Costa Rica agree very well with the holotype in that they have the band on the mid femur relatively broad, dark brown and well-defined whereas in the majority of specimens, which are smaller, this band is paler, narrower and less well-defined.

Genus *HOMALOPODA* Howard

Homalopoda Howard *in* Riley, Ashmead & Howard, 1894:90-91. Type species: *Homalopoda cristata* Howard, by monotypy.

Female. Overall length about 0.8-2.5mm.

Body generally dark brown to black with a metallic sheen; legs mostly dark brown with white to pale orange areas; fore wing infuscate with at least one pair of hyaline spots and usually with a hyaline spot in the middle; hind wing hyaline.

Head triangular in profile, tangent of frontovertex (occipital margin to top of scrobes) forming an angle of about 55-90°with that of face (top of scrobes to mouth margin); head varying from 2.5-7.7X wide as frontovertex; occipital margin sometimes rounded, but usually sharp with a bristle or scale-like seta behind posterior ocellus; area adjacent to eye and occipital margin usually with a small, indistinct, oval depression; area between eye above scrobe usually with a fairly conspicuous line of silvery setae; scrobes shallow, not sharply margined, broadly ∩-shaped; interantennal prominence dorsally rounded; scape varying from slightly broadened and flattened, about 3-6X as long as broad; flagellum slender, funicle 4-segmented, segments subcylindrical and usually all longer than broad and subequal in length, rarely some segments transverse, clava 3-segented, slightly curved downwards, apex rounded; malar sulcus absent; mandible with one tooth and a broad truncation or with 4 teeth, rarely with only 3 teeth (see below), a socketed peg present near ventral margin.

Pronotum hardly visible behind head, posterior margin strongly emarginate medially; pronotum with transversely elongate, imbricate-reticulate to polygonally reticulate sculpture that is a little shallower than that in ocellar area; mesoscutum with very similar sculpture to that on pronotum, notaular lines absent; axilla with slightly deeper, transversely elongate, polygonally reticulate to imbricate-reticulate sculpture; scutellum flat dorsally with very fine, regular, punctate-reticulate sculpture that is clearly deeper than sculpture on mesoscutum, side and apex completely smooth and shiny; apex of scutellum with 2 pairs of scale-like setae arranged regularly in a line or 1 pair of strong bristles (second pair sometimes present, but not arranged regularly and well in advance of apical pair); fore wing about 2.4-2.5X as long as broad; apex of fore wing without a hyaline spot; postmarginal vein usually much shorter than stigmal vein, rarely nearly as long; mesopleuron enlarged but posterior margin not quite reaching level of posterior margin propodeum, falling short by about diameter of propodeal spiracle.

Gaster with hypopygium not reaching apex; syntergum shorter than mid tibia to slightly longer with apex broadly truncate to acute; paratergites absent; ovipositor slightly exserted, the exserted part shorter than mid tibial spur.

Male. Overall length about 1.2-1.5mm.

Similar in general habitus to female but for hyaline wings, lack of paired setae or bristles on occipital margin and structure of antenna and genitalia; head largely metallic, thorax similar but more dull; head in profile not triangular, about 2.5X as high as deep with tangent of frontovertex forming an angle of about 90° with the face; frontovertex with fine punctate reticulate sculpture; scape attached a little above lower eye margin, about as long as distance of torulus from mouth margin, about 2.5X as long as broad; funicle 2-segmented, segments longer than broad, F1 more than 2X as long as F2; clava entire and longer than funicle; scutellum flat with fine punctate-

reticulate sculpture, vertical side and apex smooth and shiny; fore wing with marginal vein about 3.5X as long as broad, about 1.5X as long as stigmal vein or postmarginal vein; phallobase elongate, about as long as mid tibia; digiti about 3X as long as broad and each with a single apical hook.

DISTRIBUTION. Central and southern Caribbean, Sri Lanka and India (possibly introduced).

HOSTS. Primary parasitoids of armoured scale insects (Hemiptera: Diaspididae). Also reported as a parasitoid of soft scales (Hemiptera: Coccidae) but this record requires confirmation.

COMMENTS *Homalopoda aibeus* **sp.nov.**, described below, may be misplaced in *Homalopoda* because it has only 3 teeth in the mandible. However, other characters generally agree with placement in this genus.

Homalopoda is close *to Pseudhomalopoda*, *Caenohomalopoda*, and *Plagiomerus*, all four genera belonging to the Habrolepidini and having a 4-segmented funicle, 3-segmented clava and mandible with one tooth and a broad truncation or four teeth. It can be separated from *Plagiomerus* because the flagellum is relatively long and slender, not clavate, the fore wing is infuscate, there is a line of silvery setae between the eye and scrobal area and the postmarginal vein is shorter than the stigmal vein. In *Plagiomerus* the flagellum is clavate with at least 2 or 3 transverse segments, there is no line of silvery setae between the eye and scrobal area, the fore wing is hyaline and the postmarginal vein of the fore wing is at least as long as the stigmal vein. *Caenohomalopoda* has the forewing infuscate, but the funicle segments are relatively short and the pronotum is subtriangular in dorsal view clearly visible behind the head, with the posterior margin only weakly concave, whereas in *Homalopoda* the pronotum is only narrowly visible behind the head and the posterior margin is strongly emarginate medially. Of the other named genera, *Pseudhomalopoda* is the closest to *Homalopoda* and could be considered synonymous but species of *Pseudhomalopoda* have a distinct, well-defined, hyaline spot at the wing apex, whereas in *Homalopoda* there is a pair of opposite subapical, hyaline spots or the whole apex is slightly paler than proximal parts of the wing. *Pseudhomalopoda* also has a much shorter funicle compared to *Homalopoda* especially in the type species (*prima*) where the flagellum is distinctly slightly flattened with all funicle segments transverse.

IDENTIFICATION. 10 species known, including 9 described as new below. For description of *Homalopoda cristata* Howard, see Noyes (1979)

Key to Costa Rican species of *Homalopoda*
(Females)

1. Fore wing (Figs 74, 83, 93, 98) with a pair of distinct, but sometimes faint, paler subapical spots; hyaline area at apex of venation with a virtually straight lower margin, never extended proximally towards opposite hyaline area 2
- Fore wing (Fig 103, 111, 1 15, 119, 126, 134), without a pair of paler subapical spots, sometimes whole apex slightly paler; hyaline area at apex of venation with lower margin sometimes distinctly extended proximally towards opposite hyaline area (Figs 119, 126,134) 5

2 (1) Middle of fore wing below marginal vein sometimes paler but never with a well-defined hyaline spot (Fig. 74, 83) 3
- Middle of fore wing area below marginal vein with a well-defined hyaline spot (Fig. 93, 98) 4

3 (2) Apex of scutellum with one pair of bristle-like setae (Fig. 72); second valvifer without subapical setae; linea calva not interrupted (Fig. 75) ..... *onothrix* **sp.nov.** (p. 55)
- Apex of scutellum with two pairs of scale-like setae arranged in a line (Fig. 79); second valvifer with at least 3 subapical setae; linea calva interrupted by at least 3 setae (Fig. 83) ..... *aesira* **sp.nov.** (p. 57)

4 (2) Antenna (Fig. 90) with all funicle segments at least about 1.5X as long as broad, flagellum clearly more than 0.9X as long as head width; apex of scutellum with 2 pairs of bristle-like setae (Fig. 91), outer pair slightly anterior to inner pair (occasionally inner pair very slightly flattened and scale-like, but outer pair always bristle-like); fore wing (Fig. 93) with subapical hyaline spots separated by much less than length of marginal vein, usually less than half length ..... *cristata* Howard (p. 60)

- Antenna (Fig. 96) with relatively shorter funicle segments so that F2 is subquadrate, flagellum less than 0.8X as long as head width; apex of scutellum with two pairs of scale-like setae in a line; fore wing (Fig. 98) with subapical hyaline spots separated by about length of marginal vein ..... *rehdera* **sp.nov.** (p. 61)

5 (1) Antenna (Fig. 101) with F1-F3 transverse, F4 slightly longer than broad ..... *aibeus* **sp.nov.** (p. 63)

- Antenna (Figs. 108, 113, 122, 127, 133) with all funicle segments longer than broad 6

6 (5) Opposite hyaline spots distad of venation separated by more than their own greatest diameter (Figs 111, 115) 7

- Opposite hyaline spots distad of venation separated by much less than their own greatest diameter, sometimes more or less touching (Figs 119, 126, 134) 8

7 (6) Apex of scutellum with a single pair of bristle-like setae; hind tibia with an abrupt subbasal constriction; mandible (Fig. 107) with one tooth and a broad truncation; middle of fore wing (Fig. 111) below marginal vein with a well-defined hyaline spot ..... *beatriz* **sp.nov.** (p. 65)

- Apex of scutellum with two pairs of scale-like setae arranged in a line (Fig. 118); hind tibia not abruptly constricted subbasally; mandible 4-dentate (Fig. 117); middle of fore wing (Fig. 115) below marginal vein sometimes paler but never a well-defined hyaline spot ..... *carpha* **sp.nov.** (p. 67)

8 (6) Scape pale orange (Fig. 122); fore and mid legs generally pale orange, mid tibia with a narrow incomplete subbasal brown band; fore wing (Fig. 119) evenly infuscate distad of subapical pair of hyaline spots ..... *baunos* **sp.nov.** (p. 69)

- Scape dark brown (Figs 127, 133); fore and mid legs generally brown to dark brown, mid tibia dark brown in proximal half; fore wing (Figs 126, 134) with apical area conspicuously paler than area immediately distad of subapical pair of hyaline spots 9

9 (8) Frontovertex less than one-quarter head width; paler apical area of fore wing less than 0.3X as deep as width of wing (Fig. 126) ..... *opsis* **sp.nov.** (p.70)

- Frontovertex (Fig. 130) more than one-quarter head width; pale apical area of fore wing at least 0.4X as deep as width of wing (Fig. 134) ..... *donatos* **sp.nov.** (p. 72)

Homalopoda onothrix **sp.nov.**

(Figs 72-77; Hab. ♀ 12)

DIAGNOSIS. *Female* (length about 1.6-1.9mm): scape and flagellum dark brown; fore femur dark brown, distally pale orange, tibia apically pale orange with a subbasal brown band; mid femur mostly dark brown proximally pale orange, tibia pale orange, brown proximally; fore wing (Fig. 74) with a pair of subapical hyaline areas; paired hyaline spots at apex of venation separated by about 1.5X length of marginal vein; no hyaline spot present in middle of wing below marginal vein; head about 4.1X as wide as frontovertex; occipital margin with a bristle-like seta behind posterior ocellus; mandible with 4 teeth, two uppermost teeth very short; an inconspicuous line of silvery setae adjacent to eye above scrobe; scape about 6.2X as long as broad; funicle segments subcylindrical (Fig. 73), all at least about 2X as long as broad, linear sensilla present only on F2-

F4; flagellum longer than head width; apex of scutellum with a pair of bristle-like setae (Fig. 72); costal cell of fore wing ventrally with 3 lines of setae proximally, a single line of setae in distal half; postmarginal vein much shorter than stigmal vein (Fig. 75); linea calva not interrupted (Fig. 74); hind tibia without a subbasal constriction. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.85mm; excluding ovipositor, 1.69mm (CPD).

Head dark brown to black with a distinct metallic lustre; occiput mainly metallic dark green with some blue-green reflections; frontovertex metallic dark green mixed with some violet, especially area above scrobes; area immediately above scrobes coppery; scrobes metallic green with some violet, dark blue and coppery reflections; mouth margin orange-brown; temple mixed metallic dark blue, violet, purple and coppery purple; gena shining metallic dark green and blue green with some coppery; area immediately below lowest part of eye relatively dull dark blue and violet; frontovertex with a few, fairly inconspicuous, scattered, translucent, pale brown setae; an inconspicuous line of sparse, translucent silvery setae between eye and scrobe extending to position of malar sulcus; gena and interantennal prominence with scattered, similarly inconspicuous, translucent, silvery setae; maxillary palpus dark brown; radicle pale orange, with a dark brown apical ring; scape, pedicel and flagellum dark brown; thorax dark brown to black with a metallic lustre; pronotum mainly with blue-green, and violet sheen, mixed with some dark green, posterior margin medially coppery purple; mesoscutum metallic dark green, mixed dark blue and violet especially anteriorly, narrowly margined coppery purple laterally and posteriorly; tegula dark brown with a weak coppery purple sheen; axilla dark brown with a dull coppery purple sheen; scutellum dorsally quite strongly metallic dark green, mixed coppery and brassy proximally and with ridges of reticulations coppery purple, side and apex strongly shining blue-green and green, with some coppery reflections at apex; mesopleuron anteriorly with a moderate violet, coppery purple and dark blue sheen, posteriorly similar, but more strongly coppery purple; all coxae dark brown; fore femur dark brown with extreme distal apex pale orange, tibia largely pale orange, but with a broad, subbasal brown band to about 0.7X, tarsus slightly dusky pale orange, apical tarsomere dark brown; mid femur dark brown with a narrow, oblique, subbasal pale orange band, tibia pale orange, dusky along its length dorsally, spur and tarsus pale orange; hind femur dark brown, hind tibia dark brown with apex narrowly pale orange dorsally, tarsus white, apical tarsomere pale orange; fore wing with a pattern of hyaline and infuscate areas as in Fig. 74, with 3 pairs of hyaline spots; propodeum dark brown with a weak brassy and purple sheen, side with a metallic dark green and dark blue sheen mixed brassy; gaster dark purple-brown, dorsally with a coppery purple sheen, Gt1 with a metallic, dark blue, violet and blue-green sheen, side and venter with coppery, blue, brassy and green reflections; gonostylus dark brown.

Head about 4.1X as wide as frontovertex, in profile about 1.8X as high as deep, tangent to frontovertex forming an angle of about 80° with that of face; occipital margin sharp, carinate, with a conspicuous, elongate seta present behind each posterior ocellus, seta about 0.7X as long as minimum width of frontovertex; a slender, oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 80°; frontovertex clearly narrowing anteriorly; ocellar area with relatively deep, fine, polygonally reticulate sculpture of mesh size slightly less than diameter of eye facet, area between anterior ocellus and top of scrobes largely with similar sculpture, but perhaps a little shallower; temple and gena with relatively shallow, longitudinally elongate, fine polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture, above torulus almost completely smooth and shiny, elsewhere with shallow sculpture; interantennal prominence and mouth margin with shallow, relatively fine, polygonally reticulate sculpture; antenna as in Fig. 73; scape hardly broadened and flattened, about 6.2X as long as broad; all funicle segments at least about 2X as long as broad, F1 longest, segments slightly broader distad; clava about as long as F1-F3 combined, sutures parallel, sensory area small, at apex only giving it a rounded appearance; eye slightly overreaching occipital margin, naked; a shallow groove immediately below eye that continues a little way on to gena; clypeal margin medially virtually straight. Relative measurements: HW 90, HH 71, FV 22, POL 13, OOL 1, OCL 9, AOL 11, EL 41, EW 45, MS 40, SL 53, SW 8.5.

Thorax (Fig. 72) with visible part of mesoscutum about 1.5X as broad as long; scutellum about 1.4X as broad as long, apex with a pair of slender, elongate, bristles, each about 0.9X as long as

scutellum; hind femur about 3.3X as long as broad; fore wing with venation and setation as in Figs 74, 75; costal cell distally with about 14 setae extending dorsally in apical 0.4X; propodeum medially about 0.05X as long as scutellum. Relative measurements: FWL 92, FWW 39.5; HWL 68, HWW 20.

Gaster with hypopygium reaching about 0.6X towards apex; syntergum about 0.8X as long as mid tibia, with apex more less rounded; ovipositor slightly exserted, the exserted part about 0.7X length of mid tibial spur or about 0.3X mid tibia.

Paratype. Mandible with four teeth, two upper teeth very short, together almost forming a broad truncation. funicle with linear sensilla present only on F2-F4; hypopygium as in Fig. 77; ovipositor as in Fig 76, second valvifer without any subapical setae. Relative measurements: OL 71, GL 18 [MT 47.5].

Variation. Females vary in overall length from 1.64-1.90mm, the mid tibia may be mostly dark brown with only the apical 0.25X pale orange and Gt1 may be dorsally mostly deep violet.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Alajuela**, RB San Ramon, 900m, ii-iii.2000 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes); 1♀, **Alajuela**, PN Volcán Tenorio, Est. El Pilón, 700-800m, #74622, 28.vii.2003 (J. Azofeifa); 1♀, **Heredia**, 3km S. Puerto Viejo, OTS-La Selva, 100m, canopy fog *Carapa* sp., FOT 02, 15.iii.1993; 1♀, Heredia, OTS La Selva, 10°26'N 84°01'W, 100m, canopy fog *Pentaclethra*, FPM/08, 4.iv.1993; 1♀, Heredia, La Selva, 10°26'N 84°01'W, 50-150m, fog *Pentaclethra macroloba*, FPM/04, 6.v.1993 (INBio-OET); 1♀, Heredia, 11km ESE La Virgen, 10°21'N 84°03'W, 250-350m, 05/TN/ALL, 10-18.iv.2004 (ALAS-INBio/OET); 1♀, **San José**, Est. Sta Elena, 14.ii-16.iii.1996 (M. Segura, E. Alfaro); 1♀, **Puntarenas**, Monte Verde Res., 1.vi.1993 (Michalski). Holotype in MZUCR, paratypes in NHMUK and CNC.

Homalopoda aesira sp.nov.

(Figs 78-88; Hab. ♀ 13, ♂ 14)

DIAGNOSIS. *Female* (length about 1.0-2.5mm): scape dark brown; flagellum dark brown; fore femur and tibia dark brown, mid femur white with apex dark brown, tibia dark brown, apex orange; fore wing (Fig. 83) with paired apical hyaline spots; paired hyaline spots at apex of venation separated by nearly 2X length of marginal vein; no well-defined hyaline spot in middle of wing below marginal vein; head (Fig. 78) about 2.8-4X as wide as frontovertex; occipital margin with a bristle-like seta behind posterior ocellus; mandible with 4 teeth; a fairly conspicuous line of silvery setae adjacent to eye above scrobe; antenna (Fig 80, 81) with scape about 5.2X as long as broad; funicle segments cylindrical, at least 2X as long as broad, linear sensilla present on all funicle segments, or absent on F1; flagellum longer than head width; apex of scutellum with 2 pairs of scale-like setae (Fig. 79); costal cell of fore wing ventrally with 2 or 3 lines of setae proximally, a single line of setae in distal half; postmarginal vein much shorter than stigmal vein (Fig. 82); linea calva interrupted by 2 or 3 setae (Fig. 83); hind tibia without a subbasal constriction. *Male* (length about 1.0-1.5mm): head coppery purple in ocellar area; thorax with pronotum similar, mesoscutum and scutellum duller coppery purple, side and apex of scutellum shining metallic green and slightly brassy; frontovertex with fine punctate reticulate sculpture and clothed with distinct dense setae; antenna Fig. 86) with F1 curved, about 5.5X as long as broad and about 2.5X as long as F2 which is straight and about 2X as long as broad; clava nearly 5X as long as broad and very slightly longer than F1-F2 combined; longest setae on flagellum about as long as diameter of F1 at base; fore wing (Fig. 87) with stigmal vein very slightly longer than postmarginal vein.

Female (holotype): length, including ovipositor, 1.87mm; excluding ovipositor, 1.73mm (CPD).

Head dark brown to black with a distinct metallic lustre; area between posterior ocelli and occipital margin metallic blue-green with a distinct coppery sheen; area between ocelli metallic green with a slight brassy sheen, mixed dark blue and violet anteriorly; violet between anterior ocellus and top of scrobes; top of scrobes coppery, scrobes metallic blue-green with a very slight brassy sheen; interantennal prominence mixed blue-green and dark blue; area between eye and scrobe violet and blue-green; temple metallic green and brassy; gena relatively dull, metallic green and brassy, mixed with some copper; mouth margin dark orange-brown with a weak brassy sheen; frontovertex with a few, fairly conspicuous, scattered, brown setae; a line of fairly conspicuous, translucent silvery setae between eye and scrobe to position of malar sulcus; gena and interantennal prominence with a few scattered, moderately conspicuous, translucent, pale brown setae; maxillary palpus brown; radicle pale orange, with a dark brown apical ring; scape, pedicel and flagellum dark brown; thorax dark brown to black with a metallic lustre; pronotum mainly with a violet sheen, mixed dark blue with some coppery purple; mesoscutum mostly dark metallic, blue green with coppery reflections, mixed with violet and coppery purple along posterior margin; tegula dark brown with a weak purple and brassy sheen; axilla with a relatively dull, mixed coppery and dark green sheen; scutellum relatively dull, dark, metallic green, mixed slightly coppery, especially towards base, side and apex shining violet and dark blue; mesopleuron anteriorly with a moderate violet and dark blue sheen, medially dark green and brassy, posteriorly coppery purple; all coxae brown; fore femur dark brown, tibia dark brown with apical 0.3X pale orange, tarsus dusky pale orange with apical tarsomere dark brown; mid femur with proximal 0.4X white, apex dark brown, tibia with proximal 0.6X dark brown and apex pale orange, spur and tarsus pale orange with apical tarsomere brown; hind femur and tibia dark brown with extreme apex of tibia pale yellow dorsally, tarsus white with apical tarsomere dark brown; fore wing with a pattern of hyaline and infuscate areas as in Fig. 83; propodeum dark brown with a weak brassy and purple sheen, side metallic blue-green mixed with some violet; gaster dark purple-brown, dorsally with a coppery purple sheen, Gt1 with a distinct dark metallic blue sheen, mixed violet, side and venter with coppery, blue, brassy and green reflections; gonostylus dark brown.

Head (Fig. 78) about 4X as wide as frontovertex, in profile about 1.8X as high as deep, tangent to frontovertex forming an angle of about 90° with that of face; occipital margin sharp, weakly carinate, with a moderately conspicuous, slightly longer seta present behind each posterior ocellus; a short, oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 80°; frontovertex hardly narrowing in front of anterior ocellus, shiny; ocellar area with relatively deep, polygonally reticulate sculpture of mesh size mostly subequal to eye facet, area between anterior ocellus and top of scrobes virtually smooth, with extremely shallow sculpture; temple and gena with relatively shallow, longitudinally elongate, fine polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture, below this with conspicuously shallower sculpture; interantennal prominence and mouth margin with shallow, polygonally reticulate sculpture; antenna as in Fig. 73; scape very slightly broadened and flattened, about 5.2X as long as broad; all funicle segments at least 2X as long as broad; clava slightly longer than F2-F4 combined, sutures parallel, sensory area small, at apex only giving it a rounded appearance; eye slightly overreaching occipital margin, clothed with short inconspicuous setae, each clearly shorter than diameter of facet; clypeal margin medially very slightly convex. Relative measurements: HW 88, HH 70, FV 22, POL 12.5, OOL 1, OCL 7, AOL 9, EL 44, EW 43, MS 33, SL 49, SW 9.5.

Thorax (Fig. 79) with visible part of mesoscutum about 1.7X as broad as long; scutellum nearly 1.4X as broad as long, apex with two pairs of flattened, scale-like setae, inner pair much broader and larger, each about as long as scutellum, outer pair more slender, slightly curved and about 0.6X as long as scutellum; hind femur about 3X as long as broad; fore wing with venation and setation as in Figs 82, 83; costal cell with 5 dorsal setae at apex; linea calva interrupted by 3 or 4 setae; propodeum medially about 0.07X as long as scutellum. Relative measurements: FWL 96.5, FWW 39; HWL 75, HWW 21.

Gaster with hypopygium reaching about 0.8X towards apex; syntergum about 0.95X as long as mid tibia, with apex more or less narrowly rounded; ovipositor exserted, the exserted part about 0.6X length of mid tibial spur or about 0.25X mid tibia.

Paratype. Mandible with four teeth; funicle with linear sensilla present on all funicle segments,

or absent from F1; hypopygium as in Fig. 84; ovipositor as in Fig. 85, second valvifer with three subapical setae. Relative measurements: OL 79, GL 18.5 [MT 47].

Variation. Females vary in overall length from 1.00-2.52mm, the outer face of the mid coxa may be dusky white, the smallest specimens may lack the violet area between the anterior ocellus and top of scrobes and the head may be only about 2.8X as wide as the frontovertex and funicle segments relatively short, with F1 only about 2X as long as broad, larger specimens may have F1 up to 4X as long as broad and the area between the anterior ocellus and top of scrobes distinctly sculptured, although the sculpture is always much shallower than sculpture near posterior ocelli and much more shiny, in smaller specimens the pair of subapical, subhyaline spots on the fore wing may be very indistinct and the exserted part of the ovipositor may be less than 0.1X as long as the mid tibia.

Male: length 0.96-1.48mm.

Similar in general habitus to female but for hyaline wings, lack of paired setae or bristles on occipital margin and structure of antenna and genitalia; head largely metallic dark metallic green, coppery purple in ocellar area; thorax with pronotum similar, mesoscutum and scutellum duller coppery purple, side and apex of scutellum shining metallic green and slightly brassy; frontovertex with fine punctate reticulate sculpture and clothed with distinct dense setae; F1 curved (Fig. 86), about 5.5X as long as broad and about 2.5X as long as F2 which is straight and about 2X as long as broad; clava nearly 5X as long as broad and very slightly longer than F1-F2 combined; longest setae on flagellum about as long as diameter of F1 at base, ventral setae on basal half of clava distinctly shorter than those on apical half (Fig. 86); fore wing (Fig. 87) with stigmal vein very slightly longer than postmarginal vein; phallobase (Fig. 88) elongate, about as long as mid tibia; digiti about 3X as long as broad and each with a single apical hook.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Santa Rosa NP, SE70, 25.iv-16.v.1987 (D . Janzen, I.D. Gauld); 1♀, Guanacaste, Guanacaste NP, Est. Mengo Vn Cacao, 1000m, v.1988 (Gauld, Janzen); 1♀, Guanacaste, Volcán Cacao, Cerro Pedregal, 1000m, ii-iv.1989 (I. Gauld); 3♀, Guanacaste, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Est. Cacao (ACG), 2km SW Cerro Cacao, LN 323100 375800, 1000-1400m. iv.1996 (C. Moraga); 1♀, Guanacaste, Est. Cacao (ACG), LN 323150 375500, 1000-1150m, viii.1996 (M. Pereira); 1♀, Guanacaste, Est. Cacao (ACG), LN 323150 375500, 1000-1150m, #47558, ix.1996 (I. Villegas); 3♀, Guanacaste, Est. Cacao (ACG), 10°55'N 85°30'W, 1100m, 19-20.ii.2005 (J.S. Noyes); 1♀, Guanacaste, Pitilla (ACG), 700m, MT/YPT, 24.i-27.ii.1996 (J.S. Noyes); 2♀, Guanacaste, Est. Pitilla (ACG), 10°59'N 85°25'W, 700m, FIT, 4-7.i.2001 and iii.2001 (C. Moraga, P.N. Thomas); 3♀, Guanacaste, Est. Maritza (ACG), 700m, MT/YPT, 20.i-24.ii.1996 (J.S. Noyes); 2♀, Guanacaste, Est. Maritza (ACG), LN 326900 373000, 600m, iii.1991 and iii.1996 (M. Pereira); 3♀, Guanacaste, Est. Maritza (ACG), LN 426900 373000, 600m, ix.1996 and i.1997 (C. Zuñiga); 1♀, Guanacaste, Est. Maritza (ACG), 700m, 22.ii.2001 (J.S. Noyes); 1♀, Guanacaste, Est. Maritza (ACG), 10°58'N 85°29'W, 700m, 21.ii.2005 (J.S. Noyes); 4♀, Guanacaste, Macizo Miravales, Est. Cabro Muco, LN 299769 411243, 1100m, 15.iii-3.iv.2003 (J. Azofeifa); 1♀, Guanacaste, San Ramon 4.5 WSW Dos (Rios) de Upala, 720m, viii-xi.1996 (F.A. Quezada); 1♀. Guanacaste, ZP Nosara, RF Monte Alto, Send. La Ceiba, LN 221100 382950, 600m, 19.xii.2000 (I. Jiménez); 1♀, Guanacaste, Peñas Blancas, 600m rainforest, YPT, iv.1986 (A. Forsyth); 1♀, **Alajuela**, Est. Pilón, LN 299400 427913, 14.vii.2004 (J. Azofeifa); 700m, 1♀, Alajuela, PN Volcán Arenal, 10°26'N 84°43'W, 600m, 26.ii.2013 (J.S. Noyes); 1♀, Alajuela, San Ramon BS, 700m, viii-ix.1995 (P. Hanson); 1♀, Alajuela, RB San Ramon, 900m, ii-iii.2000 (P. Hanson); 1♀, Alajuela, San Ramón, RB Alberto Brenes, Est. San Lorencito, LN 244500 470680, 900m, #4500, 22.ii-16.iv.1995 ((G. Carballo); 1♀, **Heredia**, La Selva BS, 50m, 22.i-3.ii.1991 (J.S. Noyes); 1♀, Heredia, 3km S. Puerto Viejo, OTS La Selva, 10°26'N 84°01'W, 100m, x-xi.1991 (P. Hanson); 1♀, Heredia, La Selva BS, 10°26'N 84°01'W, 50-150m, fog *Carapa guianensis*, 5.iii.1993 (INBio - OET); 1♀, Heredia, OTS La Selva, 100m, canopy fog *Pentaclethra*, FPM/03, 6.iii.1993

(INBio/OET); 1♀, Heredia, La Selva BS, 10°26'N 84°01'W, 50-150m, fog *Virola* FVK/01, i.1993 (INBio - OET); 1♀, Heredia, OTS La Selva, 10°26'N 86°05'W, 100m, *Pentaclethra*, canopy fog FPM/08, 4.iv.1993; 1♀, Heredia, OTS La Selva, 100m, canopy fog *Virola*, FVK/09, 5.vii.1993 (INBio/OET); 1♀, Heredia, OTS La Selva, 10°26'N 84°01'W, xi.1993 (ALAS); 1♀, Heredia, OTS La Selva, 100m, canopy fog *Virola*, FVK/19, 8.x.1994 (ALAS); 1♀, Heredia, OTS-La Selva, FVK 24, 15.x.1994 (ALAS); 2♀, Heredia, OTS La Selva, 10°26'N 84°01'W, canopy fog *Pentaclethra macroloba*, 100m, iii.1993 and i.1994 (ALAS project); 1♀, Heredia, OTS-La Selva, FOT 2, 13.x.1994 (ALAS); 1♀, Heredia, La Selva BS, 10°26'N 84°01'W, FOT 26, 19.x.1994; 1♀, Heredia, OTS-La Selva, FVK 24, 15.x.1994 (ALAS); 2♀, Heredia, Est. Biol. La Selva, 10°25'N 84°01'W, canopy fog *Meliosoma vernicosa*, FOT/44/01-40, 8.i.2000 (INBio-OET); 5♀, Heredia, 16km SSE La Virgen, 10°16'N 85°05'W, 1050-1150m, 11/M/NOTN, 9.ii-21.iv.2001 (INBio/OET – ALAS); 2♀, Heredia, 16km SSE La Virgen, 10°16'N 85°05'W, 1050-1150m, 11/M/TN, 10.ii-21.iv.2001 (INBio/OET – ALAS); 2♀, Heredia, 11km SSE La Virgen, 10°20'N 84°04'W, 450-550m, 05/N/TN, 22.ii-20.iv.2003 (ALAS); 1♀, Heredia, 11km SSE La Virgen, 10°11'N 84°07'W, 450-550m, 05/M/TN, 22.ii-20.iv.2003 (INBio – OET - ALAS); 4♀, 2♂, Heredia, 9km NE Vara Blanca, 10°14'N 84°06'W, 1450-1550m, 15/M/TN, ii-iv.2005 INBio/OET – ALAS); 2♀, Heredia, 9km NE Vara Blanca, 10°14'N 84°06'W, 1450-1550m, 15/M/NOTN, ii-iv.2005 INBio/OET – ALAS); 1♀, Heredia, Estacion Biologica La Selva, 10°26'N 84°01'W, 1-2.iii.2007 (J.S. Noyes); 1♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, 28-29.ii.2008 (J.S. Noyes); 4♀, 3♂, **San José**, Zurqui de Moravia, 1600m, ix-x.1990, x-xii.1990, x-xi.1991, iv.1992, ii.1995, viii.1995 and ix.1995 (P. Hanson); 1♀, **Cartago**, PN Tapanti-Macizo de la Muerte, Torre ICE #31, LN 556180 188500, 1800m, #61075, 15.ix-19.x.2000 (D. Rubí); 1♀, Cartago, PN Tapanti, 1200-1500m, 9°45'N 83°47'W, 20.iii-10.iv.2000 (C. Hansson, D. Rubí); 1♀, **Puntarenas**, Res. Priv. Karen Mogensen, 305m, 9°52'N 85°03'W, 19-20.ii.2016 (J.S. Noyes); 1♀, Puntarenas, Monteverde, 1400m, 26-28.iii.1991 (P. Hanson); 3♀, Puntarenas, Est. Biol. Monteverde, 10°20'N 84°49'W, 1540m, 18-24.ii.2004 (C. Hansson); 2♀, Puntarenas, Est. Altamira, Cerro Biolley, LS 572200 334400, 1766m, i.2000 and vii-viii.2000 (D. Rubí); 1♀, Puntarenas, Est. Altamira, Send. a Casa Coca, LS 332800 574250, 1900m, #62124, 12.v-12.vi.2001 (D. Rubí); 1♀, Puntarenas, San Vito, Las Cruces, Jardin Bot., 1200m, xii.1988 (P. Hanson); 1♀, Puntarenas, Las Cruces, Wilson Bot. Gdns, 8°46'N 82°57'W, 1200-1350m, 15-16.ii.2012 (J.S. Noyes); 1♀, **Limón**, RB Hitoy-Cerere, Send. Bobocara, LN 184250 640500, 840m, #52859, 17.vi-17.vii.1999 (F. Umana); 1♀, Limón, RB Hitoy-Cerere, 100m, 14-19.i.1991 (J.S. Noyes); 1♀, Limón, RB Hitoy Cerere, Send. Espavel, LS 401200 569800, 560m, #74462, 21.vi-8.vii.2003 (R. Gamboa, et al.); 1♀, Limón, RB Hitoy Cerere, 9°40'N 83°02'W, 100m, ii.2004 (J.S. Noyes). Holotype in MZUCR, paratypes in MZUCR, NHMUK, USNM and CNC.

COMMENTS. *Homalopoda aesira* is very similar to *donatos*, females of both species having bristle-like setae on the occipital margin and scale-like setae at the apex of the scutellum and the apical area of the fore wing distinctly paler. Very small specimens of *aesira*, with a relatively wide frontovertex and relatively weakly infuscate fore wing, can be difficult to separate from those of *donatos*. However, in *aesira*, the hyaline area immediately distad of the apex of the wing venation always has the lower margin straight and never extending towards the opposite hyaline area, whereas in *donatos* the lower margin of the upper hyaline area always extends towards the lower hyaline area often virtually connecting the two. See also comments under *carpha* (p. 69).

***Homalopoda cristata* Howard**
(Figs 89-95; Hab. ♀ 15)

Homalopoda cristata Howard in Riley et al., 1894:91-92. Lectotype ♀, designated by Noyes (1979:157), St. Vincent (W.I.), NHMUK, examined.

Caenohomalopoda longiscapus Gupta & Poorani, 2008:59-62. Holotype ♀, India (Karnataka), NCPM, not examined. Synonymy with *Homalopoda cristata* by Hayat (2012:167).

DIAGNOSIS. *Female* (length about 1.1-2.4mm): frontovertex with a very conspicuous line of dense, translucent, silvery setae between eye and scrobe extending to position of malar sulcus; scape and flagellum dark brown (Fig. 90); fore femur dark brown, tibia dark brown with apex orange-brown; mid femur dark brown, tibia dark brown, apex orange; fore wing (Fig. 93) with a pair of subapical hyaline areas; paired hyaline spots at apex of venation separated by about 2X length of marginal vein; a well-defined hyaline spot present in middle of wing below marginal

vein; head (Fig. 89) about 3.5-4.8X as wide as frontovertex, larger specimens with a narrower frontovertex; occipital margin with a scale-like seta behind posterior ocellus; mandible with 4 teeth, two lowermost teeth longest; a very conspicuous line of silvery setae adjacent to eye above scrobe; scape about 5.1X as long as broad; funicle segments subcylindrical (Fig. 90), F1 at most about 1.2X as long as pedicel, all at least about 2X as long as broad, in larger specimens up to 3X as long as broad, linear sensilla present only on F2-F4; flagellum slightly shorter than head width in smaller specimens, slightly longer in large specimens; apex of scutellum with a single pair of bristle-like setae (Fig. 91), occasionally these setae very slightly broadened and scale-like, but never strongly so and never more than one pair; costal cell of fore wing ventrally with 3 lines of setae proximally, a single line of setae in distal half; postmarginal vein much shorter than stigmal vein (Fig, 92); linea calva interrupted by up to 6 setae; hind tibia without a subbasal constriction; hypopygium as in Fig. 95; ovipositor as in Fig, 94. *Male*: unknown.

Male. Unknown.

DISTRIBUTION. Some records may refer to other similar species of the genus, but *H. cristata* has been recorded from Cuba, Haiti, Puerto Rico, St Vincent & Grenadines, Trinidad & Tobago, Panama, India (Karnataka) and Sri Lanka (see Noyes, 2019), also newly recorded below from Costa Rica (**new record**). Probably accidentally introduced into India and Sri Lanka.

HOSTS. Recorded as a parasitoid of *Odonaspis secreta* (Cockerell) in Sri Lanka (Howard & Ashmead, 1896) and from *Duplaspidiotus tesseratus* (Grandpré & Charmoy) in India (Karnataka) (Fry, 1989) (Hemiptera: Diaspididae). Also recorded as a parasitoid of *Ceroplastes giganteus* Dozier (Hemiptera: Coccidae) on *Ficus rubricosta* Warb. (Rosales: Moraceae) in Puerto Rico (Dozier, 1937) but this host requires confirmation.

MATERIAL EXAMINED.

Type material. Lectotype of cristata: ST VINCENT & GRENADINES, "Leeward side St. Vincent, W.I. H. H. Smith 242" "W. Indies 99-331", "Omalopoda n.g. cristata, How." (NHMUK).

Non type material. **ST VINCENT & GRENADINES**, 1♀, **St Vincent**, Leeward side, 228 Reg. No 99-331 (H.H. Smith); 1♀, St George, Kingstown, wasteground, 4.vii.1976 (J.S. Noyes); **TRINIDAD & TOBAGO**, 11♀, **Trinidad**, Curepe, Sta Margarita Circ. Rd., various dates, 10.iii-23.vi.1974 (F.D. Bennett); 3♀, Trinidad, St George, St Augustine, Malaise trap, 15.vii-13.viii.1976 (J.S. Noyes); 1♀, Trinidad, St George, St Augustine, light trap, iv.1977 (F.D. Bennett); **COSTA RICA**, 1♀, **Guanacaste**, Santa Rosa NP, SE6C, 25.iv-16.v.1987 (D. Janzen, I.D. Gauld); 2♀, Guanacaste, Maritza (ACG), 700m, MT/YPT, 20.i-24. ii.1996 (J.S. Noyes); 1♀, Guanacaste, Nandayure, Finca Agua Fria, canopy fog, xi.2001 (W. Porras); 1♀, Guanacaste, PN Palo Verde, Cerro Guayacán, LN 388500 259750, 100m, #57963, 11.vii-10.viii.2000 (I. Jiménez); 1♀, **Puntarenas**, Golfito, Est. Agujas, 300m, LS 526650 276750, canopy fog, #61183, 15.iii.2000 (A. Solis); 1♀, **Limón**, Res. Biol. Hitoy Cerere, 9°40'N 83°02'W, 100m, 22-23.ii.2015 (J.S. Noyes). **INDIA**, 5♀, **Karnataka**, CIBC Bangalore, ex *Duplaspidiotus tesseratus*, 20.iii.1982; 1♀, Karnataka, Vasanthapura, ex *Duplaspiditous tesseratus* on *Ficus bengalensis*, CIE 14454, 9.ix.1982. Material in MZUCR and NHMUK.

Homalopoda rehdera **sp.nov.**

(Figs 96-99; Hab. ♀ 16)

DIAGNOSIS. *Female* (length about 0.8-2.3mm): scape dark brown; flagellum dark brown; fore femur and tibia dark brown, apex orange, mid femur apex dark brown, orange apically, tibia dark brown, apex orange; fore wing (Fig. 98) with paired apical hyaline spots; paired hyaline spots at apex of venation separated by about 2X length of marginal vein; a well-defined hyaline spot present in middle of wing below marginal vein; head about 2.5-5X as wide as frontovertex; occipital margin with a scale-like seta behind posterior ocellus; mandible with 1 tooth and a broad truncation; a line of silvery setae adjacent to eye above scrobe; scape about 3.8X as long as broad; funicle (Fig. 96) segments subcylindrical, F2 transverse to quadrate, remaining segments quadrate to hardly longer than broad, linear sensilla present on only F2-F4; pedicel and flagellum combined shorter than head width; apex of scutellum with two pairs of scale-like setae; costal cell of fore

wing ventrally with 2 lines of setae proximally, a single line of setae in distal half; postmarginal vein much shorter than stigmal vein (Fig. 97); linea calva interrupted by 3 or 4 setae; hind tibia without a subbasal constriction. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.58mm; excluding ovipositor, 1.40mm (CPD).

Head dark brown to black with a distinct metallic lustre; frontovertex generally metallic dark blue, mixed with blue-green, green and brassy; a violet stripe across frontovertex about midway between anterior ocellus and top of scrobes; scrobal area metallic dark green with some weak brassy, purple and coppery reflections; area between eye and scrobe metallic dark green and dark blue; upper temple metallic dark blue, a broad, coppery purple stripe across temple from lowest part of eye; gena metallic dark blue mixed dark green; mouth margin dark orange-brown with a weak brassy sheen; frontovertex with a few, fairly conspicuous, scattered, brown setae; a line of fairly conspicuous, translucent silvery setae between eye and scrobe to position of malar sulcus; gena and interantennal prominence with a few scattered, moderately conspicuous, translucent, pale brown setae; maxillary palpus pale orange-brown; radicle pale orange, with a dark brown apical ring; scape, pedicel and flagellum dark brown; thorax dark brown to black with a metallic lustre; pronotum mainly with dark blue sheen, mixed violet; mesoscutum mostly metallic, dark blue with some violet and coppery purple reflections, coppery purple along posterior margin; tegula dark brown with a weak purple and brassy sheen; axilla with a relatively dull, mixed coppery purple and brassy sheen; scutellum relatively dull, dark, metallic blue, mixed coppery purple, side and apex shining dark blue and blue-green; mesopleuron generally with a weak coppery purple and dark blue sheen; all coxae brown; fore femur dark brown, tibia dark brown with apical 0.3X pale orange, tarsus dusky pale orange with apical tarsomere dark brown; mid femur dark brown with extreme base pale orange and a small pale orange spot apically on dorsal margin, tibia with proximal 0.6X or so dark brown and apex pale orange, spur and tarsus very pale orange; hind femur and tibia dark brown with extreme apex of tibia pale yellow dorsally, tarsus white; fore wing with a pattern of hyaline and infuscate areas as in Fig. 98; propodeum dark brown with a weak brassy and purple sheen, side metallic dark blue, mixed with some violet; gaster dark purple-brown, dorsally with a coppery purple sheen, Gt1 with a weak dark metallic blue, violet and coppery sheen, side and venter with coppery, blue, brassy and green reflections; gonostylus dark brown.

Head about 5.3X as wide as frontovertex, in profile about 1.5X as high as deep, tangent to frontovertex forming an angle of about 60° with that of face; occipital margin sharp, weakly carinate, clearly emarginate medially, with a conspicuous, long scale-like seta present behind each posterior ocellus, each of which is about as long as width of frontovertex across posterior ocelli; a small, indistinct, oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 85°; frontovertex shiny, ocellar area with relatively deep, fine, polygonally reticulate sculpture of mesh size slightly smaller than eye facet, area immediately in front of anterior ocellus with similar sculpture, but area above top of scrobes quite smooth; a shallow groove present between eye and scrobe, this extending laterally a little way on to temple; temple and gena with relatively shallow, longitudinally elongate, fine polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture, below this with conspicuously shallower sculpture; interantennal prominence and mouth margin with shallow, polygonally reticulate sculpture; antenna as in Fig. 96; scape slightly broadened and flattened, about 3.8X as long as broad; F1, F3-F4 hardly longer than broad, F2 quadrate; clava about as long as pedicel and funicle combined, sutures parallel, sensory area small, at apex only giving it a rounded appearance; eye slightly overreaching occipital margin, naked; inner eye margins strongly converging anteriorly so that narrowest part of frontovertex is just above scrobes; clypeal margin medially weakly concave. Relative measurements: HW 74.5, HH 56, FV 14, POL 10, OOL 1, OCL 9, AOL 7, EL 28, EW 42, MS 31, SL 34, SW 9.

Thorax with visible part of mesoscutum about 1.6X as broad as long; scutellum about 1.6X as broad as long, apex with two pairs of flattened, scale-like setae, inner pair much broader and larger, each about 1.3X as long as scutellum, outer pair more slender, slightly curved and about as long as scutellum; hind femur about 3.8X as long as broad; fore wing with venation and setation as in Figs 97, 98; costal cell with 7 dorsal setae at apex; propodeum medially about 0.1X as long

as scutellum. Relative measurements: FWL 71, FWW 29; HWL 50, HWW 14.

Gaster with hypopygium reaching about 0.75X towards apex; syntergum about 0.75X as long as mid tibia, with apex truncate; ovipositor exserted, the exserted part about 0.8X length of mid tibial spur or about 0.35X mid tibia.

Paratype**.** Mandible with one tooth and a broad truncation, truncate part more or less with three very short teeth; funicle with linear sensilla present only on F2-F4; linea calva interrupted by 4 or 5 setae; hypopygium as in Fig, 99; second valvifer with 3 subapical setae. Relative measurements: OL 84, GL 18.5 [MT 73].

Variation. Females vary in overall length from 0.76-2.32mm, the smallest specimens may have the head dark brown and hardly metallic, and lacking any violet areas, the head may be only about 2.6X as wide as the frontovertex, with the inner eye margins hardly converging anteriorly and the funicle segments may be relatively short, with F2 transverse and F1 and F3 quadrate.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Est. Maritza (ACG), 10°58'N 85°29'W, 700m, 23.ii.2003 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Santa Rosa NP, Hacienda 1-0, 11.v-1.vi.1985 (Janzen, Gauld); 1♀, Guanacaste, Guanacaste NP, Derrumbé Vn Cacao, 1300m, iv-v.1988 (Gauld, Janzen); 1♀, Guanacaste, Guanacaste NP (error for Santa Rosa NP), near HQ, MT/YPT, 2-10.iii.1990 (J.S. Noyes); 1♀, Guanacaste, Est. Pitilla (ACG) 700m, 10°59'N 85°25'W, 4-7.i.2001 (C. Moraga, P.N. Thomas); 1♀, Guanacaste, Maritza (ACG), 700m, MT/YPT, 20.i-24.ii.1996 (J.S. Noyes); 1♀, **Alajuela**, RF Arenal, Send. Pilón, LN 269200 457900, 600m, #55399, 22.xii.1999-15.i.2000 (G. Carballo); 1♀, Alajuela, Upala, Alb. Heliconias, Send. Laguna Danto, LN 423760 298100, 1150m, #60662, 24.ix-24.x.2000 (J.D. Gutiérrez); 1♀, Alajuela, Res. Priv. Selva Verde, 10°27'N 84°04'W, 75m, 13.iii.2005 (C. Hansson); 1♀, **Heredia**, La Selva BS, 59m, MT/YPT, ii.1991 (J.S. Noyes); 1♀, Heredia, OTS-La Selva, 10°26'N 84°01'W, iii-iv.1993 (ALAS); 1♀, Heredia, OTS La Selva, 100m, canopy fog *Sacoglotis*, FOT/14, 8.xi.1993 (INBio/OET); 1♀, Heredia, OTS-La Selva, FK 19, 8.x.1994 (ALAS); 1♀, Heredia, OTS-La Selva, FVK 24, 15.x.1994 (ALAS); 1♀, Heredia, Est. Biol. La Selva, 10°24'N 84°01'W, 50-150m, canopy fog *Eugenia* sp., FOT/76/1-40, 5.i.2000 (INBio/OET); 1♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, ii.2002 (J.S. Noyes); 1♀, Heredia, Estacion Biologica. La Selva, 10°26'N 84°01'W, 75m, 1-2.iii.2007 (J.S. Noyes); 2♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, 28-29.ii.2008 (J.S. Noyes); 1♀, Heredia, Estacion Biologica La Selva, 10°26'N 84°01'W, 75m, 22-24.ii.2012 (J.S. Noyes); 1♀, Heredia, 9km NE Vara Blanca, 10°14'N 85°06'W, 1450-1550m, 15/M/TN, ii-iv.2005 (INBIo/OET – ALAS); 1♀, Heredia, 9km NE Vara Blanca, 10°14'N 85°06'W, 1450-1550m, 15/M/NOTN, ii-iv.2005 (INBIo/OET – ALAS); 3♀, **San José**, Zurqui de Moravia, 1600m, iv.1996 and x-xi.1996 (P. Hanson); 1♀, **Cartago**, PN Tapanti-Macizo de la Muerte, Torre ICE#31, LN 561800 188500, 1800m, #61071, viii-ix.2000 (D. Rubí); 1♀, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 17-18.ii.2011 (J.S. Noyes); 1♀, Puntarenas. Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 23-24.ii.2013 (J.S. Noyes); 3♀, Puntarenas. Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 19-20.ii.2016 (J.S. Noyes); 1♀, Puntarenas, Manuel Antonio NP, iii.1986 (L. Masner); 1♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 8°36'N 82°57'W, 1300m, 30.ii.2015 (J.S. Noyes). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

Homalopoda aibeus **sp.nov.**

(Figs 100-106; Hab. ♀ 17)

DIAGNOSIS. *Female* (length about 1.0-1.3mm): antenna (Fig. 101) with scape dark brown, funicle brown, mixed dusky pale orange; clava brown, mixed orange; fore femur and tibia mostly dark brown, apex of tibia pale orange; mid femur proximally dusky white, apex dark brown, tibia dark brown, apex white; fore wing (Fig. 103) apex generally weakly infuscate; paired hyaline spots at apex of venation separated by about length of marginal vein; no hyaline spot present in

middle of wing below marginal vein; head about 3.5X as wide as frontovertex; occipital margin with a scale-like seta behind posterior ocellus; mandible (Fig. 100) with 3 acute teeth; no line of conspicuous silvery setae adjacent to eye above scrobe; scape about 2.8X as long as broad; funicle segments (Fig. 101), F1-F3 transverse, F4 subquadrate, linear sensilla present only on F4; pedicel and flagellum combined shorter than head width; apex of scutellum (Fig. 104) with two pairs of scale-like setae; costal cell of fore wing ventrally with 2 or 3 lines of setae proximally, a single line of setae in distal half; postmarginal vein much shorter than stigmal vein (Fig. 102); linea calva constricted or interrupted by single seta; hind tibia without a subbasal constriction. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.08mm; excluding ovipositor, 1.02mm (CPD).

Head dark brown to black with a distinct metallic lustre; occiput metallic dark green and blue-green, foramen connected to occipital margin by a coppery line; frontovertex mostly metallic dark blue and dark green, area behind posterior ocelli with ridges of reticulate sculpture coppery-purple; a violet band above scrobes, below this narrowly metallic dark blue; top of scrobes copper, scrobes otherwise blue-green and green mixed with some coppery purple reflections; temple mainly metallic purple, mixed dark blue and green; gena dorsally quite shiny metallic green, below this relatively dull coppery purple; mouth margin coppery-purple; frontovertex with a few, fairly inconspicuous, scattered, brown setae; no line of conspicuous, silvery setae across frontovertex and below eye; gena and mouth margin with scattered, inconspicuous, translucent, white setae; interantennal prominence dorsally with a pair of submedian lines of similar setae to those on gena; maxillary palpus white; radicle pale orange, with a dark brown apical ring; scape and pedicel dark brown; funicle with F1-F3 brown and F4 slightly dusky pale orange; clava pale orange with basal segment proximally brown and terminal segment slightly dusky; thorax dark brown to black with a metallic lustre; pronotum mainly with a violet sheen, mixed dark blue medially; mesoscutum mostly metallic dark green and blue-green, laterally mixed dark blue and violet, posterior margin narrowly coppery purple; tegula dark brown with a weak coppery purple sheen; axilla with a weak coppery purple and brassy sheen; scutellum dorsally quite dull with a weak coppery purple sheen, side and apex more strongly shining coppery purple; mesopleuron with a moderate coppery purple and dark blue sheen; coxae dark brown; fore femur dark brown, distal apex dusky pale orange, tibia dark brown, extreme base dusky pale orange, apical 0.3X pale orange, tarsus dusky pale orange; mid femur with proximal 0.4X dusky white, apex dark brown, extreme apex dorsally dusky white, tibia dark brown, apical 0.4X white, spur white, tarsus white to very pale yellow, apical tarsomere pale orange; hind femur dark brown, tibia dark brown with extreme apex white, tarsus white, apical tarsomere dusky pale orange; fore wing with a pattern of hyaline and infuscate areas as in Fig. 103; propodeum dark purple-brown with a weak brassy sheen, side with a metallic dark green and coppery sheen; gaster dark purple-brown, dorsally with a coppery purple sheen, Gt1 with a coppery purple sheen, side and venter of gaster with coppery, blue, brassy and green reflections; gonostylus dark brown, extreme apex pale orange.

Head (Fig. 100) about 3.5X as wide as frontovertex, in profile about 1.6X as high as deep, tangent to frontovertex forming an angle of about 60° with that of face; occipital margin inconspicuously emarginate medially, with a shallow vertical groove running from occipital margin to foramen, a conspicuous, elongate, scale-like seta on occipital margin behind each posterior ocellus, seta about 0.8X as long as minimum width of frontovertex; a fairly conspicuous, elongate depression adjacent to eye near occipital margin; ocelli forming an angle of about 80°; frontovertex narrowing a little anteriorly; ocellar area with relatively deep, fine, polygonally reticulate sculpture of mesh size slightly less than diameter of eye facet, area between anterior ocellus and top of scrobes with shallower, transversely slightly elongate, polygonally reticulate to imbricate-reticulate sculpture; temple with area adjacent to eye completely smooth and shiny otherwise temple and gena with longitudinally elongate, fine polygonally reticulate sculpture of similar depth to that immediately above scrobes; top of scrobes with shallow, regular, polygonally reticulate sculpture, scrobes otherwise more or less completely smooth and shiny; interantennal prominence and mouth margin with shallow, relatively fine, polygonally reticulate sculpture; antenna as in Fig. 101; scape slightly broadened and flattened, broadest in middle, about 2.8X as long as broad; funicle segments subcylindrical (Fig. 101), F1-F3 clearly transverse, F4 subquadrate, segments clearly broader

distad; clava very nearly as long as pedicel and funicle combined, sutures parallel, sensory area small, at apex only giving it a rounded appearance; eye more or less reaching occipital margin, virtually naked, but with sparse, very short setae, each much shorter than diameter of facet; no shallow groove below eye; clypeal margin medially virtually straight. Relative measurements: HW 57, HH 45, FV 16.5, POL 10, OOL 1.5, OCL (line between posterior ocellus and scale-like seta on occipital margin) 8.5, AOL 7.5, EL 26, EW 29, MS 24, SL 21, SW 7.5.

Thorax (as in Fig. 104) with visible part of mesoscutum about 1.6X as broad as long; scutellum about 1.5X as broad as long, apex with 2 pairs of broad, scale-like setae, inner pair relatively broad, each very slightly longer than scutellum, outer pair more slender and about 0.8X as long as scutellum; hind femur about 3.6X as long as broad; fore wing with venation and setation as in Figs 102,103; costal cell with 3 setae dorsally at apex; propodeum medially about 0.08X as long as scutellum. Relative measurements: FWL 53.5, FWW 21.5; HWL 38.5, HWW 9.5.

Gaster with hypopygium reaching about 0.5X towards apex; syntergum about 0.75X as long as mid tibia, with apex truncate; ovipositor slightly exserted, the exserted part about 0.5X length of mid tibial spur or about 0.2X mid tibia.

Paratype. Mandible with three acute teeth, lowermost tooth longest; funicle with linear sensilla present only on F4; linea calva interrupted by a single seta or entire; second valvifer without any subapical setae; hypopygium as in Fig. 106; ovipositor as in Fig, 105. Relative measurements: OL 78, GL 16.5 [MT 63].

Variation. Females vary in overall length from 1.04-1.27mm, otherwise very little variation noted in material available.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Limón**, RB Hitoy-Cerere, Valle de Estrella, Send. Bobócara, LN 641800 184250, 300m, #58070, 14-30.vii.2000 (F. Umaña). Paratypes: **COSTA RICA**, 1♀, **Heredia**, 9km NE Vara Blanca, 10°14'N 84°06'W, 1450-1550m, 15/M/NOTN, ii-iv.2005 (INBio/OET – ALAS); 1♀, Heredia, Santo Domingo, INBio Parque, 1100m, LN 526250 217400, iii.2002 (J.A. Azofeifa, J.S. Noyes); 1♀, **Puntarenas**, MonteVerde Res., 1.vi.1993 (Michalski). Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. This species is possibly misplaced in *Homalopoda*. It appears to have characters in common with *Plagiomerus* (short funicle segments) and *Homalopoda* (infuscate pattern on fore wing; postmarginal vein clearly shorter than stigmal vein). On the balance of characters, the species is placed tentatively in *Homalopoda*, although the uniquely tridentate mandibles suggest that this placement may be incorrect.

Homalopoda beatriz **sp.nov.**

(Figs 107-112; Hab. ♀ 18)

DIAGNOSIS. *Female* (length about 1.6-1.7mm): scape dark brown; flagellum dark brown; fore femur dark brown, fore tibia brown with orange apices, mid femur proximally white, apex dark brown, tibia proximally dark brown, apex pale yellow; fore wing with apical area generally hyaline; paired hyaline spots at apex of venation separated by about 3X length of marginal vein; a hyaline spot present in middle of wing below marginal vein; head about 4.4X as wide as frontovertex; occipital margin with a bristle-like seta behind posterior ocellus; mandible with 1 tooth and a broad truncation; an inconspicuous line of silvery setae adjacent to eye above scrobe; scape about 3.5X as long as broad; funicle segments subcylindrical, all at least 1.5X as long as broad, linear sensilla present on all segments; flagellum slightly longer than head width; apex of scutellum with a pair of bristle-like setae; costal cell of fore wing ventrally with 2 lines of setae proximally, a single line of setae in distal half; postmarginal vein much shorter than stigmal vein; linea calva

interrupted by a single seta; hind tibia may have a strong subbasal constriction. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.60mm; excluding ovipositor, 1.57mm (CPD).

Head dark brown to black with a distinct metallic lustre; frontovertex metallic blue-green mixed with violet and some brassy reflections; area above scrobes deep violet separated from coppery area at top of scrobes by a narrow, metallic dark blue line; lower scrobes and interantennal prominence metallic blue-green and dark green with some coppery reflections; mouth margin orange-brown; area between eye and scrobe mixed brassy, and metallic blue-green, green and violet; temple mixed metallic blue-green, dark blue, coppery and brassy; gena relatively dull dark green, coppery purple and brassy; frontovertex with a few, fairly inconspicuous, scattered, brown setae; an inconspicuous line of translucent silvery setae between eye and scrobe extending to position of malar sulcus; gena and interantennal prominence with scattered, moderately conspicuous, translucent, silvery setae; maxillary palpus white with terminal segment very pale orange; radicle pale orange, with a dark brown apical ring; scape, pedicel and flagellum dark brown; thorax dark brown to black with a metallic lustre; pronotum mainly with a dark blue and violet sheen, posterior margin coppery purple; mesoscutum mostly shining, but relatively dull, dark, metallic blue-green with violet reflections, narrowly margined coppery purple laterally and posteriorly; tegula dark brown with a weak coppery purple and brassy sheen; axilla dark brown with a very dull brassy and coppery purple sheen; scutellum mostly dark, metallic dark green, ridges of reticulations dark blue, side shining dark blue-green and green, apex violet; mesopleuron anteriorly with a moderate violet, brassy and dark blue sheen, medially dark green and brassy, posteriorly coppery purple; all coxae dark brown; fore femur brown, tibia largely pale orange, but proximal 0.7X with a broad, incomplete, brown subbasal ring, tarsus slightly dusky pale orange; mid femur with proximal 0.4X white, tibia with proximal 0.7X brown and apex very pale yellow, spur and tarsus very pale yellow; hind femur and tibia dark brown, extreme apex of tibia white dorsally, tarsus white; fore wing with a pattern of hyaline and infuscate areas as in Fig. 111; propodeum dark brown with a weak brassy and purple sheen, side with a metallic blue-green and green sheen mixed copper; gaster dark purple-brown, dorsally with a coppery purple sheen, Gt1 proximally with a weak metallic violet and dark blue sheen, side and venter with coppery, blue, brassy and green reflections; gonostylus dark brown.

Head about 4.4X as wide as frontovertex, in profile about 1.5X as high as deep, tangent to frontovertex forming an angle of about 70° with that of face; occipital margin sharp, weakly carinate, hardly emarginate medially, with an inconspicuous, elongate seta present behind each posterior ocellus, seta about 0.5X as long a width of frontovertex across posterior ocelli; a short, oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 80°; frontovertex strongly narrowing anteriorly, shiny; ocellar area (as in Fig, 107) with relatively deep, fine, polygonally reticulate sculpture of mesh size slightly less than diameter of eye facet, area between anterior ocellus and top of scrobes with conspicuously shallower sculpture, virtually smooth anteriorly; temple and gena with relatively shallow, longitudinally elongate, fine polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture, above torulus almost completely smooth and shiny, elsewhere with shallow sculpture; interantennal prominence and mouth margin with shallow, relatively fine, polygonally reticulate sculpture; antenna as in Fig. 108; scape slightly broadened and flattened, about 3.5X as long as broad; all funicle segments at least about 1.5X as long as broad, F1 longest, about 2X as long as broad, segments slightly broader distad, linear sensilla present on all funicle segments; clava a little shorter than funicle, sutures parallel, sensory area small, at apex only giving it a rounded appearance; eye slightly overreaching occipital margin, clothed with short, very inconspicuous setae, each clearly shorter than diameter of facet; clypeal margin medially virtually straight; mandible with one tooth and a broad truncation. Relative measurements: HW 84, HH 63, FV 19, POL 12, OOL 1.5, OCL 9, AOL 10, EL 40, EW 43, MS 35, SL 39, SW 11.

Thorax with visible part of mesoscutum about 1.6X as broad as long; scutellum about 1.4X as broad as long, apex with a pair of elongate bristles, each about as long as scutellum, 3 or 4 long bristles outside these on each side; hind femur about 3.3X as long as broad; fore wing with venation and setation as in Figs 111, 112; costal cell distally with about 11 setae extending dorsally in apical 0.4X; propodeum medially about 0.08X as long as scutellum. Relative measurements:

FWL 78, FWW 30.5; HWL 51, HWW 15.

Gaster with hypopygium reaching about 0.7X towards apex; syntergum about 0.9X as long as mid tibia, with apex broadly truncate, slightly concave; ovipositor hardly exserted, the exserted part about 0.15X length of mid tibial spur or less than 0.1X mid tibia.

Paratype. Fore wing with linea calva interrupted by a single seta; second valvifer with 4-6 subapical setae; hypopygium as in Fig. 109; ovipositor as in Fig. 110. Relative measurements: OL 63.5, GL 10.5 [MT 49].

Variation. Females vary in overall length from 1.60-1.74mm, otherwise very little in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, OTS La Selva, 10°26'N 84°01'W, 100m, canopy fog *Pentaclethra*, FPM /08, 4.iv.1993. Paratypes: **COSTA RICA**, 1♀, **Heredia**, OTS La Selva, 100m, canopy fog *Virola*, FVK/09, 5.vii.1993 (INBio/OET). Holotype in MZUCR, paratype in NHMUK.

Homalopoda carpha **sp.nov.**

(Figs 113-118; Hab. ♀ 19)

DIAGNOSIS. *Female* (length about 1.2-1.5mm): scape dark brown; flagellum dark brown; fore femur and tibia dark brown, apex orange, mid femur proximally white, apex dark brown, tibia dark brown, apex pale yellow; fore wing (Fig. 115) with apical area generally pale brown; paired hyaline spots at apex of venation separated by about 2X length of marginal vein; no well-defined hyaline spot present in middle of wing below marginal vein; head (Fig. 117) about 3.3X as wide as frontovertex; occipital margin with a bristle-like seta behind posterior ocellus; mandible with 4 teeth; an indistinct line of silvery setae adjacent to eye above scrobe; scape about 4.8X as long as broad; funicle segments subcylindrical (Fig. 113), all at least about 2X as long as broad, linear sensilla present only on F2-F4; flagellum slightly longer than head width; apex of scutellum with two pairs of scale-like setae (Fig 118); costal cell of fore wing ventrally with 2 or 3 lines of setae proximally, a single line of setae in distal half; postmarginal vein much shorter than stigmal vein (Fig 114); linea calva interrupted by 3 or 4 setae; hind tibia without a subbasal constriction. *Male*: unknown.

Female **(**holotype**)**: length, including ovipositor, 1.50mm; excluding ovipositor, 1.42mm (CPD).

Head dark brown to black with a distinct metallic lustre; area between posterior ocelli and occipital margin metallic dark green with a slight coppery sheen, occipital margin blue-green; area between ocelli metallic green mixed dark blue and violet; metallic dark blue and violet between anterior ocellus and top of scrobes; deep violet a little above top of scrobes with a narrow metallic, dark blue line separating this area from a coppery area at top of scrobes; scrobes and interantennal prominence metallic dark green with a very slight coppery and brassy lustre; area between eye and scrobe copper and metallic dark blue; temple slightly duller metallic dark blue, brassy and copper; posterior gena relatively dull, coppery, anterior gena dark blue and copper; mouth margin dark orange-brown with a weak brassy sheen; frontovertex with a few, fairly conspicuous, scattered, brown setae; an inconspicuous line of short, translucent silvery setae between eye and scrobe extending to position of malar sulcus; gena and interantennal prominence with a few scattered, moderately conspicuous, translucent, pale brown setae; maxillary palpus orange-brown; radicle pale orange, with a dark brown apical ring; scape, pedicel and flagellum dark brown; thorax dark brown to black with a metallic lustre; pronotum mainly with a dark blue and violet sheen; mesoscutum mostly shining, but relatively dull, dark metallic, green with coppery reflections, posterior margin coppery purple; tegula dark brown with a weak purple and brassy sheen; axilla

dark brown with a relatively dull brassy and coppery purple sheen; scutellum relatively dull, dark, metallic green, mixed slightly coppery, especially towards base, side shining dark blue, apex violet; mesopleuron anteriorly with a moderate violet and dark blue sheen, medially dark green and brassy, posteriorly coppery purple; all coxae brown, but mid coxa externally very pale yellow; fore femur brown, extreme apices orange-brown, tibia mostly brown, but ventrally pale orange-brown with apical 0.3X pale orange, tarsus dusky pale orange; mid femur with proximal 0.4X white, apex brown but ventral margin narrowly pale orange, tibia with proximal 0.4X dark brown apex pale yellow, spur and tarsus pale yellow, apical tarsomere pale brown; hind femur and tibia dark brown with apical 0.2X of tibia very pale yellow, tarsus white with apical tarsomere dusky pale orange; fore wing with a pattern of hyaline and infuscate areas as in Fig. 115; propodeum dark brown with a weak brassy and purple sheen, side metallic dark green mixed with some blue-green; gaster dark purple-brown, dorsally with a coppery purple sheen, Gt1 proximally with a metallic dark blue sheen, side and venter with coppery, blue, brassy and green reflections; gonostylus dark brown.

Head (Fig. 117) about 3.3X as wide as frontovertex, in profile about 1.6X as high as deep, tangent to frontovertex forming an angle of about 90° with that of face; occipital margin sharp, weakly carinate, with a moderately conspicuous, slightly longer seta present behind each posterior ocellus; a short, oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 75°; frontovertex hardly narrowing in front of anterior ocellus, shiny; ocellar area with relatively deep, polygonally reticulate sculpture of mesh size mostly subequal to eye facet, area between anterior ocellus and top of scrobes virtually smooth, with extremely shallow sculpture; temple and gena with relatively shallow, longitudinally elongate, fine polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture, below this with conspicuously shallower sculpture; interantennal prominence and mouth margin with shallow, relatively fine, polygonally reticulate sculpture; antenna as in Fig. 113; scape very slightly broadened and flattened, about 4.8X as long as broad; all funicle segments at least 1.8X as long as broad (Fig. 113), linear sensilla present only on F2-F4; clava very nearly as long as funicle, sutures parallel, sensory area small, at apex only giving it a rounded appearance; eye slightly overreaching occipital margin, clothed with short, very inconspicuous setae, each clearly shorter than diameter of facet; clypeal margin medially virtually straight; mandible with four teeth, two lower teeth longest. Relative measurements: HW 70, HH 55, FV 21, POL 10.5, OOL 1, OCL 6.5, AOL 9, EL 37, EW 35.5, MS 25, SL 33.5, SW 7.

Thorax (Fig. 118) with visible part of mesoscutum about 1.6X as broad as long; scutellum about 1.4X as broad as long, apex with two pairs of flattened, scale-like setae, inner pair much broader and larger, each about 0.9X as long as scutellum, outer pair more slender, slightly curved and about 0.7X as long as scutellum; hind femur about 3X as long as broad; fore wing with venation and setation as in Figs 114, 115; costal cell with 5 or 6 dorsal setae at apex; linea calva interrupted by 2 or 3 setae; propodeum medially about 0.07X as long as scutellum. Relative measurements: FWL 89.5, FWW 36.5; HWL 68.5, HWW 17.

Gaster with hypopygium reaching about 0.7X towards apex; syntergum about 0.9X as long as mid tibia, with apex more or less rounded; ovipositor exserted, the exserted part about 0.5X length of mid tibial spur or about 0.2X mid tibia; ovipositor (Fig. 116) with second valvifer with two subapical setae. Relative measurements: OL 59.5, GL 15 [MT 35].

Variation. Females vary in overall length from 1.16-1.50mm, otherwise very little variation noted in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Pitilla (ACG), 700m, MT/YPT, 24.i-27.ii.1996 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Puntarenas**, 14km NE Dominical, Rio Magnolia Biol. Res. 9°20'N 83°47'W, 800m, 16-17.ii.2017 (J.S. Noyes). Holotype and paratype in NHMUK.

COMMENTS. Females of *Homalopoda carpha* are very similar to those of *aesira* but can be separated by the fore wing lacking any indication of subapical hyaline spots. In *carpha* the fore wing is entirely infuscate apically.

***Homalopoda baunos* sp.nov.**
(Figs 119-125; Hab. ♀ 20)

DIAGNOSIS. *Female* (length about 1.6-1.9mm): scape pale orange; funicle generally pale orange, mixed brown, clava dark brown; fore leg pale orange, mid leg white mixed pale orange; fore wing (Fig. 119) with apical area generally lightly infuscate; paired hyaline spots at apex of venation separated by about length of marginal vein; no hyaline spot present in middle of wing below marginal vein; head (Fig. 120) about 4.9X as wide as frontovertex; occipital margin with a bristle-like seta behind posterior ocellus; mandible with 4 teeth; an inconspicuous line of silvery setae adjacent to eye above scrobe; scape about 4.9X as long as broad; funicle segments subcylindrical, all at least 1.5X as long as broad (Fig. 122), linear sensilla present only on F3-F4; flagellum about as long as head width; apex of scutellum with two pairs of scale-like setae (Fig. 121); costal cell of fore wing ventrally with 3 lines of setae proximally, a single line of setae in distal half; postmarginal vein very nearly as long as stigmal vein (Fig. 123); linea calva not interrupted (Fig. 119); hind tibia without a subbasal constriction. *Male*: unknown.

Female **(**holotype**)**: length, including ovipositor, 1.89mm; excluding ovipositor, 1.78mm (CPD).

Head dark brown to black with a distinct metallic lustre; occiput mainly metallic dark green with some blue-green reflections; frontovertex metallic blue-green mixed with some violet; area above scrobes deep violet; scrobes and interantennal prominence metallic dark green with some violet and brassy reflections; mouth margin orange-brown; temple mixed metallic blue-green, dark blue, purple and coppery purple, posteriorly relatively dull; area immediately below lowest part of eye metallic blue-green, gena relatively dull coppery purple; frontovertex with a few, fairly inconspicuous, scattered, translucent, pale brown setae; an inconspicuous line of sparse, translucent silvery setae between eye and scrobe extending to position of malar sulcus; gena with scattered, similarly inconspicuous, translucent, silvery setae; interantennal prominence with two submedian lines of similar setae; maxillary palpus white; radicle pale orange, with a dark brown apical ring; scape pale orange, a little dusky at extreme apex; pedicel dark brown, pale orange at apex and ventrally; funicle generally pale orange, but segments dusky dorsally and proximally so that F1 is mostly dusky pale orange and F6 is mostly pale orange; clava dark brown; thorax dark brown to black with a metallic lustre; pronotum mainly with blue-green and violet sheen, posterior margin medially coppery purple; mesoscutum metallic blue-green with violet reflections, narrowly margined coppery purple laterally and posteriorly; tegula dark brown with a weak coppery purple sheen; axilla dark brown with a very dull coppery purple sheen; scutellum dorsally relatively dull, with very weak coppery purple and dark green reflections, side and apex strongly shining blue-green and green, with some brassy and violet reflections; mesopleuron anteriorly with a moderate violet, brassy and dark blue sheen, medially dark green and brassy, posteriorly coppery purple; all coxae dark brown; fore leg pale orange, tibia with a small, brown, subbasal spot externally and tarsus slightly dusky; mid femur with proximal 0.5X white, apex pale orange, tibia white to very pale orange with a diffuse, subbasal brown ring, spur and tarsus white to very pale orange; hind femur pale orange at extreme base otherwise dark brown, tibia dark brown with apical 0.3X white, tarsus white, apical tarsomere pale orange; fore wing with a pattern of hyaline and infuscate areas as in Fig. 110, with only one pair of hyaline spots; propodeum dark brown with a weak brassy and purple sheen, side with a metallic dark green and dark blue sheen mixed brassy; gaster dark purple-brown, dorsally with a coppery purple sheen, Gt1 with a metallic, dark blue sheen, side and venter with coppery, blue, brassy and green reflections; gonostylus dark brown.

Head (Fig. 120) about 4.9X as wide as frontovertex, in profile about 1.7X as high as deep, tangent to frontovertex forming an angle of about 55° with that of face occipital margin rounded with a conspicuous, elongate seta present behind each posterior ocellus, seta about as long a width of frontovertex across anterior ocellus; a slender, oval depression adjacent to eye near occipital margin and a small, shallow median depression medially in front of occipital margin;

ocelli forming an angle of about 60°; frontovertex clearly narrowing anteriorly; ocellar area with relatively deep, fine, polygonally reticulate sculpture of mesh size slightly less than diameter of eye facet (Fig. 120), area between anterior ocellus and top of scrobes with slightly shallower, finer, slightly transversely elongate polygonally reticulate to imbricate-reticulate sculpture; temple completely smooth and shiny adjacent to eye, otherwise temple and gena with relatively shallow, longitudinally elongate, fine polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture, above torulus almost completely smooth and shiny, elsewhere with shallow sculpture; interantennal prominence and mouth margin with shallow, relatively fine, polygonally reticulate sculpture; antenna as in Fig. 122; scape hardly broadened and flattened, about 4.9X as long as broad; all funicle segments at least about 1.5X as long as broad, F2 shortest, segments slightly broader distad, linear sensilla present only on F3-F4; clava slightly longer than F2-F4 combined, sutures parallel, sensory area small, at apex only giving it a rounded appearance; eye slightly overreaching occipital margin, naked; clypeal margin medially virtually straight; mandible with four teeth, two uppermost very short. Relative measurements: HW 82.5, HH 75, FV 17, POL 11, OOL 0, OCL 14 (shortest line from posterior ocellus to elongate seta on occipital margin), AOL 12, EL 43, EW 43, MS 40, SL 42, SW 8.5.

Thorax (Fig. 121) with visible part of mesoscutum about 1.5X as broad as long; scutellum about 1.3X as broad as long, apex with 2 pairs of elongate, scale-like setae, longer (inner) pair each about 0.9X as long as scutellum, shorter (outer) pair each about 0.8X as long as scutellum; hind femur about 3.6X as long as broad; fore wing with venation and setation as in Figs 119, 123; costal cell distally with about 10 setae extending dorsally in apical 0.3X; linea calva entire; propodeum medially about 0.07X as long as scutellum. Relative measurements: FWL 116, FWW 48; HWL 84, HWW 22.

Gaster with hypopygium (Fig. 125) reaching about 0.6X towards apex; syntergum about 0.9X as long as mid tibia, with apex acute; ovipositor (Fig. 124) slightly exserted, the exserted part about 0.4X length of mid tibial spur or about 0.2X mid tibia; second valvifer without any subapical setae. Relative measurements: OL 70.5, GL 20 [MT 48].

Variation. Females vary in overall length from 1.60-1.89mm, otherwise little variation in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 11-12.2018 (J.S. Noyes). Holotype and paratype in NHMUK.

Homalopoda opsis sp.nov.

(Figs 126-132; Hab. ♀ 21)

DIAGNOSIS. *Female* (length about 1.8-2.4mm): scape dark brown; flagellum dark brown; fore femur dark brown, orange apically, fore tibia orange with a subbasal brown ring, mid femur proximally white, apex dark brown, tibia dark brown, apex pale yellow; fore wing (Fig. 126) with apical area generally hyaline; paired hyaline spots at apex of venation separated by no more than length of marginal vein; no well-defined hyaline spot present in middle of wing below marginal vein; head about 7.7X as wide as frontovertex; occipital margin with a scale-like seta behind posterior ocellus; mandible with 1 tooth and a broad truncation; a line of silvery setae adjacent to eye above scrobe; scape about 5.6X as long as broad; funicle segments (Fig. 127) subcylindrical, all at least slightly longer than broad, linear sensilla present on all segments; flagellum slightly shorter than head width; apex of scutellum (Fig. 132) with two pairs of scale-like setae; costal cell of fore wing ventrally with 2 lines of setae proximally, a single line of setae in distal half;

postmarginal vein much shorter than stigmal vein (Fig. 128); linea calva interrupted by 2 or 3 setae; hind tibia may have a weak subbasal constriction. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.80mm; excluding ovipositor, 1.61mm (CPD).

Head with frontovertex mixed metallic green and blue-green with some violet areas; area in front of anterior ocellus violet and purple; scrobal area entirely metallic green and dark blue-green; mouth margin orange-brown; temple metallic blue-green with some violet reflections; gena metallic blue-green; frontovertex with a few, fairly conspicuous, scattered, brown setae; a conspicuous line of dense, translucent silvery setae between eye and scrobe extending to position of malar sulcus; gena and interantennal prominence with a few scattered, moderately conspicuous, translucent, silvery setae; maxillary palpus white with terminal segment pale orange-brown; radicle pale orange, with a dark brown apical ring; scape, pedicel and flagellum dark brown; thorax dark brown to black with a metallic lustre; pronotum mainly with a dark blue and violet sheen, posterior margin coppery purple; mesoscutum mostly shining, but relatively dull, dark, metallic blue-green with violet reflections, narrowly margined coppery purple laterally and posteriorly; tegula dark brown with a weak coppery purple and brassy sheen; axilla dark brown with a relatively dull brassy, green and coppery sheen; scutellum relatively dull, dark, metallic blue, proximally dark green, side shining dark blue and green, apex violet; mesopleuron anteriorly with a moderate violet, brassy and dark blue sheen, medially dark green and brassy, posteriorly coppery purple; all coxae dark brown; fore femur brown, extreme apices pale orange, tibia mostly pale orange, but with a broad, incomplete, brown subbasal ring, tarsus slightly dusky pale orange; mid femur with proximal 0.4X white, tibia with proximal 0.5X brown and apex very pale yellow, spur and tarsus very pale yellow to pale orange; hind femur and tibia dark brown, extreme apex of tibia white dorsally, tarsus white with apical tarsomere pale orange; fore wing with a pattern of hyaline and infuscate areas as in Fig. 126; propodeum dark brown with a weak brassy and purple sheen, side with a weak metallic green sheen; gaster dark purple-brown, dorsally with a coppery purple sheen, Gt1 with a metallic violet, dark blue and blue-green sheen, side and venter with coppery, blue, brassy and green reflections; gonostylus dark brown.

Head (Fig. 130) about 7.7X as wide as frontovertex, in profile about 1.6X as high as deep, tangent to frontovertex forming an angle of about 60° with that of face; occipital margin sharp, weakly carinate, clearly emarginate medially, with a conspicuous, slender, scale-like seta present behind each posterior ocellus, seta about as long as width of frontovertex across posterior ocelli; a short, oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 55°; frontovertex narrowing strongly anteriorly, shiny; ocellar area with relatively deep, polygonally reticulate sculpture of mesh size slightly less than diameter of eye facet (Fig. 130), area between anterior ocellus and top of scrobes with shallow sculpture, virtually smooth; temple and gena with relatively shallow, longitudinally elongate, fine polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture, below this with conspicuously shallower sculpture; interantennal prominence and mouth margin with shallow, relatively fine, polygonally reticulate sculpture; antenna as in Fig. 127; scape hardly broadened and flattened, about 5.6X as long as broad; all funicle segments at least 1.3X as long as broad (Fig. 127), F1 longest, slightly more than 2X as long as broad, segments broadest distad, linear sensilla present on all funicle segments; clava about as long as F1-F3 combined, sutures parallel, sensory area small, at apex only giving it a rounded appearance; eye slightly overreaching occipital margin, clothed with short, very inconspicuous setae, each clearly shorter than diameter of facet; clypeal margin medially virtually straight. Relative measurements: HW 88, HH 70, FV 11.5, POL 10, OOL 0.5, OCL 9.5, AOL 10, EL 40, EW 49, MS 37, SL 44.5, SW 8.

Thorax (Fig. 132) with visible part of mesoscutum about 1.5X as broad as long; scutellum about 1.3X as broad as long, apex with two pairs of flattened, scale-like setae, inner pair much broader and larger, each about 1.3X as long as scutellum, outer pair more slender, slightly curved and about 0.9X as long as scutellum; hind femur about 3.7X as long as broad; fore wing with venation and setation as in Figs 126, 128; costal cell distally with about 15 setae extending dorsally about 0.5X along from apex; propodeum medially about 0.08X as long as scutellum. Relative measurements: FWL 92, FWW 37; HWL 71. HWW 18.

Gaster with hypopygium reaching about 0.7X towards apex; syntergum about 1.15X as long

as mid tibia, with apex angular; ovipositor exserted, the exserted part about 0.7X length of mid tibial spur or about 0.3X mid tibia.

Paratype. Mandible with one long tooth and a broad truncation, but truncation more less with three very short teeth; hypopygium as in Fig 131; ovipositor as in Fig. 129. Relative measurements: OL 65.5, GL 18.5 [MT 42].

Variation. Females vary in overall length from 1.80-2.39mm.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, ZP Nosara, Fila Maravilla, LN 221350 381700, 800m, #66663, 24.xi-21.xii.2001 (I. Jiménez). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Santa Rosa NP, SE6C, vii.1986 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, RF Monte Alto, Send. La Ceiba, LN 221100 392950, 600m, #65435, 22.x-26.xi.2001 (I. Jiménez); 1♀, Guanacaste, PN Bosque Diría, 10°10'N 85°34'W, 200m, 14-15.ii.2011 (J.S. Noyes). Holotype in MZUCR, paratypes in NHMUK.

Homalopoda donatos **sp.nov.**

(Figs 133-138; Hab. ♀ 22)

DIAGNOSIS. *Female* (length about 1.2-1.6mm): scape dark brown, flagellum dark brown; fore femur and tibia dark brown, extreme apices pale orange; mid femur proximally white, apex dark brown, tibia dark brown, apex very pale yellow; fore wing (Fig. 134) apex generally hyaline; paired hyaline spots at apex of venation separated by less than length of marginal vein; no hyaline spot present in middle of wing below marginal vein; head about 3.1-3.62X as wide as frontovertex; occipital margin with a bristle-like seta behind posterior ocellus; mandible with 4 teeth, two uppermost teeth very short; a conspicuous line of dense, silvery setae adjacent to eye above scrobe; scape about 3.8-4.4X as long as broad; funicle segments subcylindrical (Fig. 133), slightly longer than broad, F2 subquadrate, linear sensilla present on all segments; flagellum slightly shorter than head width; apex of scutellum with two pairs of scale-like setae (Fig, 137); costal cell of fore wing ventrally with 2 or 3 lines of setae proximally, a single line of setae in distal half; postmarginal vein much shorter than stigmal vein (Fig, 135); linea calva interrupted by 1 or 2 setae; hind tibia without a subbasal constriction. *Male*: unknown.

Female **(**holotype**)**: length, including ovipositor, 1.49mm; excluding ovipositor, 1.35mm (CPD).

Head with occiput mixed metallic dark green and blue-green; frontovertex mixed metallic dark green and blue-green with some violet areas anteriorly, area around anterior ocellus violet; scrobal area entirely metallic green and dark blue-green; mouth margin violet; temple metallic green with some weak coppery reflections; gena metallic dark green and blue-green with some weak coppery reflections; frontovertex with a few, fairly conspicuous, scattered, brown setae; a conspicuous line of dense, translucent silvery setae between eye and scrobe extending beneath eye to position of malar sulcus; gena and interantennal prominence with a few scattered, moderately conspicuous, translucent, silvery setae; palpi pale orange-brown, apex of maxillary palpus pale brown; radicle pale orange, with a dark brown apical ring; scape, pedicel and flagellum dark brown; thorax with a metallic lustre; pronotum mainly with a dark blue and blue-green sheen, some violet laterally, posterior margin coppery violet; mesoscutum mostly with a metallic blue-green sheen, distinctly coppery medially; tegula dark brown with a weak coppery and brassy sheen; axilla dark brown with a relatively dull brassy, dark green and coppery sheen; scutellum with a dark, metallic blue-green sheen with ridges of reticulate sculpture dark purple, extreme side shining dark blue-green with some violet; mesopleuron anteriorly with a moderate coppery sheen, medially metallic dark blue-green with some coppery and brassy reflections, posteriorly coppery purple with some violet; all coxae dark brown; fore femur brown, extreme apices pale orange-brown, tibia mostly pale

brown with extreme apex pale orange, tarsus slightly dusky pale orange; mid femur with proximal 0.3X white, remainder dark brown, tibia with proximal 0.6X brown, apex very pale yellow, spur and tarsus very pale yellow to pale orange; hind femur and tibia dark brown, extreme apex of tibia white dorsally, tarsus white with apical tarsomere pale orange; fore wing with a pattern of hyaline and infuscate areas as in Fig. 134; propodeum dark brown with a weak brassy and purple sheen, side with a distinct metallic dark blue-green sheen; gaster dark purple-brown, dorsally with a coppery purple sheen, Gt1 with a metallic violet, dark blue and blue-green sheen, side and venter with coppery, blue, brassy and green reflections; gonostylus dark brown.

Head in facial view about 3.2X as wide as frontovertex, in profile about 1.3X as high as deep, tangent to frontovertex forming an angle of about 65° with that of face; clypeal margin medially virtually straight; occipital margin sharp, not carinate, clearly emarginate medially, with a conspicuous, slender, bristle-like seta present behind each posterior ocellus, seta about half as long as width of frontovertex across posterior ocelli; subocular line of setae in shallow groove; a short, oval depression adjacent to eye near occipital margin; frontovertex shiny, strongly narrowing anteriorly; ocelli forming an angle of about 85°; ocellar area with relatively deep, irregular, polygonally reticulate sculpture of mesh size slightly less than diameter of eye facet, area between anterior ocellus and top of scrobes with shallow sculpture, virtually smooth; temple and gena with relatively shallow, longitudinally elongate, fine polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture, below this with conspicuously shallower sculpture; interantennal prominence and mouth margin with shallow, relatively fine, polygonally reticulate sculpture; antenna as in Fig. 133; scape hardly broadened and flattened, about 4.4X as long as broad; all funicle segments at least about 1.3X as long as broad, F1 longest, about 1.7X as long as broad, longer than F2 which is shortest segment, segments broadest distad, linear sensilla present on all funicle segments; clava slightly longer than funicle, sutures parallel, sensory area small, at apex only giving it a rounded appearance; eye slightly overreaching occipital margin, clothed with short, very inconspicuous setae, each clearly shorter than diameter of facet. Relative measurements: HW 91.5, HH 62, FV 29, POL 17, OOL 2, OCL 10.5, AOL 11, EL 38.5, EW 45, MS 39, SL 44, SW 10.

Thorax (Fig. 137) with visible part of mesoscutum about 1.6X as broad as long; scutellum about 1.5X as broad as long, apex with two pairs of flattened, scale-like setae, inner pair much broader and larger, each about 1.3X as long as scutellum, outer pair more slender, slightly curved and about 0.9X as long as scutellum; hind femur about 3.3X as long as broad; fore wing with venation and setation as in Figs 134, 135; costal cell distally with about 10 setae extending dorsally about 0.4X along from apex; propodeum medially about 0.08X as long as scutellum. Relative measurements: FWL 101, FWW 40; HWL 68.5, HWW 19.5.

Gaster with hypopygium reaching about 0.6X towards apex; syntergum about 0.9X as long as mid tibia, with apex narrowly rounded; ovipositor exserted, the exserted part about 0.9X length of mid tibial spur or about 0.33X mid tibia.

Paratype. Mandible with 4 teeth, two uppermost teeth very short; linea calva interrupted by a single seta; hypopygium as in Fig, 136; ovipositor as in Fig. 138, second valvifer with 3 subapical setae. Relative measurements: OL 56, GL 14.5 [MT 33].

Variation. Females vary in overall length from 1.23-1.60mm, the mesoscutum may lack the coppery sheen medially, but may have scattered coppery reflections, the scutellum may be distinctly coppery posteriorly, the head varies from about 3.1-3.6X as wide as the frontovertex, the scape varies from 3.8-4.4X as long as broad and the clava may be very slightly shorter than the funicle, but always clearly longer than F2-F4 combined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Est. Altamira, Send. a Casa Coca, LS 332800

574250, 1900m, #63986, 12.vii-12.viii.2001 (D. Rubí). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, SW side Volcán Cacao, Est. Cacao, 1100m, 1988-1989; 1♀, Guanacaste, Guanacaste NP, below Cacao, 400-600m, 3.iii.1990 (J.S. Noyes); 2♀, Alajuela, Peñas Blancas, 9.v.1987 and 9.vi.1987 (E.C. Cruz); 1♀, Guanacaste, Est. Maritza (ACG), 700m, MT/YPT, 20.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Sector Santa Maria, 25km NE Liberia, 790m, 15.i-15.ii.1997 (D. Briceño); 1♀, **Puntarenas**, Est. Altamira, Send. a Casa Coca, LS 332800 574250, 1900m, #64576, 12.viii-12.ix.2001 (D. Rubí). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

COMMENTS. See comments under *aesira* (p. 60).

Genus *PSEUDHOMALOPODA* Girault

Pseudhomalopoda Girault, 1915b: 171. Type species: *Pseudhomalopoda prima*, by monotypy.

Female. Length about 0.5-1.9mm.

Body slightly dorsoventrally flattened, generally dark with a metallic sheen, head largely dark blue or dark green with a transverse purple or coppery band between eyes just above scrobes and occiput coppery or violet behind eye are on temple; antenna brown; palpi white; coxae brown; legs otherwise mostly dark brown, usually with tarsi, and often mid tibia pale yellow or white base; wings infuscate with a pattern of subtriangular or subrectangular hyaline areas, venation mostly brown; gaster largely with a coppery sheen with metallic green, blue, purple or brassy reflections.

Head triangular in profile with frontovertex moderately flat, forming an angle about 35-50° with face at top of scrobes; occipital margin rounded, a conspicuous long scale-like seta present on margin behind each posterior ocellus; posterior ocellus separated from occipital margin by about 2X its own diameter; frontovertex with relatively deep, punctiform, polygonally reticulate sculpture; top of scrobes with very shallow, poorly defined reticulate sculpture, scrobes otherwise more or less completely smooth and shiny; interantennal prominence and mouth margin with shallow, relatively fine, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, broadly ∩-shaped; interantennal prominence very shallow, dorsally narrowly rounded; antenna with scape triangular, broadened and flattened, about 2.3-3.0X as long as broad; funicle 4-segmented, segments transverse, rarely very slightly longer than broad; clava at least as long as funicle, 3-segmented, sutures parallel, apically pointed or rounded, sensory area at apex only; eye reaching occipital margin, clothed with inconspicuous short setae; malar sulcus absent; head about 3.0X as wide as frontovertex; ocelli forming an angle of about 90°; mandible with a distinct ventral peg (Fig. 155, arrowed) and one tooth and a broad truncation, truncate part often distinctly concave giving appearance of a broad rounded tooth and a short truncation; palp formula 4-3.

Thorax with pronotum hardly exposed behind head, with a strongly emarginate posterior margin medially which, if measured along mid-line, is not more than about one-eighth as long as the mesoscutum; pronotum and mesoscutum with imbricate-reticulate to polygonally reticulate sculpture; mesoscutum quite flat; scutellum convex, dorsally with a triangular flat area, this area with punctate-reticulate sculpture much deeper than sculpture on mesoscutum, side and apex broadly, completely smooth and shiny; scutellum about 1.5X as broad as long, apex with two pairs pair of erect scale-like setae; fore wing about 2.7X as long as broad; costal cell ventrally with a single complete line of setae and dorsally with 2-4 apical setae; submarginal vein with a subapical hyaline break, parastigma very slightly swollen, with a conspicuous, slightly longer, backwardly directed seta; marginal vein about 4-5X as long as broad, about 7X as long as postmarginal vein and 2X as long as stigmal vein; linea calva usually entire, very rarely interrupted; filum spinosum present as a line of 3-6 slightly stouter setae; mesopleuron posteriorly nearly reaching level with posterior margin of propodeum, falling short by about diameter of spiracle or a little more; propodeum short, at most 2 or 3 setae outside spiracle and some irregular linear sculpture in lateral one-third of dorsal part of propodeum extending posteriorly as troughs and ridges towards hind coxa.

Gaster with hypopygium reaching about half way to two-thirds towards apex, transverse, subrectangular, posterior margin with a shallow median invagination; syntergum slightly longer

than mid tibia, with apex weakly angular; ovipositor at most about 1.7X as long as mid tibia and about 4X as long a gonostylus, hidden or with exserted part up to about 0.25X as long as gaster.

\Male. Unknown.

DISTRIBUTION. Caribbean, South America (see below under *prima*, p. 79).

HOSTS. Recorded from a number of diaspidid (Hemiptera: Diaspididae) hosts as well as possible soft scale (Hemiptera: Coccidae) and unlikely whitefly (Hemiptera: Aleyrodidae) hosts (see below under *prima*, p. 79).

BIOCONTROL. See summary under *prima* below (p. 79).

COMMENTS. *Pseudhomalopoda* is closest to *Plagiomerus* and *Homalopoda*, but superficially most similar to *Caenohomalopoda*, all four genera belonging to the Habrolepidini and having a 4-segmented funicle. See comments under *Caenohomalopoda* (p. 81) and *Homalopoda* (p. 54).

IDENTIFICATION. Including two species described as new below, three species known from the Neotropical region only, all included in the key presented here. Several species remain to be described from Ecuador and Brazil.

Key to Costa Rican species of *Pseudhomalopoda*
(Females)

1. Mid tibia and hind tarsus entirely dark brown; fore wing (Fig. 141) with anterior hyaline area at apex of venation strongly triangular, its distal margin forming an angle of about 35-40° with anterior wing ..... *tapura* **sp. nov.** (p. 75)
- Mid tibia and hind tarsus mostly white or very pale yellow; fore wing (Fig. 148, 152) with anterior hyaline area at apex of venation subrectangular, its distal margin forming an angle of about 60-80° with anterior wing margin 2

2 (1) Antennal funicle (Fig. 146) with F1 quadrate or subquadrate, at least 0.9X as long as broad; linear sensilla on all funicle segments; length of pedicel and flagellum combined at least equal to head width .....*festa* **sp.nov.** (p. 77)
- Antennal funicle (Fig. 157, 158) with F1 strongly transverse, less than 0.6X as long as broad; linear sensilla only on at most F3-F4, sometimes absent from F3; length of pedicel and flagellum combined less than head width ..... *prima* Girault (p. 79)

***Pseudhomalopoda tapura* sp.nov.**
(Figs 139-145; Hab. ♀ 23)

DIAGNOSIS. *Female* (length about 1.3mm): legs dark brown; paired hyaline spots at apex of venation separated by more than 2X length of marginal vein (Fig. 141); no hyaline spot present in middle of wing below marginal vein; head (Fig. 143) about 2.9X as wide as frontovertex; mandible with 2 teeth and a truncate upper tooth; an inconspicuous line of silvery setae across top of scrobes and adjacent to eye above scrobe; scape about 2.4X as long as broad; funicle segments (Fig. 144) broadened, all transverse, linear sensilla present only on F3-F4; pedicel and flagellum combined hardly longer than head width; clava slightly longer than pedicel and funicle combined; postmarginal vein (Fig. 142) almost absent, much shorter than stigmal vein; linea calva constricted, but not interrupted. *Male*: unknown.

Female **(**holotype**)**: length, including ovipositor, 1.33mm; excluding ovipositor, 1.24mm (CPD).

Head dark brown to black with a distinct metallic lustre; occiput medially metallic dark blue mixed green, laterally violet behind eye, mixed dark blue and brassy below; frontovertex mostly

metallic blue-green to dark blue, eye margins dark green; a narrow coppery violet band scrobes, below this narrowly metallic dark green, then brassy and then more broadly coppery; scrobes largely metallic green, mixed coppery purple laterally, top of interantennal prominence dark blue and coppery purple, lower face with a coppery purple sheen; temple with a broad, transverse coppery purple band level with lowest part of eye, above this mostly metallic dark blue; gena coppery purple mixed metallic green, duller posteriorly; mouth margin narrowly orange-brown; frontovertex with a few, fairly inconspicuous, scattered, brown setae; a line of inconspicuous, short, sparse, silvery setae across frontovertex above scrobes, this line continuing below eye to position of malar sulcus; gena with similar, but scattered setae; interantennal prominence dorsally with relatively long, translucent, brown setae, lower parts with short setae as gena; maxillary palpus dark brown; radicle pale orange, with a dark brown apical ring; thorax dark brown to black with a metallic lustre; pronotum mainly with dark green and dark blue sheen mixed with some violet laterally; mesoscutum with a mixed violet and dark blue sheen; tegula dark brown with a weak coppery purple sheen; axilla dark purple-brown with a slight brassy sheen; scutellum dorsally quite dull with a weak coppery sheen, side strongly shining dark blue and violet, apex violet; mesopleuron anteriorly with a moderate coppery purple and dark blue sheen, posteriorly similar, but more strongly coppery purple mixed with some violet; legs, including coxae, completely dark brown except for pale orange mid tibial spur and mid tarsus, apical tarsomere dark brown; fore wing with a pattern of hyaline and infuscate areas as in Fig. 141, hyaline areas more or less forming a radiating pattern; hind wing hyaline; propodeum dark purple-brown with a weak brassy sheen, side with a metallic dark green and coppery sheen; gaster dark purple-brown, dorsally with a coppery purple sheen, Gt1 with a coppery purple sheen, side and venter of gaster with coppery, blue, brassy and green reflections; gonostylus dark brown.

Head (Fig. 143) about 2.9X as wide as frontovertex, in profile about 1.5X as high as deep, tangent to frontovertex forming an angle of about 45° with that of face; occipital margin inconspicuously emarginate medially, with a shallow vertical groove running from occipital margin to foramen, scale-like seta on occipital margin behind each posterior ocellus about 0.7X as long as minimum width of frontovertex; a fairly conspicuous, oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 90°; frontovertex narrows a little anteriorly; ocellar area with relatively deep, fine, polygonally reticulate sculpture (Fig. 143) of mesh size slightly less than diameter of eye facet, area between anterior ocellus and top of scrobes largely with similar sculpture, but perhaps a little shallower, area across narrowest part of frontovertex completely smooth and shiny; temple and gena with longitudinally elongate, fine polygonally reticulate sculpture of similar depth to that in ocellar area; antenna as in Fig. 144; scape broadened and flattened, only about 2.4X as long as broad; funicle segments slightly bilaterally flattened, F1-F3 clearly transverse, F4 quadrate, segments not broader distad, linear sensilla present only on F3-F4; clava very slightly longer than pedicel and funicle combined, slightly curved, sutures parallel, sensory area small, at apex only giving it a rounded appearance; eye not reaching occipital margin, separated by about 2-3X diameter of facet, naked; no shallow groove below eye; clypeal margin more or less evenly concave; mandible with two acute teeth and a truncate third, upper tooth. Relative measurements: HW 65, HH 51, FV 22.5, POL 14, OOL 2, OCL (line between posterior ocellus and scale-like seta on occipital margin) 10.5, AOL 8.5, EL 25.5, EW 32, MS 27, SL 28, SW 11.5.

Thorax (Fig. 139) with transversely elongate, imbricate-reticulate to polygonally reticulate sculpture on pronotum that is about as deep as that in ocellar area; mesoscutum with very similar sculpture to that on pronotum, but of larger mesh and very slightly shallower; axilla with similar, but finer transversely elongate, polygonally reticulate to imbricate-reticulate sculpture; visible part of mesoscutum about 1.5X as broad as long; scutellum with inner pair of scale-like setae about 1.4X as long as scutellum, outer pair about 0.9X as long as scutellum; hind femur about 3.2X as long as broad; fore wing with venation and setation as in Figs 141, 142; costal cell with 5 setae dorsally at apex; linea calva entire or interrupted by a single seta; propodeum medially about 0.07X as long as scutellum. Relative measurements: FWL 68, FWW 25; HWL 53.5, HWW 13.

Gaster with hypopygium (Fig. 145) reaching about 0.5X towards apex; last tergite about 0.8X as long as mid tibia, with apex narrowly truncate; ovipositor (Fig. 140) slightly exserted, the exserted part about 0.5X length of mid tibial spur or about 0.15X mid tibia; second valvifer

without subapical setae. Relative measurements: OL 96, GL 24 [MT 70].

Variation. Very little in material available

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Maritza (ACG), 700m, MT/YPT, 20.i-24. ii.1996 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, same data as holotype. Holotype and paratype in NHMUK.

COMMENTS. The pattern of dark and hyaline areas of the fore wing is reminiscent of the pattern found in some species of *Caenohomalopoda* Tachikawa or even *Cerapterocerus* Westwood where the hyaline areas from a strongly acute angle with the wing margin.

***Pseudhomalopoda festa* sp.nov.**
(Figs 146-151; Hab.♀ 24)

DIAGNOSIS. *Female* (length about 1.2-1.9mm): mid tibia white to very pale yellow, dark brown towards base; fore wing (Fig. 148) with paired hyaline spots at apex of venation separated by about length of marginal vein; no distinct hyaline spot present in middle of wing below marginal vein; head about 2.9-3.0X as wide as frontovertex; mandible with 1 acute tooth and a broad, slightly concave truncation; an inconspicuous line of sparse silvery setae adjacent to eye above scrobe; scape about 2.3-2.7X as long as broad; funicle segments (Fig. 146) slightly broadened, all transverse but not more than about 1.5X as broad as long; linear sensilla present on all funicle segments; pedicel and flagellum combined at least as long as head width; costal cell of fore wing ventrally with 2 or 3 lines of setae proximally but only a single line in apical half; postmarginal vein much shorter than stigmal vein (Fig. 147); linea calva entire or interrupted by single seta. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.39mm; excluding ovipositor, 1.29mm (CPD).

Head dark brown to black with a distinct metallic lustre; occiput metallic dark blue-green, violet immediately behind eye; frontovertex mostly metallic dark blue-green; narrowly coppery and brassy along eye margin; a coppery red band above scrobes, below this narrowly metallic dark green and then coppery; scrobes otherwise blue-green and green mixed with some coppery; temple with a violet band from lower eye to occiput and towards inner mouth margin; area between eye and scrobe metallic dark blue; gena coppery and blue-green; mouth margin coppery purple; frontovertex with a few, fairly inconspicuous, scattered, brown setae; an inconspicuous line of sparse, silvery setae across frontovertex and below eye; gena and mouth margin with scattered, inconspicuous, translucent, white setae; interantennal prominence with an inconspicuous pair of submedian lines of setae similar to those on gena; maxillary palpus white; radicle pale orange, with a dark brown apical ring; remainder of antenna dark brown; thorax dark brown to black with a metallic lustre; pronotum with a dark blue-green sheen, posterior margin violet; mesoscutum mostly bright metallic dark blue with a violet sheen;. posterior margin violet; tegula dark brown with a weak coppery purple sheen; axilla with a weak coppery purple and brassy sheen; scutellum dorsally quite dull with a weak coppery purple sheen, side more strongly shining dark blue and apex coppery purple; mesopleuron with a moderate coppery purple and dark blue sheen; coxae dark brown; fore femur brown, tibia pale orange with an external brown spot basally, tarsus pale orange, apical tarsomere brown; mid femur dark brown, dusky pale orange towards extreme base, tibia white to very pale yellow with extreme base dark brown and a short brown streak along dorsal margin proximally, spur and tarsus very pale yellow, apical tarsomere orange-brown; hind femur and tibia dark brown; tarsus white, apical tarsomere brown; fore wing with a pattern of

hyaline and infuscate areas as in Fig. 148; hind wing hyaline; propodeum dark purple-brown with a weak brassy sheen; gaster dark purple-brown, dorsally with a coppery purple sheen, with some metallic green and coppery red reflections; side and venter of gaster with coppery, blue, brassy and green reflections; gonostylus dark brown.

Head about 3.0X as wide as frontovertex, in profile about 1.6X as high as deep, tangent to frontovertex forming an angle of about 50° with that of face; clypeal margin concave, but medially virtually straight; occipital margin weakly emarginate medially, with a shallow vertical groove running from occipital margin to foramen, scale-like seta on occipital margin about 0.7X as long as minimum width of frontovertex; a small, inconspicuous, depression adjacent to eye near occipital margin; ocelli forming an angle of about 85°; frontovertex narrows a little anteriorly; ocellar area with relatively deep, fine, polygonally reticulate sculpture of mesh size slightly smaller than diameter of eye facet, area between anterior ocellus and top of scrobes with similar sculpture, but shallower anteriorly; temple with area adjacent to eye completely smooth and shiny otherwise temple and gena with longitudinally elongate, fine polygonally reticulate sculpture of similar depth to that immediately above scrobes; antenna as in Fig. 146; scape slightly broadened and flattened, broadest at apex, about 2.3X as long as broad; funicle segments slightly bilaterally flattened, all segments slightly transverse, F2 shortest, others subequal in length, segments equal in width, linear sensilla on all segments; clava slightly longer than funicle, sutures parallel, sensory area small, at apex only giving it a rounded appearance; eye not quite reaching occipital margin, virtually naked, but with sparse, very short setae, each much shorter than diameter of facet; no shallow groove below eye mandible with one acute tooth and a broad, slightly concave truncation, virtually tridentate. Relative measurements: HW 89.5, HH 70, FV 30, POL 17, OOL 4, OCL (line between posterior ocellus and scale-like seta on occipital margin) 12, AOL 12.5, EL 34, EW 43, MS 38, SL 37.5, SW 16.

Thorax with transversely elongate, imbricate-reticulate to polygonally reticulate sculpture on pronotum that is similar to that in ocellar area; mesoscutum with rounded, polygonally reticulate to imbricate-reticulate sculpture that is of larger mesh than that on pronotum and clearly shallower; axilla with similar, but finer transversely elongate, polygonally reticulate to imbricate-reticulate sculpture; scutellum dorsally with regular, fine, polygonally-reticulate sculpture that is clearly deeper than sculpture on mesoscutum or axilla, side and apex completely smooth and shiny; visible part of mesoscutum about 1.5X as broad as long; apex of scutellum with inner pair of scale-like setae relatively broad, about 1.4X as long as scutellum, outer pair more slender and about 0.9X as long as scutellum; hind femur about 3.9X as long as broad; fore wing with venation and setation as in Figs 47, 148; costal cell with 2 or 3 setae dorsally at apex; propodeum medially about 0.13X as long as scutellum. Relative measurements: FWL 210, FWW 78; HWL 175, HWW 41.

Gaster with hypopygium reaching about 0.7X towards apex; last tergite about 0.8X as long as mid tibia, with apex narrowly rounded; ovipositor slightly exserted, the exserted part about 0.6X length of mid tibial spur or about 0.25X mid tibia.

Paratype. Gastral tergites Fig. 149; hypopygium Fig. 151; ovipositor Fig. 150. Relative measurements: OL 61, GL 18 [MT 36].

Variation. Females vary in overall length from 1.23-1.85mm, otherwise little in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, PN Palo Verde, Sect. Palo Verde, Estación, LN 385020 260952, 0-50m, #57055, 10-18.vii.2000 (I. Jiménez). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, BN Diriá, Ret. Alr. Torre Control de Incendio, LN238550 358650, 600-700m, #64070, vii-viii.2001 (I. Jiménez);); 1♀, Guanacaste, Santa Cruz, Vista del Mar, Torre Cocesna, LN 357490 235340, 970m, #60713,

viii-ix.2000 (Y. Cardenas); 1♀, Guanacaste, PN Palo Verde, Sect. Palo Verde, C. de Aterrizaje, LN 260952 385020, 10m, #52845, 12.vii.1999 (I. Jiménez); 1♀, Guanacaste, ZP Nosara, Fila Maravilla, LN 221350 381700, 800m, #64580, viii-ix.2000 (I. Jiménez); 1♀, **San José**, San Pedro, Montes de Oca, 1100m, *Aenistus*, 31.v.1987 (P. Hanson); 1♀, San José, Zurqui de Moravia, 1600m, viii.1995 (P. Hanson); 1♀, San José, Zurqui de Moravia, 1600m, viii.1996 (P. Hanson); 1♀, **Cartago**, PN Tapanti-Macizo de la Muerte, Torre ICE #31, 1800m, #61067, 9.vii-10.viii.2000 (D. Rubí); 3♀, **Puntarenas**, Monteverde. St Luis Valley, 1400m, 17.viii.1986, (L. Masner). Holotype in MZUCR, paratypes in MZUCR, CNC and NHMUK.

***Pseudhomalopoda prima* Girault**
(Figs 152-163; Hab. ♀ 25)

Pseudhomalopoda prima Girault, 1915b:171. Holotype ♀, Jamaica, USNM, examined.

DIAGNOSIS. *Female* (length about 0.5-1.5mm): fore femur dark brown, tibia mostly pale orange; mid femur mostly dark brown, tibia white to very pale yellow, dark brown towards base; fore wing (Fig. 152) with paired hyaline spots at apex of venation separated by about length of marginal vein; no distinct hyaline spot present in middle of wing below marginal vein; head (Fig. 155) about 2.6-3.0X as wide as frontovertex; mandible with 1 acute tooth and a broad, slightly concave truncation; an inconspicuous line of sparse silvery setae adjacent to eye above scrobe; scape about 2.4-3.0X as long as broad; funicle segments slightly broadened (Figs 157, 158), all clearly transverse and at least about 2X as broad as long; linear sensilla present only on F3-F4, absent from F3 in smaller specimens; pedicel and flagellum combined shorter than head width; clava at least slightly longer than pedicel and funicle combined; thorax Fig 156; fore wing venation Figs 153, 154; gastral tergites Figs 162, 163; hypopygium Figs 160, 161; ovipositor Fig. 159. *Male*: unknown.

DISTRIBUTION. USA (Texas, Florida), Mexico, Cuba, Jamaica, Domincan Republic, Haiti, Puerto Rico, Argentina and introduced into Colombia (see Trjapitzin & Ruiz Cancino, 1998; Noyes, 2019); also Costa Rica (**new record**).

HOSTS. Recorded as a parasitoid of *Aonidiella aurantii* (Maskell), *Aonidiella taxus* Leonardi, *Aspidiotus destructor* Signoret, *Chrysomphalus aonidum* (Linnaeus) and *Lepidosaphes beckii* (Newman) (Hemiptera: Diaspididae); also recorded from *Saissetia oleae* (Olivier) (Hemiptera: Coccidae) and *Aleurocanthus woglumi* Ashby (Hemiptera: Aleyrodidae) (see Noyes 2019), but these records require confirmation. Recorded below from *Acutaspis morrisonorum* Kosztarab (Hemiptera: Diaspididae) on *Juniperus silicicola* (Small) L.H. Bailey (Pinales: Cupressaceae) (**new record**).

BIOCONTROL. Following the severe freeze of 1951, this species was introduced into Texas from Florida in 1955 to improve the control of Florida red scale, *Chrysomphalus aonidum* on citrus. The parasitoid became widely distributed throughout the area but control was insufficient (Rosen & DeBach *in* Clausen, 1978). Apparently also introduced into Colombia against the same pest where it provides substantial control (Trjapitzin & Ruiz Cancino, 1998).

MATERIAL EXAMINED.

Type material. Holotype ♀: “Parasitoid of Chrysomph. aonidum” “Parasite of Aleurocanthus woglumi” “L.F. Ashby Kingston Jamaica 1/20 ‘14” “Type No. 19405 U.S.N.M.” “Pseudhomalopoda prima Gir. ♀ type.” (USNM).

Non type material. **USA**, 2♀, **Florida**, Orlando, 1930, ex *Chrysom*[*phalus*] *aonidum* L., 6268, 1930 (W.W. Yothers); 3♀, Florida, Franklin, Apalachicola, ex *Acutaspis morrisonorum* on *Juniperus silicicola*, 18.viii.1998 (F.D. Bennett). **COSTA RICA**, 9♀, **Guanacaste**, Sta Rosa NP, various localities and dates 1.vi.1985-16.v.1987 (Janzen, Gauld); 1♀, Guanacaste, PN Santa Rosa, 10°51’N85°37’W, 300m, 24.ii.2009)J.S. Noyes); 1♀, Guanacaste, Volcán Cacao, Cerro Pedregal, 1000m, 11.iv.1989 (Gauld); 3♀, Guanacaste, Guanacaste NP, Est. Cacao (Pedregal), xi-xii.1990 (INBio Team); 1♀, Guanacaste, Guanacaste NP (error for Santa Rosa NP), near HQ, MT/YPT, 2-10.iii.1990 (J.S. Noyes); 1♀, Guanacaste 1♀, Guanacaste,

Guanacaste NP (error for Santa Rosa NP), near Playa Naranjo, 11.iii.1990 (J.S. Noyes); 1♀, Guanacaste, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes); 3♀, Guanacaste, Maritza (ACG), 700m, MT/YPT, 20.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Est. Maritza (ACG), 600m, LN 326900 373000, iii.1996 (M. Pereira); 2♀, Guanacaste, Murcielago (ACG), 75m, MT, 24.i-4.ii.1996 (J. Ugalde); 2♀, Guanacaste, San Ramon, 4.5km WSW Dos Rios de Upala, LN 318500 381200, 720m, iv.1996 and v.1996 (F.A. Quezada); 9♀, Guanacaste, PN Palo Verde, Sect. Palo Verde, LN 385020 260952, 250m, #57716, 10-18.viii.2000 (I. Jiménez); 6♀, Guanacaste, PN Palo Verde, Sect. Palo Verde, LN 260952 385020, 0-50m, 8-18.iii.2000 and 12-18.vii.2000 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Laguna, 200m S Estación, LN 260952 385020, YPT, #52765, 13-17.i.1999 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, 125m N Estación, LN 259050 388400, 0m, #59291, x.2000 (I. Jiménez); 6♀, Guanacaste, PN Palo Verde, Sect. Palo Verde, LN 260952 385020, 50m, 5-18.i.2000 and 8-9.ii.2000 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Est. Palo Verde, LN 259050 388400, 10m, #60224, xi.2000 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, LN 260952 385020, 0-50m, red de golpe, #53999, xi.1999 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, 300m SW Estación, LN 259050 388400, 10m, #62254, 12-21.xii.2000 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, 400m E. Puenta, La Espuela, 10m, #60219, xi.2000 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, 10°21'N 85°21'W, 20m, 21.ii.2013 (J.S. Noyes); 1♀, Guanacaste, RF Monte Alto, Cerro Romo, LN 220700 382545, 883m, #65013, 27-29.x.2001 (I. Jiménez); 1♀, Guanacaste, BN Diriá, Quebrada Brazil, LN 239390 361240, 160m, #67323, 18.ii-19.iii.2002 (G. Carballo); 1♀, Guanacaste, Santa Cruz, Vista del Mar, Torre Cocesna, LN 357490 235340, 970m, #60713, viii-ix.2000 (Y. Cardenas); 1♀, Guanacaste, Santa Cruz, Vista del Mar, Torre Cocesna, LN 357500 235350, 972m, 10.x.2002 (Y. Cardenas); 1♀, **Alajuela**, Est. Cabro Muco, 10°43'N 859'W, 1100m, 13.ii.2004 (C. Hansson, J. Azofeifa); 1♀, Alajuela, San Ramon BS, 900m, vi-vii.1995 (P. Hanson); 1♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, ix.1995 (OET/INBio); 1♀, **Heredia**, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, 1-2.iii.2007 (J.S. Noyes); 1♀, Heredia, 16km SSE La Virgen, 10°16'N 85°05'W, 1050-1150m, 10.ii-11/M/TN, 21.vi.2001 (INBio/OET/ALAS); 2♀, Heredia, Santo Domingo, INBio Parque, LN 526250 217400, 1100m, 1-12.iv.2002 (D. Rubí, J.S. Noyes): 3♀, Heredia, Santo Domingo, INBio Parque, 9°59'N 84°06'W, 1100m, 11-26.ii.2006 (J.S. Noyes); 1♀, **Puntarenas**, Est. Biol. Monteverde, 10°19'N 84°49'W, 1540-1890m, 19.ii.2013, (J.S. Noyes); 1♀, Puntarenas, Manuel Antonio, 23-28.viii.1986 (L. Masner); 2♀, Puntarenas, Est. Altamira, Send. Los Gigantes, LS 331800 572100, 1460m, ii.2002 (C. Hansson, D. Rubí); 1♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 1500m, 18-22.iii.1990 (J.S. Noyes); 1♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 8°46'N 82°57'W, 7-19.ii.2007 (C. Hansson); 1♀, Puntarenas, Est. Agujas, C. Quebraditos, 782m, #61330 18.i-20.ii.2001 (J. Azofeifa); 1♀, **Limón**, RB Hitoy-Cerere, 100m, 14-19.i.1991 (J.S. Noyes); 1♀, Limón, PN Cahuita, 9°43'N 82°49'W, 10m, 24.ii.2010 (J.S. Noyes). Material in MZUCR, NHMUK and CNC.

Genus *CAENOHOMALOPODA* Tachikawa

Caenohomalopoda Tachikawa, 1979:169. Type species *Pseudhomalopoda shikokuensis* Tachikawa, by original designation.

Female. Length about 1.1-1.6mm

Body slightly dorsoventrally flattened, generally dark with a metallic sheen, head largely dark blue or dark green mixed with a purple, coppery or brassy sheen; thorax green, blue-green, coppery, purple and brassy; antenna brown; palpi white; coxae brown; legs otherwise mostly dark brown, with tarsi, base of mid femur and most of mid tibia white or very pale yellow; wings infuscate with a radial pattern of hyaline areas, venation mostly brown; gaster with a metallic green, blue or purple sheen with brassy and coppery reflections.

Head about 3.0X as wide as frontovertex, triangular in profile with frontovertex moderately flat, forming an angle about 60° with face at top of scrobes; occipital margin rounded, a conspicuous long scale-like seta present on margin behind each posterior ocellus; posterior ocellus separated from occipital margin by about 2X its own diameter; ocelli forming an angle of about 90°; frontovertex with relatively deep, punctiform, polygonally reticulate sculpture; antenna with scape triangular, broadened and flattened, about 2.4-2.8X as long as broad; funicle 4-segmented, segments strongly transverse to hardly longer than broad; clava nearly as long as funicle or longer, 3-segmented, sutures parallel, apically pointed or rounded, sensory area at apex only; eye slightly overreaching occipital margin, clothed with inconspicuous short setae; malar

sulcus absent; mandible with four, unequal teeth. lowest tooth longest, and a distinct ventral peg; palp formula 4-3

Thorax with pronotum broadly exposed behind head, subtriangular in dorsal view, posterior margin weakly concave; pronotum and mesoscutum with imbricate-reticulate to polygonally reticulate sculpture; mesoscutum quite flat; scutellum convex, dorsally with a triangular flat area, this area with punctate-reticulate sculpture much deeper than sculpture on mesoscutum, side and apex broadly, completely smooth and shiny; scutellum about 1.3X as broad as long, apex with a pair of erect scale-like setae; fore wing about 3X as long as broad; costal cell ventrally with a single complete line of setae and dorsally with a line of setae in its apical one-third or so; submarginal vein with a subapical hyaline break, parastigma slightly swollen, without a single, longer erect seta; marginal vein about 3X as long as broad, about 5X as long as postmarginal vein and 2X as long as stigmal vein; linea calva interrupted by 1 or 2 lines of setae; filum spinosum present as a line of 5 slightly stouter setae; mesopleuron posteriorly more or less reaching level with posterior margin of propodeum; propodeum short, at most a single seta outside spiracle and some irregular linear sculpture in lateral one-third of dorsal part of propodeum extending posteriorly as troughs and ridges towards hind coxa.

Gaster with hypopygium reaching about half way to two-thirds towards apex, transverse, subrectangular, posterior margin medially invaginate; syntergum slightly longer than mid tibia, with apex angular; ovipositor slightly exserted 0.1-0.3X as long as gaster, nearly 2X as long as mid tibia and about 4X as long as gonostylus.

Male. Length about 0.7-1.0mm.

Generally very similar to female but for structure of antenna or genitalia, frontovertex about half head width; flagellum mostly white or very pale yellow, F1 sometimes dusky, apex of clava often dark brown; antenna with scape slightly broadened, about 3.5X as long as broad, pedicel about 1.5X as long as broad, funicle 2-segmented, both segments much longer than broad; clava very long, about 6-7X as long as broad and from slightly longer than pedicel and funicle combined to only about as long as F1, apex pointed, with a short finger-like projection; flagellum clothed in setae that are a little less than 0.5X diameter of segments; fore wing hyaline and with postmarginal vein about as long as stigmal vein or slightly longer.

DISTRIBUTION. India, Vietnam, China, South Korea, Japan, Indonesia, Guam, USA (Hawaii) (Noyes, 2019) and central America (see below).

HOSTS. Parasitoids of diaspidids associated with bamboo, e.g. *Froggattiella penicillata* (Green) and *Odonaspis secreta* (Cockerell), (Hemiptera: Diaspididae) (see Noyes, 2019). A record of *C. shikokuensis* (Tachikawa) as a parasitoid of *Pseudococcus* Westwood is probably erroneous and needs to be confirmed (Ge & Shi, 1995).

COMMENTS. *Caenohomalopoda* is closest to *Plagiomerus* Crawford, *Pseudhomalopoda* Girault, and *Spaniopterus* Gahan, all four genera belonging to the Habrolepidini and having a 4-segmented funicle. It differs from *Spaniopterus* by having the clava 3-segmented and subcylindrical segments whereas in *Spaniopterus* the clava is 2-segmented and the flagellum is strongly flattened. *Pseudhomalopoda* is superficially the most similar to *Caenohomalopoda* but can be distinguished by having the mandible with one tooth and a broad truncation, two pairs of scale like subapical setae on the scutellum and a relatively short pronotum that has a strongly emarginate posterior margin medially which, if the pronotum is measured along the mid-line, is not more than about one-eighth as long as the mesoscutum. In *Caenohomalopoda* the mandible has four teeth, there are only one pair of scale-like setae on the scutellum and the pronotum is subtriangular with a weakly concave posterior margin which, if measured along the mid line is nearly half as long as the mesoscutum. *Plagiomerus* has mandibles with four teeth as in *Caenhomalopoda*, but differs from *Caenohomalopoda* in having a short pronotum as in *Pseudhomalopoda* and hyaline fore wings, whereas in *Caenohomalopoda* the fore wings have a distinct infuscate pattern.

IDENTIFICATION. 12 World species: see Fatima & Zeya, 2022 (8 Indian species); Singh, 2004

(6 World species); Tachikawa et al., 1981 (4 World species); Trjapitzin & Sharkov, 1992 (5 World species); Zhang & Huang, 2006 (8 World species).

Caenohomalopoda guamensis (Fullaway, 1946)
(Figs 164-166)

Pseudhomalopoda guamensis Fullaway, 1946:209-210. Holotype ♀, Guam, USNM, not examined. *Caenohomalopoda guamensis* (Fullaway); Tachikawa, 1979:169.

DIAGNOSIS. Female (length about 1.0-1.3mm): head with frontovertex dark blue-green; antenna (Fig. 164) with F4 yellow contrasting with dark brown F1-F3; clava with base dark brown, middle dusky pale yellow, apex pale yellow-brown; mesoscutum dark metallic blue with purple reflections; scutellum coppery dorsally, very strongly metallic purple on side and apex; fore wing with a pattern of infuscate and hyaline areas as in Fig. 166; infuscate area below proximal part of parastigma about one-third width of parastigma length; infuscate line about half way between apex of venation and wing apex directed slightly towards wing base from wing margin; head about 2.5X as wide as frontovertex; antenna (Fig. 164) with scape about 2.7X as long as broad, all funicle segments transverse, F1 smallest, subtrapezoidal in profile, remaining segments subquadrate in profile, clava about as long as funicle; fore wing (Fig. 166) about 2.8-3.0X as long as broad, venation as in Fig. 165; exserted part of ovipositor about as long as mid tibial spur or 0.20-0.25X length of gaster. *Male*: Unknown

DISTRIBUTION. Guam, China (Fujian), USA (Hawaii); Costa Rica (**new record**).

HOSTS. Recorded as a parasitoid of *Odonaspis greeni* Cockerell (Beardsley, 1976).

MATERIAL EXAMINED.

USA 2♀, **Hawaii**, Oahu, Honolulu, ex *Odonaspis* on bamboo,i.1969 and v.1969 (J.W. Beardsley). **COSTA RICA**. 1♀, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W 305m, 16-17.ii.2020 (J.S. Noyes). Material in NHMUK.

Genus *COCCIDENCYRTUS* Ashmead

Coccidencyrtus Ashmead, 1900:383. Type species: *Encyrtus ensifer* Ashmead, by original designation and monotypy.

Encyrtomyia Girault, 1915a:131. Type species: *Encyrtomyia albiflagellum* Girault, by original designation. Synonymy with *Coccidencyrtus* by Noyes & Hayat (1984:253,254).

Omphalencyrtus Girault, 1915a:169. Type species: *Omphalencyrtus wallacei* Girault, by original designation and monotypy. Synonymy with *Coccidencyrtus* by Noyes & Hayat (1984:253,254).

Thomsoniella Mercet, 1921:89. Type species: *Thomsoniella typica* Mercet by original designation and monotypy. **syn.nov.**

Coccidencyrtoides Blanchard, 1940:107. Type species: *Coccidencyrtoides maculicornis* Blanchard, by designation of De Santis: 1967:161). Synonymy with *Coccidencyrtus* by Compere & Annecke (1961:61).

Thomsonisca Ghesquière, 1946:369. Replacement name for *Thomsoniella* Mercet, 1921 nec Signoret, 1880. **syn.nov.**

Heterencyrtus Hoffer, 1953:86. Type species: *Heterencyrtus sumavicus* Hoffer, by original designation and monotypy. Synonymy with *Thomsonisca* by Trjapitzin (1989:289). **syn. nov.**

Athesmus Erdös & Novicky, 1955:198. Type species: *Athesmus luctuosus* Erdös & Novicky, by original designation and monotypy. Synonymy with *Thomsonisca* by Graham (1969:246-237). **syn.nov.**

Kosztarabia Erdös, 1957:367. Type species: *Kosztarabia chionaspidis* Erdös, by original designation and monotypy. Synonymy with *Thomsonisca* by Trjapitzin (1989:289). **syn. nov.**

Eussuria Chumakova, 1957:539. Type species: *Euusuria pallipes* Chumakova, by original designation and monotypy. Synonymy with *Thomsonisca* by Trjapitzin (1973b:421). **syn. nov.**

Pakencyrtus Ahmad, 1970:237-238. Type species: *Pakencyrtus pakistanensis* Ahmad, by original designation and monotypy. Synonymy with *Thomsonisca* by Subba Rao (1976:689). **syn. nov.**

Neoadelencyrtus Hayat, Alam & Agarwal, 1975:72-73. Type species: *Neoadelencyrtus mandibularis* Hayat, Alam & Agarwal, by original designation and monotypy. Synonymy with *Coccidencyrtus* by Noyes & Hayat (1984:253).

Female. Overall length about 0.6-1.2mm.

Head and thorax dark brown, often weakly to moderately metallic.

Head about 2-2.5X as wide as frontovertex; tangent of frontovertex forming an angle of 80-110° with that of face; eye clothed with conspicuous setae, each about as long as diameter of facet; antenna attached level with lower eye margin, torulus separated from mouth margin by about its own length; funicle 6-segmented, segments transverse to longer than broad; clava 3-segmented; mandible with one acute tooth and broad concave truncation or with three teeth, inner surface with a socketed peg near lower margin (Figs 187, 272, arrowed); palp formula 3-2, rarely 2-2.

Posterior margin of pronotum roundly concave, not broadly V-shaped or angular medially; mesoscutum without notaular lines; scutellum flat with conspicuous sculpture; fore wing about 2.1-2.4X as long as broad; linea calva interrupted by at least 2 lines of setae on dorsal surface and closed by a 1-2 lines of setae on ventral surface, never closed on dorsal surface; submarginal vein sometimes with parastigma slightly broadened; marginal vein at least about 2.5X as long as broad, postmarginal vein distinct; stigmal vein subsessile but at least as long as postmarginal vein, uncus developed with 4 campaniform sensilla in a line; scutellum usually with only 3 pairs of setae, rarely 4 pairs, but with up to 7 pairs in some extralimital species.

Hypopygium not reaching apex of gaster; ovipositor varying from hidden to conspicuously exserted.

Male. Length about 0.7-1.0mm.

Similar to female but all funicle segments usually at least 2X as long as broad and with long setae, the longest of which is at least as long as diameter of widest segment. often more than 4X as long; linear sensilla on apical segments; phallobase about 3-4X as long as broad; parameres and digiti well developed, paramere reaching about half-way along digitus with apical seta present; cuspis seta present; digitus about 2-3X as long as broad with a single apical tooth; aedeagus about 8-10X as long as broad, about half as long as mid tibia, or slightly more, with apex acute.

DISTRIBUTION. Cosmopolitan.

HOSTS. Solitary, primary, endoparasitoids of armoured scale insects (Hemiptera: Diaspididae) (see Noyes, 2019). Records from non diaspidid hosts are unlikely and require confirmation. *Coccidencyrtus phenacocci* Ferrière, recorded as a parasitoid of *Phenacoccus hordei* (Lindeman) in Germany (Ferrière, 1956), probably does not belong to *Coccidencyrtus.*

BIOCONTROL. *Coccidencyrtus ochraceipes* has been tested as a biocontrol agent in France (see p. 111). In about 1958-1960 *Coccidencyrtus shutovae* (Trjapitzin) was introduced into the north Caucasus (Krasnodar and Stavropol territories of Russia) from North Korea for the control of *Comstockaspis perniciosa* (Comstock) (Hemiptera: Diaspididae) but did not become established (Shutova, 1967; Trjapitzin & Paik, 1996). *Coccidencyrtus pallipes* (Chumakova) was introduced into the former USSR for control of *C. perniciosa* sometime prior to 1988 but no further information is available (Izhevskiy (1988). Finally, *Coccidencyrtus sankarani* (Subba Rao) (as *Thomsonisca* sp.) was introduced into USA (Florida) from Pakistan in 1978-1979 for control of *Pseudaulacaspis rubra* (Green) (Hemiptera: Diaspididae) but no results have been forthcoming (CIBC (1979).

COMMENTS. Historically, recognition of *Coccidencyrtus* and *Thomsonisca* has been based mainly on differences shown in two characters. Species with all funicle segments subequal, longer than broad and with prominent linear sensilla and a well-exserted ovipositor have been placed in *Thomsonisca*, whilst those with at least some funicle segments small and transverse with indistinct linear sensilla and the ovipositor hidden or weakly exserted have been placed in *Coccidencyrtus*. All the species placed within *Thomsonisca* occur only in the Palaearctic or adjoining areas whilst those falling within *Coccidencyrtus* have a much wider global distribution.

These character states have continuous ranges within the Costa Rican species and to maintain the genera as separate would require arbitrary limits to define them. Other diagnostic character states are shared by both genera, as illustrated by the above diagnosis. I therefore have no hesitation in formally proposing the synonymy of these two genera resulting in the following new combinations: *Coccidencyrtus amathus* (Walker) (from *Encyrtus*); *Coccidencyrtus indicus* (Hayat) (from *Thomsonisca*); *Coccidencyrtus noyesi* (Japoshvili) (from *Thomsonisca*); *Coccidencyrtus pakistanensis* (Ahmad) (from *Pakencyrtus*); *Coccidencyrtus pallipes* (Chumakova) (from *Euussuria*); *Coccidencyrtus sankarani* (Subba Rao) (from *Thomsonisca*); *Coccidencyrtus shutovae* (Trjapitzin) (from *Euussuria*) (all **comb.nov.**).

See also comments under *Quetsira* (p. 124) and *Tico* (p. 160).

IDENTIFICATION. Worldwide, 74 species, including 21 described below as new. Guides to identification of species, as *Coccidencyrtus*: De Santis, 1964 (7 Argentinian species); Trjapitzin, 1989 (4 Palaearctic species); Hayat, 2006 (3 described Indian species); Xu & Huang, 2004 (3 Chinese species); Xu & Lin, 2005 (3 Chinese species); Compere & Annecke, 1961 (key to 5 species); Sushil & Khan, 1994 (5 species); as *Thomsonisca*: Hayat, 2006 (India; 4 species); Subba Rao, 1979 (4 species); Sushil & Khan, 1994 (key to 5 species); Xu & Huang, 2004 (2 Chinese species); Trjapitzin, 1989 (3 Palaearctic species)

Key to Costa Rican species of *Coccidencyrtus*
(Females)

1. Linear sensilla absent from F4, F4 usually conspicuously smaller than F5 or F6 (Figs 167, 172, 177, 183, 190, 215, 219) 2
- Linear sensilla present on F4, F4 usually hardly smaller than F5 or F6 (Figs 224, 231, 241, 246, 247, 251, 254, 261, 264,271, 282) 11

2 (1) Mid coxa white to pale orange 3
- Mid coxa brown 6

3 (2) Mid tibia completely yellow without a brown subbasal ring; palp formula 2-2 4
- Mid tibia yellow with a narrow, brown subbasal ring; palp formula 3-2 5

4 (3) Mid femur dark brown in apical half; pedicel and flagellum brown; funicle with linear sensilla on F5 and F6; clava shorter than funicle (Fig. 167); mid basitarsus with at least 3 ventral pegs ..... *pomadus* **sp.nov.** (p. 86)
- Mid femur completely white to pale yellow; pedicel and flagellum mostly pale yellow; funicle with linear sensilla on only F6; clava longer than funicle (172); mid basitarsus with only one or two ventral pegs ..... *viviana* **sp.nov.** (p. 88)

5 (3) Antenna with F5 and F6 with linear sensilla, subequal and each clearly larger than F1-F4 which are subequal (Fig. 177); basitarsus with 7 or 8 ventral pegs .... *aries* **sp.nov.** (p. 89)
- Antenna with F6 with linear sensilla and conspicuously larger than F1-F5 which are subequal (Fig. 183), F5 occasionally with linear sensilla; mid basitarsus with only 1 or 2 ventral pegs ..... *gowanus* **sp.nov.** (p. 91)

6 (2) Mesoscutum fairly bright, shining metallic dark green and coppery contrasting strongly with the matt, virtually black scutellum; fore femur almost entirely brown 7
- Mesoscutum relatively dull, virtually matt black or slightly shiny with a weak, purple, coppery or brassy sheen, more or less concolourous with scutellum; fore femur completely very pale yellow, sometimes with a narrow brown subbasal ring or a little dusky towards apex 8

7 (6) Mid tibia white basally, almost all of remainder dark brown; linear sensilla on F5 and F6 ..... *reshan* **sp.nov.** (p. 93)
- Mid tibia white basally, a dark brown subbasal band, apical 0.6X yellow; linear sensilla on F6 only ..... *juno* **sp.nov.** (p. 94)

8 (6) Mid femur and tibia and hind tibia entirely yellow to pale orange; clava shorter than F3-F6 combined (Fig. 200) ..... *chenoa* **sp.nov.** (p. 96)
- Mid femur and tibia and hind tibia with dark brown areas; clava longer than funicle (Fig 206, 215, 219) 9

9 (8) Scape at least 4X as long as broad and largely orange to orange-brown; mesoscutum shiny with shallow imbricate-reticulate sculpture that contrasts with the deeper, polygonally reticulate sculpture of the scutellum ..... *procris* **sp.nov.** (p. 97)
- Scape about 3X as long as broad and mostly dark brown; mesoscutum and scutellum matt, both with similar longitudinally elongate finely striate to striate reticulate sculpture 10

10 (9) Clava more than 4X as long as broad and 1.25X as long as pedicel and funicle combined (Fig. 215); funicle with F6 slightly longer than broad; ovipositor more than 1.3X as long as mid tibia ..... *umbro* **sp.nov.** (p. 99)
- Clava less than 4X as long as broad and about as long as pedicel and funicle combined (Fig. 219); funicle with F6 slightly transverse; ovipositor less than 1.3X as long as mid tibia ..... *cyathus* **sp.nov.** (p. 101)

11 (1). All funicle segments at least 1.5X as long as broad (Figs 224, 231) 12
- At least F1 or F3 quadrate or transverse (e.g. Figs 241, 247, 251, 261, 273) 13

12 (11) Scape generally pale orange; funicle with F1 a little narrower than pedicel (Fig. 224), segments relatively slender and becoming conspicuously broader distad, F6 nearly 1.5X as wide as F1; hind coxa white; gaster ventrally pale orange; scutellum with 4 pairs of long setae (Fig. 229) ..... *xero* **sp.nov.** (p. 103)
- Scape generally dark brown; funicle with F1 at least as wide as pedicel (Fig. 231), segments not becoming broader distad; hind coxa brown; gaster ventrally brown; scutellum with 3 pairs of long setae (Fig. 230) ..... *xylomus* **sp.nov.** (p. 105)

13 (11) Mid tibia completely white to pale yellow 14
- Mid tibia partially dark brown, at least with a subbasal brown ring 16

14 (13) Mid and hind legs at least partially dark brown ..... *jacintha* **sp.nov.** (p. 107)
- Legs, including coxae, completely white to pale orange 15

15 (14) Mid tibial spur slightly longer than basitarsus, basitarsus with not more than 4 ventral pegs; scape not more than 3X as long as broad; sculpture on scutellum mostly of rounded polygonal cells, hardly longitudinally elongate, except on side .... *sivan* **sp.nov.** (p. 109)
Mid tibial spur slightly shorter than basitarsus, basitarsus with at least 5 ventral pegs; scape not less than 3.5X as long as broad; sculpture on scutellum (Fig. 249) almost entirely longitudinally elongate striate-reticulate with only a few rounded cells adjacent to axillae and subapically ..... *ochraceipes* Gahan (p. 110)

16 (13) Fore leg with femur and tibia almost entirely brown 17
- Fore leg more or less completely white to pale orange without brown areas, at most slightly dusky 19

17 (16) Mid and hind coxae brown; scape less than 3X as long as broad; clava slightly longer than funicle (Fig. 251) ..... *quebrus* **sp.nov.** (p. 112)
- All coxae white to pale yellow; scape more than 3X as long as broad; clava shorter than funicle (Figs 254, 261)..... 18

18 (17) Mid tibia white to very pale orange with a narrow subbasal, dark brown band in proximal one-third; funicle without linear sensillum on F2; clava nearly as long as funicle (Fig. 254) ..... *fescus* **sp.nov.** (p. 113)
- Mid tibia with extreme base white, otherwise brown becoming gradually paler towards apex; funicle with linear sensillum on F2; clava not longer than F3-F6 combined (Fig. 261) ..... *tristeryx* **sp.nov.** (p. 115)

19 (16) Ovipositor strongly exserted, the exserted part much longer than mid tibial spur .... *matias* **sp.nov.** (p. 116)
- Ovipositor hidden or only slightly exserted, the exserted part shorter than mid tibial spur 20

20 (19) Hind coxa brown; hind femur mostly brown in apical two-thirds, without a distinct subapical ring ..... *harpales* **sp.nov.** (p. 118)
- Hind coxa white to pale orange; hind femur with a distinct subapical, brown ring in distal half 20

21 (20) Funicle (Fig. 275) with F1-F3 subequal in size, none with linear sensilla, F4 and F5 not longer than broad; gaster predominantly brown, hypopygium brown .... *solivus* **sp.nov.** (p. 120)
- Funicle (Fig. 282) with F2 larger than either F1-F3 and with at least one linear sensillum, F4-F6 longer than broad; gaster predominantly pale orange, hypopygium pale orange ..... *thuryus* **sp.nov.** (p. 121)

Coccidencyrtus pomadus **sp.nov.**
(Figs 167-171)

DIAGNOSIS. *Female* (overall length about 0.9mm): scape mostly brown; pedicel brown, flagellum pale brown; coxae white; fore femur and tibia very pale orange; mid femur white with apical half brown; mid tibia white; hind femur mostly dark brown; hind tibia mostly pale brown; gaster dark brown; frontovertex about half head width; antenna (Fig. 167) with scape about 2.6X as long as broad, funicle with F1 narrower than pedicel, F1-F5 subequal, small, F5-F6 larger, longer than broad; linear sensilla only on F5-F6; clava very slightly longer than F3-F6 combined, nearly 4X as long as broad; palp formula 2-2; scutellum (Fig. 170) with 4 pairs of setae and polygonally reticulate to longitudinally elongate striate-reticulate sculpture, deeper than that on mesoscutum; mid basitarsus with 3 ventral pegs; mid tibial spur about as long as basitarsus; fore wing (Fig. 169) with stigmal vein (Fig. 168) about as long as postmarginal vein and marginal veins; hypopygium reaching about 0.8X towards apex of gaster; ovipositor nearly 4X as long as gonostylus and not exserted. *Male*: unknown.

Female **(**holotype**)**: length, 0.92mm (CPD).

Head dark brown to black, generally with a weak coppery to coppery purple sheen mixed metallic dark green in ocellar area; frontovertex with a few, conspicuous, scattered, elongate, brown setae; gena and interantennal prominence with a few scattered, inconspicuous, shorter brown setae; maxillary palpus white; radicle brown; scape brown, slightly paler towards apex; pedicel brown, slightly paler towards apex; flagellum pale brown; thorax dark brown to black with

a weak metallic lustre; pronotum with a weak coppery sheen; mesoscutum with a weak brassy and coppery purple sheen; tegula dark purple-brown with a weak sheen; axilla dark purple-brown with a weak sheen; scutellum dorsally virtually matt with a weak coppery purple sheen, apex and side slightly silky in appearance with a weak coppery purple and brassy sheen; mesopleuron with a moderate purple sheen; coxae white; fore femur, tibia and tarsus very pale orange; mid femur white in proximal 0.5X, distally brown with extreme apex white, mid tibia white to very pale yellow, spur very pale yellow, tarsus very pale yellow; hind femur with proximal 0.3X white, distally dark brown, tibia pale brown, extreme base dusky white, tarsus dusky pale orange; wings hyaline, fore wing (Fig. 169) with a small, weakly infuscate area below marginal vein; propodeum dark brown with a weak purple sheen; gaster dark brown; gonostylus pale brown.

Head (Fig. 171) about 2.1X as wide as frontovertex, in profile about 1.9X as high as deep, tangent to frontovertex forming an angle of about 105° with that of face; occipital margin sharp, not carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 95°; frontovertex not wider in front of anterior ocellus, with distinct, polygonally reticulate sculpture of mesh size generally subequal to eye facet, not shallower above top of scrobes; temple and gena with much shallower, hardly elongate, fine polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture, scrobes smooth; interantennal prominence and mouth margin with slightly shallower, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, broadly ∩-shaped; interantennal prominence dorsally rounded; antenna as in Fig. 167; scape broadened and flattened, about 2.6X as long as broad; funicle with F1-F4 subequal, relatively small, subquadrate, F5 larger, slightly longer than broad, F6 largest and clearly longer than broad, linear sensilla present only on F5-F6; clava about 3.7X as long as broad and about 1.3X as wide as F6, not curved downwards towards apex, a little longer than F3-F6 combined, sutures parallel, sensory area small, at apex only giving it a pointed or narrowly rounded appearance; eye slightly overreaching occipital margin, clothed with conspicuous setae, each about as long as diameter of facet; malar sulcus present, but very indistinct; clypeal margin clearly concave; mandible more or less tridentate with two acute teeth and third, upper, shorter obtuse tooth; palp formula 2-2. Relative measurements: HW 53.5, HH 40, FV 26, POL 12, OOL 3.5, OCL 1.5, AOL 7, EL 29.5, EW 23.5, MS 13, SL 18, SW 7.

Thorax (Fig. 170) with pronotum hardly exposed behind head, its posterior margin broadly concave, not angular medially; pronotum and mesoscutum with similar sculpture to that in ocellar area, but of smaller mesh; axilla with shallower sculpture than mesoscutum; scutellum dorsally with very fine, polygonally reticulate sculpture that is very slightly deeper than sculpture on mesoscutum, and of much smaller mesh, sculpture slightly longitudinally elongate towards side, extreme side and apex completely smooth and shiny; visible part of mesoscutum about 1.8X as broad as long; scutellum about 1.2X as broad as long, apex with a pair of slender, elongate setae; hind femur about 4.2X as long as broad; mid basitarsus with 3 ventral pegs; mid tibial spur about as long as basitarsus; fore wing with venation and setation as in Figs 168, 169; propodeum (Fig. 170) medially about 0.09X as long as scutellum. Relative measurements: FWL 80, FWW 36; HWL 51.5, HWW 11.5.

Gaster with hypopygium reaching about 0.8X to apex; last tergite about 0.6X as long as mid tibia, with apex rounded; ovipositor not exserted. Relative measurements: OL 36.5, GL 9.5 [MT 52].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Zurqui de Moravia, 1600m, v.1992 (P. Hanson). Holotype in NHMUK.

COMMENTS. *Coccidencyrtus pomadus* is the only species of *Coccidencyrtus* in Costa Rica with 4 pairs of setae on the scutellum.

***Coccidencyrtus viviana* sp.nov.**
(Figs 172-176; Hab. ♀ 26)

DIAGNOSIS. *Female* (overall length about 0.6mm): scape mostly dark brown; pedicel and funicle pale yellow; clava mostly dusky yellow with paler venter; coxae white; legs otherwise white to pale yellow; gaster dorsally dark brown with Gt1 anteriorly pale orange; frontovertex about half head width; antenna (Fig. 172) with scape about 3.5X as long as broad, funicle with F1 narrower than pedicel, F1-F5 subequal, small, transverse, F6 largest and longer than broad; linear sensilla only on F6; clava very nearly as long as pedicel and funicle combined and about 4X as long as broad; palp formula 2-2; scutellum with 3 pairs of setae and slightly longitudinally elongate polygonally reticulate sculpture, hardly deeper than imbricate sculpture of mesoscutum; mid basitarsus with 2 ventral pegs; mid tibial spur slightly longer than basitarsus; fore wing (Fig. 174) with stigmal vein (Fig. 175) a little longer than postmarginal vein and slightly shorter than marginal vein; hypopygium reaching about 0.7X towards apex of gaster; ovipositor slightly more than 5X as long as gonostylus and hidden. *Male*: unknown.

Female (holotype): length 0.55mm (CPD).

Head dark brown to black with a weak to moderate metallic lustre; occiput with a weak coppery sheen; frontovertex generally coppery, mixed metallic dark green near anterior ocellus; scrobal area, temple and gena with a weak coppery to coppery purple sheen; frontovertex with a few, inconspicuous, scattered, brown setae; gena and interantennal prominence with a few scattered, very inconspicuous, brown setae; palpi white; radicle dark brown; scape dark brown with apical one-third pale yellow; pedicel and funicle pale yellow; clava with basal segment and much of venter pale yellow, remainder slightly dusky pale yellow; thorax dark brown to black with a slight to moderate metallic lustre; pronotum, mesoscutum, axilla and scutellum with a slight coppery purple sheen; tegula dark brown with a weak coppery purple sheen; mesopleuron with a moderate coppery purple sheen; coxae white, legs otherwise white to pale yellow, tarsi very pale orange; wings virtually hyaline, but fore wing (Fig. 174) with a small, weakly infuscate area adjacent to marginal and stigmal veins; propodeum dark brown with a weak coppery purple sheen; gaster dark brown with anterior part of TI pale orange medially.

Head (Fig. 173) about 1.9X as wide as frontovertex, in profile about 1.7X as high as deep, tangent to frontovertex forming an angle of about 95° with that of face; occipital margin sharp, not carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 100°; frontovertex not widening in front of anterioir ocellus, with distinct, partly slightly transversely elongate, polygonally reticulate sculpture of mesh size generally slightly larger than eye facet, not shallower above top of scrobes, but of slightly smaller mesh; temple and gena with slightly shallower, hardly elongate, fine polygonally reticulate sculpture; scrobal area with fairly uniform, distinct, regular, polygonally reticulate sculpture; scrobes shallow, margins rounded, broadly ∩-shaped; interantennal prominence dorsally narrowly rounded; antenna as in Fig. 172; scape slightly broadened and flattened, about 3.5 X as long as broad; funicle with F1-F5, subequal, relatively small, strongly transverse F6 largest and clearly longer than broad, linear sensilla present only on F6; clava about 3.9X as long as broad, about 1.2X as wide as F6, not curved downwards, very nearly as long as pedicel and funicle combined, sutures parallel, sensory area small, at apex only giving it a pointed appearance; eye slightly overreaching occipital margin, clothed with moderately dense, fairly conspicuous setae, each slightly shorter than diameter of facet; malar sulcus absent; clypeal margin conspicuously concave, straight medially; mandible with two acute teeth and an obtuse upper tooth; palp formula 2-2. Relative measurements: HW 60, HH 45, FV 32, POL 16, OOL 4, OCL 3, AOL 9, EL 30, EW 24, MS 15, SL 23, SW 6.5.

Thorax with pronotum narrowly exposed behind head, its posterior margin broadly concave, not angular medially; pronotum with similar sculpture to that in ocellar area, but very slightly shallower and of slightly smaller mesh; sculpture on mesoscutum similar to that in ocellar area but mostly composed of more rounded cells; axilla with similar sculpture to mesoscutum, but

of slightly transversely elongate cells; scutellum dorsally with very fine, polygonally reticulate sculpture that is a slightly deeper than sculpture on mesoscutum and medially of smaller, slightly longitudinally elongate cells becoming a little larger and more elongate laterally, extreme side and apex completely smooth and shiny; visible part of mesoscutum about 2.2X as broad as long; scutellum about 1.2X as broad as long; hind femur about 3.7X as long as broad; mid basitarsus with 2 ventral pegs; mid tibial spur slightly longer than basitarsus; fore wing with venation and setation as in Figs 174, 175; propodeum medially much less than 0.1X as long as scutellum. Relative measurements: FWL 109.5, FWW 50; HWL 71, HWW 15.5.

Gaster with hypopygium (Fig. 176) reaching about 0.7X to apex; last tergite about 0.65X as long as mid tibia, with apex broadly rounded; ovipositor hidden. Relative measurements: OL 55, GL 10.5 [MT 71].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, San Vito, Las Cruces, Wilson Bot. Gdns, 8°46'N 82°57'W, 1200-1350m, 15-16.ii.2012 ([J.S.] Noyes). Holotype in NHMUK.

COMMENTS. See comments under *ochraceipes* (p. 111).

Coccidencyrtus aries sp.nov.

(Figs 177-181; Hab. ♀ 27)

DIAGNOSIS. *Female* (overall length about 0.8-1.0mm): scape mostly brown; pedicel and flagellum yellow, pedicel sometimes dusky; coxae white, mid and hind coxae mixed brown; fore femur white, tibia very pale orange with a small brown area proximally; mid femur white with a subapical brown band; mid tibia white to pale orange with a subbasal brown band; hind femur white with a brown subapical band; hind tibia white with a brown subbasal band; gaster dark brown, Gt1 medially and basal sternites pale yellow; frontovertex about 0.4X head width; antenna (Fig. 177) with scape about 4X as long as broad, funicle with F1 narrower than pedicel, F1-F4 subequal, small, F5-F6 larger, longer than broad; linear sensilla only on F5-F6; clava about as long as funicle and about 4X as long as broad; palp formula 3-2; scutellum (Fig. 180) with 3 pairs of setae and polygonally reticulate to longitudinally elongate striate-reticulate sculpture, deeper than that on mesoscutum; mid basitarsus with 7 or 8 ventral pegs; mid tibial spur about as long as basitarsus; fore wing with stigmal vein (Fig. 178) longer than either postmarginal or marginal veins; hypopygium reaching about 0.8X towards apex of gaster; ovipositor (Fig. 179) nearly 3.5X as long as gonostylus and slightly exserted, the exserted part shorter than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.00mm; excluding ovipositor, 0.96mm (CPD).

Head dark brown to black with a metallic sheen; occiput with a weak coppery sheen; frontovertex generally with a coppery sheen, mixed metallic dark green near anterior ocellus; scrobal area, temple and gena with a moderate coppery purple sheen; frontovertex, gena and interantennal prominence with a few scattered, inconspicuous, brown setae; maxillary palpus white; radicle dark brown; scape brown in proximal 0.7X, apex very pale yellow; pedicel and flagellum pale yellow, clava slightly dusky; thorax dark brown to black with a weak metallic lustre; pronotum with a coppery sheen; mesoscutum coppery, laterally mixed metallic, dark green; tegula dark purple-brown with a weak sheen; axilla dark purple-brown with a weak brassy sheen; scutellum dorsally virtually matt with a very weak coppery purple sheen, apex and side slightly silky in appearance with a weak coppery purple and brassy sheen; mesopleuron with a moderate

purple sheen; fore coxa white; fore femur white, tibia and tarsus very pale orange, tibia with a very inconspicuous brown spot subbasally; mid coxa white, mixed very pale orange ventrally and brownish externally; mid femur white with a broad, slightly oblique, subapical brown band, tibia white to very pale orange with a narrow, subbasal brown band, spur and tarsus very pale orange; hind coxa white, but external face proximally brown; hind femur white in proximal 0.5X with a relatively broad, brown subapical band, extreme apex white, tibia white with a, brown, subbasal band, tarsus very pale orange; wings hyaline, but fore wing (Fig. 181) with a small, very weakly infuscate area below marginal vein; propodeum dark brown with a weak purple sheen; gaster dark brown with coppery purple, green and blue reflections, Gt1 medially pale yellow, basal sternites pale yellow; gonostylus brown.

Head about 2.5X as wide as frontovertex, in profile about 1.4X as high as deep, tangent to frontovertex forming an angle of about 90° with that of face; occipital margin sharp, not carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 85°; frontovertex not widening in front of anterior ocellus, with distinct, fairly coarse, polygonally reticulate sculpture of mesh size generally subequal to eye facet, not shallower above top of scrobes; temple and gena with much shallower, hardly elongate, fine polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture, scrobes smooth; interantennal prominence and mouth margin with slightly shallower, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, broadly ∩-shaped; interantennal prominence dorsally narrowly rounded; antenna as in Fig. 177; scape slightly broadened and flattened, about 4X as long as broad; funicle with F1-F4 subequal, relatively small, subquadrate, F5-F6 larger, subequal and clearly longer than broad; clava about 4.1X as long as broad and about 1.4X as wide as F6, not curved downwards towards apex, about as long as funicle, sutures parallel, sensory area small, at apex only giving it a pointed or narrowly rounded appearance; eye slightly overreaching occipital margin, clothed with dense conspicuous setae, each a little longer than diameter of facet; malar sulcus present, but indistinct; clypeal margin clearly concave, very slightly produced medially. Relative measurements: HW 57, HH 40, FV 23, POL 11, OOL 3, OCL 3, AOL 9, EL 30, EW 27, MS 15, SL 24.5, SW 6.

Thorax with pronotum hardly exposed behind head, its posterior margin broadly concave, not angular medially; pronotum and mesoscutum with similar sculpture to that in ocellar area, but slightly shallower and of smaller mesh; axilla with finer, shallower sculpture than mesoscutum; scutellum with 3 pairs of setae, dorsally with very fine, polygonally reticulate sculpture that is very slightly deeper than sculpture on mesoscutum, and of much smaller mesh, sculpture slightly longitudinally elongate towards side, extreme side and apex completely smooth and shiny; visible part of mesoscutum about 1.9X as broad as long; scutellum (Fig. 180) about 1.2X as broad as long, apex with a pair of slender, elongate setae; hind femur about 3.9X as long as broad; mid basitarsus with 7 or 8 ventral pegs; mid tibial spur about as long as basitarsus; fore wing with venation and setation as in Figs 178, 181; propodeum (Fig, 180) medially about 0.08X as long as scutellum. Relative measurements: FWL 52, FWW 22; HWL 36, HWW 8.

Gaster with hypopygium reaching about 0.8X to apex; last tergite about 0.65X as long as mid tibia, with apex broadly rounded; ovipositor slightly exserted, the exserted part about 0.5X as long as mid tibial spur or about 0.13X as long as mid tibia.

Paratype. Mandible with two acute teeth and a rounded upper tooth; palp formula 3-2; funicle with linear sensilla present only on F5-F6; ovipositor 179. Relative measurements: OL 55, GL 15.5 [MT 44.5].

Variation. Females vary in overall length from 0.75-1.00mm, the mid and hind coxae may be completely pale yellow or very pale orange, the hind tarsus may be slightly dusky and the base of the gaster may be pale yellow, especially ventrally. The specimen from Ecuador excluded from the type material is noticeably paler than the holotype, with the mesoscutum largely metallic green and brassy and the dark markings on the legs less extensive, the scape is also relatively broader.

Male. Unknown.

DISTRIBUTION. Costa Rica, Ecuador.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, Santo Domingo, INBio Parque, LN 526250 217400, 1100m, iii.2002 (J.A. Azofeifa, J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Pitilla (ACG), 700m, MT/YPT, 24.i-27.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Est. Cacao (ACG) 10°55'N 85°30'W, 1100m, 19-20.ii.2005 (J.S. Noyes); 2♀, **Alajuela**, PN Arenal, Sendero Mena, LN 454170 271800, 600m, 17.iv-19.v.2001 (G. Carballo); 1♀, **Heredia**, OTS La Selva, 10°26'N 84 01'W, 75m, 23.ii.2006 (J.S. Noyes); 5♀, Heredia, Estacion Biologica La Selva, 10°26'N 84°01'W, 75m, 28-29.ii.2008 (J.S. Noyes); 1♀, Heredia, Estacion Biologica La Selva, 10°26'N 84°01'W, 75m, 22-24-25.ii.2011 (J.S. Noyes); 2♀, Heredia, Estacion Biologica La Selva, 10°26'N 84°01'W, 75m, 22-24.ii.2012 (J.S. Noyes); 2♀, Heredia, Estacion Biologica La Selva, 10°26'N 84°01'W, 75m, 25.ii.2016 (J.S. Noyes); Holotype in MZUCR, paratypes in NHMUK and CNC.

Non type material. **ECUADOR**, 1♀, Napo, Res. Eth. Waorani, 00°39'N 76°26'W, 220m, canopy fog #1757, 4.x.1996 (T.L. Erwin et al.). Material in USNM.

COMMENTS. *Coccidencyrtus aries* is very similar to *thuryus* but can be separated by the absence of linear sensilla on F2 with F2 being subequal in size to F1 and F3 whereas in *thuryus* F2 has linear sensilla and is larger than either F1 or F2 (see key). This can be difficult to see on card-mounted specimens but the two species can be additionally separated on the relative width of the scape, colour of the mid and hind coxae, and the number of pegs on the ventral surface of the mid basitarsus. However, these are more variable characters and may be unreliable. In *aries* the scape is about 4X as long as broad, the mid coxa is largely brown and the mid basitarsus has 7 or 8 ventral pegs, whereas in *thuryus* the scape is about 3-3.5X as long as broad, the mid coxa is completely white and the mid basitarsus has only 5 or 6 ventral pegs.

***Coccidencyrtus gowanus* sp.nov.**

(Figs 182-187; Hab. ♀ 28)

DIAGNOSIS. *Female* (overall length about 0.7-1.2mm): scape mostly dark brown; pedicel pale orange; flagellum very pale orange, clava proximally dusky; fore coxa white, mid coxa white to pale orange, hind coxa dark brown, sometimes partially pale orange; fore femur white, tibia pale orange; mid femur white with a subapical brown band; mid tibia white to pale orange with a narrow subbasal brown band; hind femur white with a broad, brown subapical band; hind tibia white with a broad, brown, subbasal band; gaster dark brown; frontovertex about 0.4X head width (Fig. 187); antenna (Fig 183) with scape nearly 4X as long as broad, funicle with F1 narrower than pedicel, F1-F5 subequal, small, F6 larger, longer than broad; linear sensilla only on F6; clava very slightly longer than funicle, about 4X as long as broad; palp formula 3-2; scutellum (Fig. 186) with 3 pairs of setae and longitudinally elongate polygonally reticulate to striate-reticulate sculpture, deeper than that on mesoscutum; mid basitarsus with 2 ventral pegs; mid tibial spur about as long as basitarsus; fore wing (Fig. 184) with stigmal vein (Fig, 185) longer than postmarginal vein and about as long as marginal vein; hypopygium reaching about 0.8X towards apex of gaster; ovipositor nearly 4X as long as gonostylus and hardly exserted with exserted part much than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 0.73mm; excluding ovipositor, 0.71mm (CPD).

Head dark brown to black with a moderate metallic lustre; occiput with a weak coppery sheen; frontovertex generally coppery, mixed metallic dark green in ocellar area; scrobal area, temple and gena with a coppery to coppery purple sheen; frontovertex with a few, inconspicuous, scattered, brown setae; gena and interantennal prominence with a few scattered, very inconspicuous, brown setae; maxillary palpus white; radicle orange-brown; scape very pale orange, brownish towards base; pedicel very pale orange, brown dorsally and laterally towards base; flagellum very pale orange, clava dusky towards base and at apex; thorax dark brown to black with a metallic lustre; pronotum and mesoscutum with a weak coppery sheen; tegula dark purple-brown with a weak sheen; axilla with a coppery sheen; scutellum dorsally virtually matt with a weak coppery purple sheen, apex and side weakly metallic dark green and slightly brassy; mesopleuron with a moderate purple sheen; fore coxa white; fore femur white, tibia and tarsus pale yellow; mid coxa very pale

orange; mid femur white with a narrow subapical, brown band, tibia white with a narrow, subbasal brown band, spur very pale yellow, tarsus very pale orange; hind coxa dark brown; hind femur white in proximal 0.5X with a broad, dark brown, subapical band, extreme apex white, tibia with extreme base white, a fairly broad, subbasal dark brown band, apical 0.5X white, tarsus very pale orange; wings hyaline; propodeum dark brown with a weak purple sheen; gaster dark brown; gonostylus brown.

Head about 2.3X as wide as frontovertex, in profile about 1.6X as high as deep, tangent to frontovertex forming an angle of about 105° with that of face; occipital margin sharp, not carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 95°; frontovertex not widening in front of anterior ocellus, with distinct, polygonally reticulate sculpture of mesh size generally subequal to eye facet, not shallower above top of scrobes; temple and gena with much shallower, hardly elongate, fine polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture, scrobes smooth; interantennal prominence and mouth margin with slightly shallower, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, broadly ∩-shaped; interantennal prominence dorsally narrowly rounded; antenna as in Fig. 183; scape very slightly broadened and flattened, about 3.6X as long as broad; funicle with F1-F5 subequal, relatively small, subquadrate, F6 much larger, clearly longer than broad; clava about 4.2X as long as broad and about 1.3X as wide as F6, slightly curved downwards towards apex, very slightly longer than funicle, sutures parallel, sensory area small, at apex only giving it a pointed or narrowly rounded appearance; eye slightly overreaching occipital margin, clothed with inconspicuous setae, each slightly shorter than diameter of facet; malar sulcus present, distinct; clypeal margin weakly, evenly concave. Relative measurements: HW 50, HH 36, FV 22, POL 9.5, OOL 2.5, OCL 2.5, AOL 6.5, EL 25, EW 22.5, MS 14, SL 20, SW 5.5.

Thorax (Fig. 186) with pronotum hardly exposed behind head, its posterior margin broadly concave, not angular medially; pronotum and mesoscutum with similar sculpture to that in ocellar area, but very slightly shallower and of smaller mesh size; axilla with similar sculpture to mesoscutum; scutellum dorsally with very fine, polygonally reticulate sculpture that is a much deeper than sculpture on mesoscutum, slightly longitudinally elongate laterally, extreme side and apex completely smooth and shiny; visible part of mesoscutum about 1.8X as broad as long; scutellum about 1.3X as broad as long, apex with a pair of slender, elongate setae; hind femur about 3.1X as long as broad; mid basitarsus with 2 ventral pegs; mid tibial spur about as long as basitarsus; fore wing with venation and setation as in Figs 184, 185; propodeum (Fig. 186) medially about 0.09X as long as scutellum. Relative measurements: FWL 45, FWW 20.5; HWL 30, HWW 7.

Gaster with hypopygium reaching about 0.8X to apex; last tergite about 0.7X as long as mid tibia, with apex broadly rounded; ovipositor slightly exserted, the exserted part about 0.2X as long as mid tibial spur or less than 0.1X mid tibia.

Paratype. Mandible with two acute teeth and a shorter, obtuse, upper tooth; palp formula 3-2; funicle with linear sensilla present only on F6; hypopygium Fig. 182. Relative measurements: OL 41.5, GL 11 [MT 35.5].

Variation. Females vary in overall length from 0.68-0.73mm, the fore wing varies from about 2.1-2.2X as long as broad, otherwise very little variation noted in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Maritza (ACG), 700m, MT/YPT, 20.i-24. ii.1996 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, same data as holotype. Holotype in MZUCR, paratype in NHMUK.

***Coccidencyrtus reshan* sp.nov.**
(Figs 188-194; Hab. ♀ 29)

DIAGNOSIS. *Female* (overall length about 0.8mm): scape and pedicel dark brown; funicle pale yellow, clava pale orange with extreme base brown; coxae dark brown; legs otherwise mostly dark brown; gaster dark brown, ventrally dusky pale orange; frontovertex (Fig. 191) nearly half head width; antenna (Fig. 190) with scape about 3X as long as broad, funicle with F1 narrower than pedicel, F1-F4 subequal, small, subquadrate, F5-F6 larger and slightly longer than broad; linear sensilla only on F5-F6; clava about as long as funicle and 4X as long as broad; palp formula 3-2; scutellum (Fig. 192) with 3 pairs of setae and longitudinally elongate reticulate sculpture, deeper than imbricate sculpture of mesoscutum; mid basitarsus with 2 or 3 ventral pegs; mid tibial spur about as long as basitarsus; fore wing with stigmal vein (Fig. 188) a little longer than either postmarginal or marginal veins; hypopygium (Fig. 194) reaching about 0.7X towards apex of gaster; ovipositor (Fig. 189) about 3.5X as long as gonostylus and slightly exserted, the exserted part a little shorter than mid tibial spur. *Male*: unknown.

Female **(**holotype**)**: length, including ovipositor, 0.82mm; excluding ovipositor, 0.77mm (CPD).

Head dark brown to black largely with a moderate to strong metallic sheen; occiput with a somewhat coppery sheen; frontovertex generally metallic dark green, coppery between occipital margin and posterior ocelli, along inner eye margin and above scrobal area; scrobal area, temple and gena with a moderate coppery sheen; frontovertex, gena and interantennal prominence with a few scattered, inconspicuous, brown setae; palpi white; radicle dark brown; scape dark brown; pedicel dark brown, some pale orange ventrally and laterally at extreme apex; funicle pale yellow; clava slightly dusky pale orange, extreme base pale brown; thorax dark brown to black with a weak to strong metallic lustre; pronotum with a moderate coppery sheen; mesoscutum with a fairly strong metallic dark green sheen, coppery immediately behind pronotum and narrowly along posterior margin; tegula dark brown with a slight coppery sheen; axilla with a coppery sheen; scutellum dorsally virtually matt with a slight silky coppery purple sheen, extreme apex and side shiny with a coppery sheen; mesopleuron with a moderate coppery sheen, posterior half very slightly metallic dark blue; fore coxa dark brown; fore femur dark brown, tibia dark brown, knee white, tarsus slightly dusky pale orange; mid coxa dark brown; mid femur white in proximal 0.4X, otherwise dark brown, tibia white in basal 0.15X, pale orange at extreme apex otherwise dark brown, spur and tarsus pale orange; hind coxa dark brown, hind femur dark brown with extreme apex pale orange, tibia dirty white in basal 0.15X, otherwise dark brown, tarsus brown; wings hyaline, but fore wing (Fig. 193) with a small, weakly infuscate area below marginal and stigmal veins (Fig. 188); propodeum very dark brown with a weak purple sheen; gaster dark brown with coppery purple, green and blue reflections, Gt1 medially pale orange proximally, venter dusky pale orange, virtually white towards base; gonostylus brown.

Head (Fig. 191) about 2.2X as wide as frontovertex, in profile about 1.6X as high as deep, tangent to frontovertex forming an angle of about 85° with that of face; occipital margin sharp, not carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 90°; frontovertex not widening in front of anterior ocellus, with distinct, fairly coarse, polygonally reticulate sculpture of mesh size generally slightly larger than eye facet, not shallower above top of scrobes, but of slightly smaller mesh; temple and gena with similar, slightly elongate, polygonally reticulate sculpture; top of scrobes with fairly coarse, regular, polygonally reticulate sculpture, scrobes with shallow sculpture; interantennal prominence and mouth margin with hardly shallower, polygonally reticulate sculpture; scrobes moderately deep, weakly margined, broadly ∩-shaped; interantennal prominence dorsally rounded; antenna as in Fig. 190; scape broadened and flattened, about 3.1X as long as broad; funicle with F1-F4 subequal, relatively small, subquadrate, F5-F6 larger and slightly longer than broad; clava about 4X as long as broad and about 1.3X as wide as F6, not curved downwards towards apex, hardly longer than funicle, sutures parallel, sensory area small, at apex only giving it a pointed or narrowly rounded appearance; eye slightly overreaching occipital margin, clothed with fairly conspicuous, dense setae, each about as long as diameter of facet; malar sulcus present, but very indistinct, obscured by sculpture; clypeal margin fairly evenly concave. Relative measurements: HW 66, HH 50, FV

30, POL 16, OOL 4, OCL 3, AOL 9.5, EL 35, EW 27.5, MS 20, SL 29, SW 9.5.

Thorax (Fig. 192) with pronotum hardly exposed behind head, its posterior margin broadly concave, not angular medially; pronotum, mesoscutum and axilla with similar sculpture to that in ocellar area, but slightly shallower and more rounded; scutellum (Fig. 192) dorsally with very fine, polygonally reticulate sculpture that is much deeper than that mesoscutum, and of slightly smaller mesh, sculpture slightly longitudinally elongate proximally, extreme apex and side completely smooth; visible part of mesoscutum about 1.9X as broad as long; scutellum about 1.2X as broad as long; hind femur about 4.2X as long as broad; mid basitarsus with 2 or 3 ventral pegs; mid tibial spur about as long as basitarsus; fore wing with venation and setation as in Figs 188, 193; propodeum (Fig. 192) medially about 0.08X as long as scutellum. Relative measurements: FWL 80, FWW 35; HWL 52, HWW 13.

Gaster with hypopygium reaching about 0.7X to apex; last tergite about 0.65X as long as mid tibia, with apex broadly rounded; ovipositor slightly exserted, the exserted part about 0.7X as long as mid tibial spur or about 0.17X as long as mid tibia.

Paratype. Mandible with two acute teeth and an obtuse upper tooth; palp formula 3-2; funicle with linear sensilla present only on F5-F6; hypopygium Fig. 194; ovipositor Fig. 189. Relative measurements: OL 48.5, GL 14 [MT 45].

Variation. Females vary in overall length from 0.77-0.82mm, the extreme apex of each of the fore and mid femora may be white, the clava may be only about as long as the funicle and the exserted part of the ovipositor may be only about 0.15X as long as the mid tibial spur.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, San Gerardo de Dota, El Manantial, 9°34'N 83°48'W, 2250m, 18-20.ii.2010 (J.S. Noyes). **COSTA RICA**, 3♀, **San José**, same data as holotype; 1♀, San José, San Gerardo de Dota, 9°34'N 83°48'W, 2250m, 20-21.ii.2012 (J.S. Noyes). Holotype in MZUCR, paratypes in NHMUK.

Coccidencyrtus juno **sp.nov.**

(Figs 195-198; Hab. ♀ 30)

DIAGNOSIS. *Female* (overall length about 0.7mm): scape and pedicel mostly brown; flagellum pale yellow, clava dusky at base and apex; fore coxa pale yellow to pale brown, mid and hind coxae dark brown. sometimes white apically; fore femur and tibia mostly dark brown; mid femur white with a broad, brown subapical band; mid tibia white with a brown subbasal band; hind femur and tibia mostly dark brown; gaster dark brown, Gt1 medially pale yellow; frontovertex (Fig. 196) about 0.4X head width; antenna (Fig. 195) scape nearly 3X as long as broad, funicle with F1 narrower than pedicel, F1-F5 subequal, small, F6 larger and longer than broad; linear sensilla only on F6; clava about as long as funicle and about 3X as long as broad; palp formula 3-2; scutellum with 3 pairs of setae and polygonally reticulate to longitudinally elongate sculpture, deeper than that on mesoscutum; mid basitarsus with 6 or 7 ventral pegs; mid tibial spur about as long as basitarsus; fore wing with stigmal vein (Fig. 197) a little longer than postmarginal vein and about as long as marginal vein; hypopygium reaching about 0.8X towards apex of gaster; ovipositor nearly 4X as long as gonostylus and slightly exserted, the exserted part shorter than mid tibial spur. *Male*: unknown.

Female **(**holotype**)**: length, including ovipositor, 0.71mm; excluding ovipositor, 0.67mm (CPD).

Head dark brown to black with a metallic sheen; occiput with a weak coppery sheen; frontovertex generally with a coppery sheen, mixed metallic dark green near anterior ocellus; scrobal area, temple and gena with a moderate coppery purple sheen; frontovertex, gena and

interantennal prominence with a few scattered, inconspicuous, brown setae; maxillary palpus white; radicle dark orange-brown; scape dark brown in proximal 0.8X, apex pale yellow; pedicel proximally pale brown, apex pale yellow; flagellum pale yellow, clava slightly dusky proximally and at apex; thorax dark brown to black with a weak metallic lustre; pronotum with a slight coppery sheen; mesoscutum with a metallic dark green sheen mixed coppery, especially anteriorly and along posterior margin; tegula dark purple-brown with a weak brassy sheen; axilla dark purple-brown with a coppery purple sheen; scutellum dorsally virtually matt with a very weak coppery purple sheen, apex and side slightly silky in appearance with a weak coppery purple and brassy sheen; mesopleuron with a moderate purple sheen; fore coxa pale yellow, pale brown towards base; fore femur dark brown, white at extreme base and pale yellow at apex, tibia dark brown, apices narrowly pale yellow, tarsus slightly dusky pale orange; mid coxa dark brown, pale yellow towards apex; mid femur white in proximal 0.3X, a broad, dark brown, subapical band, apex pale yellow, tibia white basally, a broad, dark brown subbasal band, apical 0.5X pale yellow, spur and tarsus pale orange; hind coxa dark brown, white towards apex; hind femur with extreme base and apex white, otherwise dark brown, tibia mostly dark brown with extreme base white and extreme apex pale orange, tarsus pale yellow with apical tarsomere dusky; wings hyaline, but fore wing with a small, weakly infuscate area below marginal vein (Fig. 197); propodeum dark brown with a weak purple sheen; gaster dark brown with coppery purple, green and blue reflections, Gt1 medially pale yellow proximally; gonostylus brown.

Head (Fig. 196) about 2.2X as wide as frontovertex, in profile about 1.5X as high as deep, tangent to frontovertex forming an angle of about 100° with that of face; occipital margin sharp, not carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 95°; frontovertex not widening in front of anterior ocellus, with distinct, fairly coarse, polygonally reticulate sculpture of mesh size generally subequal to eye facet, not shallower above top of scrobes; temple and gena with much shallower, hardly elongate, fine polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture, scrobes smooth; interantennal prominence and mouth margin with slightly shallower, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, broadly ∩-shaped; interantennal prominence dorsally rounded; antenna as in Fig. 195; scape broadened and flattened, nearly 3X as long as broad; funicle with F1-F5 subequal, relatively small, subquadrate, F6 larger and longer than broad; clava about 3X as long as broad and about 1.5X as wide as F6, not curved downwards towards apex, about as long as funicle, sutures parallel, sensory area small, at apex only giving it a pointed or narrowly rounded appearance; eye slightly overreaching occipital margin, clothed with fairly conspicuous setae, each about as long as diameter of facet; malar sulcus present, but very indistinct; clypeal margin clearly concave, virtually straight medially. Relative measurements: HW 48, HH 36.5, FV 21.5, POL 11.5, OOL 2.5, OCL 3, AOL 7, EL 27, EW 22, MS 16, SL 20, SW 7.

Thorax with pronotum hardly exposed behind head, its posterior margin broadly concave, not angular medially; pronotum and mesoscutum with similar sculpture to that in ocellar area; axilla with finer, shallower sculpture than mesoscutum; scutellum with 3 pairs of setae, dorsally with very fine, polygonally reticulate sculpture that is a little deeper than sculpture on mesoscutum, and of much smaller mesh, sculpture slightly longitudinally elongate towards side, extreme side and apex completely smooth and shiny; visible part of mesoscutum about 2X as broad as long; scutellum about 1.3X as broad as long, apex with a pair of slender, elongate setae; hind femur about 3.8X as long as broad; mid basitarsus with 6 or 7 ventral pegs; mid tibial spur about as long as basitarsus; fore wing with venation and setation as in Figs 197, 198; propodeum medially about 0.08X as long as scutellum. Relative measurements: FWL 51, FWW 22.5; HWL 33, HWW 8.

Gaster with hypopygium reaching about 0.8X to apex; last tergite about 0.65X as long as mid tibia, with apex truncate; ovipositor slightly exserted, the exserted part about 0.5X as long as mid tibial spur or about 0.15X as long as mid tibia.

Paratype. Mandible with two acute teeth and an obtuse upper tooth; palp formula 3-2; funicle with linear sensilla present only on F6. Relative measurements: OL 45, GL 12 [MT 41.5].

Variation. Very little variation noted in material examined, although the fore coxae in the paratype are almost completely pale brown.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Santa Maria, 25km NE Liberia, 790m, 15.i-15.ii.1997 (D. Briceño). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, same data as holotype. Holotype in MZUCR, paratype in NHMUK.

Coccidencyrtus chenoa sp.nov.

(Figs 199-205; Hab. ♀ 31)

DIAGNOSIS. *Female* (length about 0.7mm): scape largely pale orange-brown; pedicel and flagellum pale orange; fore coxa yellow, mid and hind coxae brown; fore femur and tibia yellow; mid and hind tibiae yellow, immaculate; gaster brown; frontovertex (Fig. 199) about 0.6X head width; antenna (Fig. 200) with scape about 3X as long as broad, funicle with F1 narrower than pedicel, all segments longer than broad, F5-F6 slightly broader and larger, linear sensilla on F5-F6 or also present on F3; clava about as long as F4-F6 combined and about 4X as long as broad; palp formula 3-2; scutellum (Fig. 203) with 3 pairs of setae and very fine, longitudinally elongate, polygonally reticulate sculpture of silky appearance, that is slightly shallower than that on mesoscutum; mid tibial spur a little longer than basitarsus; mid basitarsus with 2 ventral pegs; fore wing with stigmal vein (Fig. 201) slightly longer than postmarginal vein but about as long as marginal vein; hypopygium reaching apex of gaster; ovipositor (Fig. 202) about 3.6X as long as gonostylus, exserted part longer than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 0.66mm; excluding ovipositor, 0.56mm (CPD).

Body dark brown to black with a weak to moderate metallic lustre; occiput with a slight purple and brassy sheen; frontovertex along occipital margin and in ocellar area with slight coppery sheen, elsewhere coppery purple mixed with some metallic dark green; scrobal area, temple and gena with a moderate coppery purple sheen; frontovertex, gena and interantennal prominence with a few scattered, very inconspicuous, brown setae; maxillary palpus white; radicle dusky pale orange; scape pale orange-brown; pedicel pale orange, slightly dusky dorsally; funicle and clava pale orange; pronotum with a slight coppery purple sheen; mesoscutum and axilla with a slight coppery purple sheen; scutellum with a slightly duller coppery purple sheen than mesoscutum but of slightly silky appearance; tegula dark brown with a weak coppery purple sheen; mesopleuron with a moderate coppery purple sheen; fore coxa yellow, partially pale brown proximally, mid and hind coxae dark brown; fore femur yellow, tibia yellow, tarsus yellow, apical tarsomere pale brown; mid femur very slightly dusky yellow, apices yellow, tibia yellow, spur and tarsus yellow, apical tarsomere slightly dusky; hind femur dark brown, pale orange-brown at apices, tibia and tarsus yellow, apical tarsomere slightly dusky; wings hyaline, fore wing with a very small, weakly infuscate area immediately below marginal vein (Fig. 201); propodeum with a weak brassy and coppery purple sheen; gaster brown with brassy, purple, blue, green and coppery reflections; gonostylus dark brown.

Head (Fig. 199) about 1.7X as wide as frontovertex, in profile subtrapezoidal, about 1.6X as high as deep, tangent to frontovertex forming an angle of about 105° with that of face; occipital margin rounded; no distinct oval depression adjacent to eye near occipital margin; ; ocelli forming an angle of about 95°;frontovertex widening in front of anterior ocellus, with shallow, polygonally reticulate sculpture of mesh size subequal to eye facet; temple and gena with shallow, slightly longitudinally elongate, fine, polygonally reticulate sculpture; scrobal area with shallow, regular, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, broadly ∩-shaped; interantennal prominence dorsally narrowly rounded, nearly reaching frontovertex; antenna as in Fig. 200; scape slightly broadened and flattened, about 3.1X as long as broad; funicle with F1-F4 slender, clearly narrower than pedicel, subequal and slightly longer than broad, F5-F6 very

slightly broader and longer, subequal and slightly longer than broad; linear sensilla present only on F5-F6; clava slender, about 3.8X as long as broad, about 1.2X as wide as F6, and about as long as F4-F6 combined, sutures parallel, sensory area small, at apex only giving it a pointed appearance; eye not reaching occipital margin, separated by at least about 2X diameter of facet, clothed with sparse, fairly conspicuous setae, each not longer than diameter of facet; malar sulcus absent; clypeal margin broadly concave; mandible with 3 teeth, lowest acute, middle rounded, upper short and obtuse; palp formula 3-2. Relative measurements: HW 53.5, HH 49, FV 32, POL 14.5, OOL 4.5, OCL 2, AOL 9, EL 27.5, EW 21, MS 19, SL 20, SW 6.5.

Thorax (Fig. 203) with pronotum slightly exposed behind head, its posterior margin virtually straight; pronotum with polygonally reticulate sculpture that is similar to that in ocellar area but of slightly smaller mesh and perhaps slightly shallower; mesoscutum with well-defined, slightly longitudinally elongate, polygonally reticulate sculpture that is a little deeper than that on frontovertex; axilla virtually smooth with very shallow, fine, polygonally reticulate sculpture; scutellum flat with very fine, longitudinally elongate, polygonally reticulate sculpture of silky appearance, that is slightly shallower and of much smaller mesh than that on mesoscutum, extreme apex and side quite smooth and shiny; visible part of mesoscutum about 2.4X as broad as long; scutellum about 1.1X as broad as long and with 3 pairs of setae; mid tibial spur a little longer than basitarsus; hind femur about 3.3X as long as broad; mid tibial spur a little longer than basitarsus; mid basitarsus with 2 ventral pegs; fore wing with venation and setation as in Figs 201, 204, stigmal vein slightly longer than postmarginal but about as long as marginal veins; propodeum (Fig. 203) medially much less than 0.1X as long as scutellum. Relative measurements: FWL 59, FWW 27.5; HWL 40, HWW 9.

Gaster with hypopygium (Fig. 205) reaching apex; last tergite about 0.5X as long as mid tibia, with apex broadly rounded; ovipositor (Fig. 202) clearly exserted, the exserted part about 1.5X as long as mid tibial spur or about 0.45X mid tibia. Relative measurements: OL 63, GL 17.5 [MT 36.5].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, 25.ii.2016 (J.S. Noyes). Holotype in NHMUK.

Coccidencyrtus procris **sp.nov.**

(Figs 206-210; Hab. ♀ 32)

DIAGNOSIS. *Female* (length about 1.0-1.1mm): scape mostly orange to pale orange-brown; pedicel largely brown, funicle pale orange, clava pale brown; coxae white, fore femur and tibia white to pale orange; mid femur and with a brown subapical band; mid and hind tibia each with a subbasal brown band; gaster generally pale orange, sides, Gt2-Gt4 and apex of outer pate of ovipositor dark brown; hypopygium orange; frontovertex about 0.4X head width; antenna (Fig. 206) with scape hardly more than about 4X as long as broad, F1 much narrower than pedicel, funicle with F1-F5 small, transverse, F6 larger and 2X as long as broad, linear sensilla only on F6; clava slightly longer than funicle and about 6X as long as broad; palp formula 3-2; scutellum (Fig. 209) with 3 pairs of setae and with fine, polygonally reticulate sculpture that is clearly deeper than that on mesoscutum; fore wing with stigmal vein (Fig. 208) slightly longer than postmarginal or marginal veins; mid tarsus with 5 ventral pegs; mid tibial spur slightly shorter than basitarsus; hypopygium nearly reaching apex of gaster; ovipositor about 3.1X as long as gonostylus with exserted part longer than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 0.94mm; excluding ovipositor, 0.84mm (CPD).

Head dark brown to black with a weak to moderate metallic lustre; occiput with a weak brassy sheen; frontovertex largely with a weak coppery sheen, area around anterior ocellus metallic dark green; scrobal area, temple and gena relatively dull with a slight coppery purple sheen; frontovertex, gena and interantennal prominence with a few scattered, very inconspicuous, brown setae; maxillary palpus white; radicle dark brown; scape largely pale orange-brown narrowly margined dark brown, mixed pale orange externally and towards apex; pedicel brown proximally, apex and venter pale orange; funicle pale orange; clava pale brown; thorax dark brown to black with a metallic lustre; pronotum with a weak brassy sheen with copper, purple and dark green reflections; mesoscutum with a weak brassy sheen; tegula dark purple brown with a weak brassy sheen; axilla with a weak coppery purple and brassy sheen; scutellum much less shiny than mesoscutum, virtually matt, but with very weak coppery purple and metallic dark green reflections, extreme side and apex more shiny and slightly brassy; mesopleuron with a moderate brassy and purplish sheen; all coxae white; fore femur proximally white, distally very pale orange, tibia very pale orange, tarsus slightly dusky, pale orange; mid femur white in proximal 0.7X with a dark brown subapical band, extreme apex white, tibia white proximally to very pale orange distally and a narrow, subbasal, dark brown band, spur and tarsus very pale orange; hind femur with proximal 0.5X white, extreme apex white, otherwise dark brown, tibia white at extreme base, a narrow, subbasal, dark brown band, otherwise very pale orange, tarsus very pale orange, apical tarsomere slightly dusky; wings hyaline, fore wing with a very small, weakly infuscate area immediately below marginal vein (Fig. 208); propodeum dark brown with a weak brassy and purple sheen, side more strongly coppery; gaster generally pale orange, dorsally slightly dusky with sides dark brown and Gt2-Gt4 brown medially, apex of outer plate of ovipositor dark brown; gonostylus slightly dusky pale orange.

Head about 2.4X as wide as frontovertex, in profile about 1.5X as high as deep, tangent to frontovertex forming an angle of about 105° with that of face; occipital margin sharp, not carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 80°; frontovertex slightly wider in front of anterior ocellus, with fairly shallow, polygonally reticulate sculpture of mesh size subequal to eye facet and slightly deeper in ocellar area, shallowest above scrobes; temple and gena with relatively shallow, longitudinally elongate, fine, polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture; interantennal prominence and mouth margin with shallow, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, broadly ∩-shaped; interantennal prominence dorsally acute; antenna as in Fig. 206; scape hardly broadened and flattened, about 4.2X as long as broad; funicle with F1-F5 small, subequal and slightly transverse, F6 conspicuously larger and about 2X as long as broad; clava long and slender with apex very slightly upturned, about 6X as long as broad, about 1.3X as wide as F6, slightly longer than funicle, sutures parallel, sensory area small, at apex only giving it a pointed appearance; eye slightly overreaching occipital margin, clothed with conspicuous setae, each about as long as diameter of facet; malar sulcus present, but indistinct; clypeal margin evenly very slightly concave, medially virtually straight. Relative measurements: HW 51, HH 39, FV 21, POL 9, OOL 3, OCL 3, AOL 6.5, EL 25.5, EW 23, MS 15.5, SL 23, SW 5.5.

Thorax (Fig. 209) with pronotum hardly exposed behind head, its posterior margin broadly concave, not angular medially; pronotum with polygonally reticulate sculpture that is similar to that in ocellar area but clearly shallower; mesoscutum almost smooth, but with fine, shallow, polygonally reticulate sculpture; axilla with similar sculpture to pronotum, but slightly more transversely elongate; scutellum dorsally with fine, polygonally reticulate sculpture that is clearly deeper than that on mesoscutum or pronotum, extreme side and apex completely smooth and shiny; visible part of mesoscutum about 1.7X as broad as long; scutellum about 1.25X as broad as long and with 3 pairs of setae; mid tibial spur slightly shorter than basitarsus; hind femur about 3.8X as long as broad; mid tarsus with 5 ventral pegs; mid tibial spur slightly shorter than basitarsus; fore wing with venation and setation as in Figs 207, 208, stigmal vein slightly longer than postmarginal or marginal veins; propodeum (Fig. 209) medially about 0.08X as long as scutellum. Relative measurements: FWL 53, FWW 23; HWL 35, HWW 8.

Gaster with hypopygium reaching about 0.9X towards apex; last tergite about 0.8X as long

as mid tibia, with apex rounded; ovipositor exserted, the exserted part about 1.2X as long as mid tibial spur or about 0.3X mid tibia.

Paratype**.** Funicle with linear sensilla present only on F6; mandible with 3 acute teeth; palp formula 3-2; hypopygium Fig. 210. Relative measurements: OL 78, GL 25 [MT 49].

Variation. Females vary in overall length from 0.95-1.13mm, otherwise very little variation noted in material available.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Est. Cacao (ACG) 10°55'N 85°30'W, 1100m, 19-20.ii.2005 (J.S. Noyes). Paratypes: **COSTA RICA**, 2♀, **Puntarenas**, Monteverde, 15-16.vii.1986 (L. Masner). Holotype in MZUCR, paratypes in NHMUK.

Coccidencyrtus umbro sp.nov.

(Figs 211-218; Hab. ♀ 33, ♂ 34)

DIAGNOSIS. *Female* (overall length about 0.8-1.2mm): scape largely dark brown; pedicel and funicle yellow, clava pale brown; fore coxa pale yellow, mid and hind coxa brown; fore femur and tibia yellow, tibia with a very faint, pale brown subbasal band; mid femur white with a dark brown subapical band; hind femur mostly dark brown; mid and hind tibiae white with a dark brown subbasal band; gaster largely dark brown, but Gt1 medially pale orange; hypopygium brown; frontovertex (Fig. 211) about half head width, sometimes much less; antenna (Fig. 215) with scape about 3X as long as broad, funicle with F1 narrower than pedicel, funicle with F1-F5 slightly transverse, F6 largest and slightly longer than broad; linear sensilla only on F6; clava slightly longer than pedicel and funicle combined, about 4-6X as long as broad; palp formula 3-2; scutellum (Fig. 214) with 3 pairs of setae and fine, longitudinally elongate striate-reticulate sculpture, about as deep as that on mesoscutum; mid tibial spur about as long as basitarsus; mid basitarsus with 6 ventral pegs; fore wing with stigmal vein (Fig. 213) slightly longer than postmarginal vein and longer than marginal vein; hypopygium reaching about 0.6X towards apex of gaster; ovipositor, about 3.5X as long as gonostylus and slightly exserted with exserted part about as long as mid tibial spur. *Male* (length about 0.6-0.8mm): legs darker than in female with brown areas more extensive; fore coxa orange-brown; frontovertex with deeper, reticulate sculpture than female, antenna (Fig. 217) with all funicle segments longer than broad, segments clothed with setae up to about 5X as long as diameter of segments; phallobase (Fig. 218) about 3.3X as long as broad; aedeagus about 7X as long as broad, apically acute and about 0.5X as long as mid tibia.

Female **(**holotype**)**: length, including ovipositor, 0.92mm; excluding ovipositor, 0.84mm (CPD).

Head dark brown to black with a weak to moderate metallic lustre; occiput with a weak brassy sheen; frontovertex generally metallic dark green, area between posterior ocelli and occipital margin coppery; area above scrobes coppery; scrobal area coppery to coppery purple, mixed with some violet at top of interantennal prominence and purple along scrobes; temple and gena relatively dull with a very slight brassy sheen; frontovertex with a few, inconspicuous, scattered, brown setae; gena and interantennal prominence with a few scattered, very inconspicuous, brown setae; maxillary palpus white; radicle dark brown; scape dark brown with extreme apex yellow; pedicel and funicle yellow, base of pedicel and F1-F5 slightly dusky; clava pale brown, distal part of basal segment slightly paler dusky yellow; thorax dark brown to black with a metallic lustre; pronotum with a weak coppery purple and brassy sheen; mesoscutum virtually matt with a very weak coppery purple sheen; tegula dark purple-brown with a weak brassy sheen; axilla with a weak coppery purple and brassy sheen; scutellum dorsally similar to mesoscutum, extreme side and apex shining and slightly brassy; mesopleuron with a moderate brassy sheen; fore coxa

very pale yellow, slightly dusky proximally; fore femur very pale yellow, slightly dusky dorsally towards apex, tibia very pale yellow, with a very faint, broad, pale brown, subbasal ring, tarsus dusky pale orange with basitarsus pale orange; mid coxa dark brown; mid femur white in proximal 0.5X, a broad, dark brown subapical band, extreme apex white, tibia white to very pale orange and a narrow, subbasal dark, brown band, spur and tarsus very pale orange; hind coxa dark brown; hind femur with proximal 0.25X white, extreme apex white, otherwise dark brown, tibia white at extreme base, a narrow, subbasal, dark brown band, otherwise very pale orange, tarsus very pale orange, apical tarsomere slightly dusky; wings hyaline; propodeum dark brown with a weak brassy and purple sheen; gaster dark purple-brown, dorsally with a coppery purple sheen, proximal part of Gt1 with a distinct pale orange area medially, side and venter with coppery, blue, brassy and green reflections; gonostylus dark brown.

Head about 2.5X as wide as frontovertex, in profile about 1.5X as high as deep, tangent to frontovertex forming an angle of about 80° with that of face; occipital margin sharp, not carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 90°; frontovertex hardly narrowing in front of anterior ocellus, with distinct polygonally reticulate sculpture of mesh size subequal to eye facet and slightly deeper in ocellar area, almost smooth above top of scrobes; temple and gena with relatively shallow, longitudinally elongate, fine, polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture; interantennal prominence and mouth margin with shallow, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, broadly ∩-shaped; interantennal prominence dorsally rounded; antenna as in Fig. 215; scape very slightly broadened and flattened, about 3X as long as broad; funicle with F1-F5 small, subequal and slightly transverse, F6 conspicuously larger and slightly longer than broad; clava slender, nearly 6X as long as broad, about 1.2X as wide as F6, downcurved ventrally, slightly longer than pedicel and funicle combined, sutures parallel, sensory area small, at apex only giving it a rounded appearance; eye slightly overreaching occipital margin, clothed with sparse, short inconspicuous setae, each not than diameter of facet; malar sulcus present, but very shallow and indistinct; clypeal margin evenly very slightly concave. Relative measurements: HW 54, HH 40, FV 22, POL 11.5, OOL 2.5, OCL 4.5, AOL 8, EL 28, EW 25.5, MS 16, SL 21.5, SW 7.

Thorax (Fig. 214) pronotum hardly exposed behind head, its posterior margin broadly concave, not angular medially; pronotum with polygonally reticulate sculpture that is about as deep as that in ocellar area, and of similar mesh; mesoscutum with very fine, longitudinally elongate, polygonally reticulate to striate-reticulate sculpture that is very slightly deeper than that on pronotum and quite silky in appearance; axilla with similar sculpture to pronotum, but slightly more transversely elongate; scutellum dorsally with very similar sculpture to mesoscutum, extreme side and apex completely smooth and shiny; visible part of mesoscutum about 1.8X as broad as long; scutellum about 1.25X as broad as long, apex with a pair of slender, elongate setae; hind femur about 3.8X as long as broad; mid tibial spur about as long as basitarsus; mid basitarsus with 6 ventral pegs; fore wing with venation and setation as in Figs 212, 213; propodeum (Fig. 214) about 0.08X as long as scutellum. Relative measurements: FWL 51.5, FWW 22; HWL 35.5, HWW 8.

Gaster with hypopygium reaching about 0.6X to apex; last tergite about 0.7X as long as mid tibia, with apex rounded; ovipositor exserted, the exserted part about as long as mid tibial spur or about 0.25X mid tibia.

Paratype**.** Funicle with linear sensilla present only on F6; mandible with two acute teeth and a rounded upper tooth; palp formula 3-2; hypopygium Fig. 216. Relative measurements: OL 68, GL 19.5 [MT 46].

Variation. Females vary in overall length from 0.77-1.16mm, the head varies from about 1.9-2.5X as wide as the frontovertex, with the frontovertex relatively narrower in larger specimens, F5 may be slightly larger than any of the preceding segments, the clava may only be a little more than 4.5X as long as broad, especially in smaller specimens, and the occipital margin may be weakly rounded.

Male: length 0.58-0.83mm.

Generally similar to female but for darker legs, wider frontovertex with deeper, reticulate sculpture and structure of antenna and genitalia. Legs generally slightly darker than those of

female with brown areas more extensive and more poorly defined, fore coxa orange-brown; head about 1.9X as wide as frontovertex, ocelli forming an angle of about 95°; antenna (Fig. 217) with all funicle segments longer than broad, F1 slightly longer than broad, F6 about 2X as long as broad, all segments clothed with whorls of long setae, dorsal ones longest and at least about 5X as long as diameter of segments; frontovertex less metallic than in female with conspicuous, polygonally reticulate sculpture of mesh size similar to eye facet; phallobase (Fig. 218) about 3.3X as long as broad; with each digitus about 3.5X as long a broad and with two apical hooks, aedeagus about 7X as long as broad, apically acute and about 0.5X as long as mid tibia. HW 93, FV 46, MT 79, AL 40.5.

DISTRIBUTION. Costa Rica, Ecuador.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Est. Cacao (ACG), 10°55'N 85°30'W, 1100m, 19-20.ii.2005 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Guanacaste NP, Est. Cacao, 1200m, 13.ii.1995 (L. Masner); 4♀, Guanacaste, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Est. Cacao (ACG), 10°55'N 85°30'W, 1100m, 19-20.ii.2005 (J.S. Noyes); 1♀, Guanacaste, Guanacaste NP, Est. Pitilla, YPT, iii.1990 (J.S. Noyes); 1♀, Guanacaste NP, below Pitilla, 500m, 7-8.iii.1990 (J.S. Noyes); 1♀, Guanacaste, Est. Pitilla, 9km S Santa Cecilia, LN 329950, 380450, 700m, ii.1995 (P. Rios); 1♀, Guanacaste, Pitilla (ACG), 700m, MT/YPT, 24.i-27.ii.1996 (J.S. Noyes); 2♀, Guanacaste, Maritza (ACG), 700m, MT/YPT, 20.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Guanacaste NP (error for Santa Rosa NP), near Playa Naranjo, 11.iii.1990 (J.S. Noyes); 1♀, Guanacaste, Las Pallas, 4km S Cerro Braun, KN 308400 388800, 1100m, 10-24.ii.1996 (J. Ugalde); 1♀, Guanacaste, BN Diriá, Vista del Mar, LN 233900 358750, 890m, #64582, viii-ix.2001 (I. Jiménez); 1♀, 2♂, Guanacaste, PN Palo Verde, Sector Catalina, Fila Catalina, LN 257400 400000, 250m, xii.1999, 8.i-8.ii.2000 and ii.2000 (I. Jiménez); 2♀, **Alajuela**, PN Volcán Tenorio, Sect. El Pilón, LN 298212 427913, 800m, 10.ii.2002 and 23.i.2002 (G. Carballo); 9♀, 1♂, Alajuela, PN Arenal, Sect. la Peninsula, LN 453800 271500, 600m, various dates 16.vi.1999 -x.2000 (G. Carballo); 1♀, **Heredia**, La Selva BS, 10°26'N 84°01'W, 50-150m, fog *Carapa guianensis*, FOT/02, 5.iii.1993 (INBio-OET); 1♀, Heredia, La Selva BS, 10°26'N 84°01'W, 50-150m, fog *Pentaclethra macroloba*, FPM/03, 6.iii.1993 (INBio-OET); 3♀, Heredia, Santo Domingo, INBio Parque, LN 526250 217400, 1100m, iii.2002 (J. Azofeifa, J.S. Noyes); 2♀, Heredia, Santo Domingo, INBio Parque, LN 526250 217400, 1100m, 1-12. iv.2002 (D. Rubí, J.S. Noyes); 1♀, **Puntarenas**, Las Cruces, MT/YPT, 18-22.iii.1990 (J.S. Noyes). Holotype in MZUCR, paratypes in MZUCR, NHMUK, USNM and CNC.

Non type material. **ECUADOR**, 1♀, Res. Eth. Waorani, 00°39'S 76°26'W, 220m, canopy fog, lot #1679, 30.ix.1996 (T.L. Erwin et al.). Material in USNM.

COMMENTS. *Coccidencyrtus umbro* and *cyathus* are probably the most similar Costa Rican species to *annulipes* (Blanchard) or *maculicornis* (Blanchard) from Argentina. They both differ from either of the Argentinian species by having the sculpture of the mesoscutum longitudinally strigose to striate reticulate and similar to that of the scutellum whereas in *annulipes* and *maculicornis* the sculpture on the mesoscutum is imbricate or squamiform.

***Coccidencyrtus cyathus* sp.nov.**

(Figs 219-222; Hab. ♀ 35)

DIAGNOSIS. *Female* (overall length about 0.6-0.9mm): scape largely dark brown; pedicel and funicle yellow, clava pale brown; fore coxa pale yellow, mid and hind coxa dark brown; fore femur and tibia yellow, tibia with a very faint, pale brown subbasal band; mid femur white with a dark brown subapical band; hind femur mostly dark brown; mid and hind tibiae white with a dark brown subbasal band; gaster largely dark brown, but Gt1 medially pale orange; hypopygium brown; frontovertex about one-third to half head width; antenna (Fig. 219) with scape about 3X as long as broad, funicle with F1 narrower than pedicel, funicle with F1-F5 slightly transverse, F6 largest and slightly longer than broad; linear sensilla only on F6; clava about as long as pedicel

and funicle combined, about 3.5X as long as broad; palp formula 3-2; scutellum with 3 pairs of setae and fine, longitudinally elongate striate sculpture, about as deep as that on mesoscutum; mid basitarsus with 3 or 4 ventral pegs; mid tibial spur about as long as basitarsus; fore wing with stigmal vein (Fig. 221) slightly longer than postmarginal vein and about as long as marginal vein; hypopygium reaching about 0.7X towards apex of gaster; ovipositor, about 3.5X as long as gonostylus and slightly exserted with exserted part a little shorter than mid tibial spur. *Male*: unknown.

Female **(**holotype**)**: length, including ovipositor, 0.84mm; excluding ovipositor, 0.79mm (CPD).

Head dark brown to black with a weak to moderate metallic lustre; occiput with a weak brassy sheen; frontovertex generally metallic dark green, area between posterior ocelli and occipital margin coppery; area above scrobes coppery; scrobal area coppery to coppery purple; temple and gena relatively dull with a very slight brassy sheen; frontovertex with a few, inconspicuous, scattered, brown setae; gena and interantennal prominence with a few scattered, very inconspicuous, brown setae; maxillary palpus white; radicle dark brown; scape dark brown with extreme apex yellow; pedicel and funicle yellow, base of pedicel and F1-F5 slightly dusky; clava pale brown, distal part of basal segment slightly paler; thorax dark brown to black with a metallic lustre; pronotum with a weak coppery purple and brassy sheen; mesoscutum virtually matt with a very weak coppery purple sheen; tegula dark purple-brown with a weak brassy sheen; axilla with a weak coppery purple and brassy sheen; scutellum dorsally similar to mesoscutum, extreme side and apex shining and slightly brassy; mesopleuron with a moderate purple and brassy sheen; fore coxa very pale yellow; fore femur very pale yellow, tibia very pale yellow, with indication of a very faint, interrupted, pale brown, subbasal ring, tarsus pale orange with apical tarsomere slightly dusky; mid coxa dark brown; mid femur white in proximal 0.5X, a broad, dark brown subapical band, extreme apex white, tibia white to very pale orange and a narrow, subbasal dark, brown band, spur and tarsus very pale orange; hind coxa dark brown; hind femur with proximal 0.25X white, extreme apex white, otherwise dark brown, tibia white at extreme base, a narrow, subbasal, brown band, otherwise very pale orange, tarsus very pale orange, apical tarsomere slightly dusky; wings hyaline; propodeum dark brown with a weak brassy and purple sheen; gaster dark purple-brown, dorsally with a coppery purple sheen, proximal part of Gt1 with a distinct pale orange area medially, side and venter with coppery, blue, brassy and green reflections; gonostylus dark brown.

Head about 2.2X as wide as frontovertex, in profile about 1.3X as high as deep, tangent to frontovertex forming an angle of about 80° with that of face; occipital margin more or less sharp, not carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 90°; frontovertex hardly widening in front of anterior ocellus, with distinct polygonally reticulate sculpture of mesh size a little larger than eye facet, shallower above top of scrobes; temple and gena with relatively shallow, longitudinally elongate, fine polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture; interantennal prominence and mouth margin with shallow, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, broadly ∩-shaped; interantennal prominence dorsally rounded; antenna as in Fig. 219; scape very slightly broadened and flattened, about 2.9X as long as broad; funicle with F1-F5 small, subequal and slightly transverse, F6 conspicuously larger but also slightly transverse; clava moderately slender, about 3.5X as long as broad, about 1.6X as wide as F6, not downcurved ventrally, about as long as pedicel and funicle combined, sutures parallel, sensory area relatively small, at apex only giving it a rounded or weak obliquely truncate appearance; eye slightly overreaching occipital margin, clothed with sparse, short inconspicuous setae, each not longer than diameter of facet; malar sulcus present, but very shallow and indistinct; clypeal margin evenly very slightly concave. Relative measurements: HW 42.5, HH 32, FV 19, POL 10, OOL 1.5, OCL 3.5, AOL 7, EL 23, EW 21, MS 14, SL 19, SW 6.5.

Thorax (Fig. 220) with pronotum hardly exposed behind head, its posterior margin broadly concave, not angular medially; pronotum with polygonally reticulate sculpture that is about as deep as that in ocellar area, and of similar mesh; mesoscutum with very fine, longitudinally elongate, polygonally reticulate to striate-reticulate sculpture that is very slightly deeper than that on pronotum and quite silky in appearance; axilla with similar sculpture to pronotum, but slightly more transversely elongate; scutellum dorsally with very similar sculpture to mesoscutum,

extreme side and apex completely smooth and shiny; visible part of mesoscutum about 1.9X as broad as long; scutellum about 1.25X as broad as long, apex with a pair of slender, elongate setae; mid basitarsus with 3 or 4 ventral pegs; mid tibial spur about as long as basitarsus; hind femur about 3.6X as long as broad; fore wing with venation and setation as in Figs 221, 222; propodeum (Fig. 220) medially about 0.07X as long as scutellum. Relative measurements: FWL 44, FWW 18.5; HWL 29, HWW 7.

Gaster with hypopygium reaching about 0.7X to apex; last tergite about 0.7X as long as mid tibia, with apex rounded; ovipositor exserted, the exserted part about 0.6X as long as mid tibial spur or about 0.2X mid tibia.

Paratype**.** Mandible with two sharp teeth and an upper, rounded tooth; palp formula 3-2; funicle with linear sensilla present only on F6. Relative measurements: OL 92, GL 25 [MT 81].

Variation. Females vary in overall length from 0.56-0.88mm, the head varies from about 2.0-2.7X as wide as the frontovertex, with the frontovertex relatively narrower in larger specimens.

Male. Unknown.

DISTRIBUTION. Costa Rica, Ecuador.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Pitilla (ACG), 700m, MT/YPT, 24.i-27.ii.1996 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Alajuela**, Reserva Rincon Forestal, Est. Caribe, 10°53'N 85°18'W, 19-20.ii.2003 (J.S. Noyes); 1♀, Alajuela, [PN Arenal,] Sendero Mena, Sect. Catarata, LN 454170 271800, #62078, iii-iv.2001 (G. Carballo). Holotype in MZUCR, paratypes in NHMUK.

Non type material. **ECUADOR**, 1♀, Res. Eth. Waorani, 00°39'S 76°26'W, 220m, canopy fog, lot #866, 4.x.1994 (T.L. Erwin et al.). Material in USNM.

COMMENTS. See comments under *C. umbro* (p. 99).

Coccidencyrtus xero **sp.nov.**

(Figs 223-229; Hab. ♀ 36, ♂ 37)

DIAGNOSIS. *Female* (length about 1.1-1.4mm): scape largely pale orange; pedicel mostly pale orange, flagellum pale orange; all coxae white; fore femur and tibia white to pale orange; mid femur white with a little brown subapically; mid and hind tibiae white to pale orange, each a without a subbasal brown band or stripe; gaster largely dark brown, but most of venter pale orange; frontovertex about 0.4X head width; antenna (Fig. 224) with scape very slightly more than 3X as long as broad, funicle with F1 narrower than pedicel, all segments longer than broad, but gradually increasing in size distally, linear sensilla on F3-F6 or also present on F1; clava hardly longer than F4-F6 combined and about 4X as long as broad; palp formula 3-2; scutellum (Fig. 229) with 4 pairs of setae and fine, polygonally reticulate sculpture that is clearly deeper than that on mesoscutum, becoming more longitudinally elongate laterally; mid tibial spur about as long as basitarsus; mid basitarsus with 4 or 5 ventral pegs; fore wing with stigmal vein (Fig. 225) slightly longer than either postmarginal or marginal veins; hypopygium reaching about 0.8X towards apex of gaster; ovipositor (Fig. 226) a little less than 3X as long as gonostylus with exserted part at least 2X as long as mid tibial spur. *Male* (length about 0.7-0.9mm): legs darker than in female with hind coxa and femur mostly brown; antenna (Hab. 37) with all funicle segments longer than broad, segments clothed with setae up to about 7X as long as diameter of segments.

Female **(**holotype**)**: length, including ovipositor, 1.09mm; excluding ovipositor, 0.89mm (CPD).

Head dark brown to black with a weak to moderate metallic lustre; occiput with a weak coppery sheen; frontovertex generally with a weak coppery sheen, area around anterior ocellus mixed relatively bright, metallic dark green; scrobal area, temple and gena relatively dull with a slight coppery purple sheen; frontovertex, gena and interantennal prominence with a few scattered, very

inconspicuous, brown setae; maxillary palpus white; radicle orange-brown; scape pale orange slightly dusky at base; pedicel pale orange, mixed pale brown proximally, flagellum pale orange, clava slightly dusky; thorax dark brown to black with a weak metallic lustre; pronotum and mesoscutum with a weak coppery and dark green sheen; tegula dark purple brown with a weak brassy sheen; axilla with a weak coppery purple sheen; scutellum less shiny than mesoscutum, but with a very weak coppery purple sheen, extreme side and apex more shiny and slightly brassy; mesopleuron with a moderate purplish sheen; all coxae white; fore femur white proximally, pale orange distally, tibia and tarsus pale orange; mid femur white proximally, pale orange distally with dorsal margin narrowly brown subapically, tibia white at extreme base, otherwise pale orange with a short, subbasal, brown stripe dorsally, spur and tarsus pale orange; extreme base of hind femur white, remainder pale orange, tibia pale orange, tarsus slightly dusky pale orange; wings hyaline, fore wing with a very small, weakly infuscate area immediately below marginal vein (Fig. 225); propodeum dark brown with a weak brassy and purple sheen; gaster dark brown dorsally with brassy, purple, blue, green and coppery reflections, venter pale orange with apex of outer plate of ovipositor dark brown; gonostylus dark brown.

Head (Fig. 223) about 2.3X as wide as frontovertex, in profile about 1.5X as high as deep, tangent to frontovertex forming an angle of about 105° with that of face occipital margin sharp, not carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 90°; frontovertex slightly widening in front of anterior ocellus with moderately deep, polygonally reticulate sculpture of mesh size subequal to eye facet; temple and gena with relatively shallow, slightly longitudinally elongate, fine, polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture; interantennal prominence and mouth margin with shallow, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, broadly ∩-shaped; interantennal prominence dorsally acute; antenna as in Fig. 224; scape slightly broadened and flattened, about 3.1X as long as broad; funicle with all segments clearly longer than broad, subequal, but gradually increasing in size distally, linear sensilla present only on F3-F6, also F1 on one antenna; clava slender, about 4X as long as broad, about 1.2X as wide as F6, and very slightly longer than F4-F6 combined, sutures parallel, sensory area small, at apex only giving it a pointed appearance; eye slightly overreaching occipital margin, clothed with conspicuous setae, each about as long as diameter of facet; malar sulcus present, distinct; clypeal margin concave, medially very slightly produced and straight; mandible tridentate with 2 lower, acute teeth and an upper, slightly shorter, rounded tooth; palp formula 3-2. Relative measurements: HW 52, HH 39.5, FV 22.5, POL 9.5, OOL 2.5, OCL 3.5 AOL 7, EL 30, EW 23.5, MS 11.5, SL 22, SW 7.

Thorax (Fig. 229) with pronotum hardly exposed behind head, its posterior margin broadly concave, not angular medially; pronotum and mesoscutum with polygonally reticulate sculpture that is similar to that in ocellar area, but perhaps slightly shallower; axilla with transversely elongate reticulate sculpture that is shallower than that on mesoscutum; scutellum (Fig. 229) dorsally with fine, polygonally reticulate sculpture that is clearly deeper than that on mesoscutum, sculpture more longitudinally elongate laterally, extreme side and apex completely smooth and shiny; visible part of mesoscutum about 1.9X as broad as long; scutellum about 1.2X as broad as long with 4 pairs of setae; mid tibial spur about as long as basitarsus; hind femur about 3.9X as long as broad; mid tibial spur about as long as basitarsus; mid basitarsus with 4 or 5 ventral pegs; fore wing with venation and setation as in Figs 225, 227, stigmal vein slightly longer than either postmarginal or marginal veins; propodeum (Fig. 229) medially about 0.08X as long as scutellum. Relative measurements: FWL 72, FWW 31; HWL 48, HWW 10.5.

Gaster with hypopygium (Fig. 228) reaching about 0.8X towards apex; last tergite about 0.8X as long as mid tibia, with apex rounded, almost truncate; ovipositor (Fig. 226) exserted, the exserted part about 2.3X as long as mid tibial spur or about 0.6X mid tibia. Relative measurements: OL 111.5, GL 40 [MT 52].

Variation. Females vary in overall length from 1.05-1.36mm, otherwise little variation noted in material examined.

Male: length 0.71-0.88mm.

Generally similar to female but for slightly darker legs and structure of antenna and genitalia.

Legs generally slightly darker than those of female with hind coxa and femur mostly dark brown; antenna (Hab. 37) with all funicle segments at least 3X as long as broad with segments gradually increasing in length and width distally and F6 about one-third longer than F1, all segments clothed with whorls of long setae, dorsal ones longest and at least 6-7X as long as diameter of segments.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, ii.2003 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Alajuela**, Res. Priv. Selva Verde, 10°27'N 84°04'W, 75m, 13.iii.2005 (C. Hansson); 1♀, **Heredia**, Estacion Biologica La Selva, 10°26'N 84°01'W, 75m, 1-2. iii.2007 (J.S. Noyes); 10♀, 8♂, Heredia, Estacion Biologica La Selva, 10°26'N 84°01'W, 75m, 28-29. ii.2008 (J.S. Noyes); 7♀, Heredia, Estacion Biologica La Selva, 10°26'N 84°01'W, 75m, 24-25.ii.2011 (J.S. Noyes); 1♀, Heredia, Estacion Biologica La Selva, 10°26'N 84°01'W, 75m, 22-24.ii.2012 (J.S. Noyes); 1♂, Heredia, Estacion Biologica La Selva, 10°26'N 84°01'W, 75m, 25-27.ii.2015 (J.S. Noyes). Holotype in NHMUK, paratypes in NHMUK, MZUCR and USNM.

Coccidencyrtus xylomus sp.nov.

(Figs 230-238; Hab. ♀ 38, ♂ 39)

DIAGNOSIS. *Female* (length about 0.8-1.1mm): scape largely brown; pedicel and flagellum brown; fore and mid coxae white, hind coxa brown; fore femur and tibia white to pale orange; mid femur and tibia white to very pale orange; mid and hind tibiae immaculate, very pale orange; gaster dark brown; frontovertex slightly less than half head width; antenna (Fig. 231) with scape about 3x as long as broad, funicle with F1 about as wide as pedicel, segments subequal, all longer than broad but becoming slightly broader distally, linear sensilla on all segments; clava about as long as F4-F6 combined and about 3X as long as broad; palp formula 3-2; scutellum (Fig. 230) with 3 pairs of setae and with fine, polygonally reticulate sculpture that is slightly deeper than that on mesoscutum, becoming more longitudinally elongate laterally; mid tibial spur hardly longer than basitarsus; mid basitarsus with 4 ventral pegs; fore wing with stigmal vein (Fig. 233) slightly longer than postmarginal but clearly shorter than marginal vein; hypopygium reaching a little more than half way along gaster; ovipositor (Fig. 235) about 2.7X as long as gonostylus, the exserted part about 2X as long as mid tibial spur. *Male* (length about 0.7-1.0mm): legs darker than in female, with mid coxa slightly dusky and a poorly defined, broad, subapical, brown band on mid femur; all funicle segments clothed in whorls of long setae, longest about 5X as long as diameter of segments (Fig. 237); phallobase (Fig. 238) about 4X as long as broad; aedeagus about 7X as long as broad and about 0.5X as long as mid tibia.

Female **(**holotype**)**: length, including ovipositor, 1.06mm; excluding ovipositor, 0.90mm (CPD).

Head dark brown to black with a weak to moderate metallic lustre; occiput with a weak brassy sheen; frontovertex near occipital margin with a weak coppery sheen, area around anterior ocellus relatively bright, metallic dark green; scrobal area, temple and gena relatively dull with a slight coppery purple sheen; frontovertex, gena and interantennal prominence with a few scattered, very inconspicuous, brown setae; maxillary palpus white; radicle dark brown; scape brown, orange-brown towards apex; pedicel dark brown proximally, apex pale brown; funicle and clava pale brown; thorax dark brown to black with a weak metallic lustre; pronotum with a weak coppery sheen; mesoscutum with a weak coppery sheen, posterolaterally with dark green and brassy reflections; tegula dark purple brown with a weak brassy sheen; axilla with a weak coppery purple and brassy sheen; scutellum less shiny than mesoscutum, but with a very weak coppery purple sheen, extreme side and apex more shiny and slightly brassy; mesopleuron with a moderate purplish sheen; fore coxa white; fore femur proximally white, distally very pale orange, tibia very pale orange, tarsus slightly dusky, pale orange; mid coxa white; mid femur white proximally, very pale orange distally, tibia very pale orange, spur and tarsus slightly dusky, pale orange; hind coxa

brown; hind femur white in proximal 0.4X with a broad, subapical, brown band, extreme apex pale orange, tibia very pale orange, tarsus pale orange-brown; wings hyaline, fore wing with a very small, weakly infuscate area immediately below marginal vein; propodeum dark brown with a weak brassy and purple sheen; gaster dark brown with brassy, purple, blue, green and coppery reflections; gonostylus dark brown.

Head (Fig. 232) about 2.3X as wide as frontovertex, in profile about 1.5X as high as deep, tangent to frontovertex forming an angle of about 100° with that of face; occipital margin sharp, not carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 85°; frontovertex slightly widening in front of anterior ocellus with fairly coarse, polygonally reticulate sculpture of mesh size subequal to eye facet; temple and gena with relatively shallow, slightly longitudinally elongate, fine, polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture; interantennal prominence and mouth margin with shallow, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, broadly ∩-shaped; interantennal prominence dorsally rounded; antenna as in Fig. 231; scape broadened and flattened, about 2.9X as long as broad; funicle with segments subequal, all slightly longer than broad, distal segments progressively slightly longer and broader; clava slender, about 4.3X as long as broad, about as wide as F6, and about as long as F4-F6 combined, sutures parallel, sensory area small, at apex only giving it a pointed appearance; eye slightly overreaching occipital margin, clothed with conspicuous setae, each slightly longer than diameter of facet; malar sulcus present, distinct; clypeal margin evenly very slightly concave, medially virtually straight. Relative measurements: HW 47.5, HH 36.5, FV 20.5, POL 7, OOL 3, OCL 2, AOL 5.5, EL 28, EW 22, MS 11, SL 17.5, SW 6.

Thorax (Fig. 230) with pronotum hardly exposed behind head, its posterior margin broadly concave, not angular medially; pronotum and mesoscutum with polygonally reticulate sculpture that is similar to that in ocellar area but slightly shallower; axilla with transversely elongate reticulate sculpture that is much shallower than that on mesoscutum; scutellum dorsally with fine, polygonally reticulate sculpture that is slightly deeper than that on mesoscutum, sculpture much more longitudinally elongate laterally, extreme side and apex completely smooth and shiny; visible part of mesoscutum about 2X as broad as long; scutellum about 1.1X as broad as long and with 3 pairs of setae; mid tibial spur hardly longer than basitarsus; hind femur about 3.4X as long as broad; fore wing with venation and setation as in Figs 233, 234, stigmal vein slightly longer than postmarginal but clearly shorter than marginal vein; propodeum (Fig. 230) medially about 0.09X as long as scutellum. Relative measurements: FWL 50, FWW 21.5; HWL 32.5, HWW 7.

Gaster with hypopygium reaching about 0.6X towards apex; last tergite about 0.9X as long as mid tibia, with apex angular but not acute; ovipositor exserted, the exserted part about 2X as long as mid tibial spur or about 0.6X mid tibia.

Paratype**.** Funicle with linear sensilla conspicuous and present on all funicle segments; mandible with 3 acute teeth; palp formula 3-2; hypopygium Fig. 236; ovipositor Fig. 235.. Relative measurements: OL 91.5, GL 34.5 [MT 47].

Variation. Females vary in overall length from 0.77-1.08mm, the hind coxa may be partially pale orange, the posterior ocellus may be equidistant from eye and occipital margins or even very slightly closer to the eye margin, and the exserted part of the ovipositor may be only about as long as the mid tibial spur or about 0.3X as long as the mid tibia.

Male: length 0.68-0.97mm.

Generally similar to female but for slightly darker legs and structure of antenna and genitalia. Legs generally slightly darker than those of female with mid coxa slightly dusky and a poorly defined, broad, subapical, brown band on mid femur; antenna (Fig. 238) with all funicle segments longer than broad, F1 slightly longer than broad, F6 at least 2X as long as broad, all segments clothed with whorls of long setae, dorsal ones longest and at least about 5X as long as diameter of segments; phallobase (Fig. 237) about 4X as long as broad with two apical hooks on each digitus, aedeagus apically acute, about 7X as long as broad and nearly 0.5X as long as mid tibia. Relative measurements MT 81; AL 37, AW 5.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, PN Corcovado, Est. Sirena, 8°29'N 83°35'W, 0-10m, 19-20.ii.2004 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Alajuela**, Peñas Blancas, 9.v.1987 (E.C. Cruz); 1♀, **Heredia**, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, 28-29.ii.2008 (J.S. Noyes); 1♀, **Cartago**, Turrialba, CATIE, Reventazon, 550m, 4.ix.1996 (L. Masner); 1♀, **Puntarenas**, San Vito, Las Cruces, Wilson Bot. Gdns, 8°46'N 82°57'W, 1300m, 15-16.ii.2006 (J.S. Noyes); 1♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 8°46'N 82°57'W, 1200-1350m, 15-16.ii.2012 (J.S. Noyes); 4♀, 3♂, Puntarenas, Los Charcos de Osa, 8°40'N 83°30'W, 50m, 18-19.ii.2008 (J.S. Noyes); 2♀, Puntarenas, Los Charcos de Osa, 8°40'N 83°30'W, 50m, 15-16.ii.2010 (J.S. Noyes); 1♀, Puntarenas, Golfo Dulce, 24km W Piedras Blancas, 200m, iii-v.1989 (P. Hanson); 1♀, Puntarenas, PN Corcovado, Send. Los Patos/Sirena, LS 509200 275700, 70m, 20.ii.2002 (J. Azofeifa); 1♀, Puntarenas, PN Corcovado, Los Patos, LS 514200 276500, 20.ii.2002 (J. Azofeifa); 2♀, 1♂, same data as holotype; 1♀, Puntarenas, PN Piedras Blancas, Est. El Bonito, 8°43'N 83°13'W, 100m, 13-14.ii.2012 (J.S. Noyes); 1♀, 1♂, **Limón**, PN Cahuita, 5m, 1.iii.1991 (J.S. Noyes); 1♀, Limón, RB Hitoy Cerere, Est. Hitoy Cerere, Send. Toma de Agua, LN 194600 643400, 100-140m, MT, #54013, 11.x-11.xi.1999 (F. Umana); 2♀, 1♂, Limón, RB Hitoy Cerere, 9°40'N 83°02'W, 100m, ii.2004 (J.S. Noyes); 1♀, Limón, Res. Biol. Hitoy Cerere, 9°40'N 83°02'W, 100m, 20-21.ii.2006 (J.S. Noyes); 1♀, Limón, RB Hitoy Cerere, 9°40'N 83°02'W 100m, 22-23.ii.2010 (J.S. Noyes). Holotype in MZUCR, paratypes in MZUCR, CNC and NHMUK.

COMMENTS. Of the Costa Rica species of *Coccidencyrtus,* females of *xylomus* are the most similar to any of the species known from the Palaearctic and adjacent areas because they have a clearly exserted ovipositor and subequal funicle segments that are at least as broad as the pedicel, longer than broad and with prominent linear sensilla. Of these, *xylomus* is most similar to *amathus* (Walker) in having the maxillary palpi 3-segmented and distinctly imbricate-reticulate sculpture on the mesoscutum. Females differ from those of *amathus* in many characters, but most conspicuously having the clava composed of three closely adpressed segments, very uniform imbricate sculpture on the mesoscutum and longitudinally elongate striate-reticulate to striate sculpture on the scutellum. In *amathus* the clava is composed of three clearly separate segments (especially the proximal one which has the appearance of a funicle segment) and the mesoscutum has imbricate-reticulate sculpture only medially and the sculpture on the scutellum is composed of longitudinally elongate, cellular, polygonally reticulate sculpture. The males of the two species have similar differences in sculpture of the mesoscutum and scutellum.

Coccidencyrtus jacintha **sp.nov.**

(Figs 239-243; Hab. ♀ 40)

DIAGNOSIS. *Female* (overall length about 0.7mm): scape dark brown; pedicel mostly brown; flagellum pale brown; coxae white; fore femur and tibia white to yellow; mid femur mostly dark brown; mid tibia pale yellow; hind femur white with apex dark brown; hind tibia mostly dark brown; gaster dark brown, Gt1 medially pale orange, basal sternites white; frontovertex (Fig. 240) about half head width; antenna (Fig. 241) with scape about 2.5X as long as broad, funicle with F1 narrower than pedicel, F1-F2 subequal, small, subquadrate, F3-F6 gradually increasing in size, F6 largest and longer than broad; linear sensilla only on F3-F6; clava about as long as F3-F6 combined and about 4.5X as long as broad; palp formula 3-2; scutellum with 3 pairs of setae and longitudinally elongate polygonally reticulate to striate-reticulate sculpture, deeper than imbricate sculpture of mesoscutum; mid basitarsus with 2 ventral pegs; mid tibial spur slightly longer than basitarsus; fore wing with stigmal vein (Fig. 239) a little longer than postmarginal vein and about as long as marginal vein; hypopygium reaching about 0.7X towards apex of gaster; ovipositor (Fig. 242) about 4X as long as gonostylus and hidden. *Male*: unknown.

Female (holotype): length 0.74mm (CPD).

Head dark brown to black with a weak to moderate metallic lustre; occiput with a weak coppery sheen; frontovertex generally metallic dark green, area between posterior ocelli and occipital

margin coppery; area above scrobes coppery; scrobal area, temple and gena with a coppery sheen; frontovertex, gena and interantennal prominence with a few scattered, very inconspicuous, brown setae; palpi white; radicle mostly pale orange, dorsally and ventrally margined dark brown; scape dark brown, extreme apex pale orange-brown; pedicel brown, venter and extreme apex pale orange; flagellum pale brown; thorax dark brown to black with a metallic lustre; pronotum with a weak coppery sheen; mesoscutum slightly brighter coppery purple; tegula dark purple-brown with a weak coppery sheen; axilla with a weak coppery purple sheen; scutellum with a weak coppery purple sheen, extreme side and apex more shiny; mesopleuron with a moderate coppery purple sheen; fore coxa white; fore femur white in proximal 0.5X, distally pale yellow, tibia pale yellow, tarsus pale yellow; mid coxa white; mid femur white in proximal 0.3X, otherwise dark brown, tibia white to pale yellow, spur and tarsus very pale yellow; hind coxa white; hind femur white in proximal 0.25X, apex dark brown, tibia with extreme base white, extreme apex orange otherwise dark brown, tarsus proximally pale brown, apex pale orange; wings mainly hyaline, but fore wing weakly infuscate immediately below marginal vein (Fig. 239); propodeum dark brown with a weak purple sheen; gaster dorsally dark brown with coppery purple and dark green reflections, Gt1 medially pale orange, side and venter mostly dark brown, but basal sternites white; gonostylus pale orange.

Head (Fig. 240) about 1.9X as wide as frontovertex, in profile about 1.6X as high as deep, tangent to frontovertex forming an angle of about 85° with that of face; occipital margin more or less sharp, not carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 100°; frontovertex not widening in front of anterior ocellus with distinct polygonally reticulate sculpture of mesh size mostly much larger than eye facet, but generally subequal in size in ocellar area and above scrobes, not shallower above top of scrobes; temple and gena with slightly shallower, longitudinally elongate, fine polygonally reticulate sculpture; top of scrobes with distinct, regular, polygonally reticulate sculpture, scrobes with shallow sculpture; interantennal prominence and mouth margin with polygonally reticulate sculpture; scrobes fairly deep, margins rounded, broadly ∩-shaped; interantennal prominence dorsally rounded; antenna as in Fig. 241; scape broadened and flattened, about 2.7X as long as broad; funicle with F1-F2, subequal, relatively small, subquadrate, F3 slightly larger, F4 intermediate between F2 and F3, F5 larger than F3 and slightly longer than broad, F6 largest and clearly longer than broad, linear sensilla present only on F3-F6; clava about 3.5X as long as broad, about 1.2X as wide as F6, not curved downwards, about as long as F3-F6 combined, sutures parallel, sensory area relatively small, at apex only giving it a very narrow, weak, truncate appearance; eye slightly overreaching occipital margin, clothed with dense, conspicuous setae, each slightly longer than diameter of facet; malar sulcus absent; clypeal margin concave, but more or less straight medially; mandible with two acute teeth and a short, rounded, upper tooth; palp formula 3-2. Relative measurements: HW 67, HH 50, FV 35, POL 16.5, OOL 5, OCL 2, AOL 9, EL 35.5, EW 26, MS 19, SL 24, SW 9.

Thorax with pronotum hardly exposed behind head, its posterior margin broadly concave, not angular medially; pronotum with slightly shallower polygonally reticulate sculpture than that in ocellar area; sculpture on mesoscutum similar to that in ocellar area but more regular and of more rounded cells; axilla with similar sculpture to mesoscutum, but finer and much shallower; scutellum dorsally with very fine, polygonally reticulate sculpture that is a much deeper than sculpture on mesoscutum, slightly longitudinally elongate, more strongly so laterally, extreme side and apex completely smooth and shiny; visible part of mesoscutum about 2.0X as broad as long; scutellum about 1.1X as broad as long; hind femur about 4.0X as long as broad; mid basitarsus with 2 ventral pegs; mid tibial spur slightly longer than basitarsus; fore wing with venation and setation as in Figs 239, 243; propodeum medially about 0.06X as long as scutellum. Relative measurements: FWL 74.5, FWW 34.5; HWL 47.5, HWW 11.

Gaster with hypopygium reaching about 0.7X to apex; last tergite about 0.7X as long as mid tibia, with apex broadly rounded; ovipositor hidden. Relative measurements: OL 34, GL 8.5 [MT 44].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, San Gerardo de Dota, El Manantial, 9°34'N 83°48'W, 2250m, 18-20.ii.2010 (J.S. Noyes). Holotype in NHMUK.

COMMENTS. *Coccidencyrtus jacintha* is very close to *fescus*, and apart from the colour of the mid tibia (see key) the two species differ in the relative width of the scape, distribution of linear sensilla on the funicle and the relative length of the clava. In *jacintha* the scape is about 2.5X as long as broad, linear sensilla are present on F3 and the clava is only about as long F3-F6 combined, whereas in *fescus* the scape is about 3.5X as long as broad, linear sensilla are absent from F3 and the clava is about as long as the funicle.

Coccidencyrtus sivan **sp.nov.**

(Figs 244-246; Hab. ♀ 41)

DIAGNOSIS. *Female* (overall length about 0.8mm): scape mostly dark brown; pedicel and funicle pale yellow; clava dusky yellow with darker apex; coxae white; legs otherwise white to pale yellow; gaster dorsally dark brown with a large, median pale orange area; side and venter pale orange; frontovertex about 0.4X head width; antenna (Fig. 246) with scape a little less than 3X as long as broad, funicle with F1 narrower than pedicel, F1-F3 subequal, small, subquadrate, F4-F6 largest and longer than broad; linear sensilla only on F4-F6; clava nearly as long as funicle and about 4.5X as long as broad; palp formula 3-2; scutellum with 3 pairs of setae and longitudinally elongate polygonally reticulate to striate-reticulate sculpture, deeper than polygonally reticulate sculpture of mesoscutum; mid basitarsus with 4 ventral pegs; mid tibial spur slightly longer than basitarsus; fore wing with stigmal vein (Fig. 244) a little longer than postmarginal vein and about as long as marginal vein; hypopygium reaching about 0.6X towards apex of gaster; ovipositor nearly 4X as long as gonostylus and exserted with exserted part a little shorter than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 0.76mm; excluding ovipositor, 0.72mm (CPD).

Head dark brown to black with a weak to moderate metallic lustre; occiput with a weak coppery sheen; frontovertex generally metallic dark green with some coppery areas especially along occipital and inner eye margins and above scrobes; scrobal area, temple and gena with a weak to moderate coppery sheen; frontovertex with a few, inconspicuous, scattered, brown setae; gena and interantennal prominence with a few scattered, very inconspicuous, brown setae; palpi white; radicle dark brown; scape dark brown with apical one-third yellow, pedicel and funicle pale yellow, clava slightly dusky yellow, apical segment slightly darker; thorax dark brown to black with a metallic lustre; pronotum with a moderate coppery sheen; mesoscutum brighter metallic dark green with some coppery beneath pronotum and narrowly coppery purple along posterior margin; tegula dark purple-brown with a weak coppery sheen; axilla with a coppery purple sheen; scutellum dorsally virtually matt, but with a weak coppery sheen, extreme apex weakly shining and slightly brassy, extreme side mostly metallic dark green; mesopleuron with a moderate coppery purple sheen; coxae white, legs otherwise white to pale yellow, tarsi very pale orange, each apical tarsomere slightly dusky; wings virtually completely hyaline but fore wing with a small, very weakly infuscate area adjacent to marginal and stigmal veins (Fig. 244); propodeum dark brown with a weak purple sheen; gaster dorsally mainly dark brown with a pale orange subtriangular area from TI-TIV, area width of gaster on TI and narrowest on TIV, side and venter pale orange; gonostylus dark brown.

Head about 2.4X as wide as frontovertex, in profile about 1.45X as high as deep, tangent to frontovertex forming an angle of about 90° with that of face; occipital margin sharp, not carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 75°; frontovertex not widening in front of anterior ocellus, with distinct, moderately

deep, polygonally reticulate sculpture of mesh size generally subequal to eye facet, not shallower above top of scrobes; temple and gena with slightly shallower, hardly elongate, fine polygonally reticulate sculpture; scrobal area with distinct, fairly regular, polygonally reticulate sculpture; scrobes moderately deep with rounded margins, broadly ∩-shaped; interantennal prominence dorsally rounded; antenna as in Fig. 246; scape broadened and flattened, about 2.7X as long as broad; funicle with F1-F3, subequal, relatively small, subquadrate, F4-F6 largest and clearly longer than broad, linear sensilla present only on F4-F6; clava about 4.5X as long as broad, about 1.2X as wide as F6, not curved downwards, very slightly longer than F2-F6 combined, sutures parallel, sensory area small, at apex only giving it a pointed appearance; eye slightly overreaching occipital margin, clothed with fairly dense, conspicuous setae, each slightly longer than diameter of facet; malar sulcus absent; clypeal margin conspicuously concave, more or less straight medially; mandible with two acute teeth and a shorter, weakly acute, upper tooth; palp formula 3-2. Relative measurements: HW 66, HH 50.5, FV 28, POL 12, OOL 3, OCL 2, AOL 9.5, EL 40, EW 33, MS 19, SL 26, SW 9.5.

Thorax with pronotum hardly exposed behind head, its posterior margin broadly concave, not angular medially; pronotum with similar sculpture to that in ocellar area but generally of slightly smaller cells; sculpture on mesoscutum similar to that on pronotum; axilla with much shallower and finer sculpture than mesoscutum; scutellum dorsally with very fine, polygonally reticulate sculpture that is a much deeper than sculpture on mesoscutum, slightly longitudinally elongate laterally, extreme side and apex completely smooth and shiny; visible part of mesoscutum about 2.1X as broad as long; scutellum about 1.1X as broad as long; hind femur about 3.5X as long as broad; mid basitarsus with 4 ventral pegs; mid tibial spur slightly longer than basitarsus; fore wing with venation and setation as in Figs 244, 245; propodeum medially much less than 0.1X as long as scutellum. Relative measurements: FWL 54.5, FWW 23.5; HWL 37, HWW 8.

Gaster with hypopygium reaching about 0.6X to apex; last tergite about 0.65X as long as mid tibia, with apex broadly rounded; ovipositor exserted, the exserted part about 0.6X as long as mid tibial spur or about 0.17X mid tibia. Relative measurements: OL 47.5, GL 13 [MT 42.5].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, 25.ii.2016 (J.S. Noyes). Holotype in NHMUK.

Coccidencyrtus ochraceipes Gahan
(Figs 247-250; Hab. ♀ 42)

Coccidencyrtus ochraceipes Gahan, 1927b:18. Holotype ♀, USA (New York), USNM, examined.
Coccidencyrtus malloi De Santis, 1964:223-225. Syntypes ♀♂, Argentina. (MLP), not examined.
syn.nov.

DIAGNOSIS *Female* (overall length about 0.9mm): head dark brown to black with a weak to moderate metallic lustre; frontovertex generally coppery, mixed metallic dark green near anterior ocellus; scrobal area, temple and gena with a weak coppery to coppery purple sheen; scape, pedicel and flagellum mostly yellow, clava with apical segments dusky; mesoscutum bright metallic dark green mixed coppery anteriorly and near margins; scutellum dorsally virtually matt, but with a very weak coppery purple sheen, extreme side and apex weakly shining and slightly brassy; all coxae white, legs otherwise pale yellow; gaster mostly pale orange, side and apex

of dorsum dark brown; gonostylus dark brown with apex pale orange; tangent of frontovertex forming an angle of about 105° with that of face; frontovertex about half head width; antenna (Fig. 247) with scape nearly 4X as long as broad, funicle with F1 narrower than pedicel, F1-F3 relatively small, subequal, F4-F6 largest and longer than broad; linear sensilla present only on F4-F6; clava nearly as long as funicle, about 4.5X as long as broad; mandible with two acute teeth and an obtuse upper tooth; palp formula 3-2; scutellum (Fig. 249) with 3 pairs of setae and longitudinally elongate polygonally reticulate to striate-reticulate sculpture, deeper than imbricate sculpture of mesoscutum; mid basitarsus with 5 or 6 ventral pegs; mid tibial spur slightly shorter than basitarsus; fore wing (Fig. 250) with stigmal vein (Fig. 248) longer than postmarginal vein and slightly longer than marginal vein; hypopygium reaching about 0.8X towards apex of gaster; ovipositor a little less than 3.5X as long as gonostylus and slightly exserted with exserted part slightly shorter than mid tibial spur. *Male*: unknown.

DISTRIBUTION. USA (Hawaii, New York, California), Bermuda, Brazil, Argentina, France (greenhouses), Italy, South Africa (see Noyes, 2019). Newly recorded below from Costa Rica and Spain (Canary Islands) (**new records**).

HOSTS. Recorded as a parasitoid of *Diaspis boisduvalii* Signoret (Hemiptera: Diaspididae) on *Cattleya* (Gahan, 1927b) and from *Diaspis bromeliae* (Kerner) on pineapple, *Ananas comosus* (L.) Merr. (Poales: Bromeliaceae) (Prinsloo, 1985). Recorded below from *Aspidiotus nerii* Bouché on banana, *Musa* L. (Zingiberales: Musaceae) (**new record**).

BIOCONTROL. *Coccidencyrtus ochraceipes* was introduced accidentally into a greenhouse in France from Brazil in 1970. The species was tested as a biocontrol agent of *Diaspis boisduvalii* Signoret, *D. bromeliae* (Kerner) *and D. coccois* (Lichtenstein) (Hemiptera: Diaspididae) on bromeliads in greenhouses in south-eastern France. Unfortunately, the tests showed that control was poor, probably as a result of low humidity and poor shade (Panis & Pinet, 2001*).*

MATERIAL EXAMINED.

Type material. Holotype ♀: "0-3-P.3.c. Reared from ♀ Diaspis boisduvalli on Cattleya Grace H. Griswold coll." "USNMENT" "Coccidencyrtus ochraceipes Gahan Type ♀ Type No 29460 U.S" (USNM).

Non type matrerial. **BERMUDA**, 1♀, ex *Diaspis boisduvalii* Sign. on orchids, No 10438 of F. Bennett's list of Nov. 23 1953, ix.1953 (F.D. Bennett). **COSTA RICA**, 1♀, **Heredia**, Santo Domingo. INBio Parque, LN 526250 217400, 1100m, 1-12.iv.2002 (D. Rubí, J.S. Noyes); 1♀, Heredia, Santo Domingo. INBio Parque, 9°59'N 84°06'W, 1100m, 12.ii.2011 (J.S. Noyes); 2♀, Heredia, Santo Domingo. INBio Parque, 9°59'N 84°06'W, 1100m, 14.ii.2015 (J.S. Noyes); 1♀, Heredia, Santo Domingo. INBio Parque, 9°59'N 84°06'W, 1100m, 12.ii.2016 (J.S. Noyes). **SPAIN**, 2♀, **Islas Canarias**, Tenerife, Guia de Isora, Finca Acevedo, ex *Aspidiotus nerii* on banana, No 102 (n 02-09), 7.v.2009. **ITALY**, 1♀, Campania, Portici (NA), ex *Diaspis boisduvalii* on orchid stem. 20.vii.2002 (E. Guerrieri). **SOUTH AFRICA**, 7♀, CP, East London, ex *Diaspis bromeliae* on pineapple, Gt6386, vii.1983 (G. Pettey). Material in NHMUK and MZUCR.

COMMENTS. I have attributed the name *malloi* to De Santis because there is no clear evidence in the original publication that shows that Blanchard was responsible for making the name available in way that satisfies the criteria of availability (ICZN, Article 50). I have not examined the type material of *malloi*, but it is clear from the description and recorded host that it must the same as *ochraceipes* Gahan.

Within Costa Rica the most similar species is *viviana* which also has the legs completely yellow. The two species can be separated on the palp formula, placement of the linear sensilla on the antennal funicle, the sculpture of the scutellum and colour of the gaster. In *ochraceipes* the palp formula is 3-2, linear sensilla are present on F4-F6, the scutellum has distinctly longitudinally elongate strigose to striate-reticulate sculpture and the gaster is mostly yellow, whereas on *viviana* the palp formula is 2-2, linear sensilla are present only on F6, the scutellum has rounded cellular sculpture and the gaster is mostly brown.

***Coccidencyrtus quebrus* sp.nov.**
(Figs 251-253; Hab. ♀ 43)

DIAGNOSIS. *Female* (overall length about 0.9-1.0mm): scape mostly dark brown; pedicel mostly brown; flagellum pale orange, clava dusky pale orange; fore coxa white, mid and hind coxae brown. sometimes partly dusky white; fore and mid femora white with a broad, brown subapical band; fore and mid tibia white with a brown subbasal band; hind femur white with a brown subapical band; hind tibia mostly dark brown; gaster dark brown, Gt1 medially and basal sternites medially pale yellow; frontovertex about half head width; antenna (Fig. 251) with scape about 2.5X as long as broad, funicle with F1 narrower than pedicel, F1-F3 subequal, small, F4-F6 larger, F5-F6 longer than broad; linear sensilla only on F5-F6; clava slightly longer than funicle and nearly 4.5X as long as broad; palp formula 3-2; scutellum with 3 pairs of setae and polygonally reticulate to longitudinally elongate striate-reticulate sculpture, deeper than that on mesoscutum; mid basitarsus with 7 or 8 ventral pegs; mid tibial spur about as long as basitarsus; fore wing with stigmal vein (Fig. 253) about as long as postmarginal vein, but shorter than marginal vein; hypopygium reaching about 0.8X towards apex of gaster; ovipositor nearly 4X as long as gonostylus and slightly exserted, the exserted part shorter than mid tibial spur. *Male*: unknown.

Female **(**holotype**)**: length, including ovipositor, 1.00mm; excluding ovipositor, 0.94mm (CPD).

Head dark brown to black with a metallic sheen; occiput with a weak coppery sheen; frontovertex generally with a coppery sheen, mixed metallic dark green near anterior ocellus; scrobal area, temple and gena with a moderate coppery purple sheen; frontovertex, gena and interantennal prominence with a few scattered, inconspicuous, brown setae; maxillary palpus white; radicle dark brown; scape dark brown in proximal 0.7X, apex white; pedicel brown with apex pale orange; flagellum very pale orange-yellow, clava slightly dusky, pale orange; thorax dark brown to black with a weak metallic lustre; pronotum with a slight coppery sheen; mesoscutum with blue, blue-green, dark green and brassy reflections mixed with some coppery, posterior margin narrowly coppery purple; tegula dark purple-brown with a weak brassy sheen; axilla dark purple-brown with a coppery purple sheen; scutellum dorsally virtually matt with a very weak coppery purple sheen, apex and side slightly silky in appearance with a weak coppery purple and brassy sheen; mesopleuron with a moderate purple sheen; fore coxa white; fore femur white in proximal 0.5X, a broad, dark brown, subapical band, extreme apex pale yellow, tibia white basally, a broad, dark brown subbasal band, apical 0.5X pale orange, tarsus pale orange; mid coxa dark brown, apex very pale yellow; mid femur white in proximal 0.5X, a broad, dark brown, subapical band, extreme apex white, tibia white at extreme base, a narrow, dark brown subbasal band, apical 0.6X very pale yellow to very pale orange, spur very pale orange, tarsus pale orange; hind coxa dark brown; hind femur with proximal 0.3X white, a broad, dark brown, subapical band, extreme apex white, tibia with extreme base white, extreme apex very pale orange, otherwise virtually completely dark brown, tarsus pale orange; wings hyaline, but fore wing with a small, weakly infuscate area below marginal vein (Fig. 253); propodeum dark brown with a weak purple sheen; gaster dark brown with coppery purple, green and blue reflections, Gt1 medially pale yellow, basal sternites medially white; gonostylus brown.

Head about 2.1X as wide as frontovertex, in profile about 1.7X as high as deep, tangent to frontovertex forming an angle of about 110° with that of face; occipital margin sharp, not carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 105°; frontovertex not widening in front of anterior ocellus, with distinct, fairly coarse, polygonally reticulate sculpture of mesh size generally subequal to eye facet, but of larger mesh in front of anterior ocellus, not shallower above top of scrobes; temple and gena with much shallower, hardly elongate, fine polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture, scrobes smooth; interantennal prominence and mouth margin with slightly shallower, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, broadly ∩-shaped; interantennal prominence dorsally narrowly rounded; antenna as in Fig. 251; scape broadened and flattened, about 2.5X as long as broad; funicle with F1-F3 subequal, relatively small, subquadrate, F4-F6 larger, gradually increasing in size, F4 quadrate, F5-F6 longer than broad; clava about 4.4X as long as broad and about 1.5X as wide as F6, not curved

downwards towards apex, slightly longer than funicle, sutures parallel, sensory area small, at apex only giving it a pointed or narrowly rounded appearance; eye slightly overreaching occipital margin, clothed with dense conspicuous setae, each about as long as diameter of facet; malar sulcus present, but very indistinct; clypeal margin clearly concave, virtually straight medially. Relative measurements: HW 63.5, HH 48, FV 30, POL 14.5, OOL 6, OCL 2, AOL 8.5, EL 32.5, EW 26, MS 18, SL 28, SW 11.

Thorax with pronotum hardly exposed behind head, its posterior margin broadly concave, not angular medially; pronotum with similar sculpture to that in ocellar area; mesoscutum with slightly shallower sculpture than in ocellar area, but of generally slightly larger mesh; axilla with finer, shallower sculpture than mesoscutum; scutellum with 3 pairs of setae, dorsally with very fine, polygonally reticulate sculpture that is a little deeper than sculpture on mesoscutum, and of much smaller mesh, sculpture slightly longitudinally elongate towards side, extreme side and apex completely smooth and shiny; visible part of mesoscutum about 1.9X as broad as long; scutellum about 1.1X as broad as long, apex with a pair of slender, elongate setae; hind femur about 3.8X as long as broad; fore wing with venation and setation as in Figs 252, 253; propodeum medially about 0.05X as long as scutellum. Relative measurements: FWL 76, FWW 34; HWL 49, HWW 12.5.

Gaster with hypopygium reaching about 0.8X to apex to apex; last tergite about 0.6X as long as mid tibia, with apex rounded; ovipositor slightly exserted, the exserted part about 0.6X as long as mid tibial spur or about 0.2X as long as mid tibia.

Paratype. Mandible with two acute teeth and a rounded upper tooth; palp formula 3-2; funicle with linear sensilla present only on F4-F6. Relative measurements: OL 53, GL 14 [MT 52].

Variation. Females vary in overall length from 0.85-1.00mm, the mid and hind coxae may be slightly paler than in the holotype, with the ventral surface of the hind coxa dusky white and the hind tarsus may be slightly dusky.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Cerro de la Muerte, Est. Biol. Cuerici, 2600m, xi.1999 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **Heredia**, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/TN, iv.2002 (INBio-OET-ALAS). Holotype in MZUCR, paratype in NHMUK.

Coccidencyrtus fescus sp.nov.
(Figs 254-259)

DIAGNOSIS. *Female* (overall length about 1.1mm): scape mostly dark brown; pedicel brown; funicle yellow; clava pale brown; all coxae white to pale yellow; fore femur white, distally pale brown; fore tibia pale orange with a diffuse, pale brown subbasal band; mid femur white with a subapical brown band; mid tibia white to pale orange with a narrow subbasal brown band; hind femur white with a broad, brown subapical band; hind tibia mostly dark brown; gaster dorsally dark brown, medially and ventrally dusky pale yellow, hypopygium brown; frontovertex about 0.4X head width; antenna (Fig. 254) with scape about 3.5X as long as broad, funicle with F1 narrower than pedicel, F1-F4 relatively small, subequal, F5-F6 largest and longer than broad; linear sensilla present only on F4-F6; clava very nearly as long as funicle, about 3.4X as long as broad; palp formula 3-2; scutellum (Fig. 259) with 3 pairs of setae and longitudinally elongate polygonally reticulate to striate-reticulate sculpture, deeper than that on mesoscutum; mid basitarsus with 6 or 7 ventral pegs; mid tibial spur about as long as basitarsus; fore wing with stigmal vein slightly longer than postmarginal vein but slightly shorter than marginal vein (Fig. 255); hypopygium reaching about 0.8X towards apex of gaster; ovipositor about 3.5X as long as gonostylus and slightly exserted with exserted part slightly shorter than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.14mm; excluding ovipositor, 1.09mm (CPD).

Head dark brown to black with a weak to moderate metallic lustre; occiput with a weak coppery sheen; frontovertex generally metallic dark green mixed coppery, area between posterior ocelli and occipital margin coppery; area above scrobes coppery; scrobal area, temple and gena with a weak coppery to coppery purple sheen; frontovertex with a few, inconspicuous, scattered, brown setae; gena and interantennal prominence with a few scattered, very inconspicuous, brown setae; maxillary palpus white; radicle dark brown; scape mostly dark brown, apical 0.25X pale yellow; pedicel brown; funicle yellow, clava pale brown with proximal segment more or less yellow-brown; thorax dark brown to black with a metallic lustre; pronotum with a weak coppery sheen; mesoscutum slightly brighter metallic dark blue-green mixed coppery especially near margins; tegula dark purple-brown with a weak sheen; axilla with a weak coppery purple sheen; scutellum dorsally virtually matt, but with a very weak coppery purple sheen, extreme side and apex weakly shining and slightly brassy; mesopleuron with a moderate purple sheen; fore coxa white; fore femur white in proximal 0.5X, distally orange-brown to pale brown, tibia basically pale orange with a broad, diffuse, subbasal pale brown ring in proximal 0.6X, tarsus pale orange, apical tarsomere pale orange-brown; mid coxa very pale yellow; mid femur white in proximal 0.5X, a broad, dark brown, subapical band in distal 0.5X, extreme apex white, tibia white to pale orange with a narrow, subbasal dark, brown band, spur and tarsus very pale orange; hind coxa very pale yellow, slightly dusky proximally; hind femur white in proximal 0.5X, a broad, dark brown, subapical band in distal 0.5X, extreme apex white, tibia with extreme base white, dark brown to about 0.8X, apex pale orange, tarsus slightly dusky pale orange, apical tarsomere pale brown; wings mainly hyaline, but fore wing weakly infuscate immediately below marginal vein (Fig. 255); propodeum dark brown with a weak purple sheen; gaster dorsally purple-brown with coppery purple and green reflections, Gt1-Gt2 medially dusky, pale yellow, side and venter mostly dark brown, but basal sternites dusky, pale yellow; gonostylus dark brown.

Head (Fig. 257) about 2.4X as wide as frontovertex, in profile about 1.4X as high as deep, tangent to frontovertex forming an angle of about 105° with that of face; occipital margin more or less sharp, not carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 90°; frontovertex not widening in front of anterior ocellus with distinct polygonally reticulate sculpture of mesh size generally a little smaller than eye facet, not shallower above top of scrobes; temple and gena with slightly shallower, longitudinally elongate, fine polygonally reticulate sculpture; top of scrobes with distinct, regular, polygonally reticulate sculpture, scrobes smooth; interantennal prominence and mouth margin with slightly shallower, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, broadly ∩-shaped; interantennal prominence dorsally rounded; antenna as in Fig. 257; scape very slightly broadened and flattened, about 3.4X as long as broad; funicle with F1-F4, subequal, relatively small, subquadrate, F5-F6 largest and clearly longer than broad, linear sensilla present only on F4-F6; clava about 3.4X as long as broad, about 1.6X as wide as F6, not curved downwards, very nearly as long as funicle, sutures parallel, sensory area relatively small, at apex only giving it a weak, obliquely truncate appearance; eye slightly overreaching occipital margin, clothed with dense, conspicuous setae, each slightly longer than diameter of facet; malar sulcus present, but shallow and indistinct; clypeal margin concave, but more or less straight medially; mandible with two acute teeth and obtuse upper tooth; palp formula 3-2. Relative measurements: HW 60.5, HH 44, FV 25, POL 12, OOL 3, OCL 2.5, AOL 8, EL 33, EW 28, MS 16.5, SL 24, SW 7.

Thorax (Fig. 259) with pronotum hardly exposed behind head, its posterior margin broadly concave, not angular medially; pronotum with slightly coarser and deeper polygonally reticulate sculpture than that in ocellar area; sculpture on mesoscutum similar but less coarse and clearly shallower; axilla with similar sculpture to mesoscutum; scutellum dorsally with very fine, polygonally reticulate sculpture that is a much deeper than sculpture on mesoscutum, slightly longitudinally elongate laterally, extreme side and apex completely smooth and shiny; visible part of mesoscutum about 1.6X as broad as long; scutellum about 1.1X as broad as long, apex with a pair of slender, elongate setae; hind femur about 4.2X as long as broad; mid basitarsus with 6 or 7 ventral pegs; mid tibial spur about as long as basitarsus; fore wing with venation and setation as in Figs 255, 256; propodeum (Fig. 259) medially about 0.11X as long as scutellum. Relative measurements: FWL 81, FWW 37; HWL 52.5, HWW 13.

Gaster with hypopygium (Fig. 258) reaching about 0.8X to apex; last tergite about 0.7X as long as mid tibia, with apex broadly rounded; ovipositor exserted, the exserted part about 0.6X as long as mid tibial spur or about 0.2X mid tibia. Relative measurements: OL 57, GL 16 [MT 53].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Cartago**, PN Tapanti, 1200-1500m, 9°45'N 83°47'W, 20.iii-10.iv.2000 (C. Hansson, D. Rubí). Holotype in NHMUK.

COMMENTS. See comments under *jacintha* (p. 109).

Coccidencyrtus tristeryx sp.nov.
(Figs 260-263)

DIAGNOSIS. *Female* (overall length about 0.9mm): scape mostly dark brown; pedicel and flagellum brown all coxae white, legs otherwise mostly brown; gaster dorsally mostly dark brown, Gt1 medially and venter pale orange; frontovertex about half head width; antenna (Fig. 261) with scape about 3.5X as long as broad, funicle with F1 narrower than pedicel, F1 and F3 subequal, small, F2 larger, F4-F6 largest, longer than broad; linear sensilla present on F2 and F4-F6; clava about as long as F3-F6 combined and about 3.3X as long as broad; palp formula 3-2; scutellum (Fig. 260) with 3 pairs of setae and longitudinally elongate polygonally reticulate to striate-reticulate sculpture, deeper than imbricate sculpture on mesoscutum; mid basitarsus with 4-6 ventral pegs; mid tibial spur about as long as basitarsus; fore wing with stigmal vein (Fig. 262) slightly longer than postmarginal vein but very slightly shorter than marginal vein; hypopygium reaching about 0.7X towards apex of gaster; ovipositor nearly 3.5X as long as gonostylus and slightly exserted with exserted part clearly shorter than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 0.88mm; excluding ovipositor, 0.85mm (CPD).

Head dark brown to black with a moderate metallic lustre; occiput with a weak coppery sheen; frontovertex generally coppery, mixed metallic dark green level with, and in front of, anterior ocellus; scrobal area, temple and gena with a coppery to coppery purple sheen; frontovertex with a few, inconspicuous, scattered, brown setae; gena and interantennal prominence with a few scattered, very inconspicuous, brown setae; maxillary palpus white; radicle dark brown; scape dark brown, slightly paler towards apex; pedicel and flagellum brown; thorax dark brown to black with a metallic lustre; pronotum with a weak coppery sheen; mesoscutum brighter metallic dark green mixed coppery especially anteriorly and near margins; tegula dark purple-brown with a weak sheen; axilla with a coppery purple sheen; scutellum dorsally with a weak coppery sheen, apex and side weakly metallic dark green and slightly brassy; mesopleuron with a moderate purple sheen; fore coxa white; fore femur, tibia and tarsus brown; mid coxa white; mid femur and tibia mainly brown, proximal 0.4X of femur and knee white, spur very pale orange, tarsus slightly dusky, pale orange; hind coxa white; hind femur and tibia mainly brown, proximal 0.4X of femur and knee white, tarsus brown; wings hyaline, fore wing very weakly infuscate immediately below marginal vein (Fig. 262); propodeum dark brown with a weak purple sheen; gaster mainly dorsally brown with Gt1 medially mixed pale orange, venter pale orange; gonostylus brown.

Head about 2.1X as wide as frontovertex, in profile about 1.6X as high as deep, tangent to frontovertex forming an angle of about 105° with that of face; occipital margin sharp, weakly carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 95°; frontovertex not widening in front of anterior ocellus, with distinct, polygonally reticulate sculpture of mesh size generally subequal to eye facet, clearly larger immediately

in front of anterior ocellus, not shallower above top of scrobes; temple and gena with slightly shallower, hardly elongate, fine polygonally reticulate sculpture; top of scrobes with distinct, regular, polygonally reticulate sculpture, scrobes smooth; interantennal prominence and mouth margin with slightly shallower, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, broadly ∩-shaped; interantennal prominence dorsally rounded; antenna as in Fig. 261; scape very slightly broadened and flattened, about 3.4X as long as broad; funicle with F1 and F3, subequal, relatively small, subquadrate, F2 larger, slightly longer then broad, F4-F6 largest, subequal, clearly longer than broad, linear sensilla present on F2 and F4-F6; clava slightly collapsed, but about 3.3X as long as broad and about 1.5X as wide as F6, not curved downwards, about as long as F3-F6 combined, sutures parallel, sensory area small, at apex only giving it a pointed or narrowly rounded appearance; eye slightly overreaching occipital margin, clothed with dense, conspicuous setae, each slightly longer than diameter of facet; malar sulcus present, distinct; clypeal margin conspicuously concave, but slightly produced medially; mandible with one tooth and a broad, concave truncation, more or less appearing tridentate; palp formula 3-2. Relative measurements: HW 55, HH 42, FV 26, POL 11, OOL 4, OCL 2.5, AOL 7, EL 28, EW 22.5, MS 17, SL 24, SW 7.

Thorax (Fig. 260) with pronotum hardly exposed behind head, its posterior margin broadly concave, not angular medially; pronotum with similar sculpture to that in ocellar area; sculpture on mesoscutum similar, but very slightly shallower; axilla with similar sculpture to mesoscutum; scutellum dorsally with very fine, polygonally reticulate sculpture that is a much deeper than sculpture on mesoscutum, slightly longitudinally elongate laterally, extreme side and apex completely smooth and shiny; visible part of mesoscutum about 1.8X as broad as long; scutellum about 1.2X as broad as long, apex with a pair of slender, elongate setae; hind femur about 4.3X as long as broad; fore wing with venation and setation as in Figs 262, 263; propodeum (Fig. 260) medially about 0.08X as long as scutellum. Relative measurements: FWL 86.5, FWW 40.5; HWL 55, HWW 13.5.

Gaster with hypopygium reaching about 0.7X to apex; last tergite about 0.7X as long as mid tibia, with apex broadly rounded; ovipositor slightly exserted, the exserted part about 0.3X as long as mid tibial spur or about 0.1X mid tibia. Relative measurements: OL 56, GL 17 [MT 55].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/NOTN, iv.2002 (INBio-OET-ALAS). Holotype in NHMUK.

Coccidencyrtus matias sp.nov.

(Figs 264-268; Hab. ♀ 44)

DIAGNOSIS. *Female* (length about 0.8-0.9mm): scape largely brown; pedicel largely dark brown; flagellum pale orange-brown; fore and mid coxae white, hind coxa pale orange; fore femur and tibia white to pale orange; mid femur with a brown subapical band; mid and hind tibiae white, each with a narrow, subbasal brown band; gaster largely dark brown, but Gt1 medially and most of venter pale orange, hypopygium pale orange; frontovertex slightly less than half head width; antenna (Figs 264, 265) with scape about 3.1X as long as wide, pedicel wider than F1; funicle with first 2 or 3 segments, small and usually subequal, remaining segments conspicuously larger and increasing in size towards apex, linear sensilla on F3-F6 (Fig. 265) or absent from F3 (Fig. 264) ; antenna with clava about as long as F3-F6 combined and about 3X as long as broad; palp formula 3-2; scutellum (Fig. 268) with 3 pairs of setae and fine, polygonally reticulate sculpture that is clearly deeper than that on mesoscutum, becoming more longitudinally elongate laterally;

mid basitarsus with 4 ventral pegs; mid tibial spur slightly longer than basitarsus; fore wing with stigmal vein (Fig. 266) slightly longer than postmarginal vein but slightly shorter than marginal vein; hypopygium reaching about 0.8X towards apex of gaster; ovipositor a little more than 3X as long as gonostylus, exserted part a little longer than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 0.91mm; excluding ovipositor, 0.77mm (CPD).

Head dark brown to black with a weak to moderate metallic lustre; occiput with a weak coppery sheen; frontovertex near occipital margin with a weak coppery sheen, area around anterior ocellus relatively bright, metallic dark green, area above scrobes slightly coppery; scrobal area, temple and gena relatively dull with a slight coppery purple sheen; frontovertex, gena and interantennal prominence with a few scattered, very inconspicuous, brown setae; maxillary palpus white; radicle dark brown; scape largely brown, pale orange towards apex; pedicel dark brown dorsally, ventrally pale orange; funicle and clava pale orange-brown; thorax dark brown to black with a weak metallic lustre; pronotum and mesoscutum with a weak coppery and brassy sheen; tegula dark purple brown with a weak brassy sheen; axilla with a weak coppery purple sheen; scutellum less shiny than mesoscutum, but with a very weak coppery purple sheen, extreme side and apex more shiny and slightly brassy; mesopleuron with a moderate purplish sheen; fore coxa white; fore femur white, tibia and tarsus very pale orange; mid coxa white; mid femur white with a slightly oblique, dark brown, subapical band, tibia white proximally to very pale orange distally, with a very narrow, dark brown, subbasal band, spur and tarsus pale orange; hind coxa very pale orange; hind femur white in proximal 0.5X with a broad, subapical, brown band, extreme apex white, tibia white at base with a dark brown subbasal band to about 0.33X, apex very pale orange, tarsus pale orange; wings hyaline, fore wing with a very small, weakly infuscate area immediately below marginal vein; propodeum dark brown with a weak brassy and purple sheen; gaster dark brown dorsally with brassy, purple, blue, green and coppery reflections, Gt1 medially pale orange, venter of gaster pale orange with apex of outer plate of ovipositor dark brown; gonostylus mostly brown, but proximally and distally mixed pale orange.

Head about 2.2X as wide as frontovertex, in profile about 1.5X as high as deep, tangent to frontovertex forming an angle of about 100° with that of face; occipital margin sharp, not carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 90°; frontovertex widening in front of anterior ocellus, with moderately deep, polygonally reticulate sculpture of mesh size subequal to eye facet; temple and gena with relatively shallow, slightly longitudinally elongate, fine, polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture; interantennal prominence and mouth margin with shallow, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, broadly ∩-shaped; interantennal prominence dorsally rounded; antenna as in Fig. 264; scape broadened and flattened, about 3.1X as long as broad; funicle with F1 and F2 smallest, subequal, F3-F6 conspicuously larger, gradually increasing in length and width distad so that F6 is about 2X as long and 1.5X as wide as F3; clava slender, slightly upturned at apex, about 3.8X as long as broad, about 1.2X as wide as F6, and about as long as F4-F6 combined, sutures parallel, sensory area small, at apex only giving it a pointed appearance; eye slightly overreaching occipital margin, clothed with conspicuous setae, each about as long as diameter of facet; malar sulcus present, distinct; clypeal margin evenly very slightly concave. Relative measurements: HW 47, HH 37, FV 21, POL 9, OOL 3, OCL 3, AOL 6.5, EL 25, EW 22, MS 13, SL 18.5, SW 6.

Thorax (Fig. 268) with pronotum hardly exposed behind head, its posterior margin broadly concave, not angular medially; pronotum and mesoscutum with polygonally reticulate sculpture that is similar to that in ocellar area; axilla with transversely elongate reticulate sculpture that is shallower than that on mesoscutum; scutellum dorsally with fine, polygonally reticulate sculpture that is clearly deeper than that on mesoscutum, sculpture much more longitudinally elongate laterally, extreme side and apex completely smooth and shiny; visible part of mesoscutum about 1.9X as broad as long; scutellum about 1.2X as broad as long and with 3 pairs of setae; mid tibial spur slightly longer than basitarsus; hind femur about 3.5X as long as broad; mid basitarsus with 4 ventral pegs; mid tibial spur slightly longer than basitarsus; fore wing with venation and setation as in Figs 266, 267, stigmal vein (Fig. 266) slightly longer than postmarginal vein but slightly shorter than marginal vein; propodeum (Fig. 268) medially about 0.08X as long as scutellum.

Relative measurements: FWL 53.5, FWW 23.5; HWL 35, HWW 8.

Gaster with hypopygium reaching about 0.8X towards apex; last tergite about 0.8X as long as mid tibia, with apex more or less acute; ovipositor exserted, the exserted part about 1.4X as long as mid tibial spur or about 0.4X mid tibia.

Paratype**.** Mandible with 3 teeth, lowest acute, middle and upper rounded; palp formula 3-2; funicle with linear sensilla present only on F4-F6. Relative measurements: OL 58, GL 19 [MT 35].

Variation. Females vary in overall length from 0.82-0.91mm, the head varies from about 2.2-2.4X as wide as the frontovertex. In both specimens excluded from the paratypes F4 is subequal to F3 (Fig, 264) and in one specimen (P.N. Tapanti) the mid and hind coxae are dusky, the hind femur is mostly brown, the dorsum of the gaster is entirely brown and the tangent to the frontovertex forms an angle of about 80° with the face, but in this specimen the head is somewhat dorsally collapsed.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, San Vito, Las Cruces, Wilson Bot. Gdns, 8°46'N 82°57'W, 1300m, 15-16.ii.2006 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Puntarenas**, Las Cruces, MT/YPT, 18-22.iii.1990 (J.S. Noyes). Holotype in MZUCR, paratype in NHMUK.

Non type material. **COSTA RICA**, 1♀, **Alajuela**, PN Volcán Tenorio, Est. Pilón, 700m, 10°43'N 84°59'W, 13-17.ii.2004 (C. Hansson); 1♀, **Cartago**, Paraiso, PN Tapanti, 1200-1600m, iv.1999 (C. Hansson). Material in NHMUK.

Coccidencyrtus harpales **sp.nov.**

(Figs 269-274; Hab. ♀ 45)

DIAGNOSIS. *Female* (overall length about 0.6-0.9mm): scape dark brown; pedicel brown; funicle dusky yellow; clava pale brown; fore coxa white, mid coxa pale yellow, hind coxa brown; fore femur and tibia very pale yellow; mid femur very pale yellow with a subapical brown band; mid tibia white with a subbasal brown band; hind femur and tibia largely brown; gaster dorsally dark brown, medially and ventrally pale orange; frontovertex about half head width; antenna (Figs 271, 273) with scape about 3X as long as broad, funicle with F1 narrower than pedicel and subquadrate, F2-F3 slightly larger and slightly longer than broad, F4-F5 larger and slightly longer than broad, F6 largest and longer than broad; linear sensilla present on all funicle segments, sometimes absent from F1; clava about as long as F3-F6 combined, about 4X as long as broad; palp formula 3-2; scutellum (Fig. 274) with 3 pairs of setae and longitudinally elongate polygonally reticulate to striate-reticulate sculpture, deeper than that on mesoscutum; mid basitarsus with 5 ventral pegs; mid tibial spur about as long as basitarsus; fore wing (Fig. 269) with stigmal vein slightly longer than postmarginal vein and about as long as marginal vein; hypopygium reaching about 0.6X towards apex of gaster; ovipositor nearly 4X as long as gonostylus and slightly exserted with exserted part much shorter than mid tibial spur. *Male*: unknown.

Female **(**holotype**)**: length, including ovipositor, 0.84mm; excluding ovipositor, 0.80mm (CPD).

Head dark brown to black with a weak to moderate metallic lustre; occiput with a weak brassy sheen; frontovertex generally metallic dark green mixed coppery, area between posterior ocelli and occipital margin coppery; area above scrobes coppery; scrobal area, temple and gena with a weak brassy and coppery purple sheen; frontovertex with a few, inconspicuous, scattered, brown setae; gena and interantennal prominence with a few scattered, very inconspicuous, brown setae; maxillary palpus white; radicle dark brown; scape brown; pedicel brown; funicle slightly dusky yellow; clava pale brown; thorax dark brown to black with a metallic lustre; pronotum with a weak coppery purple and brassy sheen; mesoscutum relatively bright metallic dark green mixed

coppery especially near margins and in anterior half; tegula dark purple-brown with a weak brassy sheen; axilla with a weak coppery purple and brassy sheen; scutellum dorsally virtually matt, but with a very weak coppery purple sheen, extreme side and apex weakly shining and slightly brassy; mesopleuron with a moderate purple sheen; fore coxa white; fore femur and tibia very pale yellow, tarsus slightly dusky, pale orange; mid coxa very pale yellow, mixed brownish externally; mid femur very pale yellow in proximal 0.3X, a broad, dark brown subapical band, extreme apex white, tibia white to pale orange with a subbasal dark, brown band to 0.3X, spur and tarsus very pale orange; hind coxa brown; hind femur with proximal 0.4X white, extreme apex white, remainder brown, tibia white at extreme base, brown to about 0.7X, apex pale orange, tarsus slightly dusky, pale orange; wings mainly hyaline, but fore wing (Fig. 269) with a small, pale fuscous patch below the marginal and stigmal veins; propodeum dark brown with a weak purple sheen; gaster dorsally purple-brown with coppery purple and green reflections, basal tergites medially very slightly paler, side and venter pale orange, apex of outer plate of ovipositor brown; gonostylus pale brown.

Head about 2.1X as wide as frontovertex, in profile about 1.6X as high as deep, tangent to frontovertex forming an angle of about 100° with that of face; occipital margin more or less sharp, not carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 90°; frontovertex clearly widening in front of anterior ocellus, with distinct polygonally reticulate sculpture of mesh size subequal to or conspicuously larger than eye facet, not shallower above top of scrobes; temple and gena with relatively shallow, longitudinally elongate, fine polygonally reticulate sculpture; top of scrobes with distinct, regular, polygonally reticulate sculpture; interantennal prominence and mouth margin with slightly shallower, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, broadly ∩-shaped; interantennal prominence dorsally rounded; antenna as in Fig. 271; scape very slightly broadened and flattened, about 3X as long as broad; funicle with F1 relatively small, subquadrate, F2-F3 a little larger, subequal and clearly a little longer than broad and subequal, F4-F5 slightly larger, subequal and a little longer than broad, F6 largest and clearly longer than broad, linear sensilla present on F2-F6; clava moderately slender, about 4X as long as broad, about 1.2X as wide as F6, not downcurved ventrally, about as long as F3-F6 combined, sutures parallel, sensory area relatively small, at apex only giving it a weak, obliquely truncate appearance; eye slightly overreaching occipital margin, clothed with dense, conspicuous setae, each about as long as diameter of facet; malar sulcus present, but very shallow and indistinct; clypeal margin evenly very slightly concave; mandible (Fig. 272) with three teeth, upper tooth rounded; palp formula 3-2. Relative measurements: HW 50, HH 37, FV 24, POL 11, OOL 2.5, OCL 2, AOL 6.5, EL 25.5, EW 22, MS 14.5, SL 18, SW 6.

Thorax (Fig. 274) with pronotum hardly exposed behind head, its posterior margin broadly concave, not angular medially; pronotum and mesoscutum with polygonally reticulate sculpture that is about as deep as that in ocellar area, and of similar mesh; axilla with similar sculpture to mesoscutum but clearly shallower; scutellum dorsally with very fine, slightly longitudinally elongate, polygonally reticulate sculpture that is a little deeper than sculpture on mesoscutum, extreme side and apex completely smooth and shiny; visible part of mesoscutum about 1.8X as broad as long; scutellum about 1.2X as broad as long, apex with a pair of slender, elongate setae; hind femur about 3.3X as long as broad; mid basitarsus with 5 ventral pegs; mid tibial spur about as long as basitarsus; fore wing with venation and setation as in Fig. 269; propodeum medially about 0.06X as long as scutellum. Relative measurements: FWL 56.5, FWW 26; HWL 37.5, HWW 9.

Gaster with hypopygium (Fig. 270) reaching about 0.6X to apex; last tergite about 0.7X as long as mid tibia, with apex rounded; ovipositor exserted, the exserted part about 0.4X as long as mid tibial spur or about 0.1X mid tibia. Relative measurements: OL 46, GL 12.5 [MT 47].

Variation. Females vary in overall length from 0.64-0.87mm, the legs may be slightly paler than in holotype with brown markings slightly less extensive, the mid coxa may be completely pale yellow, the hind coxa may be only partially brown, Gt1 may be pale orange medially and the fore wing varies between 2.17-2.30X as long as broad.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Est. Biol. Monteverde, 1540m, 10°20'N 84°49'W, 18-24.ii.2004 (C. Hansson). Paratypes: **COSTA RICA**, 1♀, **Puntarenas**, Monteverde Res. 1500m, ii.1980 (W. Mason); 6♀, Puntarenas, Est. Biol. Monteverde, 10°19'N 84°49'W, 1540-1890m, 25-26.ii.2007 (J.S. Noyes); 5♀, Puntarenas, San Vito, Est. Las Alturas, 8°57'N 82°50'W, 1500-2000m, 17-18.ii.2012 (J.S. Noyes); 3♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 8°46'N 82°57'W, 1200-1350m, 19.ii.2015 (J.S. Noyes). Holotype in MZUCR, paratypes in NHMUK and CNC.

COMMENTS. *Coccidencyrtus harpales* is very similar to *thuryus* and apart from the characters given in the key differs in the colour of the hind tibia, the distribution of the linear sensilla on the funicle and the relative length of the clava. In *harpales* the hind tibia is largely brown without a distinct subbasal brown band, linear sensilla are present on all funicle segments, except sometimes F1 and the clava is about as long as F3-F6 combined, whereas in *thuryus* the hind tibia is mostly pale yellow with a weak subbasal brown band, linear sensilla are absent from F1 and F3 and the clava is very nearly as long as the funicle.

Coccidencyrtus solivus **sp.nov.**

(Figs 275-280; Hab. ♀ 46)

DIAGNOSIS. *Female* (overall length about 0.8mm): scape mostly dark brown; pedicel and flagellum pale yellow; all coxae white; fore femur and tibia white to very pale yellow; mid femur white with a subapical brown band; mid tibia white to pale orange with a narrow subbasal brown band; hind femur white with a brown subapical band; hind tibia white with a narrow subbasal brown band; gaster dorsally dark brown, medially and ventrally pale orange, hypopygium brown; frontovertex slightly less than half head width; antenna (Fig. 275) with scape about 2.5X as long as broad, funicle with F1 narrower than pedicel, F1-F6 relatively small, F6 largest and subquadrate; linear sensilla present on F4-F6 or missing from F5; clava very slightly longer than funicle, about 3X as long as broad; palp formula 3-2; scutellum (Fig. 279) with 3 pairs of setae and longitudinally elongate polygonally reticulate to striate-reticulate sculpture, deeper than that on mesoscutum; mid basitarsus with 3 or 4 ventral pegs; mid tibial spur about as long as basitarsus; fore wing with stigmal vein slightly longer than postmarginal vein but shorter than marginal vein (Fig. 276); hypopygium reaching about 0.7X towards apex of gaster; ovipositor about 4X as long as gonostylus and slightly exserted with exserted part slightly shorter than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 0.79mm; excluding ovipositor, 0.73mm (CPD).

Head dark brown to black with a weak to moderate metallic lustre; occiput with a weak brassy sheen; frontovertex generally metallic dark green mixed coppery, area between posterior ocelli and occipital margin coppery; area above scrobes coppery; scrobal area, temple and gena with a weak coppery sheen, interantennal prominence coppery purple; frontovertex with a few, inconspicuous, scattered, brown setae; gena and interantennal prominence with a few scattered, very inconspicuous, brown setae; maxillary palpus white; radicle orange-brown to dark brown; scape mostly dark brown, apical 0.3X pale yellow; pedicel and flagellum pale yellow, clava slightly dusky; thorax dark brown to black with a metallic lustre; pronotum with a weak coppery sheen; mesoscutum relatively bright metallic dark green mixed coppery especially near margins and in posterior half; tegula dark purple-brown with a weak brassy sheen; axilla with a weak coppery purple and brassy sheen; scutellum dorsally virtually matt, but with a very weak coppery purple sheen, extreme side and apex weakly shining and slightly brassy; mesopleuron with a moderate purple sheen; all coxae white, hind coxa slightly dusky proximally; fore femur and tibia white to very pale yellow, tarsus slightly dusky, pale orange; mid femur white with a narrow, incomplete, dark brown subapical band, tibia white to pale orange with a narrow, subbasal dark, brown band, spur and tarsus very pale orange, apical tarsomere slightly dusky; hind femur white

with a slightly oblique, narrow, brown, subapical band, tibia white with a narrow, brown, subbasal band, tarsus very pale yellow, apical tarsomere slightly dusky; wings mainly hyaline, but fore wing with a small, very faint, pale fuscous patch below the marginal and stigmal veins(Fig. 276); propodeum dark brown with a weak purple sheen; gaster dorsally purple-brown with coppery purple and green reflections, Gt1-Gt3 medially pale yellow, side and venter mostly dark brown, but basal sternites pale yellow; gonostylus dark brown.

Head (Fig. 277) about 2.3X as wide as frontovertex, in profile about 1.6X as high as deep, tangent to frontovertex forming an angle of about 105° with that of face; occipital margin more or less sharp, not carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 95°; frontovertex not widening in front of anterior ocellus, with distinct polygonally reticulate sculpture of mesh size subequal to, or a little smaller, than eye facet, not shallower above top of scrobes; temple and gena with slightly shallower, longitudinally elongate, fine polygonally reticulate sculpture; top of scrobes with distinct, regular, polygonally reticulate sculpture; interantennal prominence and mouth margin with slightly shallower, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, broadly ∩-shaped; interantennal prominence dorsally rounded; antenna as in Fig. 275; scape very slightly broadened and flattened, about 2.7X as long as broad; funicle with F1-F5, relatively small, F6 largest and quadrate or very slightly longer than broad; linear sensilla present on F4-F6 or missing from F5; clava moderately slender, about 3.2X as long as broad, about 1.5X as wide as F6, not downcurved ventrally, very slightly longer than funicle, sutures parallel, sensory area relatively small, at apex only; eye slightly overreaching occipital margin, clothed with dense, conspicuous setae, each slightly longer than diameter of facet; malar sulcus absent; clypeal margin evenly quite strongly concave; mandible with two acute teeth and an upper obtuse tooth; palp formula 3-2. Relative measurements: HW 45, HH 34.5, FV 20, POL 10, OOL 2.5, OCL 1, AOL 7, EL 27, EW 22.5, MS 12.5, SL 16, SW 6.

Thorax (Fig. 279) with pronotum hardly exposed behind head, its posterior margin broadly concave, not angular medially; pronotum and mesoscutum with polygonally reticulate sculpture that is about as deep as that in ocellar area, and of similar mesh; axilla with similar sculpture to mesoscutum but clearly shallower; scutellum dorsally with very fine, slightly longitudinally elongate, polygonally reticulate sculpture that is a little deeper than sculpture on mesoscutum, extreme side and apex completely smooth and shiny; visible part of mesoscutum about 1.8X as broad as long; scutellum about 1.3X as broad as long, apex with a pair of slender, elongate setae; hind femur about 3.5X as long as broad; fore wing with venation and setation as in Figs 276, 278; propodeum (Fig. 279) medially about 0.05X as long as scutellum. Relative measurements: FWL 101.5, FWW 41; HWL 69, HWW 14.5.

Gaster with hypopygium reaching about 0.7X to apex; last tergite about 0.7X as long as mid tibia, with apex broadly rounded; hypopygium Fig 280; ovipositor exserted, the exserted part about 0.8X as long as mid tibial spur or about 0.25X mid tibia. Relative measurements: OL 86, GL 22 [MT 75].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Guanacaste NP (error for Santa Rosa NP), near HQ, MT/YPT, 2-10.iii.1990 (J.S. Noyes). Holotype in NHMUK.

Coccidencyrtus thuryus sp.nov.

(Figs 281-286; Hab. ♀ 47)

DIAGNOSIS. *Female* (overall length about 0.6-0.9mm): scape largely dark brown; pedicel and funicle yellow, clava pale brown; all coxae white or very pale yellow, hind coxa may be partially brown; fore femur and tibia very pale yellow; mid and hind femora pale yellow with a dark

brown subapical band; mid tibia pale yellow with a dark brown subbasal band; hind tibia pale yellow with a weak subbasal brown band; gaster dorsally dark brown, medially and ventrally pale orange; frontovertex about half head width; antenna (Fig. 282) with scape about 3-3.5X as long as broad, funicle with F1 narrower than pedicel, funicle with F1-F3 subquadrate, F4-6 larger and slightly longer than broad; linear sensilla present on F2, and F4-F6; clava very nearly as long as funicle, about 4X as long as broad; palp formula 3-2; scutellum (Fig. 286) with 3 pairs of setae and longitudinally elongate polygonally reticulate to striate-reticulate sculpture, deeper than that on mesoscutum; mid basitarsus with 5-6 ventral pegs; mid tibial spur about as long as basitarsus; fore wing with stigmal vein slightly longer than postmarginal vein and about as long as marginal vein(Fig. 283); hypopygium reaching about 0.6X towards apex of gaster; ovipositor, about 3.5-4X as long as gonostylus and slightly exserted with exserted part a little shorter than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 0.73mm; excluding ovipositor, 0.68mm (CPD).

Head dark brown to black with a weak to moderate metallic lustre; occiput with a weak brassy sheen; frontovertex generally metallic dark green mixed coppery, area between posterior ocelli and occipital margin coppery; area above scrobes coppery; scrobal area, temple and gena with a weak brassy and coppery purple sheen; frontovertex with a few, inconspicuous, scattered, brown setae; gena and interantennal prominence with a few scattered, very inconspicuous, brown setae; maxillary palpus white; radicle dark brown; scape dark brown with extreme apex yellow; pedicel and funicle yellow; clava pale brown; thorax dark brown to black with a metallic lustre; pronotum with a weak coppery purple and brassy sheen; mesoscutum relatively bright metallic dark green mixed coppery near margins and in anterior half; tegula dark purple-brown with a weak brassy sheen; axilla with a weak coppery purple and brassy sheen; scutellum dorsally virtually matt, but with a very weak coppery purple sheen, extreme side and apex weakly shining and slightly brassy; mesopleuron with a moderate purple sheen; all coxae very pale yellow; fore femur and tibia very pale yellow, tarsus slightly dusky, pale orange; mid femur very pale yellow in proximal 0.5X, a broad, dark brown subapical band, extreme apex white, tibia white to very pale yellow with a narrow, subbasal dark, brown band, spur and tarsus very pale orange; hind femur with proximal 0.6X very pale yellow, extreme apex white and a pale brown, slightly diagonal, subapical band, tibia pale yellow with a diffuse, narrow, pale brown, subbasal band, tarsus slightly dusky, pale orange; wings mainly hyaline, but fore wing with a small, pale fuscous patch below the marginal and stigmal veins (Fig. 283); propodeum dark brown with a weak purple sheen; gaster dorsally dark purple-brown on side, medially pale orange, median area a little dusky posteriorly, side and venter pale orange; gonostylus pale brown.

Head (Fig. 281) about 2.3X as wide as frontovertex, in profile about 1.5X as high as deep, tangent to frontovertex forming an angle of about 100° with that of face; occipital margin more or less sharp, not carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 85°; frontovertex clearly widening in front of anterior ocellus, with distinct polygonally reticulate sculpture of mesh size subequal to, or conspicuously larger than, eye facet, not shallower above top of scrobes; temple and gena with relatively shallow, longitudinally elongate, fine polygonally reticulate sculpture; top of scrobes with distinct, regular, polygonally reticulate sculpture; interantennal prominence and mouth margin with slightly shallower, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, broadly ∩-shaped; interantennal prominence dorsally narrowly rounded; antenna as in Fig. 282; scape very slightly broadened and flattened, about 3.1X as long as broad; funicle with F1-F3 relatively small, subquadrate and subequal, F4-F5 slightly larger, subequal and a little longer than broad, F6 larger and clearly longer than broad; clava moderately slender, about 4X as long as broad, about 1.5X as wide as F6, not downcurved ventrally, very nearly as long as funicle, sutures parallel, sensory area relatively small, at apex only giving it a rounded or weak obliquely truncate appearance; eye slightly overreaching occipital margin, clothed with dense, conspicuous setae, each a little longer than diameter of facet; malar sulcus present, but very shallow and indistinct; clypeal margin evenly very slightly concave. Relative measurements: HW 43.5, HH 32, FV 19, POL 7.5, OOL 2.5, OCL 2, AOL 5.5, EL 25, EW 21, MS 12, SL 17, SW 5.5.

Thorax (Fig. 286) with pronotum hardly exposed behind head, its posterior margin broadly

concave, not angular medially; pronotum and mesoscutum with polygonally reticulate sculpture that is about as deep as that in ocellar area, and of similar mesh; axilla with similar sculpture to mesoscutum but clearly shallower; scutellum dorsally with very fine, slightly longitudinally elongate, polygonally reticulate sculpture that is a little deeper than sculpture on mesoscutum, extreme side and apex completely smooth and shiny; visible part of mesoscutum about 1.9X as broad as long; scutellum about 1.2X as broad as long, apex with a pair of slender, elongate setae; hind femur about 3.3X as long as broad; mid basitarsus with 5 ventral pegs; mid tibial spur about as long as basitarsus; fore wing with venation and setation as in Figs 283, 285; propodeum (Fig. 286) medially about 0.05X as long as scutellum. Relative measurements: FWL 43, FWW 17.5; HWL 28, HWW 5.5.

Gaster with hypopygium reaching about 0.6X to apex; last tergite about 0.65X as long as mid tibia, with apex rounded; ovipositor exserted, the exserted part about 0.6X as long as mid tibial spur or about 0.2X mid tibia.

Paratype**.** Mandible with two acute teeth and an obtuse upper tooth; palp formula 3-2; funicle with linear sensilla present on F2, F4-F6. Relative measurements: OL 99, GL 27 [MT 91].

Variation. Females vary in overall length from 0.58-0.85mm, the terminal segments of the gaster may be completely brown dorsally, specimens from higher altitudes have the hind coxa partially brown externally, the fore wing varies between 2.28-2.46X (Figs. 284, 285) as long as broad and the ovipositor varies from about 3.5-4X as long as the gonostylus.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, San Vito, Las Cruces, Wilson Bot. Gdns, 8°46'N 82°57'W, 7-19.ii.2007 (C. Hansson). Paratypes: **COSTA RICA**, 2♀, **Guanacaste**, PN Santa Rosa, Bosque Humedo, 10°51'N 85°37'W. 300m, 20.ii.2007 (J.S. Noyes); 1♀, Guanacaste, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes); 1♀, **Puntarenas**, RB Carara, 9°46'N 84°57'W, 40m, 1-7.iii.2005 ((C. Hansson); 1♀, Puntarenas, Buenos Aires, Est. Altamira, Send. los Gigantes, LS 572200 331700, #57880, vii-viii.2000 (D. Rubí); 1♀, Puntarenas, Est. Altamira, Send. los Gigantes, LS 331800 572100, 1460m, ii.2002 (C. Hansson, D. Rubí); 2♀, Puntarenas, San Vito. Las Cruces, Wilson Bot. Gdns, 1500m, 18-22. iii.1990 (J.S. Noyes); 2♀, same data as holotype; 1♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 8°46'N 82°57'W, 1200-1350m, 19.ii.2015 (J.S. Noyes); 11♀, Puntarenas, San Vito, Est. Las Alturas, 8°57'N 82°50'W, 1500m, 20.ii.2015 (J.S. Noyes); 1♀, Puntarenas, Pen. Osa, 23km N. Puerto Jiménez, 10m, xi-xii.1992 (P. Hanson). 1♀, Puntarenas, Golfito, Est. Agujas, LS 526550 276750, 300m, #57901, 21.ii.2000 (J. Azofeifa); 1♀, Puntarenas, PN Corcovado, Los Patos, 8°33'N 83°30'W, 200m, ii.2000 (J.S. Noyes, J. Azofeifa); 5♀, **Limón**, PN Cahuita, 5m, 1.iii.1991 (J.S. Noyes). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

COMMENTS. See comments under *aries* (p. 91) and *harpales* (p. 120).

Genus *QUETSIRA* gen.nov.

Type species: *Quetsira tinthrax* **sp.nov.** Gender feminine.

Female. Overall length about 0.5-0.9mm.

Head and thorax velvety dark brown, almost black, weakly metallic, frontovertex sometimes orange-brown.

Head about 2.5X as wide as frontovertex; tangent of frontovertex forming an angle of about 105° with that of face; eye clothed with conspicuous setae, each about as long as diameter of facet; antenna attached a little below lower eye margin, torulus separated from mouth margin by about half its own length; funicle 6-segmented, segments transverse to quadrate; clava 3-segmented,

apex with an oblique truncation; mandible with 4 short teeth, inner surface with a socketed peg near lower margin; palp formula 4-3**.**

Thorax with posterior margin of pronotum roundly concave, not broadly V-shaped or angular medially; mesoscutum without notaular lines; scutellum flat with conspicuous sculpture; fore wing about 2.1X as long as broad; linea calva, on dorsal surface, interrupted by 3 or 4 lines of setae and closed by a line of setae; submarginal vein with parastigma not broadened; marginal vein nearly 3X as long as broad, postmarginal vein distinct; stigmal vein subsessile and very slightly shorter than postmarginal vein, uncus developed with 3 campaniform sensilla in a line; scutellum with at least about 10 pairs of setae.

Gaster without paratergites; hypopygium not quite reaching apex; ovipositor slightly shorter than md tibia and slightly exserted; gonostylus free.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown, but probably a primary parasitoid of armoured scale insects Diaspididae (Hemiptera: Diaspididae).

COMMENTS. *Quetsira* is most similar in habitus to smaller species of *Coccidencyrtus*, but the quadridentate mandibles, palp formula and presence of only 3 campaniform sensilla at the apex of the stigmal vein suggest that it is most closely related to *Adelencyrtus*. It differs from both genera in having the apex of the clava obliquely truncate, the postmarginal vein of the fore wing longer than the stigmal vein and very characteristic fine vermiculate sculpture on the head and aciculate-imbricate sculpture on the mesoscutum and scutellum. Species of *Adelencyrtus* and *Coccidencyrtus* have the apex of the clava more or less rounded or pointed, the postmarginal vein of the fore wing not longer than the stigmal vein, usually conspicuously shorter and non-aciculate, imbricate, polygonally reticulate or striate-reticulate sculpture on head and dorsum of thorax. In addition, in all species of *Coccidencyrtus* the mandible is basically tridentate, the maxillary palpus is at most 3-segmented, the postmarginal vein is not longer than the stigmal vein and there are always 4 campaniform sensilla at the apex of the stigmal vein.

Quetsira tinthrax **sp.nov.**

(Figs 287-293; Hab. ♀ 48)

Female **(**holotype**)**: length, including ovipositor, 0.90mm; excluding ovipositor, 0.86mm (CPD).

Head dark brown to black with a weak metallic lustre; occiput with a weak brassy sheen; frontovertex with a weak silky sheen with some weak coppery purple reflections; scrobal area with a weak coppery purple sheen with some weak dark blue and brassy reflections; temple and gena with a mixed, weak coppery purple and dark blue sheen; frontovertex with a few, inconspicuous, scattered, brown setae; gena and interantennal prominence with a few scattered, inconspicuous, translucent, brown setae; maxillary palpus white; radicle brown; scape white; pedicel white, brown in proximal half or so; F1-F4 white, F5 dusky white, F6 very pale orange-brown; clava pale orange-brown; thorax dark brown to black with a metallic lustre; pronotum with a weak coppery purple sheen with some dark blue reflections; mesoscutum with a weak coppery purple sheen; tegula dark purple-brown with a weak brassy sheen; axilla with a weak coppery purple and brassy sheen; scutellum more or less matt, but with a slight, silky sheen, extreme side and apex shining coppery purple; mesopleuron with a moderate coppery purple sheen; fore coxa white, slightly brownish proximally; fore femur white with a brown streak dorsally in middle, tibia white, with an incomplete, brown subbasal ring, tarsus dusky very pale orange with apical tarsomere pale brown; mid coxa very pale orange, slightly dusky proximally; mid femur white with a slender, oblique brown ring at about 0.7X, tibia white to very pale orange and a narrow, subbasal dark, brown band, spur and tarsus very pale orange; hind coxa pale yellow, proximally pale brown; hind femur white with a moderately broad, brown band at about 0.6X, tibia very pale yellow with a narrow,

subbasal, brown band, tarsus pale yellow with apical tarsomere slightly dusky, pale orange; wings hyaline; propodeum dark brown with a weak brassy and coppery purple sheen; gaster dark purple-brown, with coppery purple, green and brassy reflections; gonostylus dark brown.

Head (Fig. 290) about 2.7X as wide as frontovertex, in profile about 1.6X as high as deep; occipital margin sharp, not carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 80°; frontovertex not narrowing in front of anterior ocellus, with very fine, vermiculate sculpture of distinctly silky appearance, area between eye and scrobe with sculpture tending to imbricate; temple and gena with relatively shallow, longitudinally elongate, fine vermiculate sculpture; top of scrobes with similar, but shallower sculpture; interantennal prominence and mouth margin with shallow, imbricate-reticulate sculpture; scrobes moderately deep, indistinctly margined laterally, but quite sharply margined dorsally, more or less Λ-shaped; interantennal prominence dorsally acute and extended towards frontovertex as a narrow, median ridge; antenna as in Fig. 288; scape very slightly broadened and flattened, about 3.5X as long as broad; funicle with F1-F5 small, subequal and slightly to strongly transverse, F6 conspicuously larger and slightly longer than broad; clava about 3.5X as long as broad, about 1.4X as wide as F6, slightly longer than funicle, sutures slightly oblique, sensory area enlarged, extending nearly 0.4X along ventral surface giving apex an obliquely truncate appearance; eye slightly overreaching occipital margin; malar sulcus present, but shallow and very indistinct; clypeal margin evenly very slightly concave. Relative measurements: HW 43, HH 39.5, FV 16, POL 8, OOL 1, OCL 3.5, AOL 6.5, EL 27, EW 22, MS 15.5, SL 22.5, SW 6.5.

Thorax (Fig. 287) with pronotum hardly exposed behind head; pronotum, mesoscutum and axilla relatively shiny, with coarse, aciculate-imbricate sculpture that is about as deep as that in ocellar area; scutellum dorsally of silky in appearance, with similar sculpture to that on mesoscutum, but more longitudinally elongate anteriorly and laterally, extreme side and apex completely smooth and shiny; visible part of mesoscutum about 2X as broad as long; scutellum about 1.25X as broad as long and with about 20 setae; hind femur about 3.4X as long as broad; fore wing with venation and setation as in Figs 289, 291; propodeum (Fig. 287) medially about 0.08X as long as scutellum. Relative measurements: FWL 37.5, FWW 17.5; HWL 28, HWW 7.5.

Gaster with hypopygium reaching about 0.9X to apex; last tergite about 0.7X as long as mid tibia, with apex rounded; ovipositor exserted, the exserted part about 0.5X as long as mid tibial spur or about 0.2X mid tibia.

Paratype**.** Funicle with linear sensilla present only on F6; hypopygium Fig. 292; ovipositor Fig. 293. Relative measurements: OL 62.5, GL 16 [MT 72].

Variation. Females vary in overall length from 0.46-0.90mm, the frontovertex may be orange-brown, the scape may be largely pale brown, F3-F5 may be pale brown and the legs may be slightly paler or darker than in the holotype, the dark markings may be reduced and almost absent or more extensive, occasionally the hind tibia has a partial second, brown band at about 0.7X and this may be connected to the subbasal band.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Santa Rosa NP, Sn. Emilio 6-C, 5.vi-22.vi.1985 (Janzen, Gauld). Paratypes: **COSTA RICA**, 6♀, **Guanacaste**, Santa Rosa NP, various localities and dates 11.v.1985-15.v.1987 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, Murcielago (ACG), 75m, MT, 24.i-4.ii.1996 (J. Ugalde); 2♀, Guanacaste, Maritza (ACG), 700m, MT/YPT, 20.i-24.ii.1996 (J.S. Noyes); 1♀, **Heredia**, La Selva BS, 50m, MT/YPT, 22.i-3.ii.1991 (J.S. Noyes); 1♀, **Limón**, RB Hitoy-Cerere, Send. Espavel, LS 401200 569800, 500m, #74462, 21.vi-8.vii.2003 (R. Gamboa, et al.). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

Genus *NEOCOCCIDENCYRTUS* Compere

Neococcidencyrtus Compere, 1928:209-212. Type species: *Neococcidencyrtus alula* Compere, by original designation.

Xenocomys Blanchard, 1940:106. Type species: *Xenocomys chrysomphali* Blanchard, by monotypy. Synonymy with *Neococcidencyrtus* by Annecke (1974:375).

Platylyca De Santis, 1972:58. Type species: *Platylyca quadriceps* De Santis, by original designation and monotypy. Synonymy with *Neococcidencyrtus* by Noyes (1987:995).

Female. Overall length about 0.6-1.4mm.

Body slightly flattened; body often completely dark or with pale orange areas, or almost completely pale orange, darker areas often weakly to moderately metallic; paler specimens with a symmetrical dark pattern between top of scrobe and anterior ocellus, or a series of transverse dark and pale bands across scrobal area; mid tibia pale orange with knee orange-brown and a pair of incomplete, slightly oblique, dark brown bands at about 0.3X and 0.6X along its length (absent in some extra-limital species); fore wing hyaline or infuscate with a hyaline band after apex of venation, proximal margin more or less straight, distal margin broadly emarginate medially, band sometimes interrupted medially (especially in short-winged forms) apex sometime hyaline, marginal vein darker than other parts of venation; hind wing hyaline.

Head with frontovertex narrower than eye, in profile with tangent to frontovertex, between occipital margin and top of scrobes, forming an angle of 70-105° with face below top of scrobes; occipital margin indistinct, rounded, usually without a conspicuous seta behind each posterior ocellus, oval depression adjacent to eye margin behind posterior ocellus often present but indistinct; scrobes shallow, poorly defined; antenna with scape not broadened or hardly broadened, about 3.5-4.0X as long as broad; pedicel subconical about 1.5-2X as long as broad; funicle varying from all segments transverse to all longer than broad, but not more than 1.5X as long as broad; clava from about as long as funicle to slightly more than half as long as funicle, slightly wider than funicle, 3-segmented, outer suture often dorsally quite strongly oblique; sensory area small and at apex only, apex rounded; malar sulcus absent or present but usually inconspicuous; mandible basically tridentate, mostly from 1 sharp tooth and an upper, slightly concave truncation tooth to 1 sharp tooth and a broad, straight truncation with a very short acute tooth on the lower edge, with a socketed peg on its inner surface near the ventral margin; palp formula 4-3.

Thorax with pronotum hardly exposed behind head, its posterior margin fairly concave and slightly angular or notched medially; pronotum with imbricate-reticulate to polygonally reticulate sculpture that is slightly coarser than that in ocellar area, but generally of smaller mesh; mesoscutum without notaular lines, with polygonally reticulate sculpture that is slightly shallower than that on pronotum and generally of larger mesh size; axilla with shallow, transversely elongate, polygonally reticulate to imbricate-reticulate sculpture; scutellum dorsally with very fine, regular, polygonally reticulate sculpture that is clearly deeper and of much smaller mesh than sculpture on mesoscutum, scutellum with up to about 20 setae, a pair of long, slender, subapical bristle-like setae and another pair of shorter bristle-like setae proximad of these, side and apex completely smooth and shiny; mid tibial spur about as long as basitarsus; wings fully developed or sometimes reduced with fore wing not quite reaching half way along gaster; fully developed fore wing about 2.4X as long as broad; marginal vein at least about 3X as long as broad; as long as stigmal vein or longer; postmarginal vein short or absent; filum spinosum present.

Gaster with hypopygium not reaching apex; paratergites absent; syntergum slightly shorter than mid tibia with apex rounded; ovipositor mostly only slightly exserted, but occasionally very strongly exserted with exserted part as much as 1.5X as long as gaster; second valvifer with 2-9 subapical setae on second valvifer; gonostylus free.

Male. Overall length about 0.6-1.2mm.

Antenna with scape about a long as F1, about 2.5X as long as broad; funicle with 6 segments, all segments about 2.5-3X as long as broad with all segments clothed in whorls of long setae the longest of which is about 7-8 X as long as width of segment; clava entire, slightly shorter than F5-F6 combined; phallobase with digiti about 2X as long as broad, each with a single apical hook;

parameres developed, each with an apical and basal seta; aedeagus slender, about 10X as long as broad; apex acute or narrowly rounded, slightly less than half as long as mid tibia.

DISTRIBUTION. Virtually cosmopolitan: USA (California, South Carolina), Caribbean, central America, South America, southern Europe, Afrotropics, Middle East; central Asia.

HOSTS. Species of the genus have been recorded as primary parasitoids of various diaspidid scale insects (Hemiptera: Diaspididae) including *Acutaspis paulista* (Hempel*), Crenulaspidiotus lahillei* (Lizer y Trelles), *Diaspis echinocacti* (Bouché), *Epidiaspis zygophylli* (Borchsenius), *Furchadaspis zamiae* (Morgan), *Hemiberlesia rapax* (Comstock), *Lepidosaphes* Shimer, *Melanaspis smilacis* (Comstock) and *Pudasis newsteadi* (Leonardi) (see Noyes, 2019).

BIOCONTROL. In 1984, *Neoccoccidencyrtus dryslidis* Noyes was released in southern India from Brazil in an attempt to control *Melanaspis smilacis* on sugarcane (CIBC, 1984) but no further information is available.

COMMENTS. *Neococcidencyrtus* is close to *Paraschedius* Mercet and the two are possibly synonymous. Sufficiently diverse material of the latter has not been available for study, and thus, for the present, the two genera are treated as distinct. Species currently placed in *Paraschedius* have the frontovertex wider than an eye in dorsal view and the head is yellow or pale orange without dark or metallic areas.

IDENTIFICATION. 27 species, including 7 described below as new, see: Noyes, 1987 (review and key to 18 species); Annecke, 1974 (review and key to 4 species); Myartseva, 1977 (6 species); Singh, 2008 (descriptions of two species).

Key to Costa Rican species of *Neococcidencyrtus* (Females)

1. Hind femur orange, at most with a slightly oblique, dorsal, dark brown, subapical spot 2
- Hind femur mostly dark brown, sometimes mixed dark orange-brown or orange at apices 5

2(1) Face (Fig. 295) without a transverse brown band above toruli .... *mansua* **sp.nov.** (p. 128)
- Face (Figs 300, 309, 312) with a distinct brown band above toruli, level with top of interantennal prominence 3

3(2) Fore wing (Fig. 302) relatively slender, more than 2.6X as long as broad; broadest point of hyaline band distad of venation about 4.5X as wide as narrowest point; dark brown rings on hind tibia connected externally by a narrow brown streak; gonostylus longer than mid tibial spur ..... *grias* **sp.nov**. (p. 130)
- Fore wing (Fig. 310, 315) not more than 2.5X as long as broad; broadest point of hyaline band distad of venation about 2.5X as wide as narrowest point; dark brown rings on hind tibia not connected by a dark brown streak externally; gonostylus shorter than mid tibial spur 4

4(3) Head (Fig. 309) less than 5.5X as wide as frontovertex; occiput without a brown spot above the foramen ..... *drysus* Noyes (p. 131)
- Head (Fig. 312) at least 6X as wide as frontovertex; occiput with a brown spot above the foramen ..... *cyclope* **sp.nov.** (p. 132)

5(1) Hind tibia with a pair of distinct brown bands 6
- Hind tibia completely dark brown, without brown bands 7

6(5) Head (Fig. 322) less than 5X as wide as frontovertex; antenna (Fig. 317) with funicle segments transverse or subquadrate, linear sensilla present on at most F4-F6; fore wing (Fig. 319) with linea clava entire ..... *hilaria* **sp.nov.** (p. 134)
- Head (Fig. 328) more than 5X as wide as frontovertex; antenna (Fig. 323) with all funicle segments longer than broad, linear sensilla present on F3-F6; fore wing (Fig. 326) with linea calva interrupted by at least 2 setae ..... *orion* **sp.nov.** (p. 135)

7(5) Fore wing hyaline ..... *crouzelae* De Santis (p. 137)
- Fore wing with a distinct infuscate pattern 8

8(7) Antenna with F3 longer than broad, clearly larger than F1 or F2; head more than 3.5X as wide as frontovertex; mandible with three teeth, lowest tooth acute .... *dracaenus* **sp.nov.** (p. 138)
- Antenna with F3 quadrate or transverse, subequal in size to F1 and F2; head less than 3.5X as wide as frontovertex; mandible with one lower tooth, a short acute middle tooth and a broad, straight truncation ..... *plinthus* **sp.nov.** (p. 140)

***Neococcidencyrtus mansua* sp.nov.**
(Figs 294-299; Hab. ♀ 49)

DIAGNOSIS. *Female* (length about 0.7-1.0mm): face (Fig. 295) without a brown band above toruli level with top of interantennal prominence; mesoscutum orange with a faint metallic sheen, lightly dusky anteriorly or generally slightly dusky; tegula pale orange, apex dusky; scutellum orange; all coxae orange, hind coxa brown proximally; fore femur and tibia mostly pale orange; mid femur mostly pale orange; hind femur mostly orange; hind tibia with a pair of dark brown bands; fore wing (Fig. 297) with an infuscate pattern; hyaline band distad of venation with widest point a little less than 2X as wide as narrowest point; head (Fig. 295) about 3.8-5.3X as wide as frontovertex; funicle with longitudinal sensilla on F4-F6; clava with outer suture complete and not dorsally oblique; mandible virtually tridentate, with one acute tooth and a concave, upper truncation; fore wing (Fig. 297) about 2.4X as long as broad; linea calva entire; exserted part of ovipositor about 0.6X as long as mid tibial spur; gonostylus shorter than mid tibial spur. *Male*: unknown.

Female **(**holotype**)**: length, including ovipositor, 1.02mm; excluding ovipositor, 0.94mm (CPD).

Head generally pale orange; frontovertex orange between posterior ocelli and top of scrobes; an inconspicuous pale brown band across top of interantennal prominence more or less reaching temple and a similar, slightly curved band across lower parts of toruli more or less delimiting orange area adjacent to mouth margin; gena with a faint, vertical pale brown line indicating position of malar sulcus; frontovertex with a few, moderately conspicuous, brown setae; a line of very inconspicuous, translucent silvery setae between eye and scrobe to position of malar sulcus; gena and interantennal prominence with only a few, scattered inconspicuous pale brown setae; maxillary palpus white with terminal segment pale orange; radicle orange, apex with an incomplete, narrow, brown ring; scape orange, ventral margin narrowly brown; pedicel pale orange, with a complete orange-brown stripe internally; F1-F3 pale orange-brown, slightly dusky internally, F4-F5 pale orange, F6 very pale orange; clava proximally dark brown, apical segments pale orange; thorax mainly orange; pronotum orange, posterior margin completely translucent, neck hardly dusky; mesoscutum orange with a faint dark blue and purple sheen and slightly dusky anteriorly, especially below posterior margin of pronotum where it has a stronger blue-green and purple sheen; tegula orange, apex slightly dusky; axilla and scutellum matt orange with weak coppery reflections, side and apex of scutellum with a weak purple and brassy sheen; setae on scutellum dark brown and conspicuous; metanotum dark brown; mesopleuron orange with a weak brassy sheen; all coxae orange, hind coxa brown proximally; fore femur orange, extreme base white, tibia and tarsus orange; mid femur very pale orange, almost white with a small, weak, dorsal, subapical orange-brown mark, mid tibial spur and tarsus very pale yellow, almost white,

pretarsus slightly dusky; hind femur orange with a slightly oblique, dorsal, dark brown, subapical spot, extreme apex white, tibia with a pair of broad, dark brown bands, one at base and the other subapical, off-white between these bands, apex pale orange, tarsus white with pretarsus pale orange; fore wing (Fig. 297) conspicuously infuscate, hyaline below proximal half of submarginal vein and with a complete, hyaline band immediately distad of apex of venation, followed by an infuscate area with apex subhyaline; hind wing hyaline; propodeum orange with a weak brassy sheen, side dark brown with a faint, metallic blue, green and purple sheen; gaster orange, with a weak brassy sheen with weak purple, blue and green reflections, Gt1 brown laterally, Gt4-Gt6 and syntergum medially dusky, outer plate of ovipositor brown; gonostylus very pale yellow.

Head about 5.3X as wide as frontovertex, in profile about 1.8X as high as deep, tangent to frontovertex forming an angle of about 90° with that of face; occipital margin acute, not carinate; a small, elongate, shiny bottomed, oval depression adjacent to eye immediately behind posterior ocellus; ocelli of normal size, forming an angle of about 45°; frontovertex (Fig. 295) moderately shiny with shallow, polygonally reticulate sculpture of mesh size clearly smaller than eye facet; temple and gena with very shallow, longitudinally elongate, fine, polygonally reticulate sculpture; top of scrobes, interantennal prominence and mouth margin with shallow, regular, polygonally reticulate sculpture; scrobes extremely shallow, indistinct; antenna as in Fig. 294; scape very slightly broadened and flattened, about 3.6X as long as broad; funicle with F1-F3 smaller, subequal, subquadrate, F4-F6 larger, gradually increasing in size distally, subquadrate; clava about as long as F2-F6 combined, sutures parallel, outer suture complete and not dorsally oblique; sensory area small, at apex only giving it a rounded or narrowly truncate appearance; eye slightly overreaching occipital margin, virtually naked, but with sparse, very short, indistinct setae, each much shorter than diameter of facet; malar sulcus present, but incomplete and very inconspicuous; clypeal margin weakly emarginate medially. Relative measurements: HW 63, HH 54, FV 12, POL 5, OOL 0.5, OCL 5.5, AOL 7.5, EL 35, EW 34, MS 29, SL 27, SW 7.5.

Thorax with visible part of mesoscutum about 2X as broad as long; scutellum about 1.4X as broad as long with subapical setae about 0.7X its length; hind femur about 4X as long as broad; fore wing with venation and setation as in Figs 296, 297; propodeum medially about 0.05X as long as scutellum. Relative measurements: FWL 53.5, FWW 23; HWL 41, HWW 10.

Gaster with hypopygium reaching about 0.6X towards apex; last tergite about 0.7X as long as mid tibia, with apex broadly truncate; ovipositor exserted, the exserted part about 0.6X as long as mid tibial spur or about 0.2X mid tibia.

Paratype. Mandible virtually tridentate, with one acute tooth and a concave, upper truncation; funicle with linear sensilla present only on F4-F6; head, Fig. 295; hypopygium Fig. 299, ovipositor Fig. 298. Relative measurements: OL 53, GL 10.5 [MT 43].

Variation. Females vary in overall length from 0.71-1.02mm, some specimens are relatively darker than the holotype with the lower transverse band on the face very distinct and the mesoscutum partially dark brown or almost completely dusky and with a relatively strong dark blue, green and purple sheen and the head varies from about 3.8-5.3X as wide as the frontovertex.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Est. Maritza (ACG), 700m, MT/YPT, 20.i-24.ii.1996 (J.S. Noyes). Paratypes, **COSTA RICA**, 5♀, **Guanacaste**, same data as holotype; 1♀, **Limón**, PN Cahuita, 9°43'N 82°49'W, 10m, 24.ii.2010 (J.S. Noyes). Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. Smaller darker females of *Neococcidencyrtus mansua* are similar to those of *selogis* Noyes, some specimens of *mansua* even having a very similar pattern of infuscation and setation of the fore wing to that of *selogis*. They generally differ in colour, darker females of

mansua having at least most of the head, scutellum and much of the gaster pale orange, whereas in *selogis* the head, thoracic dorsum and gaster are dark brown and the frontovertex, and thorax are quite strongly metallic dark green and purple. Darker specimens of *mansua* also have the clava completely dark brown, whereas in *selogis* only the base and extreme apex of the clava is brown.

Neococcidencyrtus grias **sp.nov.**
(Figs 300-303; Hab. ♀ 50)

DIAGNOSIS. *Female* (length about 1.4mm): face with a distinct dark brown band above toruli, level with top of interantennal prominence; mesoscutum orange with a faint metallic sheen; tegula pale orange, apex dusky; scutellum orange; all coxae orange; fore femur and tibia mostly pale orange; mid femur mostly pale orange; hind femur mostly orange; hind tibia with a pair of dark brown bands connected by a dark brown streak; fore wing (Fig. 302) with an infuscate pattern; hyaline band distad of venation with widest point about 4.5X as wide as narrowest point; head (Fig 300) about 3.4X as wide as frontovertex; funicle with longitudinal sensilla on F4-F6; clava with outer suture incomplete and dorsally oblique; mandible with one acute tooth and a broad, concave truncation; fore wing (Fig. 302) about 2.7X as long as broad; linea calva interrupted by a single seta; exserted part of ovipositor about as long as mid tibial spur; gonostylus longer than mid tibial spur. *Male*: unknown.

Female **(**holotype**)**: length, including ovipositor, 1.39mm; excluding ovipositor, 1.29mm (CPD).

Head generally orange; occiput with a small, dark brown mark immediately above foramen; frontovertex (Fig. 300) with a narrow, transverse, dark brown band between lowest eye margins, not quite reaching eyes; a dark brown band between toruli and mouth margin not quite reaching mouth margin, narrowest medially, laterally reaching position of genal suture; area between dark brown bands pale orange; frontovertex with a few, moderately conspicuous, brown setae; a line of very inconspicuous, translucent silvery setae between eye and scrobe to position of malar sulcus; gena and interantennal prominence with only a few, scattered inconspicuous translucent setae; maxillary palpus white; radicle orange, apex with a narrow dark brown ring; scape orange, ventral margin narrowly brown; pedicel pale orange, with a complete brown stripe internally; F1-F3 pale orange-brown, progressively becoming paler distad, F4-F5 pale orange, marked with brownish internally, F6 dusky pale orange mixed pale orange; clava dark brown; thorax mainly orange; pronotum orange, posterior margin completely translucent, neck dark brown; mesoscutum orange with a faint pale green, blue, purple and brassy sheen; tegula orange, apex slightly dusky; axilla orange with weak coppery reflections; scutellum orange, dorsally with weak coppery reflections, side and apex with a weak purple and blue sheen; metanotum orange; mesopleuron orange with a weak brassy sheen; all coxae orange; fore femur orange, extreme base white, tibia orange with a small, brown, subbasal, spot dorsally, tarsus orange; mid femur orange, mid tibial spur and tarsus pale yellow, almost white, pretarsus slightly dusky; hind femur orange with a slightly oblique, dorsal, dark brown, subapical spot, extreme apex white, tibia with a pair of broad, dark brown bands, one at base and the other subapically, these connected externally by a narrow brown streak, orange between these bands, apex white, tarsus white with apical tarsomere orange; fore wing (Fig. 302) conspicuously infuscate, hyaline below proximal half of submarginal vein and with a complete, hyaline band immediately distad of apex of venation, followed by an infuscate area with apex narrowly subhyaline; hind wing hyaline; propodeum orange with a weak brassy and purple sheen; gaster orange, with a weak brassy sheen with weak purple, blue and green reflections, Gt1-Gt4 laterally brown, apex of outer plate of ovipositor dark brown; gonostylus very pale yellow.

Head (Fig, 300) about 3.4X as wide as frontovertex, in profile about 1.4X as high as deep, tangent to frontovertex forming an angle of about 70° with that of face; occipital margin rounded, indistinct; no oval depression adjacent to eye near occipital margin, but a transverse, curved, shallow groove present between posterior ocelli and occipital margin; ocelli very small, forming an angle of about 60°; frontovertex (Fig. 300) moderately shiny with very shallow, polygonally reticulate sculpture of mesh size subequal to eye facet; temple and gena with very shallow, longitudinally elongate, fine polygonally reticulate sculpture; top of scrobes, interantennal prominence and mouth margin with shallow, regular, polygonally reticulate sculpture; scrobes extremely shallow,

indistinct; antenna as in Fig.301; scape very slightly broadened and flattened, about 4X as long as broad; funicle with F1-F3 smaller, subequal, subquadrate, F4-F6 larger, gradually increasing in size distally, subquadrate, linear sensilla present only on F4-F6; clava very slightly longer than the funicle, sutures parallel, outer suture incomplete and dorsally oblique; sensory area small, at apex only giving it a rounded appearance; eye slightly overreaching occipital margin, with sparse, moderately conspicuous setae, each about as long as diameter of facet; malar sulcus present, but incomplete and very inconspicuous; clypeal margin weakly emarginate medially; mandible with one acute lower tooth and an upper, broad, slightly concave truncation. Relative measurements: HW 60, HH 50, FV 17.5, POL 7, OOL 3.5, OCL c.9, AOL 8, EL 29, EW 30.5, MS 28, SL 30, SW 7.5.

Thorax with visible part of mesoscutum about 1.8X as broad as long; scutellum about 1.3X as broad as long with subapical setae about 0.5X its length; hind femur about 4.2X as long as broad; fore wing with venation and setation as in Figs 302, 303; propodeum medially about 0.12X as long as scutellum. Relative measurements: FWL 73, FWW 27; HWL 54, HWW 12.

Gaster with hypopygium reaching about 0.6X towards apex; last tergite about as long as mid tibia, with apex weakly angular; ovipositor exserted, the exserted part about as long as mid tibial spur or about 0.3X mid tibia. Relative measurements: OL 48.5, GL 12 [MT 30.5].

Variation. Females vary in overall length from 1.17-1.39mm, the area between the two transverse dark brown bands on the face may be pale yellow and F6 may be dark brown internally.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Est. Altamira, Send. Los Gigantes, LS 331800 572100, 1460m, ii.2002 (C. Hansson, D. Rubí). Paratypes: **COSTA RICA**, 1♀, **Alajuela**, PN Arenal, Sendero Ceibo, 10°27'N 84°44'W, 620m, 22-23.ii.2016 (J.S. Noyes). Holotype and paratype in NHMUK.

COMMENTS. Females of *Neococcidencyrtus grias* are very similar to those of *drysus*. Apart from the characters given in the key, females of *grias* can be distinguished from those of *drysus* by having a shallower invagination of the posterior margin of the hypopygium and relatively longer ovipositor. In *grias* the invagination is only about 0.1X as deep as the overall length of the hypopygium and the ovipositor about 1.5X as long as the mid tibia. In *drysus* the invagination of the posterior margin of the hypopygium is about 0.25X as deep as the overall length of the hypopygium and the ovipositor is about 1.2X as long as the mid tibia.

***Neococcidencyrtus drysus* Noyes**
(Figs 304-310; Hab. ♀ 51)

Neococcidencyrtus drysus Noyes, 1987:1006-1008. Holotype ♀, FML, Argentina, not examined.

DIAGNOSIS. *Female* (length about 0.6-1.3mm): head generally orange; occiput without a brown spot above foramen; face (Fig. 309) with a distinct dark brown band above toruli level with top of interantennal prominence and another level with lower parts of toruli; maxillary palpus white; funicle orange with F1-F3 dusky, clava dark brown; mesoscutum orange with a faint metallic sheen; tegula pale orange, apex dusky; scutellum orange; all coxae orange; fore femur and tibia mostly pale orange; mid femur mostly pale orange; hind femur mostly orange; mid and hind tibia with a pair of dark brown bands; fore wing (Fig. 310) with an infuscate pattern, a hyaline band distad of venation with widest point about 2X as wide as narrowest point, apex subhyaline; gaster orange, with Gt1-Gt4 laterally brown; head (Fig. 309) about 4.1-4.5X as wide as frontovertex; funicle with longitudinal sensilla on F4-F6; clava (Fig. 305) with outer suture incomplete and dorsally oblique; mandible with three teeth; scape about 3.5X as long as broad;

thorax as in Fig, 204; fore wing (Fig. 310) about 2.4X as long as broad, venation as in Fig.306; linea calva interrupted by 2-4 setae; ovipositor as in Fig. 308, exserted part about 0.6X as long as mid tibial spur; gonostylus shorter than mid tibial spur; posterior margin of hypopygium (Fig. 307) biconvexly curved with a moderately deep median invagination. *Male*: length about 0.8-1.0mm: head mostly metallic green; scape yellow; flagellum testacecous; thorax dark brown with mesoscutum brassy and coppery and scutellum metallic green; wings hyaline; legs mostly dark brown; fore and mid tibia yellow, tibia with incomplete dark brown rings; frontovertex slightly less than half head with; scape about 2.5X as long as broad; funicle segments about 2.5-4X as long as broad, clothed with long setae, the longest of which is about 6X as long as width of segment; phallobase about 4X as long as broad, digitus nearly 3X as long as broad, with a single apical hook; parameres developed, each with an apical seta; aedeagus about half as long as mid tibia.

DISTRIBUTION. Argentina (Noyes, 1987), Costa Rica (**new record**).

HOSTS. Recorded as a parasitoid of *Acutaspis paulista* (Hempel) (Hemiptera Diaspididae) on *Aspidosperma quebracho-blanco* Schldtl. (Gentianales: Apocynaceae) and *Maytenus* Molina (Celastrales: Celastraceae) (Noyes, 1987).

MATERIAL EXAMINED.

Type material. Paratypes: ARGENTINA, 1♀, 1♂, Tucuman, Tapia, ex *Melanaspis paulistus* on *C. coccinea*, i.1975 (P. Fidalgo); 2♂, Tucuman, Tapia, ex *M. paulistus* on *A. quebracho blanco*, 3.iv.1975 (P. Fidalgo). Material in NHMUK.

Non type material. **COSTA RICA**, 1♀, **Heredia**, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, ii.2003 (J.S. Noyes); 1♀, **Puntarenas**, PN Piedras Blancas, Est. El Bonito, 8°43'N 83°13'W, 100m, 13-14.ii.2012 (J.S. Noyes). Material in NHMUK.

COMMENTS. See comments under *cyclope* (p, 133) and *grias* (p. 131).

***Neococcidencyrtus cyclope* sp.nov.**
(Figs 311-316; Hab. ♀ 52)

DIAGNOSIS. *Female* (length about 1.1-1.2mm): head generally orange; occiput with a brown spot above the foramen; face with a distinct dark brown band above toruli level with top of interantennal prominence (Fig. 312); mesoscutum orange with a faint metallic sheen; tegula pale orange, apex dusky; scutellum orange; all coxae orange; fore femur and tibia mostly pale orange; mid femur mostly pale orange; hind femur mostly orange; hind tibia with a pair of dark brown bands; fore wing (Fig. 315) with an infuscate pattern; hyaline band distad of venation with widest point about 2X as wide as narrowest point; head (Fig. 312) about 6.1-6.2X as wide as frontovertex; funicle with longitudinal sensilla on F4-F6; clava with outer suture incomplete and dorsally oblique; mandible with one acute tooth and a broad, straight truncation; fore wing (Fig. 315) about 2.4X as long as broad; linea calva entire; exserted part of ovipositor about 0.4X as long as mid tibial spur; gonostylus shorter than mid tibial spur; posterior margin of hypopygium virtually straight with hardly a median invagination. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.15mm; excluding ovipositor, 1.08mm (CPD).

Head generally orange; occiput with a brown spot above the foramen; frontovertex (Fig 312) with a narrow, transverse, dark brown band between lowest eye margins, not quite reaching eyes, area above this white; a dark brown band level with lower parts of toruli laterally reaching position of genal suture, area between this and upper band white; mouth margin orange; frontovertex with a few, moderately conspicuous, brown setae; a line of very inconspicuous, translucent silvery setae between eye and scrobe to position of malar sulcus; gena and interantennal prominence with only a few, scattered inconspicuous translucent setae; maxillary palpus white; radicle orange, apex with a narrow dark brown ring; scape orange, ventral margin narrowly brown; pedicel pale orange, with a complete brown stripe internally; F1-F3 orange, dusky internally, F4-F5 pale orange, slightly dusky internally, F6 pale orange; clava dark brown; thorax mainly orange; pronotum

orange, posterior margin completely translucent, neck hardly dusky; mesoscutum orange with a faint dark blue and purple sheen; tegula orange, apex slightly dusky; axilla orange with weak coppery reflections; scutellum orange, dorsally with weak coppery reflections, side and apex with a weak purple and brassy sheen; metanotum dark brown; mesopleuron orange with a weak brassy sheen; all coxae orange; fore femur orange, extreme base white, tibia orange with a small, brown, elongate, subbasal, spot dorsally, tarsus orange; mid femur orange, mid tibial spur and tarsus pale yellow, almost white, pretarsus slightly dusky; hind femur orange with a slightly oblique, dorsal, dark brown, subapical spot, extreme apex white, tibia with a pair of broad, dark brown bands, one at base and the other subapical, area between bands off-white, apex white, tarsus white with pretarsus pale orange; fore wing (Fig. 315) conspicuously infuscate, hyaline below proximal half of submarginal vein and with a complete, hyaline band immediately distad of apex of venation, followed by an infuscate area with apex subhyaline; hind wing hyaline; propodeum orange with a weak brassy and purple sheen; gaster orange, with a weak brassy sheen with weak purple, blue and green reflections, Gt1 brown, Gt5-Gt6 medially dusky, apex of lateral lobe of Gt6 pale brown, apex of outer plate of ovipositor brown; gonostylus very pale yellow.

Head about 6.1X as wide as frontovertex, in profile about 1.7X as high as deep, tangent to frontovertex forming an angle of about 85° with that of face; occipital margin acute, not carinate; an elongate, shiny bottomed, oval depression adjacent to eye immediately behind posterior ocellus; ocelli of normal size, forming an angle of about 40°; frontovertex (Fig. 312) moderately shiny with shallow, polygonally reticulate sculpture of mesh size clearly smaller than eye facet; temple and gena with very shallow, longitudinally elongate, fine, polygonally reticulate sculpture; top of scrobes, interantennal prominence and mouth margin with shallow, regular, polygonally reticulate sculpture; scrobes extremely shallow, indistinct; antenna as in Fig. 311; scape very slightly broadened and flattened, about 3.7X as long as broad; funicle with F1-F3 smaller, subequal, subquadrate, F4-F6 larger, gradually increasing in size distally, subquadrate, linear sensilla present only on F4-F6; clava very slightly longer than F2-F6 combined, sutures parallel, outer suture incomplete and dorsally oblique; sensory area small, at apex only giving it a rounded appearance; eye slightly overreaching occipital margin, naked; malar sulcus present, but incomplete and very inconspicuous; clypeal margin weakly emarginate medially; mandible with one acute tooth and a broad, straight truncation. Relative measurements: HW 67, HH 57.5, FV 11, POL 3, OOL 0, OCL 7.5, AOL 8.5, EL 37.5, EW 38.5, MS 30, SL 33, SW 9.

Thorax with visible part of mesoscutum about 1.9X as broad as long; scutellum about 1.5X as broad as long with subapical setae about 0.7X its length; hind femur about 3.6X as long as broad; fore wing with venation and setation as in Figs 314, 315; propodeum medially about 0.05X as long as scutellum. Relative measurements: FWL 77, FWW 31.5; HWL 56, HWW 13.

Gaster with hypopygium reaching about 0.7X towards apex; last tergite about 0.7X as long as mid tibia, with apex broadly truncate; ovipositor exserted, the exserted part about 0.4X as long as mid tibial spur or about 0.15X mid tibia; posterior margin of hypopygium virtually straight with hardly a median invagination (Fig. 316). Relative measurements: OL 75, GL 17.5 [MT 69.5].

Variation. Females vary in overall length from 1.15-1.18mm, the shiny bottomed depression adjacent to eye immediately behind posterior ocellus may be small and difficult to see, otherwise little variation noted in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, RF Golfo Dulce, 24km W Piedras Blancas, 8°46'N 83°24'W, 200m, xi.1990 (P. Hanson). Paratype: **COSTA RICA**; 1♀, **Heredia**, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, 28-29.ii.2008 (J.S. Noyes). Holotype and paratype in NHMUK.

COMMENTS. *Neococcidencyrtus cyclope* is extremely similar to *drysus*. Apart from the relatively

narrower frontovertex and a brown spot on the occiput above the foramen (see key), *cyclope* differs from *drysus* in having the mandible with one acute tooth and a very broad, straight upper truncation and the posterior margin of the hypopygium virtually straight. In *drysus* the mandible is tridentate with a longer, lower acute tooth and two shorter upper teeth and the posterior margin of the hypopygium is distinctly biconvexly curved either side of a moderately deep invagination.

Neococcidencyrtus hilaria **sp.nov.**
(Figs 317-322)

DIAGNOSIS. *Female* (length about 0.9mm): face without a dark brown band above toruli (Fig. 322); mesoscutum dark brown with a metallic sheen; tegula pale orange, apex pale brown; scutellum orange; fore and hind coxae dark brown, mid coxa mostly pale orange; fore femur and tibia mostly pale orange; mid femur white to pale orange; hind femur dark brown; hind tibia mostly dark brown, without bands; fore wing (Fig. 319) with an infuscate pattern; hyaline band distad of venation with widest point a little less than 2X as wide as narrowest point; head (Fig. 322) about 3.9X as wide as frontovertex; funicle with longitudinal sensilla on F4-F6, or absent from F4; clava with outer suture complete, not dorsally oblique; mandible more or less with three teeth; fore wing (Fig. 319) about 2.4X as long as broad; linea calva entire; exserted part of ovipositor about 0.3X as long as mid tibial spur; gonostylus shorter than mid tibial spur. *Male*: unknown.

Female **(**holotype**)**: length, including ovipositor, 0.89mm; excluding ovipositor, 0.85mm (CPD).

Head generally orange; occiput slightly dusky; frontovertex brown between posterior ocelli and in this area with metallic dark blue and purple reflections; face (Fig. 322) below top of scrobes mainly orange with a narrow, irregular, transverse, dark brown band between ventral parts of toruli extending more faintly almost to gena, median area immediately above brown band pale yellow; temple and gena orange; frontovertex with a few, inconspicuous, brown setae; a line of inconspicuous, translucent silvery setae between eye and scrobe to position of malar sulcus; gena with only a few, scattered inconspicuous translucent setae, these becoming more dense and conspicuous on lower gena and on interantennal prominence; maxillary palpus white; radicle orange; scape orange, ventral margin narrowly dark brown; pedicel pale orange, with a faint, complete dark brown stripe internally; F1-F4 pale orange-brown, F5-F6 pale orange, F5 slightly dusky internally; clava dark brown; thorax mixed orange and dark brown with a metallic lustre; pronotum orange, posterior margin completely translucent, neck dusky; mesoscutum dark brown with a strong, metallic, green and dark blue sheen with some coppery purple reflections; tegula orange, apex pale brown with a weak coppery purple sheen; axilla orange with posterior margin dark brown; scutellum orange, dorsally with weak coppery reflections, side and apex with a weak purple and brassy sheen; mesopleuron orange with a weak purple and brassy sheen; fore coxa dark brown, apically orange; fore femur mostly pale orange with dorsal and ventral margins weakly marked pale brown to about 0.7X along its length, tibia mostly pale orange with dorsal margin brown proximally, tarsus dusky pale orange; mid coxa mostly pale orange, but ventrally brown in proximal 0.5X; mid femur proximally white, but mostly pale orange, mid tibial spur and tarsus pale yellow, almost white, pretarsus slightly dusky; hind coxa dark brown; hind femur dark brown with apices narrowly pale orange, tibia pale orange with a pair of broad, dark brown bands, one at base and the other subapically, tarsus white with apical tarsomere orange-brown; fore wing (Fig. 319) weakly infuscate, hyaline below proximal half of submarginal vein and with a complete, slightly irregular, hyaline band immediately distad of apex of venation, followed by a weakly infuscate area with apex broadly hyaline; hind wing hyaline; propodeum dark brown with a weak purple sheen, side with a weak metallic green, blue-green and purple sheen; gaster dark brown with a coppery purple sheen; gonostylus very pale yellow.

Head (Fig. 322) about 3.9X as wide as frontovertex, very slightly collapsed, but in profile about 1.9X as high as deep, tangent to frontovertex forming an angle of about 105° with that of face; occipital margin rounded, indistinct; no oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 65°; frontovertex (Fig. 322) moderately shiny with fairly shallow, polygonally reticulate sculpture of mesh size mostly very slightly smaller than eye facet; temple

and gena with relatively shallow, longitudinally elongate, fine polygonally reticulate sculpture; top of scrobes, interantennal prominence and mouth margin with shallow, regular, polygonally reticulate sculpture; scrobes extremely shallow, indistinct; antenna as in Fig. 317; scape very slightly broadened and flattened, about 4X as long as broad; funicle with F1-F3 smaller, subequal, subquadrate, F4-F6 larger, gradually increasing in size distally, subquadrate, linear sensilla present only on F4-F6, or absent from F4; clava about as long as pedicel and funicle combined, sutures parallel, outer suture complete not dorsally oblique, sensory area small, at apex only giving it a rounded appearance; eye slightly overreaching occipital margin, naked; malar sulcus absent; clypeal margin weakly concave; mandible more or less tridentate, with one acute tooth and an upper, broad, slightly concave truncation. Relative measurements (head slightly collapsed): HW 59, HH 50, FV 15, POL 8, OOL 1, OCL c.3, AOL 7, EL 33, EW 28, MS 25, SL 28, SW 7.

Thorax with visible part of mesoscutum about 1.75X as broad as long; scutellum about 1.5X as broad as long with subapical setae about 0.6X its length; hind femur about 4.2X as long as broad; fore wing with venation and setation as in Figs 318, 319; propodeum medially about 0.09X as long as scutellum. Relative measurements: FWL 73, FWW 31; HWL 53, HWW 14.

Gaster with hypopygium (Fig. 321) reaching about 0.8X towards apex; last tergite about 0.7X as long as mid tibia, with apex broadly rounded; ovipositor (Fig. 320) exserted, the exserted part about 0.3X length of mid tibial spur or about 0.1X mid tibia. Relative measurements: OL 72, GL 65 [MT 53.5].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Est. Pitilla (ACG), 10°59'N 85°25'W, 700m, iii.2001 (C. Moraga, P.N. Thomas). Holotype in NHMUK.

COMMENTS. The head of the holotype when card-mounted was very slightly collapsed and therefore some of the measurements and ratios obtained from the card-mounted specimen are only approximate.

Of the previously described species, this species is most similar to *selogis* Noyes. It differs in having the face mainly orange, the clava dark brown, the mesoscutum dark brown with a dark green and blue sheen, the scutellum orange, the hind femur completely dark brown, the fore wing relatively strongly infuscate with a conspicuous hyaline band at the apex of the venation and the gaster is completely dark brown. In *selogis*, the face is mainly deep purple with the area around the toruli and mouth margin metallic green, the clava is dusky yellow with the basal segment dusky, the mesoscutum is brilliant metallic green, the scutellum is purple-brown, the hind femur is infuscate only towards the apex, the fore wing is weakly infuscate except for a stronger patch in the middle of the wing distad of the hyaline fascia and the gaster is ventrally yellow proximally.

Neococcidencyrtus orion **sp.nov.**

(Figs 323-328; Hab. ♀ 53)

DIAGNOSIS. *Female* (length about 1.8mm): face (Fig. 328) with a brown band above toruli level with top of interantennal prominence; mesoscutum orange-brown with a metallic sheen; tegula pale orange, apex brown; scutellum orange; coxae mostly dark brown, but mid coxa partly pale orange; fore femur mostly pale orange, but partially dark brown, fore tibia mostly pale orange; mid femur mostly pale orange mixed dark brown; hind femur mostly brown, distally orange; hind tibia with a pair of dark brown bands; fore wing (Fig. 326) with an infuscate pattern; hyaline band distad of venation with widest point about 2X as wide as narrowest point; head (Fig. 328) about 6.0X as wide as frontovertex; funicle with longitudinal sensilla on F3-F6; clava with outer suture

incomplete and dorsally oblique; mandible virtually tridentate, with one acute tooth and a concave, upper truncation; fore wing (Fig. 326) about 2.5X as long as broad; linea calva interrupted by 2 or 3 setae; ovipositor not exserted; gonostylus shorter than mid tibial spur. *Male*: unknown.

Female (holotype): length 1.83mm (CPD).

Head (Fig. 328) generally yellow to orange with dark brown markings; occiput pale orange; frontovertex orange; temple and posterior part of gena pale orange; scrobal area largely yellow with a slender, dark brown, transverse band from malar sulcus just below eye across upper part of interantennal prominence, narrowest at malar sulcus, another slightly broader band from malar sulcus across lower part of toruli, broadest at malar sulcus, below this pale orange to mouth margin, area immediately above base of mandible dark brown; frontovertex with a conspicuous dark brown setae behind each posterior ocellus, otherwise setae inconspicuous and pale brown; a line of inconspicuous, translucent silvery setae between eye and scrobe to position of malar sulcus; gena with only a few, scattered inconspicuous translucent setae, these becoming more dense and conspicuous on lower gena and interantennal prominence; labial palpus pale yellow, maxillary palpus pale yellow with apex pale orange; radicle amber with a dark brown apical ring; scape pale orange, ventral margin and extreme apex dark brown; pedicel pale orange, with a complete dark brown stripe internally; F1-F5 pale orange, dorsally dark brown, distal segments progressively less extensively dark brown, F6 pale orange; clava dark brown; thorax mixed orange and dark brown with a metallic lustre; pronotum orange, posterior margin completely translucent, neck dusky; mesoscutum orange-brown with a fairly strong, metallic dark blue-green and violet sheen, extreme side pale orange; tegula orange, apex brown with a weak coppery purple sheen; axilla orange, inner margins dark brown; scutellum orange, dorsally with weak coppery reflections and a slightly curved, dusky orange, subapical band, extreme side and apex mostly orange with a weak blue-green and coppery sheen, area immediately behind axilla metallic green and coppery; mesopleuron pale orange with a weak coppery and brassy sheen; prosternum dark brown, mesosternum mostly pale orange margined dark brown; fore and hind coxae dark brown, mid coxa ventrally orange-brown to dark brown, otherwise pale orange; fore femur externally with proximal one-third dark brown, remainder pale orange, internally with brown area slightly more extensive, tibia mostly pale orange with a short subbasal brown stripe externally, tarsus dusky orange, apical tarsomere brown; mid femur mostly pale orange margined brown in distal two thirds, mid tibial spur and tarsus pale yellow, almost white; hind femur largely dark brown, apical half mostly orange to orange-brown with dorsal margin dark brown, tibia with proximal one-quarter or so dark brown, a slightly broader dark brown band at about 0.4X, remainder pale orange, tarsus white with apical tarsomere orange-brown; fore wing (Fig. 326) generally infuscate, hyaline below proximal half of submarginal vein and with a complete, slightly irregular, hyaline band immediately distad of apex of venation; hind wing hyaline; propodeum medially and side anteriorly dark brown with a weak purple sheen, area around spiracle pale orange; gaster dark brown, dorsally mostly with a coppery sheen but TI with mixed coppery red, metallic dark blue-green and brassy reflections and apex of syntergum with a mixed purple and metallic dark-blue sheen, side and venter with mixed coppery red, metallic dark green, blue-green and brassy reflections; gonostylus white.

Head (Fig. 328) about 6.0X as wide as frontovertex, slightly collapsed, but in profile about 1.9X as high as deep, tangent to frontovertex forming an angle of about 75° with that of face; occipital margin rounded, indistinct; no oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 38°; frontovertex hardly shiny with moderately deep, fine, polygonally reticulate sculpture of mesh size mostly a little smaller than eye facet; temple and gena with moderately deep, fine, longitudinally elongate, polygonally reticulate sculpture; top of scrobes and interantennal prominence with fairly shallow, regular, polygonally reticulate sculpture, mouth margin with similar, but slightly deeper, coarser sculpture; scrobes extremely shallow, indistinct; antenna as in Fig. 323; scape very slightly broadened and flattened, about 3.8X as long as broad; funicle with all segments slightly longer than broad and gradually increasing in width distad, F1 about 1.9X as long as broad, F6 about 1.2X as long as broad, linear sensilla present only on F3-F6; clava nearly as long as F4-F6 combined, sutures parallel, outer suture incomplete and dorsally oblique; sensory area small, at apex only giving it a narrowly truncate appearance; eye slightly

overreaching occipital margin, naked; malar sulcus present; clypeal margin weakly concave, but medially with a shallow convex lobe; mandible virtually tridentate, with one acute tooth and a concave, upper truncation. Relative measurements: HW 142, HH 127, FV 23.5, POL 11, OOL 0, OCL 3(?), AOL 21, EL 79, EW 75, MS 67, SL 70, SW 18.5.

Thorax with visible part of mesoscutum about 1.6X as broad as long; scutellum about 1.3X as broad as long with subapical setae about 0.7X its length; hind femur about 3.4X as long as broad; fore wing with venation and setation as in Figs 325, 326; propodeum medially about 0.1X as long as scutellum. Relative measurements: FWL 113, FWW 46; HWL 86, HWW 22.

Gaster with hypopygium (Fig. 324) reaching about 0.5X towards apex; last tergite about 0.8X as long as mid tibia, with apex rounded; ovipositor (Fig. 327) hidden. Relative measurements: OL 58, GL 11 [MT 53].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, PN Bosque Diría, 10°10'N 85°34'W, 200m, 14-15.ii.2011 (J.S. Noyes). Holotype in NHMUK.

COMMENTS. Of the previously described species, *Neococcidencyrtus orion* is most similar to *dryslidis* Noyes but differs in having a distinct brown band across the face above the toruli and all funicle segments longer than broad. In *dryslidis* the face is without a brown band above the toruli and the antenna has F1-F5 transverse.

Neococcidencyrtus crouzelae De Santis
(Figs 329-335; Hab. ♀ 54)

Neococcidencyrtus crouzelae De Santis, 1964:233. Holotype ♀, Argentina, MLP, not examined.

DIAGNOSIS. *Female* (length about 0.7-1.2mm): body generally dark brown to black with a weak to moderate metallic sheen; frontovertex with a characteristic orange to pale brown area bordering occipital margin; head largely with a weak purple sheen; scrobal area with a weak metallic green sheen; scape orange-brown to dark brown; flagellum brown with F6 pale orange; mesoscutum with a moderate dark green or dark blue sheen, mixed purple; tegula dark brown, axilla and scutellum with a weak coppery sheen, side and apex of scutellum very shiny with brassy, green and coppery sheen; all coxae dark brown; femora mostly dark brown; fore and hind tibiae mostly dark brown; fore tarsus orange-brown, mid and hind tarsus white; wings hyaline; gaster with a moderate brassy and purple sheen, Gt1 with a dark blue or green sheen; gonostylus proximally brown, apically very pale yellow; head (Fig. 331) about 4-6X as wide as frontovertex, the latter wider in smaller specimens; occipital margin acute, not carinate; an elongate, shiny bottomed, depression adjacent to eye immediately behind posterior ocellus; antenna as in Fig. 332; scape weakly broadened and flattened, about 5X as long as broad; funicle with F1-F3 smaller, subequal, subquadrate, F4-F6 larger, gradually increasing in size distally, usually slightly longer than broad, occasionally quadrate; linear sensilla on F4-F6; clava about as long as funicle, outer suture incomplete and dorsally oblique; eye clothed with very short inconspicuous setae, each a little shorter than facet; mandible with a long, acute, lower tooth and a broad, mostly straight truncation, but with a short, lower, acute tooth; scutellum (Fig. 329) dorsally with very fine, regular, polygonally reticulate sculpture that is clearly deeper and of much smaller mesh than sculpture on mesoscutum, side and apex completely smooth and shiny; fore wing with venation and setation as in Figs 333, 335, about 2.3X as long as broad and with linea calva interrupted; gaster with ovipositor (Fig. 330) slightly exserted, the exserted part generally about 0.5X as long as mid tibial spur or about

0.2X mid tibia; hypopygium Fig. 334; gonostylus shorter than mid tibial spur. *Male* (length about 0.91mm): head mostly black with a slight metallic sheen, lower face purple, scrobes metallic green; scape dark brown; flagellum testaceous; thorax dark brown mesoscutum slightly brassy and coppery, scutellum matt, side and apex coppery purple; wings hyaline; legs coloured as in female; frontovertex slightly less than half head width; scape about 2.5X as long as broad; funicle segments about 2.5-4X as long as broad, clothed in long setae, the longest of which is about 6X as long as diameter of segment; phallobase with each digitus about 3X as long as broad and with a single apical hook; aedeagus very slender.

DISTRIBUTION. Argentina (De Santis, 1964; Annecke, 1974): Brazil, Peru, Trinidad & Tobago (Noyes, 1987) and St Vincent & Grenadines, Costa Rica and Ecuador (**new records**).

HOSTS. Recorded as a parasitoid of *Hemiberlesia rapax* (Comstock) (Hemiptera: Diaspididae) on *Ribes* sp. (Saxifragales: Grossulariaceae) (De Santis, 1964) and *Diaspis echinocacti* (Bouché) on *Harrisia* Britton. (Caryophyllales: Cactaceae) (Annecke, 1974).

MATERIAL EXAMINED.

Type material. Paratypes: ARGENTINA, 2♀, Buenos Aires, La Plata, ex Diaspididae, 1959, xii.1961 (De Santis) (NHMUK).

Non type material. **ST VINCENT & GRENADINES**, 1♀, **St Vincent**, St David, Richmond Beach, coastland, 10.vii.1976 (J.S. Noyes). **TRINIDAD & TOBAGO**, 1♂, **Trinidad**, St George, St Augustine, Malaise trap, 15.-vii-13.viii.1976 (J.S. Noyes); 1♀, Trinidad, St George, St Augustine, light trap, viii.1976 (F.D. Bennett). **COSTA RICA**, 2♀, **Guanacaste**, Santa Rosa NP, various localities, 3-24.viii.1985, 16.xi-7.xii.1985 and 6-27.ix.1986 (D. Janzen, I. Gauld); 3♀, Guanacaste, Nandayure, Finca Agua Fria, LN 222550 399500, canopy fog, i.2002 (W. Porras); 1♀, Guanacaste, PN Palo Verde, Sec. Palo Verde, Estacion, LN 385020 260952, 0m, #58299, 13-20.ix.2000 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Cerro Guayacan, LN 259350 389600, 200m, #54245, xi-xii.1999 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Cerro Guayacan, LN 388500 259750, 100m, #57963, 11.vii-10.viii.2000 (I. Jiménez); 1♀, **Alajuela**, Reserva Rincon Forestal, Est. Caribe, 10°53'N 85°18'W, 400m, 19-20.ii.2003 (J.S. Noyes); 1♀, **Heredia**, 11km SE La Virgen, 10°20'N 84°04'W, 450-550m, 05/M/NOTN, 22.ii-20.iv.2003 (INBio-OET-ALAS); 1♀, Heredia, Santo Domingo, INBio Parque, LN 526250 217400, 1200m (error for 1100m), 19.ii.2001 (J.S. Noyes); 1♀, Heredia, INBio Parque, LN 217300 526200,1100m, #62271, v.2001 (R. Zuñiga); 3♀, Heredia, Santo Domingo, INBio Parque, LN 526250 217400, 1100m, iii.2002 (J.A. Azofeifa, J.S. Noyes); 1♀, **Puntarenas**, Pen. Osa, 8km S. R. Rincon, Coopermarti, x.1990 (A. Retama); 1♀, Puntarenas, RF Golfo Dulce, 24km W Piedras Blancas, vi.1991 (P. Hanson); 1♀, Puntarenas, Pen. Osa, Puerto Jimenez, 10m, iv.1991 (P. Hanson). **ECUADOR**, 1♀, **Napo**, Res. Ethnica Waorani, 00°39'S 76°26'W, 220m, canopy fog #853, 4-10.x.1994 (T.L. Erwin et al.); 1♀, Napo, Res. Ethnica Waorani, 00°39'S 76°26'W, 220m, canopy fog #913/914, 10.x.1994 (T.L. Erwin et al.); 1♀, Napo, Res. Ethnica Waorani, 00°39'S 76°26'W, 220m, canopy fog #924, 4-10.x.1994 (T.L. Erwin et al.). **PERU**, 1♀, Junin, Satipo, 18-19.i.1984 (L. Huggert). **BRAZIL**, 8♀, **Sta Catarina**, Nova Teutonia, various dates 18.v.1943-14.xii.1949 (F. Plaumann). Material in NHMUK and MZUCR.

COMMENTS. Females of *Neococcidencyrus crouzelae* are the easiest to recognise in the genus because this is the only species known with an overall dark brown body with completely hyaline wings.

Neococcidencyrtus dracaenus sp.nov.
(Figs 336-340)

DIAGNOSIS. *Female* (length about 1.3mm): face (Fig. 336) with a distinct dark brown band above toruli level with top of interantennal prominence; mesoscutum dark brown with a metallic sheen; tegula pale orange, apex pale brown; scutellum orange; all coxae dark brown; fore femur mostly dark brown, fore tibia mostly pale orange; mid femur pale orange; hind femur dark brown; hind tibia dark brown, without bands; fore wing (Fig. 340) with an infuscate pattern; hyaline band distad of venation with widest point about 1.5X as wide as narrowest point; head (Fig. 336) about 4.6X as wide as frontovertex; funicle with longitudinal sensilla on F3-F6; clava (Fig. 337) with

outer suture complete and dorsally oblique; mandible with three teeth; fore wing (Fig. 340) about 2.4X as long as broad; linea calva interrupted by 3 setae; exserted part of ovipositor about 0.3X as long as mid tibial spur; gonostylus shorter than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.25mm; excluding ovipositor, 1.17mm (CPD).

Head generally orange; frontovertex brown between ocelli and in this area with metallic dark blue and purple reflections; face (Fig. 336) below top of scrobes mainly white with a narrow, slightly curved, transverse, dark brown band between lowest eye margins and another, slightly broader, transverse, dark brown band across ventral parts of toruli and gena to occiput, mouth margin orange; temple and gena orange; frontovertex with a few, inconspicuous, brown setae; a line of inconspicuous, translucent silvery setae between eye and scrobe to position of malar sulcus; gena with only a few, scattered inconspicuous translucent setae, these becoming more dense and conspicuous on lower gena and on interantennal prominence; maxillary palpus dusky pale orange; radicle pale orange, with a dark brown apical ring; scape pale orange, ventral margin narrowly dark brown; pedicel pale orange, with a complete dark brown stripe internally; F1 and F2 orange-brown, darker internally, remainder of funicle pale orange but F3 slightly dusky; clava dark brown; thorax mixed orange and dark brown with a metallic lustre; pronotum orange, posterior margin completely translucent, neck dusky; mesoscutum dark brown with a strong, metallic, mixed green, blue-green and dark blue sheen with some brassy reflections; tegula orange, apex pale brown with a weak coppery purple sheen; axilla orange, margined dark brown; scutellum orange, dorsally with weak coppery reflections, side and apex with a metallic dark blue and purple sheen; mesopleuron mainly dark brown with a very weak purple, coppery and dark blue sheen, anterior part orange-brown; all coxae dark brown; fore femur mostly dark brown, apex pale orange, tibia mostly pale orange with dorsal and ventral margins brown proximally, tarsus dusky orange, apical tarsomere brown; mid femur mostly pale orange with dorsal margin brown proximally and a slender, oblique subapical brown band, extreme apex white, mid tibial spur and tarsus pale yellow, almost white; hind femur and tibia dark brown with apex of tibia pale orange, tarsus white with apical tarsomere orange-brown; fore wing (Fig. 340) generally infuscate, hyaline below proximal half of submarginal vein and with a complete, slightly irregular, hyaline band immediately distad of apex of venation, apex more or less broadly hyaline; hind wing hyaline; propodeum dark brown with a weak purple sheen; gaster dark brown with a coppery purple sheen; gonostylus brown with apex broadly pale orange.

Head (Fig. 336) about 4.6X as wide as frontovertex, slightly collapsed, but in profile about 1.8X as high as deep, tangent to frontovertex forming an angle of about 80° with that of face; occipital margin rounded, indistinct; no oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 45°; frontovertex (Fig. 336) moderately shiny with fairly shallow, polygonally reticulate sculpture of mesh size mostly a little smaller than eye facet; temple and gena with relatively shallow, longitudinally elongate, fine polygonally reticulate sculpture; top of scrobes, interantennal prominence and mouth margin with shallow, regular, polygonally reticulate sculpture; scrobes extremely shallow, indistinct; antenna as in Fig. 337; scape very slightly broadened and flattened, about 4.1X as long as broad; funicle with F1-F2 smaller, subequal, subquadrate, F3-F5 larger, slightly longer than broad, gradually increasing in size distad, F6 largest and subquadrate, linear sensilla present only on F3-F6; clava about as long as F3-F6 combined, sutures parallel, outer suture complete and dorsally oblique; sensory area small, at apex only, giving it a rounded appearance; eye slightly overreaching occipital margin, naked; malar sulcus absent; clypeal margin weakly concave; mandible more or less tridentate, with one acute tooth and an upper, broad, slightly concave truncation. Relative measurements (head slightly collapsed): HW c.76, HH c.60, FV c.16.5, POL 7, OOL 1, OCL c.10, AOL 11, EL c.37, EW c.37, MS 31, SL 37, SW 9.

Thorax visible part of mesoscutum about 1.75X as broad as long; scutellum about 1.5X as broad as long with subapical setae about 0.75X its length; hind femur about 3.8X as long as broad; fore wing with venation and setation as in Figs 339, 340; propodeum medially about 0.09X as long as scutellum. Relative measurements: FWL 86, FWW 35.5; HWL 63.5, HWW 16.5.

Gaster with hypopygium (Fig. 338) reaching about 0.7X; last tergite about 0.7X as long as mid tibia, with apex broadly rounded; ovipositor exserted, the exserted part about 0.4X length of mid

tibial spur or about 0.15X mid tibia. Relative measurements: OL 95, GL 19 [MT 74].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Santa Rosa NP, BH90, xi.1986 (D. Janzen, I.D. Gauld). Holotype in NHMUK.

COMMENTS. The head of the holotype when card-mounted was slightly collapsed and therefore many of the measurements and ratios obtained from the card-mounted specimen are only approximate.

Neococcidencyrtus dracaenus is similar in general appearance to *hynodis* Noyes. However, in *dracaenus* the mesoscutum has a strong green, blue-green and dark blue sheen, the scutellum is orange with coppery reflections and metallic dark blue on the side and apex and the apex of the fore wing is more or less hyaline or at least conspicuously paler than area proximad. In *hynodis* the mesoscutum has only a slight metallic blue and purple sheen, the scutellum is yellow orange to orange and the apex of the fore wing is clearly infuscate.

Neococcidencyrtus plinthus **sp.nov.**

(Figs 341-344)

DIAGNOSIS. *Female* (length about 0.8mm): face with a distinct dark brown band above toruli level with top of interantennal prominence; mesoscutum dark brown with a metallic sheen; tegula pale orange, apex brown; scutellum orange; all coxae dark brown; fore femur and tibia mostly dark orange-brown; mid femur pale orange; hind femur dark brown; hind tibia dark brown, without bands; fore wing (Fig. 342) with an infuscate pattern; hyaline band distad of venation with widest point about 2X as wide as narrowest point; head about 2.6X as wide as frontovertex; funicle with longitudinal sensilla on F4-F6; clava with outer suture dorsally oblique and incomplete; mandible with one tooth and a broad, straight, truncation; fore wing (Fig. 342) about 2.4X as long as broad; linea calva interrupted by 2 setae; exserted part of ovipositor about 0.6X as long as mid tibial spur; gonostylus shorter than mid tibial spur. *Male*: unknown.

Female **(**holotype**)**: length, including ovipositor, 0.80mm; excluding ovipositor, 0.74mm (CPD).

Head with occiput dark orange-brown, frontovertex above scrobes dark brown with a weak, dark blue sheen, eye margins with a coppery purple sheen; face generally pale orange with a transverse, dark brown band with a slight coppery purple sheen immediately below eyes, and a broader dark brown band across toruli, mouth margin medially narrowly pale orange, dark brown laterally; temple and gena dark brown, temple with a weak coppery purple and dark blue sheen, gena with weak dark blue and blue-green sheen; frontovertex with a few inconspicuous, brown setae; a line of inconspicuous, translucent silvery setae between eye and scrobe to position of malar sulcus; gena with only a few, scattered inconspicuous translucent setae, these becoming more dense and conspicuous on lower gena and on interantennal prominence; maxillary palpus dusky pale orange; radicle dusky pale orange, with a dark brown apical ring; scape slightly dusky pale orange narrowly margined dark brown; pedicel and funicle dusky pale orange, clava dark orange-brown; thorax generally dark brown to black with a weak metallic lustre; pronotum with weak coppery purple and dark blue reflections; mesoscutum with a dull, metallic dark blue sheen mixed with some coppery purple, posterior margin dark coppery purple; tegula dark brown with a weak purple and brassy sheen; axilla with a relatively dull, coppery purple sheen; scutellum dorsally orange with a very slight brassy sheen and an irregular, brown spot proximally, side with a metallic dark blue and purple sheen, apex brassy; mesopleuron mainly with a purple sheen

mixed with some metallic dark blue; all coxae dark brown; fore femur dark orange-brown, apex pale orange, tibia mostly orange-brown with apical 0.3X pale orange, tarsus dusky orange, apical tarsomere brown; mid femur mostly dark brown, but pale orange in proximal 0.3X and extreme apex very pale orange, mid tibia spur and tarsus pale orange with apical tarsomere brown; hind femur and tibia dark brown with extreme apex of tibia pale orange, tarsus pale orange with apical tarsomere dark brown; fore wing (Fig. 342) generally weakly infuscate, hyaline below proximal half of submarginal vein and with a pair of opposite, subtriangular, hyaline spots immediately distad of apex of venation; hind wing hyaline; propodeum dark brown with a weak brassy sheen; gaster dark brown with a coppery purple sheen; gonostylus brown with apex pale orange.

Head about 2.6X as wide as frontovertex, slightly collapsed, but in profile about 1.7X as high as deep, tangent to frontovertex forming an angle of about 100° with that of face; occipital margin rounded, indistinct; no oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 80°; frontovertex moderately shiny with fairly shallow, polygonally reticulate sculpture of mesh size mostly a little smaller than eye facet; temple and gena with relatively shallow, longitudinally elongate, fine polygonally reticulate sculpture; top of scrobes with very shallow, regular, polygonally reticulate sculpture; scrobes extremely shallow, indistinct; antenna as in Fig. 342; scape slightly broadened and flattened, about 3.5X as long as broad; funicle with F1-F3 smaller, subequal, subquadrate, F4-F6 larger, subequal, slightly longer than broad, linear sensilla present only on F3-F6; clava slightly shorter than funicle, sutures parallel, outer suture dorsally oblique and incomplete; sensory area small, at apex only giving it a rounded appearance; eye slightly overreaching occipital margin, clothed with short inconspicuous setae, each clearly shorter than diameter of facet; malar sulcus absent; clypeal margin very slightly concave; mandible with one, acute tooth and a very broad, straight truncation that has a small ventral tooth. Relative measurements (head slightly collapsed): HW 50, HH c.39, FV c.19, POL 7.5, OOL 3, OCL c.7, AOL 6, EL c.21, EW c.20, MS 18, SL 21, SW 6.

Thorax with visible part of mesoscutum about 1.8X as broad as long; scutellum about 1.4X as broad as long with subapical setae about 0.8X its length; hind femur about 3.1X as long as broad; fore wing with venation and setation as in Figs 341, 342; propodeum medially about 0.09X as long as scutellum. Relative measurements: FWL 57, FWW 24; HWL 37, HWW 10.

Gaster with hypopygium (Fig. 344) reaching about 0.8X towards apex; last tergite about 0.8X as long as mid tibia, with apex broadly rounded, virtually truncate; ovipositor exserted, the exserted part about 0.6X length of mid tibial spur or about 0.2X mid tibia. Relative measurements: OL 65, GL 14.4 [MT 45].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, La Selva BS, 50m, 22.i-3.ii.1991 (J.S. Noyes). Holotype in NHMUK.

COMMENTS. The head of the holotype when card-mounted was slightly collapsed and therefore many of the measurements and ratios obtained from the card-mounted specimen are only approximate. It is likely that the angle formed by the face with the tangent to the frontovertex is less than 90°.

Of the described species, *Neoccoccidencyrtus plinthus* is most similar to *hynodis* Noyes It differs in having the head above the scrobes dark brown with a weak dark blue sheen, the clava dark orange-brown, the fore wing infuscation weak, the scutellum with the side and apex with a dark blue and purple sheen, the mid femur dark brown and the frontovertex nearly two-fifths head width. In *hynodis* the frontovertex is orange-brown below the anterior ocellus, the clava is dark brown, the fore wing infuscation is strong, the scutellum is entirely pale orange, the mid femur is testaceous and the frontovertex is about one-quarter head width.

Genus *COMPERIELLA* Howard

Comperiella Howard, 1906:121-122. Type species: *Comperiella bifasciata* Howard, by monotypy.
Pseudanusia Girault, 1915a:155. Type species: *Pseudanusia pia* Girault, by original designation. Synonymy with *Comperiella* by Girault, 1917a:37.
Habrolepistia Mercet, 1921:668. Type species: *Habrolepistia cerapterocera* Mercet, by original designation. Synonymy with *Comperiella* by Mercet (1926:320).

Female. Overall length about 0.5-1.4mm.

Body slightly dorsoventrally flattened, generally dark brown with a weak metallic sheen, some areas strongly metallic; frontovertex with a pale yellow band adjacent to each eye and a median dark brown, slightly metallic band; pronotal collar with a median rectangular yellow area, sometimes divided into two longitudinally; mesoscutum with a longitudinal median metallic green or blue-green stripe margined laterally by a dark purple and coppery area; scutellum with a moderate to strong metallic sheen; legs mostly dark brown with yellow areas on fore and mid tibia; tarsi mostly yellow; fore wings with a pattern of hyaline and infuscate areas, usually with one or two longitudinal infuscate streaks apically; hind wing hyaline.

Head in profile strongly triangular with frontovertex more or less straight, strongly angled at top of scrobes and from there straight to the mouth margin, angled formed by frontovertex and face about 65°; top of scrobes delimited by a sharp, transfacial carina; antenna attached about half way between mouth margin and transfacial carina; scrobal area with shallow sculpture; frontovertex with fine, polygonally reticulate sculpture, a little shallower in front of anterior ocellus; scape broadened and flattened, in most cases subtrapezoidal; pedicel and flagellum usually strongly broadened and flattened, rarely subcylindrical; pedicel dorsally very slightly convex and very shiny; funicle 6-segmented, the segments usually strongly transverse; club 3-segmented with a weak to strong oblique apical truncation; mandible with one tooth and a broad, straight truncation, with a distinct socketed peg, near ventral margin on inner surface; palp formula 4-3.

Mesoscutum with imbricate-reticulate sculpture, notaular lines absent; scutellum dorsally flat with transversely elongate lineolate-aciculate sculpture, side and apex completely smooth and shiny; mesopleuron reaching level with posterior margin of propodeum; fore wing about 2.5-3.3X as long as broad; submarginal vein with parastigma slightly to strongly expanded and slightly downcurved, junction with marginal vein with a hyaline break; marginal vein about 2.5-3X as long as broad and about as long as stigmal vein; postmarginal vein absent or virtually so; filum spinosum present.

Gaster slightly shorter than thorax; hypopygium reaching about 0.7X along gaster; paratergites absent; ovipositor a little longer than mid tibia, slightly exserted with exserted part shorter than mid tibial spur; gonostylus free.

Male. Overall length about 0.5-1.1mm.

Similar in general habitus to female, but for colouration and structure of head, antenna and genitalia; head with ocellar area dark brown bordered by yellow, rest of head, thorax and gaster dark brown with a very weak metallic sheen; legs largely dark brown with fore and mid tibiae and tarsi largely white; fore wing completely hyaline; head about 2X as wide as frontovertex; antenna with scape slightly broadened, flagellum filiform with all funicle segments longer than broad, clava entire, about as long as F5-F6 combined, segments clothed in long setae; phallobase about 2.3-4.3X as long as wide; aedeagus about 0.4-0.6X as long as mid tibia with apex tapered, acute; digitus with a single apical hook.

DISTRIBUTION. Cosmopolitan, introduced into Americas.

HOSTS. Primary parasitoids of a variety of armoured scale insects (Hemiptera: Diaspididae).

BIOCONTROL. *Comperiella bifasciata* (Howard, 1906), mainly originating from China, has been released in many countries throughout the world (e.g. Chile, France, Greece, Morocco, Turkey, Zambia, Indonesia and Philippines) in attempts to control *Aonidiella aurantii* (Maskell),

A. citrina (Coquillett), *A. inornata* McKenzie and *Aspidiotus destructor* Signoret (Hemiptera: Diaspididae). In most cases control attempts have failed (Gonzalez & Rojas, 1966; Greathead, 1976, Argyriou, 1974; Bennett et al., 1976; Trjapitzin, 1989; Uygin & Sekeroglu, 1987; Dean 1955; CIBC 1978, 1979, 1980; Vandenberg, 1929; Hoyt, 1957; Voute, 1937). However, in Australia, partial control of *Aonidiella citrina* was achieved in Victoria (Bennett et al., 1976), and successful control of *Aonidiella aurantii* in Queensland (Murray, 1976; Smith, 1978, 1981; Wilson, 1960). Partial control of *Aonidiella aurantii* in Swaziland was achieved by releases of the parasitoid in 1969-1970 (Catling, 1971; Atkinson, 1977). The same parasitoid was introduced into South Africa in 1966 and again in 1981-1983 and resulted in the successful control of *Aondiella aurantii* (Bruwer & Villiers, 1988; Greathead, 1971) and similar results were obtained in Mexico by releases of the parasitoid against the same pest in 1989 (Altieri et al., 1989). Most success has been achieved in California (USA) where multiple releases of the parasitoid up to 1969 have led to the successful control of *Aonidiella aurantii* and A. *citrina* (Compere, 1956; DeBach, 1955; Rao et al., 1971). *Comperiella bifasciata* was also used in biological control programmes in a various countries (e.g. USA, spain, Italy, Greece, Israel, South Africa, Mauritius, Philippines) against *Chrysomphalus aonidum* (Linnaeus), *C. bifasciculatus* Ferris, *C. dictyospermi* (Morgan), *Comstockaspsis perniciosa* (Comstock), *Hemiberlesia rapax* (Comstock) and *Pseudaulacaspis pentagona* (Targioni Tozzetti) (Hemiptera: Diaspididae) but did not contribute to control of any of these pests (see summary in Noyes & Hayat, 1994).

Comperiella unifasciata Ishii was introduced from Japan into Fiji, Mauritius and Indonesia in 1926-1938 for the control of *Aspidiotus destructor* but without success (Taylor, 1935; Moutia & Mamet, 1946; Reyne, 1947).

COMMENTS. *Comperiella* can be distinguished from other encyrtid genera by the combination of the flattened scape, pedicel and flagellum (except *apoda* Prinsloo, 1996 from south Africa), yellow frontovertex with a median dark stripe and the partially infuscate fore wing with oblique apical stripes (except *ponticula* Prinsloo & Annecke, 1976 from southern Africa and the Cape Verde Islands). It is probably closest to *Ceraptroceroideus* Girault, 1916a and *Spaniopterus* Gahan, 1927 known only from North America and Indonesia respectively. However, females of both *Ceraptroceroideus* and *Spaniopterus* lack a sharp, transfacial carina that extends laterally between the eye and facial depression and the funicle in *Spaniopterus* is only 4-segmented and the clava 2-segmented. *Ceraptroceroideus* currently includes two described species: *cinctipes* Girault, 1916 and *idahoensis* Trjapitzin & Gordh, 1979. The type species of *Ceraptroceroideus* (*cinctipes*) is known only from brachypterous females that differ from known species of *Comperiella* by having a single orange median stripe on the frontovertex bordered by brown lines along each eye margin (opposite of the character state in *Comperiella*), a yellow band across the face below the eyes and a completely dark brown mesoscutum with a slight brassy sheen. The second species is similar but is fully winged and lacks the median orange stripe on the frontovertex.

IDENTIFICATION. Worldwide 11 species. See Hayat, 2006 (India; key to 5 species); Prinsloo 1996 (southern Africa; key to 9 world species); Hayat & Veenakumari, 2014 (new species description); Barrion et al. 2016 (new species description);

Comperiella lemniscata **Compere & Annecke**

(Figs 345-349; Hab. ♀ 55)

Comperiella lemniscata Compere & Annecke, 1961:32-33. Syntypes ♀, India (Maharashtra), USNM, not examined.

DIAGNOSIS. *Female* (length about 0.7-1.2mm): head (Fig, 345) largely dark brown with a weak metallic sheen; frontovertex pale yellow with a median brown stripe that is moderately metallic green, from occipital margin to transfacial carina; antenna dark brown; thorax as in Fig. 349; pronotal collar with a median, rectangular, yellow area; mesoscutum with very well defined median longitudinal metallic blue-green stripe, a little less than one-third width of mesoscutum, contrasting strongly with the lateral dark coppery purple areas, this colouration carried on to

scutellum where it is bordered by completely smooth, strong metallic dark blue and purple; fore wing (Fig. 347) with two, strongly divergent, subequal, radiating lines from middle, one reaching wing apex and other distal margin at anal angle, posterior ocelli separated by about their own diameters; antenna with club (Fig. 346) slightly narrower than F1, slightly shorter than pedicel and funicle combined and clearly narrowing towards apex; fore wing (Fig. 347) about 2.5-2.8X as long as broad, setae basad of linea calva modified, slightly flattened and apically rounded, venation as in Fig. 348; mid tibial spur as long as basitarsus. *Male* (length about 0.5-1.1mm): head with area delimited by ocelli and occipital margin dark brown; eye margin, line across frontovertex between anterior ocellus ant top of scrobes and sometimes occiput behind eye yellow to orange-pink; antenna with scape about 2.3X as long as broad; funicle clothed in long setae, longest about 2.3X as long as diameter of segment; linear sensilla on F4-F6; phallobase about 4.3X as long as wide; aedeagus about 0.5X as long as mid tibia.

DISTRIBUTION. Spain. Italy, South Africa, Saudi Arabia, Iran, Israel, Pakistan, India, China, Australia (see Noyes, 2019) and recorded below from Costa Rica (**new record**) and Thailand (**new record**).

HOSTS. This species has been recorded as a primary parasitoid of *Aonidiella orientalis* and *Chrysomphalus dictyospermi* (Hemiptera: Diaspididae) (see Noyes, 2019).

MATERIAL EXAMINED.

Non type material. **COSTA RICA**, 1♀, **Heredia**, Santo Domingo, INBio Parque, 9°59'N 84°06'W, 12.ii.2011 (J.S. Noyes); 1♀, Heredia, Santo Domingo, INBio Parque, 9°59'N 84°06'W, 14.ii.2015 (J.S. Noyes). **SAUDI ARABIA**, 1♀, Riyadh, Deirab, ex scale sp. 6 *Aonidiella orientalis*, CIE A19693, 10.xi.1987; 5♂, Oleisha, ex *Aonidiella orientalis* on *Ficus nitida*, sp. 14 CIE A20151, 20.x.1988 (A. Al-Ahmad); IRAN, Jiroft, 6♀, ex *Aonidiella orientalis* on sweet lemon, 27.viii.1991 (R. Lachinani); **INDIA**, 11♀, **Jharkhand**, AOCI, Nankum, Lac Res. Inst., ex *Aspidiotus orientalis*, 1933 "Comperiella bifasciata How. ♀ Ch Ferrière det."; **THAILAND**, 4♀, Chiang Mai, diaspine on oleander, 12.i.1993 (F.D. Bennett); **CHINA**, 2♀, **Hong Kong**, Tai Po, ex *Aonidiella orientalis* on papaya, , SzR 1200, 26.xi.1943 (S.E. Flanders), erroneously labelled as "Paratype"; 7♀, **Hainan**, Haikou, ex *Aonidia* on oleander, 2.vi.1988 (F.D. Bennett, Ren Hui). Material in NHMUK.

COMMENTS. I have not examined the syntypes of *Comperiella lemniscata*, but Prinsloo (1996) provides an excellent diagnosis of the species based on his study of them. It is closest to *pia* (Girault) from Australia and *bifasciata* (Howard) a cosmopolitan species, the females of all three species having two divergent, subequal, radiating lines from the middle of the wing, separated from main infuscate area by a hyaline break, one reaching the wing apex and other the distal margin at the anal angle of the wing. *Comperiella lemniscata* can be separated from *pia* by having the fore wing less than 3X as long as broad and from *bifasciata* by the mesoscutum having a very well-defined median, longitudinal, metallic blue-green stripe that is slightly less than one-third width of mesoscutum and is very strongly margined laterally by the metallic dark coppery purple sides of the mesoscutum. In *pia* the fore wing is more than 3X as long as broad and in *bifasciata* the metallic stripe on the mesoscutum is at least about half the width of the mesoscutum and its lateral margins are rather more diffuse. The males can be separated from those of *bifasciata* by the presence of linear sensilla on F4-F6 of the funicle whereas those of *bifasciata* have linear sensilla only on F5-F6 (see Battaglia, 1989).

Genus *ORIXIA* gen.nov.

Type species: *Orixia philotes* **sp.nov.** Gender feminine.

Female. Length about 0.8-1.2mm.

Body moderately robust, not flattened; generally orange, head sometimes black; fore wing weakly to moderately strongly infuscate.

Head triangular in profile, about 1.3-1.4X as high as deep, evenly and gently rounded from occipital margin to top of scrobes and then angled at approximately 90° towards mouth margin

and more or less straight; in facial view, subcircular, slightly broader than high, about 4X as wide as frontovertex; a slender, elongate depression adjacent to eye margin near posterior ocellus; eye reaching occipital margin, clothed in very conspicuous, dense setae that are at least as long as diameter of facet; frontovertex with evenly spaced piliferous punctures along inner eye margin; scrobes shallow, but well defined dorsally and laterally, more or less ∩-shaped, meeting and quite smooth; interantennal prominence acute dorsally with shallow, regular, polygonally reticulate sculpture; torulus separated from mouth margin by about its own length, upper margin about level with lowest eye margin; scape slightly broadened and flattened, widest about middle; funicle 6-segmented, segments clearly transverse or quadrate, becoming progressively slightly broader distally; linear sensilla on all funicle segments or absent from proximal segments; clava 3-segmented, sutures hardly oblique, subparallel, outer suture sometimes virtually absent so that clava is more or less 2-segmented, sensory area at apex and slightly enlarged giving it a truncate appearance; malar sulcus present, distinct; clypeal margin quite strongly concave; dorsal tentorial arms reaching frontovertex about midway between eye and torulus, about level with lowest eye margin; mandible with a small lower tooth and a very broad, straight truncation, internal surface with a socketed peg near ventral margin (Fig. 364, arrowed); palp formula 4-3.

Thorax with pronotum short, its posterior margin strongly concave; notaular lines absent; mesoscutum about 1.6X as broad as long; scutellum slightly longer than broad; dorsum of thorax quite strongly sculptured with sculpture on mesoscutum about as deep as that on scutellum; axillae meeting medially; scutellum with fairly dense, evenly distributed setae, those at apex only slightly longer than those at base; scutellum with 4-6 small subapical pits or pores; fore wing about 2.5-2.7X as long as broad, weakly infuscate; costal cell of fore wing with at least two lines of setae ventrally and with a single line of setae dorsally in apical 0.4X; junction of submarginal vein and marginal vein indicated by a hyaline break; parastigma not downcurved and hardly swollen, without any backwardly directed setae; linea calva entire, open; filum spinosum present, not strong; marginal vein about 5X as long as broad; postmarginal vein at least about half as long as stigmal vein; stigmal vein subsessile, about 0.5X as long as marginal vein; uncus present, campaniform sensilla in a line; mesophragma projecting slightly into gaster; mid tibial spur shorter than basitarsus; mesopleuron well separated from base of gaster by propodeum and metapleuron; propodeum not more than 0.2X as long as scutellum with distinct carinae and sculpture medially and strongly sculptured laterally, with only 2 or 3 setae near spiracle.

Petiole about 0.4X as wide as propodeum and anelliform; Gt2 of gaster on each side with a very close pair of small groups of tiny pores near the anterior margin; syntergum roughly U-shaped, shorter than mid tibia with apex truncate; hypopygium about 2.3X as broad as long with anterior margin weakly concave and posterior margin straight or weakly convex; paratergites absent; outer plates of ovipositor free, detached from Gt7 and slightly more than 2X as long as broad; ovipositor hidden or hardly exserted, about 0.7X as long as mid tibia or 3.5X as long as gonostylus; base of second valvifer with a very reduced semi-circular sheet with posterior margin hardly concave and the apical part without any subapical setae; gonostylus free.

Male. Length about 1.0mm.

Virtually identical to female, differing only in genitalia structure. Antenna with clava 3-segmented, but with outer suture incomplete; phallobase slightly less than 3X as long as broad; digitus about 2X as long as broad with a single apical hook, paramere not developed, without apical seta; cuspis seta present; aedeagus about 4.5X as long as broad, about one-third as long as mid tibia, hardly longer than mid tibial spur.

DISTRIBUTION. Costa Rica, Ecuador.

HOSTS. Unknown.

COMMENTS. The triangular profile of the head and presence of a socketed peg near the ventral margin of the mandible suggests that *Orixia* may belong to the tribe Habrolepidini. However, females of *Orixia* lack a slightly, but distinctly enlarged parastigma and have a distinctly convex scutellum (mostly dorsally flat in Habrolepidini). The structure of the ovipositor, particularly the

proximal part of the second valvifer with the reduced semicircular sheet that has a hardly concave posterior margin also distinguishes *Orixia* the genera currently include in the tribe. Further to this, the antenna of the male is very similar to that of the female whereas in males of Habrolepidini the antenna either has a 2 segmented funicle and extremely long clava (Habrolepidina) or the funicle is composed of 6 elongate segments clothed in whorls of long setae that are several times longer than the diameter of the segments (Comperiellina). Another distinguishing feature of *Orixia* is the presence of 2 or 3 pairs of subapical pits or pores on the scutellum. Unfortunately, these can only be seen on slide-mounted material.

Key to Costa Rican species of *Orixia*
(Females)

1. Head orange ..... *demos* **sp.nov.** (p. 146)
- Head black 2

2 (1) Antenna with clava yellow or pale orange; hind tibia orange ..... *philotes* **sp.nov.** (p. 147)
- Antenna with clava dark brown; hind tibia mostly dark brown ..... *sirus* **sp.nov.** (p. 148)

***Orixia demos* sp.nov.**
(Figs 350-355; Hab. ♀ 56)

DIAGNOSIS. *Female* (length about 1.1-1.2mm): head orange; F6 and clava dark brown; hind tibia orange-brown; fore wing (Fig. 365) weakly, but distinctly infuscate; hind wing hyaline; ocelli forming an angle of about 55°; antenna with linear sensilla on F2-F6 sometimes absent from F2; fore wing about 2.5X as long as broad, postmarginal vein (Fig. 351) about 0.6X as long as stigmal vein; sculpture on mesoscutum and scutellum (Fig. 355) composed of longitudinally elongate imbricate-reticulate to polygonally reticulate cells that are much more strongly elongate laterally; mid tibial spur about 0.8X as long as basitarsus. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.23mm; excluding ovipositor, 1.21mm (CPD).

Head generally orange with a weak brassy sheen, occiput with a brown mark above foramen; antenna with radicle, scape and pedicel orange; F1-F3 brown, F4-F5 orange (slightly dusky on right antenna), F6 brown, clava dark brown; mandible orange; palpi pale orange; frontovertex and gena with relatively scattered, conspicuous brown setae, interantennal prominence with relatively dense brown setae; thorax generally orange with a weak brassy sheen, scutellum subapically orange-brown, mesopleuron pale orange, setae on dorsum of thorax relatively dense, dark brown and conspicuous; legs pale orange, hind tibia mostly orange-brown; fore wing (Fig. 350) mostly weakly infuscate, virtually hyaline proximad of linea calva and with a pair of opposite, poorly defined, paler, subtriangular areas distad of apex of wing venation, submarginal and stigmal veins pale orange, rest of venation brown; hind wing hyaline; propodeum orange, side slightly dusky; gaster pale orange, Gt3-Gt6 slightly dusky, apices of syntergum and outer plates of ovipositor dusky; gonostylus pale orange.

Head (Fig. 352) about 3.9X as wide as frontovertex, in profile about 1.4X as high as deep; occipital margin not sharp; ocelli forming an angle of about 55°; about 10 punctures in two rows on frontovertex below anterior ocellus and with relatively shallow, polygonally reticulate sculpture of slightly smaller mesh than diameter of eye facet; antenna as in Fig. 353; scape about 2.4X as long as broad; F1-F2 subquadrate, F3-F6 clearly transverse, segments slightly broader distad; clava slightly broadened, slightly longer than F4-F6 combined, 2-segmented, sutures not oblique, sensory area slightly enlarged, at apex only giving the clava a distinctly transversely truncate appearance; inner eye margins subparallel; malar sulcus present, distinct. Relative measurements: HW 60, HH 48, FV 15.5, POL 4.5, OOL 1, OCL 5.5, AOL 5.5, EL 35, EW 33, MS 20, SL 26, SW 11.

Thorax (Fig. 355) with polygonally reticulate sculpture on pronotum and axilla that is of similar depth to that on frontovertex but mostly composed of distinctly longitudinally elongate, polygonal cells that are more strongly elongate laterally; mesoscutum and scutellum with rounded

to longitudinally elongate, imbricate-reticulate to polygonally reticulate sculpture that is clearly deeper than that on frontovertex; scutellum with three pairs of very small subapical pits or pores that are each of much smaller diameter than cell of reticulate sculpture; visible part of mesoscutum about 1.6X as broad as long; scutellum about as long as broad; setae on dorsum moderately dense and of more or less uniform length, separated by less than their own lengths, apical setae on scutellum slightly longer; fore wing with venation and setation as in Figs 350, 351. Relative measurements: FWL 67, FWW 26.5; HWL 44, HWW 9.5.

Gaster with hypopygium reaching about 0.8X towards apex; syntergum about 0.7X as long as mid tibia, with apex truncate; ovipositor very slightly exserted, the exserted part less than 0.2X as long as mid tibial spur.

Paratype. Funicle with linear sensilla present only on F2-F6 or absent from F1; ovipositor Fig. 354; . Relative measurements: OL 39.5, GL 11.5 [MT 53].

Variation. Females vary in overall length from 1.12-1.22mm, F4 may be brown, otherwise little variation in material available.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Pitilla (ACG), 700m, MT/YPT, 24.i-27.ii.1996 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, same data as holotype; 1♀, Guanacaste, Est. Pitilla (ACG), 10°59'N 85°25'W, 700m, FIT, iii.2001 (C. Moraga, P.N. Thomas). Holotype in MZUCR, paratypes in NHMUK.

Orixia philotes sp.nov.

(Figs 356-365; Hab. ♀ 57, ♂ 58)

DIAGNOSIS. *Female* (length about 0.8-1.2mm): head black; clava yellow or pale orange; legs pale orange; fore wing generally weakly infuscate; hind wing generally weakly infuscate; ocelli forming an angle of about 75°; antenna with linear sensilla on F3-F6; fore wing (Fig. 361) about 2.7X as long as broad, postmarginal vein very nearly as long as stigmal vein (Fig. 357); mesoscutum and scutellum (Fig. 356) with uniform polygonally reticulate sculpture composed of rounded cells; scutellum with three pairs of subapical pits or pores that are mainly of subequal diameter to cell of reticulate sculpture; mid tibial spur about 0.9X as long as basitarsus. Male (length 0.95mm): almost identical to female, differing only in genitalia structure.

Female (holotype): length, 1.04mm (CPD).

Head generally black with a weak brassy sheen; antenna, including radicle, mainly pale orange, but F4-F6 brown, apical segments of clava slightly paler orange; mandible amber; palpi white; frontovertex and gena with relatively sparse, scattered, inconspicuous brown setae, interantennal prominence with relatively dense brown setae; thorax generally orange with a weak brassy sheen, neck of pronotum dark brown, mesopleuron pale orange, setae on dorsum of thorax relatively dense, brown and conspicuous; legs pale orange; fore wing (Fig. 361) generally weakly infuscate, more strongly so below marginal vein, venation slightly dusky pale orange; hind wing generally very weakly infuscate; propodeum orange, side slightly dusky; gaster pale orange, Gt1-Gt6 slightly dusky; gonostylus pale orange.

Head (Fig. 359) about 3.9X as wide as frontovertex, in profile about 1.4X as high as deep; occipital margin not sharp; ocelli forming an angle of about 75°; with 7 or 8 scattered punctures below anterior ocellus and with relatively shallow, polygonally reticulate sculpture of much smaller mesh size than diameter of eye facet; antenna as in Fig. 358; scape about 2.4X as long as broad; F1-F2 subquadrate, very slightly longer than broad, F3-F6 transverse, segments slightly broader distad; clava slightly broadened, about as long as F3-F6 combined, 3-segmented, sutures

hardly oblique, subparallel, sensory area slightly enlarged, at apex only giving the clava a weakly truncate appearance; malar sulcus present, distinct.. Relative measurements: HW 58.5, HH 50, FV 15, POL 5, OOL 1, OCL 4, AOL 5.5, EL 36, EW 34, MS 17.5, SL 24, SW 10.

Thorax (Fig. 356) with polygonally reticulate sculpture on pronotum, mesoscutum, axilla and scutellum that is of similar depth to that on frontovertex but generally composed of uniformly, rounded, polygonal cells; visible part of mesoscutum about 1.6X as broad as long; scutellum about 1.1X as broad as long; scutellum with three pairs of subapical pits or pores that are mainly of subequal diameter to cell of reticulate sculpture; setae on dorsum moderately dense and of more or less uniform length, separated by less than their own lengths, apical setae on scutellum slightly longer; fore wing with venation and setation as in Figs 357, 361. Relative measurements: FWL 61, FWW 22.5; HWL 42, HWW 8.5.

Gaster with hypopygium reaching about 0.8X towards apex; syntergum about 0.7X as long as mid tibia, with apex narrowly truncate; ovipositor hidden.

Paratype. Funicle with linear sensilla present only on F3-F6. Relative measurements: OL 67, GL 20 [MT 99].

Variation. Females vary in overall length from 0.76-1.15mm, the apical segments of clava may be yellow, the head varies from 3.7-4.1X as wide as the frontovertex, the ocellar angle varies from 50-75°, otherwise little variation in material available.

Male: length 0.95mm.

Almost identical to female, differing only in genitalia structure. Head as in Fig. 364; mesosoma as in Fig. 360); fore wing as in Fig. 365; antenna (Fig. 363) with clava 3-segmented, but with outer suture incomplete; phallobase (Fig. 362) slightly less than 3X as long as broad; digitus about 2X as long as broad with a single apical hook, paramere not developed, without apical seta; cuspis seta present; aedeagus about 4.5X as long as broad, about one-third as long as mid tibia, hardly longer than mid tibial spur. Relative measurements: HW 55, FV 15, SL 20, SW 9; AL 17.5, MT 51.5, MTS 16.5.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: COSTA RICA, **Limón**, 4km NE Bribri, 50m, xii.1989-iii.1990 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **Heredia**, OTS-La Selva, M.01.399, 17.vii.1995 (ALAS); 1♀, Heredia, Estación Biologica La Selva, 10°26'N 84°01'W, 75m, 28-29.ii.2008 (J.S. Noyes); 1♀, Heredia, Estación Biologica La Selva, 10°26'N 84°01'W, 75m, 22-24.ii.2012 (J.S. Noyes); 1♀, Heredia, Braulio Carrillo NP (HQ), 250-500m, 10.iv.1985 (L. Masner, H. Goulet); 1♀, **Cartago**, Braulio Carrillo NP, 26.iii.1990 (J.S. Noyes); 1♀, **Puntarenas**, Buenos Aires, Est. Altamira, Cerro Biolley, LS 572200 332400, 1760m, #61088, 2-13.ii.2001 (D. Rubí); 1♀, Puntarenas, 10km W Golfo Dulce, xii.1989-iii.1990 (Hanson, Gauld); 2♀, Puntarenas, PN Piedras Blancas, Alrededor de Estac. El Bonito, LS 259300 540900, 100m, 17.i.2003 (J. Azofeifa); 1♂, Puntarenas, Golfo Dulce, 10km W Piedras Blancas, 100m, iii-v.1989 (Hanson); 7♀, Puntarenas, RF Golfo Dulce, 5km W. Piedras Blancas, 8°46'N 83°17'W, 100m, x.1990-iii.1993 (P. Hanson); 1♀, **Limón**, PN Braulio Carrillo, Est. Queb. Gonzalez, 10°09'N 83°57'W, 450m, 15.ii.2003 (J.S. Noyes); 1♀, **Limón**, RB Hitoy-Cerere, 100m, 14-19.i.1991 (J.S. Noyes). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

COMMENTS. A specimen collected in Ecuador (Rio Palenque, forest, 4.ii.1983 (L. Huggert) (NHMUK)) may also belong to this species.

Orixia sirus sp.nov.

(Figs 366-371; Hab. ♀ 59)

DIAGNOSIS. *Female* (length about 1.1mm): head dark brown; clava dark brown; wings virtually hyaline, but fore wing (Fig. 370) with a very weak, infuscate area adjacent to marginal vein; hind wing hyaline; ocelli forming an angle of about 45°; antenna (Fig. 367) with linear sensilla on all

funicle segments; fore wing (Fig. 369) about 2.5X as long as broad, postmarginal vein a little longer than stigmal vein; mesoscutum and scutellum (Fig. 366) with similar imbricate-reticulate sculpture composed mostly of longitudinally elongate cells; scutellum with two pairs of subapical pits or pores that are smaller than diameter of cell of reticulate sculpture; mid tibial spur about 0.9X as long as basitarsus. *Male*: unknown.

Female (holotype): length 1.11mm (CPD).

Head dark brown, body otherwise generally orange; head with a weak brassy sheen; antenna with radicle pale orange-brown; scape pale orange, narrowly margined brown; pedicel pale orange, a little dusky dorsally; F1-F5 pale orange, slightly dusky dorsally, F6 dark brown; clava dark brown; mandible amber; palpi white; pronotum dark orange-brown with a slight brassy and coppery sheen; dorsum of thorax orange with a weak brassy sheen and some very weak purple reflections clothed in conspicuous brown setae, scutellum brownish medially in distal half; metanotum pale orange-brown; prepectus, mesopleuron and venter of thorax pale orange with a weak brassy sheen; legs completely pale orange except for hind tibia which is almost completely dark brown, only extreme base pale orange, apical tarsomeres generally orange-brown; wings virtually hyaline, but fore wing (Figs. 369, 370) with a very weak, infuscate area adjacent to marginal vein, venation pale orange; hind wing hyaline; propodeum generally with a weak purple and brassy sheen, pale orange-brown between spiracle and median area otherwise mostly pale orange; gaster generally with dark green, violet, brassy and coppery reflections, dorsally orange-brown with Gt1 and syntergum partially pale orange, lateral areas anteriorly darker brown, venter pale orange; gonostylus pale orange.

Head (Fig. 368) about 3.6X as wide as frontovertex, in profile about 1.3X as high as deep; occipital margin slightly obtuse, but sharp, not carinate; ocelli forming an angle of about 45°; frontovertex almost smooth but with very shallow, slightly irregular, polygonally reticulate sculpture of mesh size smaller than eye facet, mesh a little larger above scrobes; temple, gena and scrobes with poorly defined sculpture similar to that on frontovertex; bottoms of scrobes and interantennal prominence smooth; antenna as in Fig. 367; scape about 2.4X as long as broad; funicle with all segments transverse and gradually increasing in size distad; linear sensilla on all funicle segments; clava slightly enlarged, 3-segmented, outer suture incomplete, about 2X as long as broad, about 1.4X as wide F6, about as long as F3-F6 combined, sensory area forming a very slightly oblique apical truncation; eye clothed in dense, conspicuous setae, each at least about 1.5X as long as diameter of facet; malar sulcus absent. Relative measurements: HW 57, HH 47.5, FVL 34.5, FV 16.5, POL 5.5, OOL 2, OCL 5.5, AOL 7, EL 33, EW 31, MS 21.5, SL 26.5, SW 11.

Thorax (Fig. 366) with polygonally reticulate to imbricate-reticulate sculpture on pronotum that is about as deep as that on frontovertex but slightly transversely elongate and of slightly larger mesh; mesoscutum with longitudinally elongate imbricate-reticulate sculpture that is a little deeper than that on frontovertex and of larger cell size, sculpture slightly deeper and almost striate laterally more elongate laterally; axilla virtually smooth with transversely elongate polygonally reticulate sculpture; scutellum with polygonally reticulate sculpture that is about as deep as that on side of mesoscutum, but cells generally more rounded, although those toward side are longitudinally elongate, extreme apex and side completely smooth, but apex with two pairs of subapical pits that are of slightly smaller diameter than cell of reticulate sculpture in middle of scutellum; visible part of mesoscutum about 1.6X as broad as long; scutellum about 1.1X as long as broad; setae on dorsum moderately dense and of more or less uniform length, separated by less than their own lengths, apical setae on scutellum slightly longer; fore wing with venation and setation as in Figs 369. 370; propodeum with 1 or 2 seta near spiracle. Relative measurements: FWL 96, FWW 39; HWL 62.5, HWW 13.5.

Gaster with hypopygium reaching about 0.75X; last tergite about 0.7X as long as mid tibia, with apex rounded; ovipositor (Fig. 371) not exserted. Relative measurements: OL 57, GL 17 [MT 76].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: COSTA RICA, Heredia, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/TN, iv.2002 (INBio-OET-ALAS). Holotype in NHMUK.

Genus *CERAPTEROCERUS* Westwood

Cerapterocerus Westwood, 1833b:495. Type species: *Cerapterocerus mirabilis* Westwood, by monotypy.

Jurinia Costa, 1839:115. Type species: *Jurinia platicera* Costa by subsequent designation of Bouček (1970:86). Synonymy with *Cerapterocerus* by Bouček (1970:86).

Telegraphus Ratzeburg, 1848:153. Type species: *Telegraphus maculipennis* Ratzeburg, by monotypy. Synonymy with *Cerapterocerus* by Trjapitzin (1989:298).

Female. Length about 1.1-2.2mm.

Body dark brown to black; head generally with a strong metallic dark blue, green or purple sheen; thorax mostly duller but often with a strong metallic sheen medially or at apex of scutellum; tegula dark brown; legs orange with some dark brown, sometimes mostly dark brown; fore wing infuscate, macropterous forms (Fig. 373) with a pattern of mainly triangular hyaline areas; hind wing hyaline; gaster with a weak to moderate metallic coppery purple and brassy sheen.

Head about 3X as wide as frontovertex, in profile with frontovertex hardly convex, abruptly angled at a little more than 90° level with top of scrobes and then fairly straight to mouth margin; ocelli forming a slightly acute angle; frontovertex with transversely elongate lineolate-reticulate to polygonally reticulate sculpture; scrobal area (Fig, 377) deep, dorsally delimited by a transfacial carina that continues across face and below eye to outside of torulus; a line of silvery setae across dorsal surface of carina; eye more or less naked, inner eye margins subparallel; antenna attached a little above mouth margin; scape (Fig. 372) broadened and flattened, subtrapezoidal with upper and lower margins largely subparallel, apical margin curved and slightly extended past insertion of pedicel; pedicel triangular in profile, partially enclosing F1; flagellum flattened, funicle segments subequal in width, strongly transverse, clava slightly narrower, 3-segmented, sensory area enlarged giving apex a strong obliquely truncate appearance; malar sulcus absent; mandible tridentate, sometimes with 2 acute teeth and a truncate upper tooth; palp formula 4-3.

Pronotum (Fig. 380) short, posterior margin concave, subparallel to occipital margin; mesoscutum without notauli, with transversely elongate fine, imbricate-reticulate to lineolate reticulate sculpture; axilla and scutellum with shallow, polygonally reticulate to imbricate-reticulate sculpture, scutellum sometimes completely smooth medially; apex of scutellum often flange-like and clearly overhanging middle of propodeum; mesopleuron extending to about level with posterior margin of propodeum; mid tibial spur about as long as basitarsus; wings fully developed or abbreviated, sometimes fore wing not reaching base of gaster; fully developed fore wing about 3-4X as long as broad, submarginal vein (Fig. 373) with a distinct triangular expansion of proximal part of parastigma; junction of submarginal and marginal veins with a hyaline band; marginal vein about 7-8X as long as broad; postmarginal vein less than half as long as stigmal vein, sometimes virtually absent, stigmal vein about one-third length of marginal vein, with 3 campaniform sensilla at apex, uncus undeveloped; linea calva open, filum spinosum present; middle of propodeum with some sculpture, spiracular area mostly with shallow, irregular longitudinal ridges.

Gaster (Fig, 379) with syntergum slightly longer than mid tibia, with apex acute; hypopygium (Fig. 378) not quite reaching half way along gaster, about 2X as broad as long, with fairly well developed anterolateral and anteromedian projections, posterior margin almost straight; ovipositor (Fig. 376) at least 2X as long as mid tibia, about 3-4X as long as gonostylus and slightly exserted, the exserted part about as long as mid tibial spur; gonostylus about 2X as long as mid tibial spur.

Male. Length about 0.7-1.3mm.

Body dark brown, head and thorax with a more or less uniform metallic dark green or blue sheen; legs varying from mostly yellow to mostly dark brown with pale orange apices to mid and hind tibiae and pale orange tarsi; wings hyaline; frontovertex without a transfacial carina; scape slightly broadened, about 2.5-3X as long as broad; pedicel short, triangular in profile; flagellar segments (Fig. 382) subcylindrical, at least 2X as long as broad and clothed in long setae, longest of which is slightly more than 2X as long as diameter of segment; mesoscutum with moderately deep imbricate-reticulate sculpture, axilla and scutellum similar sculpture to that of female; apex of scutellum with a distinct, thin, apical flange that partially overhangs the propodeum medially; fore wing (Fig. 383) with venation to that of female but marginal vein slightly shorter, about 3-4X as long as broad, and distinct postmarginal vein, about half as long as stigmal vein; genitalia with phallobase (Fig. 381) about 5X as long as broad, digitus about 2X as long as broad and with a pair of apical hooks; paramere distinct with an apical seta; aedeagus slightly more than half as long as mid tibia, slightly broadened subapically, apex acute.

DISTRIBUTION. Cosmopolitan.

HOSTS. Recorded as secondary parasitoids of scales insects (Hemiptera: Coccidae, Aclerdidae, Diaspididae, Eriococcidae, Kermesidae and Pseudococcidae) via encyrtid (Hymenoptera: Encyrtidae) primary parasitoids (see Noyes, 2019). The biology of *Cerapterocerus mirabilis* Westwood has been described by Silvestri (1919).

IDENTIFICATION. Worldwide 11 species; Gordh & Trjapitzin, 1981 (3 species); Trjapitzin, 1989 (3 Palaearctic species); Fatima & Shafee, 1994 (2 Indian species),

COMMENTS. Females of *Cerapterocerus* can be recognised by flattened antennae, metallic colouration and fore wing with a radial hyaline pattern and triangular expansion of the submarginal vein. Similarly, the males can be recognised by the metallic colouration and triangular expansion of the submarginal vein and elongate marginal vein. The males are most likely to be confused with those of *Tyndarichus* Howard, 1910 but can be separated by their stronger metallic sheen and relatively longer marginal vein.

Cerapterocerus phragmitis Gordh & Trjapitzin

(Figs 372-383; Hab. ♀ 60, ♂ 61)

Cerapterocerus phragmitis Gordh & Trjapitzin, 1981:9-13. Holotype ♀, USA (Florida), USNM, not examined.

DIAGNOSIS. *Female* (length about 1.4-1.8mm): head generally metallic green, blue-green and brassy with coppery and metallic blue areas, mouth margin sometimes orange; thorax with pronotum medially with a metallic green and blue-green sheen, mixed coppery, laterally and on sides mostly coppery; mesoscutum with middle one-third or so metallic green, laterally coppery mixed with some metallic blue and purple; tegula dark brown; axilla with a weak purple sheen; scutellum medially bright metallic green with a pair of sublateral, longitudinal, coppery stripes, side metallic green and blue-green; fore and mid coxa white, hind coxa brown; legs otherwise mostly white or very pale orange, mid femur with a subapical brown band, mid tibia with a subbasal brown band, hind femur mostly dark brown, hind tibia with a broad, subbasal brown band; fore wing with hyaline and infuscate pattern as in Figs 373, 375; hind wing hyaline; gaster dark brown with a metallic sheen; gonostylus dark brown with extreme apex pale orange; frontovertex (Fig, 377) with fine, conspicuous, transversely elongate, imbricate-reticulate sculpture; transfacial carina dorsally with a transverse line of translucent silvery setae between and below eyes; eye not reaching occipital margin, separated by about 1.5X diameter of facet, clothed with inconspicuous translucent setae that are each a little shorter than diameter of facet; antenna as in Fig. 372; scape subtrapezoidal, about 1.7X as long as broad; pedicel and funicle about as wide as scape; clava about as long as funicle, apex strongly obliquely truncate, sensory area extending ventrally about

0.6X length of clava; head about 3.1X as wide as frontovertex; frontovertex about 2.3X as long as broad; ocelli forming an angle of about 75°; mesoscutum (Fig. 380) with sculpture similar to that on frontovertex, but slightly finer and more transversely striate; scutellum with very shallow polygonally reticulate sculpture similar to that on axilla but of larger mesh; axilla and scutellum more shiny than mesoscutum; wings shortened or fully developed; fully developed fore wing about 3.1-3.6X as long as broad, with venation and setation as in Figs 373, 374, shortened fore wing (Fig, 375) not reaching apex of gaster, up to 5X as long as broad; gaster about as long as head and thorax combined, hypopygium (Fig. 378) reaching about 0.4X towards apex; ovipositor (Fig. 376) about 2.5X as long as mid tibia and about 3.5X as long as gonostylus, slightly exserted, the exserted part very nearly as long as mid tibial spur or 0.25X length mid tibia. *Male* (length about 1.5mm): generally similarly coloured to female but with a much less striking patter of colours; head metallic green mixed coppery; scape largely pale orange with dorsal margin slightly dusky, pedicel orange-brown, flagellum brown; frontovertex, in front of anterior ocellus, with very slightly transversely elongate, polygonally reticulate sculpture; antenna as in Fig. 382 with scape about 2.3X as long as broad, funicle segments subcylindrical, each about 2X as long as broad and clothed in long setae, the longest of which is about 2X as long as diameter of segments; fore wing venation and setation as in Fig. 383; phallobase (Fig. 381) with a single apical tooth on each digitus.

DISTRIBUTION. USA (Florida), Costa Rica (**new record**).

HOSTS. The type material was collected on *Phragmites communis* Trin. (Poales: Poaceae) infested with *Aclerda holci* Teague (Hemiptera: Aclerdidae) (Gordh & Trjapitzin, 1981). It is likely the species is a hyperparasitoid of encyrtid primary parasitoids attacking aclerdids on reeds or tall grasses (Poales: Poaceae)

MATERIAL EXAMINED.

COSTA RICA, 1♀, **Guanacaste**, Santa Rosa NP, Hacienda 1-0, 2-23.iii.1986 (Janzen, Gauld); 1♀, Guanacaste, Santa Rosa NP, Hacienda 1-0, 20.xii.1986-10.i.12987 (Janzen, Gauld); 1♀, Guanacaste, Santa Rosa NP, Sn. Emilio 8-C, 31.i-21.ii.1987 (Janzen, Gauld); 1♀, Guanacaste, NW Volcan Orosi, Cerro el Hacha, 1988; 1♀, Guanacaste, Cacao (ACG) 1100m, 26.i-24.ii.1996 (J.S. Noyes); 4♀, Guanacaste, Murcielago (ACG), 24.i-4.ii.1996 (J. Ugalde); 1♂, Guanacaste, Macizo Miravalles, Est. Cabro Muco, LN 299769 411243, 1100m, #73635, iii.2003 (J. Azofeifa); 1♀, **Heredia**, INBio Parque, LN 217300 526200, 1100m, #62271, v.2001 (R. Zuñiga). Material in MZUCR and NHMUK.

COMMENTS. The Costa Rica specimens of *phragmitis* agree well with the original description of the species by Gordh & Trjapitzin (1981), but there are some differences that probably fall within the likely range of normal intraspecific variation. In Costa Rica females the mouth margin is orange, including adjacent parts of interantennal prominence and gena and the fore wing is 3.3-3.6X as long as broad, whilst Gordh & Trjapitzin describe the “malar space” as metallic green and the fully developed, macropterous fore wing (their Fig. 4) is 3.14X as long as broad.

Genus *HELEGONATOPUS* Perkins

Helegonatopus Perkins, 1906:257. Type species: *Helegonatopus pseudophanes* Perkins by monotypy.

Chalcerinys Perkins, 1906:258. Type species: *Chalcerinys eximia* Perkins, by monotypy. Synonymy with *Helegonatopus* by Noyes & Hayat (1984:283).

Schedioides Mercet, 1919:96. Type species: *Schedioides formosus* Mercet, by monotypy. Synonymy with *Helegonatopus* Perkins by Szelényi (1972:350).

Euchalcerinys Timberlake. 1922:161. Type species: *Euchalcerinys apicicornis* Timberlake, by original designation and monotypy. Synonymy with *Helegonatopus* by Noyes & Hayat (1984:283).

Hazmburkia Hoffer, 1954:172. Type species: *Hazmburkia dimorpha* Hoffer, by original designation. Synonymy with *Helegonatopus* by Szelényi (1972:350).

Masencyrtus Hoffer, 1960:98. Type species: *Masencyrtus concupiens* Hoffer, by original designation and monotypy. Synonymy with *Helegonatopus* by Hoffer (1969:173).

Paludencyrtus Hoffer, 1965:16, Type species: *Helegonatopus nikolskajae* Hoffer, by original designation and monotypy (as subgenus of *Helegonatopus*). Synonymy with *Helegonatopus* by Noyes & Hayat (1984:283).

Female. Length about 1.0-1.6mm.

Body dark brown to black with a moderate to strong or even brilliant metallic sheen; legs sometimes completely yellow, rarely mostly darkened; tegula sometimes white with a dark apex; mesoscutum often with contrasting well-differentiated strong metallic colouration, anterior half contrasting with the posterior half; wing venation pale orange-yellow.

Head in profile fairly evenly rounded anteriorly; occipital margin rounded; frontovertex rarely more than 1/3 head width; scrobes shallow, meeting dorsally; antennal torulus about its own length from mouth margin or slightly more; scape subcylindrical, slender, funicle 6-segmented, slender, all segments usually longer than broad, rarely some transverse; clava 3-segmented, apex narrowly rounded or pointed; malar sulcus present; mandible with three acute teeth; palp formula 4-3; eye reaching occipital margin, clothed in conspicuous setae.

Mesoscutum without notaular lines; axilla meeting medially, not separated by overhanging posterior margin of mesoscutum; scutellum convex, often apically strongly metallic, apical one-third smooth and shiny; mid tibial spur shorter than basitarsus; fore wing with marginal vein at least 1.5X as long as wide, postmarginal vein absent or short; filum spinosum present; mesopleuron expanded, posteriorly reaching level with posterior margin of propodeum and widely separating propodeum from hind coxa and more or less touching base of gaster.

Gaster without paratergites; hypopygium not reaching apex of gaster; ovipositor hidden or hardly exserted, longer than mid tibia; gonostylus free.

Male. Length about 0.8-1.3mm.

Body generally dark brown or black with a moderate to strong metallic sheen; face sometimes white; funicle segments sometimes contrasting in colour; tegula sometimes white a dark apex; legs usually yellow; head about 2X as wide as frontovertex; head sometimes compressed from side to side, sometimes tapering anteriorly or with paired anterolateral projections; antenna attached very high above mouth margin; scape often triangular, broadened at base or with a deep, dorsal emargination, funicle sometimes 5-segmented, segments varying from hardly longer than broad to 2 or 3 times as long as broad; flagellum clothed in short to fairly long setae, shortest not as long as diameter of segment, longest at least 1.5X as long as diameter of segment; malar sulcus present or absent; phallobase (Fig. 391) with a single hook on digitus, aedeagus slender with apex rounded.

DISTRIBUTION. Cosmopolitan.

HOSTS. Parasitoids of dryinids (Hymenoptera: Dryinidae) attacking auchenorrhynchous bugs (Hemiptera) and also parasitoids of Syrphid pupae (Diptera: Syrphidae).

COMMENTS. Females of *Helegonatopus* are extremely similar to those of *Ooencyrtus* and can be difficult to separate. Females of both genera are generally robust, strongly metallic, have a rounded occipital margin, slender antennal segments; convex scutellum. enlarged mesopleuron, pale venation, short marginal vein and weakly exserted ovipositor. In most cases females of *Helegonatopus* can be distinguished from those of *Ooencyrtus* because when the thorax is in the "resting" position, the axillae meet medially and are not separated by the strongly convex posterior margin of the mesoscutum. In *Ooencyrtus* the axillae are medially widely separated by the overhanging convex posterior margin of the mesoscutum. In all *Helegonatopus* the mandible is tridentate whereas in *Ooencyrtus* the mandible mostly has 1 tooth and broad truncation. Females of *Helegonatopus* frequently have well-defined, strongly contrasting metallic colours on the mesoscutum, whereas in *Ooencyrtus* the mesoscutum is more uniformly coloured or at least not with well-defined areas of different metallic colouration. On the other hand, if males of the species are present this can aid identification because males of *Helegonatopus* often have a 5-segmented

funicle or the head compressed from side to side or with paired anterolateral projections or a contrasting white anterior part of the head. No species of *Ooencyrtus* is known where the male has any of these characters. Within Encyrtidae, *Helegonatopus* is unusual because males are easier to identify to species than are the females.

IDENTIFICATION. 13 species Worldwide. Trjapitzin, 1989 (key to 8 Palaearctic species); for additional species diagnoses see also Perkins, 1906 (Australian species), Timberlake, 1922 (Hawaiian species), Hayat & Verma, 1978 (Indian species); Prinsloo, 1979a (Afrotropical species).

Helegonatopus pseudophanes **Perkins**

(Figs 384-391; Hab. ♀ 62, ♂ 63)

Helegonatopus pseudophanes Perkins, 1906:258. Syntypes ♀♂, USA (Ohio), BPBM, not examined.

DIAGNOSIS. *Female* (length about 1.0-1.6mm): head black, frontovertex with a dull purple hue; scape dark brown externally, orange-brown internally; flagellum testaceous-brown; pronotum with a dark coppery-purple sheen; mesoscutum more less uniform shining metallic green, rarely metallic blue, clothed in pale, translucent setae that are generally silvery in appearance, posterior margin narrowly coppery purple; tegula dark brown; scutellum dull coppery purple, apex metallic green to metallic blue; legs pale orange; head about 2.9-3.8X as wide as frontovertex; frontovertex slightly shiny with relatively shallow, regular, polygonally reticulate sculpture of slightly smaller mesh size than diameter of eye facet; antenna (Fig. 385) with scape subcylindrical, about 6.4X as long as broad; funicle with all segments about 1.5X as long as broad, becoming slightly wider and longer distally, linear sensilla present on all segments; clava slender, hardly broadened, about as long as F4-F6 combined; mesoscutum and axilla with polygonally reticulate to imbricate reticulate sculpture that is generally of slightly larger mesh size than that in ocellar area and about as deep; anterior two-thirds of scutellum with conspicuously deeper, coarse polygonally reticulate sculpture, posterior one-third smooth and shiny; fore wing about 2.75X as long as broad, with venation and setation as in Figs 386, 387; costal cell with a single line of setae in apical one-third or so; hypopygium Fig. 389; ovipositor (Fig. 390) hardly exserted, the exserted part less than 0.2X as long as mid tibial spur. *Male* (length about 0.9-1.3mm): flagellum brown, F1 usually at least slightly paler, sometimes pale orange; frontovertex and face with a distinct metallic green or blue-green sheen; head about 1.8X as wide as frontovertex; a tight group of 2-8 bristle-like setae medially at top of scrobes, above these numerous, fairly dense, scattered, shorter setae on frontovertex; gena, and area above mouth margin with several conspicuous, longer, erect, setae; antenna (Fig. 388) with scape triangular, broadest at base, about 2.4X as long as broad, funicle 5-segmented, all segments at least about 4-5X as long as broad, clothed in setae not longer than 1.5X diameter of segment; aedeagus (Fig, 391) slightly less than half length of mid tibia.

DISTRIBUTION. Recorded from Canada (**new record**), USA (mainland and Hawaii), Cuba, Jamaica, Dominican Republic (**new record**), Puerto Rico (**new record**), St Vincent & Grenadines, Trinidad & Tobago, Mexico (**new record**), Guatemala (**new record**), Belize (**new record**), Costa Rica (**new record**), Venezuela (**new record**), Surinam (**new record**), Ecuador, Peru (**new record**), Brazil, Uruguay and Argentina (see below and also Noyes 2019).

HOSTS. Recorded as a parasitoid of *Gonatopus* Ljungh (Perkins, 1906), *Gonatopus ashmeadi* Kieffer (Fry, 1989), *Gonatopus cavazzutii* Olmi and *Pseudogonatopus flavus* Olmi (De Santis & Fidalgo, 1994) and *Haplogonatopus vitiensis* Perkins. (Herting, 1977) (Hymenoptera: Dryinidae) parasitising various auchenorrhynchus Hemiptera, e.g. *Amblysellus* Sleesman (Hemiptera: Cicadellidae), *Megamelus* Fieber, (Hemiptera: Delphacidae) (see Noyes, 2019). Recorded below from *Haplogonatopus crucianus* Olmi (**new record**) (Hymenoptera: Dryinidae). Also recorded below from Florida as a gregarious parasitoid of the pupa of a syrphid (Diptera: Syrphidae) feeding

on aphids. A series was reared from a single syrphid puparium (?*Ocyptamus* Macquart, det. N.P. Wyatt, 2022) which is mounted together with one of the parasitoids (NHMUK). This confirms the record of this species being a hyperparasitoid of *Baccha* Fabricius (Diptera: Syrphidae) in Brazil (De Santis, 1980).

MATERIAL EXAMINED.

Non type material. **CANADA**, 1♀, **Ontario**, Shirley's Bay, viii.1985 (M. Sanbourne); 2♀, Ontario, 15km W Ottawa, Shirley's Bay, 13.viii.1985 (J.S. Noyes); 2♀, 1♂, Ontario, Ottawa, Mer Bleu, bog, 26.vii-15.ix.1982 (H. Goulet); 1♀, Ontario, Ottawa, viii.1978 (L. Masner); 1♀, Ontario, Ottawa, 15-26.vi.1984 (A. Austin); 1♀, 2♂, Ontario, Ottawa, Fallowfield, 3.viii.1985 (J.S. Noyes); 1♂, Ontario, nr Ottawa, Constance Bay, 18.viii.1985 (J.S. Noyes); 5♀, Ontario, Morrisburg, viii.1985 (J.S. Noyes); 1♀, 1♂, Ontario, Innisville, Carleton Place, 10.viii.1985 (J.S. Noyes); 1♀, **Quebec**, Gatineau N. Parc, nr Ottawa, 20.ix.1973 (Z. Bouček); 1♂, Quebec, Gatineau Park, 20.viii-6.ix.1983 (L. Masner); 4♀, Quebec, Gatineau Pk, Luskville Falls, 11. ix.1985 (J.S. Noyes); 8♀, 5♂, Quebec, Gatineau Park, Ridge Rd, viii.1985 (J.S. Noyes); 1♀, Quebec, Gatineau Park, King Mt., 24.viii.1985 (J.S. Noyes); 9♀, 2♂, Quebec, Hwy 201, 8km SW Rigaud, 9.ix.1985 (J.S. Noyes); 8♀, 8♂, Quebec, Lac Roddick, 1.ix.1985 (Noyes); 1♀, 1♂, Quebec, Bristol Mines, 45°31'N 78°27'W, open fine sand, 1-12.viii.1987 (H. Goulet, L. Dumouchel); 1♀, Quebec, Bristol Mines, 45°30'N 78°21'W, 27.viii-4.ix.1987 (H. Goulet, L. Dumouchel). **USA**, 3♀, "Helegonatopus pseudophanes ♀ U.S.A. R.C.L. Perkins"; 2♀, **Hawaii**, Oahu, Ewa, 21.xii.1961and 21.x.1965 (J.S. Beardsley); 1♂, Oahu, Waipo peninsula, 4.v.1966 (J.W. Beardsley); 1♂, **Florida**, Eureka nr Ocala, 3.ix.1976 (Z. Bouček); 1♀, Florida, Alachua Co., Gainesville, vi.1983 (D. Wahl); 1♀, Florida, Alachua Co., Gainesville, airport (N), 7.vii.1987 (J.S. Noyes); 6♀, 2♂, Florida, Alachua. Gainesville, *Lactuca* ex syrphid puparium,/aphid pred. 9072, 26. vi.1989; 1♀, Florida, Dade C., Everglades NP, Long Pine Key, vi.1986 (S. & J. Peck); 1♀, Florida, N. Key Largo, SP, 8-9.v.1992 (J.S. Noyes); 1♂, **Georgia**, Clark Co., Athens, beaver swamp, vi.1987 (BRC Hym Team); 1♀, Illinois, Fayette Co., Wright's Corner, 7.vii.1980 (S. Heydon); 1♀, 1♂, **Illinois**, Effingham Co., 2ml E Shumway, 7.vii.1980 (S. Heydon); 1♂, Illinois, Effingham Co., 1 ml SSE Beecher City, 7.vii.1980 (S. Heydon); 3♀, 1♂, **Maryland**, Patuxent Wildlife Reserve, vii.1982 (Fitton, Quinlan); 1♀, **MN**, Lac Qui Parle, LQP County Park, 6.ix.1985 (P. Hanson); 1♀, **Missouri**, Williamsville, v.1970 (J.T. Becker); 6♀, **Missouri**, Williamsville, viii.1987 and 10-26.ix.1987 and 21.x-11.xi.1988 (J.T. Becker); 1♀, 1♂, **Oklahoma**, Latimer Co., Red Oak, xii.1993 (K. Stephen); 2♀, **NH**, Mt Washington, 5500ft, 20.viii.1981 (H. Goulet); 2♀, **SC**, Anderson Co., Pendleton, 250km, Hardwood forest, 1-7.vii.1987 (BRC Hym Team); 1♂, **Texas**, Kerr Co., 2000', 5 ml W Hunt, 1-2.vii.1982 (G.A.P. Gibson); 1♂, Texas, 5200', Culberson Co., Guadalupe Springs, 20-22.vii.1982 (G.A.P. Gibson); 1♀, Texas, Burnet Co., Inks Lake SP, 2.v.1987 (J.S. Noyes); 1♀, **Virginia**, Burke, 15.viii.1976 (Z. Bouček). **JAMAICA**, 1♀, 2♂, St Andrew Parish, Hardwar Gap, 2.vii.1982 (N. & J. Johnson). **DOMINICAN REPUBLIC**, 3♀, 2♂, Duarte, 20km N San Francisco de Macoris, Lamo Quito Espuela, 300m, 18.iii.1991 (L. Masner). **PUERTO RICO**, 1♀, 1♂, Mun., San Juan, Rio Piedras, Est. Exper. Agric., 19.v.1982 (S.L. Heydon). **ST LUCIA**, 7♀, Univ. Waterloo Research Station, x.1984 (D. Moore). **ST VINCENT**, 1♀, 4♂, Charlotte, Montreal, edge of rainforest, 8.vii.1976 (J.S. Noyes); 1♀, 1♂, St George, Kingstown, wasteground, 4.vii.1976 (J.S. Noyes); 1♀, St George, Kingstown, botanic gardens, 13.vii.1976 (J.S. Noyes). **TRINIDAD & TOBAGO**, 1♀, **Trinidad**, St George, St Augustine, wasteground, 18.vi.1976 (J.S. Noyes); 1♂, Trinidad, St George, Arena Reserve, rainforest, 3.viii.1976 (J.S. Noyes). MEXICO, 1♀, Tabasco, Teapa, March (H.H.S.; Godman-Salvin coll. 1904-1); 1♀, Vera Cruz, 5.6km NE Coscomatepec, 1130m, 22.vi.1983 (R. Anderson); 1♀, Chiapas, Ocozocoautla, i.1984 (M. Badii); 2♀, 1♂, Puebla, Zaca Pouxtla, 18.v.1985 (J.M. Smith). **GUATEMALA**, 6♀, Zacapa, San Lorenzo, 750m, xi.1986 (M. Sharkey). **BELIZE**, 1♂, Ambergria, Caye, 26.iii.1993 (J. Denis, K. Bolte). **COSTA RICA**, 1♀, **Guanacaste**, Santa Rosa NP, Hacienda 1-0, 5-26.x.1985 (Janzen, Gauld); 2♀, Guanacaste, Santa Rosa NP, H4C, 18.x-8.xi.1986 and iii.1987 (D. Janzen, I.D. Gauld); 1♂, Guanacaste, Santa Rosa NP, Hacienda 3-0, 11.v-1.vi.1985 (Janzen, Gauld); 1♀, Guanacaste, Pitilla (ACG), 700m, MT/YPT, 12-16.ii.1996 (J.S. Noyes); 1♀, Guanacaste, 13km E Filadelfia, Hda El Viejo, 40m, v-vi.1989 (M. Garcia); 1♀, Guanacaste, PN Guanacaste, San Cristobal, #51905, 17.viii-17.ix.1996 (F.A. Quezada); 2♀, Guanacaste, Tierras Morenas, ZP Tenorio, Rio San Lorenzo, LN 287800 427600, 1050m, vii.1994 and iv.1995 (G. Rodriguez); 4♀, Guanacaste, Santa Cruz, PN Marino Las Baulas, LN 258040 332690, 0m, 16.viii.2000 and 14.xii.2000 (Y. Cardénas); 1♀, Guanacaste, Santa Cruz, Vista del Mar, Torre Cocesna, LN 357490 235430, 970m, #61247, xii.2000-i.2001 (Y. Cardénas); 1♀,

Guanacaste, PN Palo Verde, Campo Aterrizaje, LN 258700 389200, YPT, #52842, vii.1999 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sector Palo Verde, Cerro Guayacan, LN 259450 388750, 150m, MT, #53297, 15.vi.1999 (I. Jiménez); 5♀, 3♂, Guanacaste, PN Palo Verde, Sector Palo Verde, LN 260952 385020, 10-50m, various dates 2.xii.1999-18.iii.2000 (I. Jiménez); 9♀, Guanacaste, PN Palo Verde, Sector Catalina, Fila Catalina, LN 257400 400000, 250m, #54956, xii.1999 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, 125m N Estación, LN 259050 388400, 0m, #59291, x.2000 (I. Jiménez); 2♀, Guanacaste, PN Palo Verde, 150m E Estación, LN 260952 385020, 10m, YPT, #53297, 4-14.ix.1999 (I. Jiménez); 2♀, **Alajuela**, Chiles de Aguas Zarcas, cafe, xii.1989 (R. Céspedes); 1♀, Alajuela, Aguas Zarcas, La Chiles, cafe, iii.1990 (P. Hanson); 2♀, Alajuela, San Cristobal, LN 318056 383200, 600-820m, #51902, 23.ii-25.iii.1996 (F.A. Quezada, D. Briceno); 1♀, Alajuela, Peñas Blancas, 9.vi.1987 (E. Cruz); 4♀, Alajuela, San Pedro de la Tigra, 200m, cacao, i-ii.1990 (R. Cespedes); 1♀, Alajuela, PN Arenal, La Peninsula, 10°27'N 84°40'W, 600m, 25.ii.2003 (J.S. Noyes); 1♀, Alajuela, San Ramon BS, 700m, YPT, 26.iii.1996 (L. Masner); 1♀, **Heredia**, Est. Biol. La Selva, 10°26'N 84°01'W, ix.1995 (OET/INBio); 1♀, Heredia, 16km SSE La Virgen, 10°16'N 85°05'W, 1050-1150m, 11/M/TN, 10.ii-21.iv.2001 (INBio/OET-ALAS); 1♀, Heredia, 16km SSE La Virgen, 10°16'N 85°05'W, 1050-1150m, 11/M/NOTN, 9.ii-21.iv.2001 (INBio/OET-ALAS); 1♀, Heredia, 11km SE La Virgen, 10°11'N 84°07'W, 450-550m, 05/M/TN, 23.ii-20.iv.2003 (INBio OET-ALAS); 1♀, Heredia, Santo Domingo, INBio Parque, LN 217300 526200, TM, #67118, 11.ii-18.iii.2002 (R. Zuniga); 1♀, 1♂, Heredia, Santo Domingo, INBio Parque, LN 217400 526250, iii.2002 (J.A. Azofeifa, J.S. Noyes); 1♀, Heredia, Braulio Carrillo NP, 4-500m, 11-12.iv.1985 (L. Masner, H. Goulet); 7♀, 2♂, **San José**, Zurqui de Moravia, 1600m, various dates v.1991- iv.1999 (P. Hanson); 1♀, San José, Ciudad Colon, 800m, ii.1990 (L. Fournier); 1♀, San José, Cerro Muerte, 19km W Empalme, 2600m, 1991 (P. Hanson, C. Godoy); 2♂, **Cartago**, Paraiso, PN Tapanti, 1200-1600m, iv.1999 (C. Hansson); 1♀, Cartago, PN Tapanti, 9°45'N 83°47'W, 1200-1500m, 20.iii-10.iv.2000 (C. Hansson, D. Rubí); 1♀, Cartago, PN Tapanti-Macizo de la Muerte, Send. Arboles Caldos, LN 561400 192500, 1500m, #61077, ix-x.2000 (D. Rubí); 2♂, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 14-15.ii.2005 (J.S. Noyes); 1♀, Puntarenas, Manuel Antonio, 23-26.viii.1986 (L. Masner); 1♀, 1♂, Puntarenas, Est. Altamira, 9°03'N 83°00'W, 1450m, ii.2002 (C. Hansson, D. Rubí); 1♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 18-22.iii.1990 (J.S. Noyes); 2♀, Puntarenas, PN Piedras Blancas, Alrededor de Estac. El Bonito, LS 259300 540900, 100m, #72910, 17.i.2003 (J. Azofeifa); 1♀, Puntarenas, PN Corcovado, Los Patos, 8°33'N 83°30'W, 200m, 1-9.iii.2000 (J.S. Noyes, J.A. Azofeifa); 12♀, 4♂, Puntarenas, PN Corcovado, Rio Rincon, 3km NE Los Patos [18°33'N 83°30'W], 50m, 1-9.iii.2000 (J. A. Azofeifa); 2♂, Puntarenas, Est. Agujas, El Tigre, LS 529600 277800, 34m, #62435, 25.iv.2001 (J. Azofeifa); 2♀, Puntarenas, RF Golfo Dulce, 3km SW Rincon, iii-iv.1991and i.1992 (P. Hanson); 2♀, Puntarenas, 5km N Puerto Jimenez, 8°33'N 83°21'W, i-ii.1991 and i-ii.1992 (P. Hanson); 3♀, Puntarenas, Pen. Osa, Puerto Jimenez, 10m, iv.1991 and x.1992 (P. Hanson); 1♀, Puntarenas, Golfito, Puerto Jimenez, Bosque del Cabo, LS 259300 540900, #72911, 30.i.2003 (J. Azofeifa); 1♀, **Limón**, PN Braulio Carrillo, Est. Quebrada Gonzalez, LN 238380 543100, 400-500m, #67599, 23.iv.2002 (P. Hanson, C. Godoy). VENEZUELA, 1♀, Merida, Tabay, La Mucuy, 1900m, vi-viii.1989 (S. & J. Peck); 2♀, Merida, 2km W La Azulita, 11.iv.1988 (A.T. Finnamore, C.E. Baxfield). **SURINAM**, 1♂, Marowine Prov., 30km E Paramaribo on Albina Hwy, 6.ii.1985 (A.T. Finnamore, T.W. Thormin). **ECUADOR**, 3♀, **Galapagos**, S. Cristobal, 6km E Baquerizo, 150m, ii.1989 (Peck, Sinclair); 1♀, Galapagos, Santa Cruz, Media Luna, Puntudo pampa, 600-700m, ii.1989 (S. Peck); 2♀, 1♂, Galapagos, S. Cruz I., El Puntudo, 800m, ex Haplogonatopus crucianus Olmi (Dryinidae), 19.i.1989 (M. Olmi); 1♂, Galapagos, Isabela, 12km NW Villamil iii.1989 (Peck, Sinlcair); 150m, 2♀, 1♂, **Napo**, Tena, 5.ii.1986 (A.T. Finnamore); 8♀, 2♂, S. Domingo, Las Pampas, ex *Pseudogonatopus flavus* Olmi, 29.iii.1986 (M. Olmi); 1♀, Baeza, 1800m, ex *Gonatopus cavazzutii* Olmi, 5.iv.1986 (M. Olmi). **PERU**, 1♀, Cuzco, Agua Caliente, 20-28.xii.1983 (L. Huggert); 3♂, Huanuco, Tingo Maria, 29.i.1984 (L. Huggert); 1♂, Madre de Dios, Pto Maldonado, 2-9.i.1984 (L. Huggert). Material in NHMUK, MZUCR and CNC.

COMMENTS. Of the other species of the genus the female is most similar to that of *citripes* Erdös, but differs in having the frontovertex dull, dark purple and the tegulae dark brown whereas in *citripes* the frontovertex is metallic green and the tegulae are basally pale yellow with the apex translucent pale brown. The males of *citripes* also have a 5-segmented funicle, but have the scape is sublinear and the tegulae are coloured as in the female. The males of *pseudophanes* have a distinctly triangular scape and dark brown tegulae.

Genus *MAHENCYRTUS* Masi

Mahencyrtus Masi, 1917:157. Type species: *Mahencyrtus occultans* Masi, by monotypy.
Tyndarichoides Mercet, 1921:649. Type species: *Tyndarichoides metallicus* Mercet, by monotypy. Synonymy with *Mahencyrtus* by Noyes & Hayat (1984:294).
Protyndarichus Mercet, 1923:279. Replacement name for *Tyndarichoides* Mercet, 1921 nec Girault, 1920.

Female. Overall length about 1.0-2.1mm.

Body generally dark brown to black with a metallic green or blue-green sheen; scape pale orange; pedicel and flagellum slightly dusky pale orange; legs mainly yellow to pale orange, coxae and hind femur sometimes darkened; fore wing (Fig. 394) hyaline, frequently with a median, elongate, wedge-shaped, infuscate mark in distal half.

Head in profile, anteriorly quite evenly and strongly curved from occipital margin to top of scrobes, more strongly curved at top of scrobes and from there quite straight to mouth margin, with interantennal prominence hardly protuberant; occipital margin rounded; frontovertex shiny, mainly with shallow, fairly fine, polygonally reticulate sculpture of mesh size generally less than diameter eye facet; piliferous punctures on frontovertex shallow, but 1.5-2X diameter of eye facet; eye hardly overreaching occipital margin, with very inconspicuous pale setae, each much shorter than diameter of facet; lower inner eye margin (Fig. 392) slightly emarginate, posterior eye margin strongly emarginate. concave; scrobes shallow, ∩-shaped, meeting dorsally, with distinct sculpture, dorsally and lateral margins rounded; interantennal prominence distinct, clearly reaching past toruli, dorsally rounded; antenna attached about level with lower eye margins, middle of torulus about level with lower eye margin, torulus separated from mouth margin by about its own length; antenna with scape hardly broadened about 4-5X as long as broad; funicle segments varying from all slightly longer than broad to some distinctly transverse, becoming slightly wider distad; linear sensilla present only on F4-F6; clava slightly wider than F6, shorter than funicle, three segmented, sensory area small, at apex only giving it a rounded appearance; head about 3-4X as wide as frontovertex; posterior ocellus virtually touching eye, separated from occipital margin by about 2X its own diameter; occipital margin rounded; clypeal margin not emarginate, weakly convex; malar sulcus present and distinct or absent; mandible with 3 acute teeth, without a ventral peg; palp formula 4-3.

Thorax with pronotum moderately long, clearly visible behind head with posterior margin hardly to strongly concave, sometimes hardly visible medially behind head; notaular lines absent; mesoscutum with imbricate to polygonally reticulate sculpture that is about as deep as that on pronotum or axilla; scutellum dorsally weakly convex and with coarse, longitudinally elongate polygonally reticulate to lineolate reticulate sculpture that is much deeper than that on mesoscutum or axilla, apex and side completely smooth and shiny; scutellum apex, in dorsal view, broadly rounded; mid tibial spur as long as basitarsus, or very slightly longer; wings variable in length, fore wing may be strongly abbreviated and hardly reaching posterior margin of first gastral tergite or fully developed and reaching well past apex of gaster; fully developed fore wing about 2.8-3.4X as long as broad, with linea calva entire; basal cell fairly evenly setose; filum spinosum present, with 3-5 peg-like setae; costal cell with a line of setae dorsally in apical half and a line of setae ventrally; submarginal vein with parastigma slightly downcurved, swollen, forming a weak triangular expansion, apex with a hyaline break; marginal vein at least about 4X as long as broad, slightly longer than postmarginal vein and about 2X as long as postmarginal vein; uncus developed and with 3 campaniform sensilla arranged in almost a straight line; posterior margin of mesopleuron almost reaching level with posterior margin of propodeum; propodeum medially about 0.25X as long as scutellum, with some shallow, irregular sculpture medially, including a median carina; about 10-20 silvery setae anterior to and outside spiracle.

Gaster very nearly as long as head and thorax combined; Gt2 anterolaterally with a more strongly reticulate area; syntergum longer than mid tibia, its apex acute; hypopygium reaching about 0.5X along gaster, about 1.5X as broad as long, anteriorly biconcave, with distinct median and anterolateral projections, posteriorly moderately biconvex with a moderate median invagination that is at least 0.2X as deep as hypopygium length; ovipositor at least 1.5X as long

as mid tibia, slightly exserted with exserted part at least about one-third as long as mid tibial spur; second valvifer without subapical setae; gonostylus freely articulated with second valvifer, about 0.25-0.35X as long as ovipositor and slightly longer than mid tibial spur.

Male. Overall length about 0.6-1.6mm.

Extremely similar to female, but with fore wing less strongly infuscate, slightly wider frontovertex, structure of antenna and structure of genitalia; fore wing (Fig. 401) with infuscate streak paler than in female or absent; head about 2X as wide as frontovertex or slightly wider, posterior ocellus a little less than its own diameter from eye margin and a little more than its own diameter from occipital margin; antennal toruli well above lower eye margin, flagellum filiform with all funicle segments at least about 3X as long as broad and clothed with whorls of long setae, the longest of which may be more than 2X as long as diameter of segment; genitalia (Fig. 402) with a single small, apical hook on digitus, paramere with apical seta, cuspis seta present; aedeagus slender, apically acute, about 0.4-0.6X as long as mid tibia.

DISTRIBUTION. Cosmopolitan, but see Noyes (2019). The genus has not yet been recorded from the Nearctic region but I have examined specimens of *Mahencyrtus* (possibly *comara* (Walker)) from Canada and the USA (NHMUK).

HOSTS. Probably a secondary parasitoid (Trjapitzin (1989). Recorded from various mealybugs (Hemiptera: Pseudococcidae) associated with grasses (Poales: Poaceae): *Antonina phragmitis* Borchsenius, *Brevennia rehi* (Lindinger), *Chaetococcus phragmitis* (Marchal), *Heterococcus nudus* (Green), *Trionymus copiosus* (Borchsenius), *Trionymus dactylis* (Green), *Trionymus perrisii* (Signoret) and *Trionymus radicum* (Danzig) (see Noyes, 2019)

COMMENTS. See comments under *Georynus* (p. 164), *Prionias* (p. 169) and *Strigenia* (p. 172).

IDENTIFICATION. 14 species Worldwide: Hayat, 2006 (key to 4 Indian species); Noyes & Hayat, 1984 (list of 3 Indo-Pacific species); Hayat et al., 2014 (Saudi Arabia, comparison of 5 World species); Trjapitzin, 1989 (key to 2 Palaearctic species); single species treatments: Masi, 1917 (Seychelles); Noyes, 1979 (West Indies); Hayat, 2010b (India).

Mahencyrtus nitidus (Howard)

(Figs 392-402; Hab. ♀ 64, ♂ 65)

Encyrtus nitidus Howard in Riley, Ashmead & Howard, 1894:94-95. Lectotype ♀, St Vincent (WI), NHMUK, designated Noyes (1979:163), examined.
Encyrtus convexus Howard, 1897:153. Holotype ♂, Grenada (WI), NHMUK, examined. Synonymised with *Protyndarichus nitidus* by Noyes (1979:163).
Sceptrophorus convexus (Howard); Ashmead, 1900:381.
Pseudencyrtus nitidus (Howard); Ashmead, 1900:396.
Protyndarichus proximus De Santis, 1945. Holotype ♀, Argentina, MLP, examined. Synonymised with *Protyndarichus nitidus* by Noyes (1979:163).
Protyndarichus nitidus (Howard); Noyes, 1979:163.
Mahencyrtus nitidus (Howard); Noyes & Hayat, 1984:294.

DIAGNOSIS. *Female* (length about 1.1-2.1mm): head mainly metallic green or blue-green, with some weak coppery areas especially between eye and scrobes; scape pale orange; pedicel and flagellum slightly dusky pale orange, proximal segments a little darker; pronotum dark brown with a conspicuous coppery purple sheen; mesoscutum metallic green or blue-green, posteriorly with slight coppery purple sheen; scutellum metallic green or blue-green, anteriorly with a slight coppery purple sheen; mesopleuron, mesosternum and metanotum dark brown with a slight purple sheen; fore wing (Fig. 394) largely hyaline but with a median, elongate, wedge-shaped, infuscate mark; legs mainly pale orange, but hind femur mostly brown to dark brown, mid and hind coxae sometimes brownish proximally, rarely mid femur brown in distal half or mid and hind coxae

almost completely brown; propodeum dark brown with a slight purple sheen, side with a group of silver setae dorsally, metallic green or blue-green; gaster dark brown, dorsally with a coppery sheen, Gt1 metallic green or blue-green, side and venter with mixed coppery and green or blue-green reflections; gonostylus dark brown; head (Fig. 392) about 3.2-3.5X as wide as frontovertex, ocelli forming an angle of about 65-70°; sculpture on frontovertex fine, polygonally reticulate of mesh size slightly smaller than eye facet; scrobes shallow, meeting, weakly margined; antenna (Fig. 396) with all funicle segments slightly longer than broad, broader distad, clava slightly widened, sutures slightly oblique, about as long as F3-F6 combined or slightly shorter, sensory area at apex only giving apex a weakly truncate or rounded appearance; malar sulcus absent; mesoscutum (Fig. 393) with irregular, polygonally reticulate sculpture that is very slightly deeper and coarser than that on frontovertex; scutellum mostly with polygonally reticulate sculpture that is deeper and more regular than that on mesoscutum, area between axillae with cells more rounded, posterior cells more longitudinally elongate, apical 0.14 of scutellum and side completely smooth and shiny; forewing about 3.2-3.4X as long as broad, venation and setation as in Figs 394, 397. Gaster very slightly shorter than head and thorax combined, hypopygium (Fig. 395) reaching about 0.4X towards apex, syntergum about 1.4X as long as mid tibia, ovipositor (Fig, 398) about 1.6-1.7X as long as mid tibia and slightly exserted, the exserted part about one-third length of mid tibial spur. *Male* (length about 0.7-1.6mm): fore wing (Fig. 401) with infuscate streak paler than in female or absent; flagellum (Fig. 400) clothed with whorls of long setae, the longest of which is about 2.2X as long as diameter of segment; genitalia (Fig. 402) with a single small, apical tooth on digitus, aedeagus slender, apically acute, 0.45-0.6X as long as mid tibia.

DISTRIBUTION. Mexico. Grenada, St Vincent & Grenadines, Trinidad & Tobago and Argentina (Noyes, 2019). Also recorded below from Costa Rica (**new record**),

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Lectotype ♀ of *Encyrtus nitidus*: "*Encyrtus nitidus* n. How." [St Vincent]. Paralectotypes of *Encyrtus nitidus*: 3♀, one labelled ST VINCENT, H.H. Smith, "*Encyrtus nitidus* n. How. Type" and all (including lectotype) (BM) (18)99-331. Holotype ♂ of *Encyrtus convexus*: GRENADA, windward side, Balthazar, H.H. Smith, (BM) (18)99-331, "*Encyrtus convexus* How. type ♂".

Non type material. **ST VINCENT & GRENADINES**, 4♀, 8♂, **St Vincent**, various localities, 6-13. vii.1976 (J.S. Noyes). **TRINIDAD & TOBAGO**, 1♀, **Trinidad**, Caroni, Gran Couva, cacao plantation, 27.vi.1976 (J.S. Noyes); 2♀, 1♂, Trinidad, St George, St Augustine, Malaise trap, 15.vii-13.viii.1976 (J.S. Noyes); 1♀, **Tobago**, St Patrick, Mount Irvine Bay, coastal grassland, 19.vii.1976 (J.S. Noyes); 1♀, Tobago, St John, Cambleton, secondary forest, 22.vii.1976 (J.S. Noyes); **COSTA RICA**, 7♀, **Guanacaste**, Santa Rosa NP, Hacienda, various dates 17.iv.1985-31.i.1987 (Janzen & Gauld). 1♀, 1♂, Guanacaste, Guanacaste NP, below Pitilla, 600m, 7-8.iii.1990 (J.S. Noyes); 1♀, Guanacaste, San Lorenzo, Tienas Morenas, LN 287800 427600, iv.1995 (G. Rodriguez); 4♀, Guanacaste, PN Marino Las Baulas, LN 332690 258040, 0m, 16.viii.2000, 20.ix-16.x.2000 and 14.xii.2000 (Y. Cardenas); 1♀, Guanacaste, Santa Cruz, Vista del Mar, Torre Cocesna, LN 357490 235430, 970m, #61247, xii.2000-i.2001 (Y. Cardenas); 1♀, Guanacaste, ZP Nozara, File Maravilla, LN 221350 381700, 800m, #66663, 24.xi-21.xii.2001 (I. Jiménez); 2♀, Guanacaste, PN Palo Verde, Sector Palo Verde Estación, LN 385020 260952, 0m, 6.i-18.ii.2000 and 13-20.ix.2000 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sector Catalina, Puente Espuela, 0m, #58295, 9.viii-8.ix.2002 (I. Jiménez); 1♀, **Heredia**, OTS-La Selva, 100m, ix.1992 (P. Hanson); 1♀, Heredia, 11km SE La Virgen, 10°20'N 84°04'W, 450-550m, 05/N/TN, 22.ii-20.iv.2003 (INBio-OET-ALAS); 1♀, Heredia, Santa Rosa de Heredia, INBio, LN 217400 526250, 1100m, #58654, 5.ix-5.x.2000 (R. Zuñiga); 1♀, **San José**, Ciudad Colon, ii.1990 (L. Fournier); 4♀, Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 14-15.ii.2005 (J.S. Noyes); 1♀, Puntarenas, Manuel Antonio, 26.vii.1986 (L. Masner); 1♀, Puntarenas, Est. Altamira, Send. a Casa Coca, LS 331750 574400, 1700m, ii.2002 (C. Hansson, D. Rubí, J. Azofeifa); 1♀, Puntarenas, RF Golfo Dulce, 5km W Piedras Blancas, 8°46'N 83°17'W, 100m, i-iii.1991 (P. Hanson, C. Godoy); 2♀, 2♂, Puntarenas, Pen. Osa, 5km N Puerto Jimenez, 8°33'N 83°21'W, 10m, x.1990, i-ii.1991 and vii-viii.1993 (P. Hanson); 2♀, Puntarenas, Pen. Osa, Puerto Jimenez, 8°32'N 83°19'W, i.1992 and x.1992 (P. Hanson); 2♂, Puntarenas, PN Corcovado, Los Patos, LS 517900 281600, 200m, #62437, 4-5.v.2001 (J. Azofeifa). Material in MZUCR and NHMUK.

Genus *TICO* gen.nov.

Type species: *Tico sinabelus* **sp.nov.** Gender masculine.

Female. Overall length about 0.8-0.9mm.

Head and thorax dark brown, almost black, with a weak metallic sheen; gaster dark brown.

Head in profile moderately triangular, angled above top of scrobes, about 2.5X as wide as frontovertex; a shiny-bottomed depression present on eye margin behind each posterior ocellus; eye clothed with inconspicuous setae, each about half as long as diameter of facet; malar sulcus absent; antenna attached a little below lower eye margin, torulus separated from mouth margin by about half its own length; funicle 6-segmented, segments transverse to slightly longer than broad; clava 3-segmented, apex rounded; mandible with 3 acute teeth, inner surface with a distinct, socketed bristle near lower margin; palp formula 4-3**;**

Thorax with posterior margin of pronotum roundly concave, not broadly V-shaped or angular medially; mesoscutum without notaular lines, with relatively shallow, slightly shiny sculpture that contrasts with the deeper, more or less matt sculpture of scutellum; axilla clearly raised above level of scutellum which is dorsally weakly convex, with 6 or 7 setae and clearly broader than long with a broadly rounded apical margin; mid tibial spur longer than basitarsus; fore wing about 2.4X as long as broad; linea calva entire and open; filum spinosum present, represented by 2 or 3 modified setae; submarginal vein with parastigma very weakly broadened; marginal vein about 1.5-2X as long as broad, postmarginal vein distinct; stigmal vein subsessile, very slightly longer than marginal or postmarginal veins, uncus developed with 3 campaniform sensilla in a line.

Gaster with anterior margin of TII with an almost continuous, narrow fringe-like structure in its middle one-third that may be part of a glandular complex (visible only on slide-mounted material); paratergites absent; apex of syntergum broadly rounded; hypopygium not reaching apex of gaster, strongly transverse, at least 3X as broad as long with anterior margin concave and posterior margin subparallel, convex and weakly invaginate medially; ovipositor much shorter than mid tibia with and about 4-5X as long as gonostylus which is freely articulated.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

COMMENTS. The placement of *Tico* within the current tribal classification of the Encyrtinae is difficult, but the tridentate mandible, slightly expanded mesopleuron and shallow, shiny-bottomed depression adjacent to the eye margin behind the posterior ocellus suggests that *Tico* may belong to the Cheiloneurini. In habitus, the two species described below are somewhat reminiscent of some species of *Ooencyrtus* Ashmead or perhaps *Coccidencyrtus* due to their squat appearance, short marginal vein, subsessile stigmal vein and relatively small size. They differ from *Ooencyrtus* in having a strong, bristle-like seta near the inner, ventral margin of the mandible, head triangular in profile and scutellum that is much broader than long with a broadly rounded apex. The absence of a socketed peg-like structure on the inner surface of the mandible and presence of a conspicuous bristle excludes *Tico* from the Habrolepidini to which *Coccidencyrtus* belongs.

Key to Costa Rican species of *Tico*
(Females)

1. Hind tibia completely pale yellow; scape not longer than minimum width of frontovertex; funicle (Fig. 403) with F1-F3 transverse or quadrate, F4-F6 larger but quadrate, not more than 1.1X as long as broad ..... *sinabelus* **sp.nov.** (p. 161)
- Hind tibia mostly dark brown; scape at least 1.2X as long as width of frontovertex; funicle (Fig. 410) with F1-F3 at least slightly longer than broad, F4-F6 larger and at least about 1.5X as long as broad ..... *ryaspis* **sp.nov.** (p. 162)

***Tico sinabelus* sp.nov.**
(Figs 403-409; Hab. ♀ 66)

DIAGNOSIS. *Female* (length about 0.9mm): hind tibia completely pale yellow; tangent to frontovertex forming an angle of about 70° with that of face; scape not longer than minimum width of frontovertex; funicle segments (Fig. 403) not longer than broad; mesopleuron not extending past posterior margin of propodeum and not quite touching base of gaster. *Male*: unknown.

Female **(**holotype**)**: length, including ovipositor, 0.92mm; excluding ovipositor, 0.89mm (CPD).

Head dark brown to black with a metallic sheen; occiput with a weak coppery purple sheen; frontovertex generally with a weak, mixed brassy, dark green and coppery-purple sheen, mostly coppery purple above scrobes; scrobal area, temple and gena with a weak coppery purple sheen, scrobes weakly metallic dark green; frontovertex, gena and interantennal prominence with a few scattered, inconspicuous, pale brown setae; maxillary palpus white; radicle dark brown; scape dark brown in proximal 0.5X, apex pale yellow; pedicel and flagellum mainly pale yellow, but pedicel brown at base and distal segments of clava slightly dusky; thorax dark brown to black with a weak metallic lustre; pronotum with a weak coppery purple sheen; mesoscutum and axilla with a weak brassy sheen and weak green and coppery purple reflections; tegula dark purple brown with a weak coppery purple sheen; scutellum dorsally slightly shiny with a weak coppery purple sheen with some dark green reflections, more dark green towards apex and side, extreme apex and side more strongly shining coppery and metallic green; mesopleuron with a moderate purple sheen, posteriorly more strongly coppery; fore coxa white; fore femur white to very pale yellow, tibia and tarsus very pale yellow; mid coxa orange-brown, ventrally mostly brown; mid leg otherwise pale yellow; hind coxa brown; hind femur dark brown, pale orange at apex, tibia and tarsus very pale orange; wings hyaline; propodeum dark brown with a weak purple sheen, side with a weak metallic green and coppery sheen; gaster dark brown with coppery purple, brassy, green and blue reflections; gonostylus brown.

Head (Fig. 408) about 2.5X as wide as frontovertex, in profile about 1.3X as high as deep, tangent to frontovertex forming an angle of about 70° with that of face; occipital margin sharp, carinate; an indistinct, shallow, shiny-bottomed, oval depression present near occipital margin adjacent to eye; ocelli forming an angle of about 85°; frontovertex narrowest about level with anterior ocellus, with distinct, coarse, polygonally reticulate sculpture of mesh size generally subequal to eye facet, not shallower above top of scrobes; temple and gena with much shallower, fine, elongate, polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture, scrobes smooth; interantennal prominence and mouth margin with slightly shallower, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, narrowly ∩-shaped; interantennal prominence dorsally acute; antenna as in Fig. 408; scape relatively short and stout, about 3.6X as long as broad; funicle with segments subquadrate, but distinctly increasing in size and width distad so that F6 is largest; clava about 3X as long as broad and about 1.2X as wide as F6, not curved downwards towards apex, about as long as F3-F6 combined, sutures parallel, sensory area small, at apex only giving it a rounded appearance; eye reaching occipital margin, clothed with sparse, very inconspicuous setae, each clearly shorter than diameter of facet; clypeal margin clearly concave; mandible with 3 acute teeth. Relative measurements: HW 48, HH 38, FV 19.5, POL 9.5, OOL 2, OCL 2.5, AOL 7.5, EL 28, EW 24.5, MS 15.5, SL 18, SW 5.

Thorax (Fig. 409) with pronotum hardly exposed behind head, its posterior margin broadly concave, not angular medially; pronotum and mesoscutum with sculpture generally similar to that in ocellar area but clearly finer and shallower; axilla clearly raised, dorsally with shallow, polygonally reticulate sculpture, posterior face virtually completely smooth and shiny; scutellum mainly with fine, striate-reticulate sculpture that is clearly deeper than sculpture on mesoscutum and more or less arranged in whorls, extreme side and apex completely smooth and shiny; visible part of mesoscutum about 1.8X as broad as long; scutellum about 1.2X as broad as long, dorsally slightly convex, apex with a pair of slender, elongate setae; hind femur about 3.8X as long as broad; fore wing with venation and setation as in Figs 404, 406; mesopleuron not extending past posterior margin of propodeum and not quite touching base of gaster; propodeum (Fig. 409)

medially about 0.1X as long as scutellum. Relative measurements: FWL 48, FWW 20; HWL 30, HWW 7.5.

Gaster with hypopygium reaching about 0.8X towards apex; last tergite about 0.8X as long as mid tibia, with apex broadly rounded; ovipositor slightly exserted, the exserted part about 0.3X as long as mid tibial spur or about 0.1X as long as mid tibia.

Paratype. Funicle with linear sensilla present only on F4-F6; hypopygium Fig. 407; ovipositor Fig. 405. Relative measurements: OL 36, GL 7.5 [MT 62].

Variation. Females vary in overall length from 0.85-0.94mm, otherwise little variation noted in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, Est. Biol. La Selva, 10°24'N 84°01'W, 50-150m, FOT/45/01-40, *Pouruma minor*, 4.i.2000 (INBio/OET). Paratypes: **COSTA RICA**, 1♀, **Alajuela**, Est. Biol. San Ramon, 700m, 24-26.iii.1996 (L. Masner); 1♀, **Heredia**, Est. Biol. La Selva, 10°24'N 84°01'W, 50-150m, fog *Carapa guianensis*, FOT/02, 5.iii.1993 (INBio-OET); 1♀, Heredia, Est. Biol. La Selva, 10°24'N 84°01'W, 50-150m, canopy fog, FOT/42/01-40, 29.xii.1999 (INBio/OET); 1♀, **Puntarenas**, PN Corcovado, Send. Los Patos/Sirena, LS 509200 275700, 70m, 20.ii.2002 (J.A. Azofeifa). Holotype in MZUCR, paratypes in NHMUK.

Tico ryaspis **sp.nov.**

(Figs 410-416; Hab. ♀ 67)

DIAGNOSIS. *Female* (length about 0.8mm): hind tibia mostly dark brown; tangent to frontovertex forming an angle of about 90° with that of face; scape at least 1.2X as long as minimum width of frontovertex; funicle (Fig. 410) with F1-F3 at least slightly longer than broad and F4-F6 at least about 1.5X as long as broad; mesopleuron clearly extending past posterior margin of propodeum and touching base of gaster. *Male*: unknown.

Female (holotype): length, including ovipositor, 0.84mm; excluding ovipositor, 0.82mm (CPD).

Head dark brown to black with a metallic sheen; occiput with a weak coppery purple sheen; frontovertex generally with a weak, mixed brassy, dark green and coppery purple sheen, mostly coppery purple above scrobes; scrobal area, temple and gena with a weak coppery purple and slightly brassy sheen; frontovertex, gena and interantennal prominence with a few scattered, inconspicuous, pale brown setae; maxillary palpus white; radicle dark brown; scape dark brown in proximal 0.7X, apex pale yellow; pedicel and flagellum mainly yellow, but pedicel brown at base and distal segments of clava slightly dusky; thorax dark brown to black with a weak metallic lustre; pronotum with a weak coppery purple sheen; mesoscutum and axilla with a weak brassy sheen and weak green and coppery purple reflections; tegula dark purple brown with a weak coppery purple sheen; scutellum dorsally moderately shiny with a weak coppery purple sheen with some dark green reflections, more dark green towards apex and side, extreme apex and side more strongly shining coppery and metallic green; mesopleuron with a moderate purple sheen; fore coxa white; fore femur white to very pale yellow, tibia and tarsus very pale yellow; mid coxa brown; mid leg otherwise pale yellow; hind coxa dark brown; hind femur dark brown, tibia brown, pale orange at apices, tarsus dusky very pale orange, apical tarsomere brown; wings hyaline; propodeum dark brown with a weak purple sheen, side with a weak metallic green and coppery sheen; gaster dark brown with coppery purple, brassy, green and blue reflections; gonostylus brown.

Head (Fig. 411) about 2.5X as wide as frontovertex, in profile about 1.5X as high as deep, tangent to frontovertex forming an angle of about 90° with that of face; occipital margin sharp,

carinate; an indistinct, shallow, shiny-bottomed, elongate, oval depression present near occipital margin adjacent to eye; ocelli forming an angle of about 90°; frontovertex narrowest about level with anterior ocellus, with distinct, coarse, polygonally reticulate sculpture of mesh size generally a little larger than eye facet, not shallower above top of scrobes; temple and gena with much shallower, fine, elongate, polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture, scrobes smooth; interantennal prominence and mouth margin with slightly shallower, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, narrowly ∩-shaped; interantennal prominence dorsally acute; antenna as in Fig. 410; scape relatively short and stout, about 4.2X as long as broad; funicle with all segments clearly slightly longer than broad, distinctly increasing in size and width distad so that F6 is largest; clava about 3.5X as long as broad and about 1.2X as wide as F6, not curved downwards towards apex, slightly longer than F4-F6 combined, sutures parallel, sensory area small, at apex only giving it a rounded appearance; eye reaching occipital margin, clothed with sparse, inconspicuous setae, each clearly shorter than diameter of facet; clypeal margin clearly concave; mandible with 3 acute teeth. Relative measurements: HW 54, HH 44.5, FV 22, POL 12, OOL 2, OCL 2.5, AOL 7.5, EL 31, EW 25, MS 18, SL 26.5, SW 7.

Thorax (Fig. 416) with pronotum hardly exposed behind head, its posterior margin broadly concave, not angular medially; pronotum and mesoscutum with sculpture generally similar to that in ocellar area but clearly shallower; axilla clearly raised, dorsally with shallow, polygonally reticulate sculpture, posterior face virtually completely smooth and shiny; scutellum mainly with fine, striate-reticulate sculpture that is clearly deeper than sculpture on mesoscutum and more or less arranged in whorls, extreme side and apex completely smooth and shiny; visible part of mesoscutum about 1.7X as broad as long; scutellum about 1.2X as broad as long, dorsally slightly convex, apex with a pair of slender, elongate setae; hind femur about 3.9X as long as broad; fore wing with venation and setation as in Figs 412, 414; mesopleuron clearly extending past posterior margin of propodeum and touching base of gaster; propodeum (Fig. 416) medially about 0.1X as long as scutellum.

Gaster with hypopygium reaching about 0.6X towards apex; last tergite about 0.7X as long as mid tibia, with apex broadly rounded; ovipositor hardly exserted, the exserted part about 0.1X as long as mid tibial spur or about 0.05X as long as mid tibia.

Paratype. Funicle with linear sensilla present only on F4-F6; hypopygium Fig. 413; ovipositor Fig. 415. Relative measurements (wings): FWL 67, FWW 29; HWL 44, HWW 10; (ovipositor): OL 43, GL 10 [MT 72].

Variation. Little variation noted in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Santa Rosa NP, Bosque Hum 10-C, 11.v-1.vi.1985 (D. Janzen, I.D. Gauld); 1♀, same data as holotype. Holotype in MZUCR, paratypes in NHMUK.

Genus *GEORYNUS* gen.nov.

Type species: *Georynus aitne* **sp.nov.** Gender masculine.

Female. Overall length about 1.7-1.8mm.

Body generally dark brown to black with a metallic sheen; maxillary palpus off-white; antenna pale orange with clava orange-brown to brown; tegula dark brown; mesoscutum and scutellum contrasting in colour with scutellum more metallic; all coxae white, remainder of legs pale white to orange; fore wing hyaline or weakly infuscate below marginal vein, venation pale orange;

gonostylus at leat partly pale orange.

Head about 8X as wide as frontovertex, in profile about 1.6X as high as deep, anteriorly quite evenly and strongly curved from occipital margin to top of scrobes, more strongly curved at top of scrobes and from there quite straight to mouth margin, with interantennal prominence hardly protuberant; occipital margin rounded; frontovertex narrowest about midway between anterior ocellus and top of scrobes, shiny, mainly with shallow, fairly fine, polygonally reticulate sculpture of mesh size generally less than diameter eye facet; piliferous punctures on frontovertex shallow; eye slightly overreaching occipital margin, with very conspicuous pale setae, each much longer than diameter of facet; scrobes very shallow, narrowly ∩-shaped, meeting dorsally, with shallow sculpture, weakly margined dorsally and laterally; interantennal prominence distinct, clearly reaching past toruli, dorsally acute; antenna with scape hardly broadened about 4-5X as long as broad; funicle segments varying from all slightly longer than broad to some distinctly transverse, becoming slightly wider distad; linear sensilla absent on proximal funicle segments; clava slightly wider than F6, shorter than funicle, three segmented, apex strongly obliquely truncate; malar sulcus absent; clypeal margin weakly concave; mandible with 3 acute teeth, without a ventral peg; palp formula 4-3.

Thorax with pronotum short, but visible behind head and with imbricate-reticulate to polygonally reticulate sculpture that is about as deep as that on frontovertex below anterior ocellus; notaular lines absent; mesoscutum with polygonally reticulate sculpture that is about as deep as that on pronotum; axilla with polygonally reticulate sculpture that is conspicuously finer and deeper than that on mesoscutum; scutellum dorsally weakly convex and with regular, fine, punctate-reticulate, honeycomb-like sculpture that is much finer and deeper than that on mesoscutum or axillae, apex and side almost vertical and completely smooth and shiny; scutellum apex, in dorsal view, broadly rounded; mid tibial spur slightly shorter than basitarsus; fore wing about 2.4-2.5X as long as broad, with linea calva entire; basal cell fairly evenly setose; costal cell with a line of setae dorsally in apical half and 1 or 2 lines of setae ventrally in apical half or so; submarginal vein with parastigma hardly swollen, with a very weak triangular expansion, not downcurved; marginal vein at least about 4X as long as broad, hardly longer than postmarginal vein, stigmal vein longer than postmarginal vein; uncus of stigmal vein with 3 campaniform sensilla arranged in almost a straight; posterior margin of mesopleuron reaching level with posterior margin of propodeum; propodeum medially about 0.16X as long as scutellum, with some shallow, irregular sculpture medially; about 4-8 setae anterior to and outside spiracle.

Gaster about as long as head and thorax combined; Gt2 with a conspicuous, subspherical, gland-like structure anterolaterally, of about the same diameter as width of cercal plate, in addition to an area of strong reticulate sculpture (clearly visible on slide-mounted material); syntergum at least about as long as mid tibia, its apex acute; hypopygium reaching about 0.5X along gaster, about 2X as broad as long, anteriorly biconcave, with distinct median and anterolateral projections, posteriorly moderately biconvex with a moderate median invagination that is at least 0.2X as deep as hypopygium length; ovipositor 1.5X as long as mid tibia, slightly exserted with exserted part at least about half as long as mid tibial spur; second valvifer without subapical setae; gonostylus freely articulated with second valvifer, about 0.25-0.35X as long as ovipositor and up to about 2.5X as long as mid tibial spur.

Male. Unknown.

DISRIBUTION. Costa Rica.

HOSTS. Unknown.

COMMENTS. The habitus of species of *Georynus* is very similar to those of *Mahencyrtus* Masi and the two species described below were initially included in the latter genus as aberrant species. However, the presence of the unusual, spherical gland-like structures anterolaterally on the second gastral tergite immediately separates *Georynus* from *Mahencyrtus*. *Georynus* also differs from *Mahencyrtus* in the scutellum having a broadly rounded apex, fine punctate sculpture and very smooth and shiny vertical sides as well as a very weakly expanded parastigma and hyaline fore

wings. In *Mahencyrtus* the scutellum is shield-shaped and has coarse longitudinally elongate polygonally reticulate sculpture, the sides are rounded and generally shiny but with shallow sculpture and the fore wing has a conspicuously swollen parastigma and usually has a median infuscate streak in its apical half.

Georynus may be close to *Casus* Noyes & Woolley. Species of both genera have a sharply tridentate mandible, the clava with an oblique apical truncation, similar wing venation with a long marginal vein and only three campaniform sensilla at the apex of the stigmal vein, an acutely angled apex of the syntergum, similarly structured ovipositor and similar hypopygium. However in *Casus* the scutellum has shallow, longitudinally elongate imbricate-reticulate sculpture, the mesopleuron clearly does not reach level with the posterior margin of the propodeum, the propodeal spiracle is separated from the anterior margin of propodeum by at least 2X its own diameter and there are no spherical gland-like structures on the second gastral tergite. In *Georynus* the scutellum has deep, regular, polygonally reticulate (honeycomb-like) sculpture, the mesopleuron reaches level with the posterior margin of the propodeum and the propodeal spiracle is separated from the anterior margin of the propodeum by at most its own diameter.

It is possible that *Georynus* is related to two species currently placed in combination with *Tyndarichus* Howard (*clavicornis* Cameron and *orarius* Annecke & Mynhardt) and which appear to uniquely share these round, gland-like structures. It is very likely that these two species are misplaced in *Tyndarichus*. However, *Georynus* can be distinguished from *clavicornis* and *orarius* (and other species currently placed in *Tyndarichus*, but which lack these structures) by the lack of a strong triangular expansion of the parastigma, marginal vein at least 4X as long as broad and the scutellum having fine, punctate-reticulate sculpture with the sides and apex near vertical and completely smooth and shiny. In *Tyndarichus* the parastigma has a very strong, triangular expansion, the marginal vein is not more than 3X as long as broad and the scutellum is evenly convex, usually with relatively shallow sculpture.

It seems likely that *Georynus* and *Mahencyrtus* belong to the tribe Cheiloneurini (mainly associated with Hemiptera) and *Tyndarichus* (s.s.) belongs to the Bothriothoracini, subtribe Syrphophagina (mainly associated with Holometabola). The phylogenetic relationships of the scale insect parasitoids, previously placed in *Parechthrodryinus* Girault, and now included in *Tyndarichus* (see Hayat, 2012) need to be reassessed using a holistic approach.

See also comments under *Strigenia* (p. 172).

Key to Costa Rican species of *Georynus*
(Females)

1. Sensory area of clava smaller, extending only about 0.3X along ventral surface (Fig. 417); fore wing (Fig. 419) with linea calva open near posterior wing margin and costal cell with two lines of setae on ventral surface in apical half; ovipositor about 2X as long as mid tibia; gonostylus about 2.5X as long as mid tibial spur .... *aitne* **sp.nov.** (p. 165)
- Sensory area of clava larger, extending at least half way along ventral surface of clava (Fig, 425); fore wing (Fig. 426) with linea calva closed near posterior margin and costal cell with only a single line of setae on ventral surface in apical half; ovipositor about 1.5X as long as mid tibia; gonostylus about 1.5X as long as mid tibial spur ..... *dionysus* **sp.nov.** (p. 167)

***Georynus aitne* sp.nov.**
(Figs 417-422; Hab. ♀ 68)

DIAGNOSIS. *Female* (length about 1.3-1.8mm): fore wing (Fig. 419) completely hyaline; head with 4 or 5 setae medially in front of anterior ocellus; area immediately below eye completely smooth and shiny; antenna (Fig. 417) with scape about 4.0X as long as broad; funicle with all segments slightly longer than broad; clava with sensory area extending about 0.3X as long ventral surface; fore wing (Fig. 419) with linea calva open near posterior wing margin; costal cell with two lines of setae on ventral surface in apical half; syntergum about 1.3X as long as mid tibia;

ovipositor about 2X as long as mid tibia; gonostylus about 2.5X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.76mm; excluding ovipositor, 1.61mm (CPD).

Head mainly black; frontovertex generally with a weak brassy and coppery purple sheen with some blue reflections; scrobes with a weak dark green sheen mixed coppery purple, interantennal prominence with a weak coppery purple sheen; temple and gena with a weak dark metallic green sheen, position of malar sulcus broadly marked metallic coppery purple; frontovertex, gena and interantennal prominence with short, moderately conspicuous, dark brown setae; clava brown; pronotum black with a coppery purple and brassy sheen; propleuron and prosternum dark brown; mesoscutum black with a slight metallic dark blue and purple sheen; tegula dark brown with a slight purple and brassy sheen; axilla dark brown with a purple sheen; scutellum largely metallic dark green, purplish anteriorly between axillae, extreme apex shining metallic green, side largely coppery mixed metallic green; dorsum of thorax clothed with dark brown setae; metanotum dark orange-brown with a weak brassy sheen; mesopleuron dark purple-brown with a weak brassy sheen; mesosternum dark brown; fore femur proximally white, very pale orange distally, tibia and tarsus very pale orange; mid femur mostly white, apex pale orange, tibia largely white, but very pale orange at apices, spur very pale orange, tarsus pale orange; hind femur white, apical one-third pale orange, tibia white proximally, apex very pale orange, tarsus very pale orange; fore wing (Fig. 419) hyaline; propodeum dark orange-brown with a weak purple and brassy sheen, setae anterior to and outside spiracle white, translucent and moderately conspicuous; gaster dark brown dorsally mainly with a coppery and purple sheen, but mixed brassy and blue, side and venter mainly with a mixed green, blue, brassy, purple and coppery sheen; gonostylus dark brown with apex widely pale orange.

Head about 8.3X as wide as frontovertex, with 4 or 5 setae medially in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; ocelli forming an angle of about 35°; temple and gena slightly more shiny than frontovertex, with slightly shallower, longitudinally elongate, strigose to striate-reticulate sculpture, area immediately below eye completely smooth and very shiny; eye separated from scrobal margin by less than 0.5X diameter of ocellus, area between eye and scrobe with shallow, transversely elongate, imbricate-reticulate sculpture; sculpture on interantennal prominence polygonally reticulate but a little shallower that on frontovertex; antenna as in Fig. 417; scape hardly broadened, about 4.1X as long as broad; funicle with all segments only slightly longer than broad, becoming wider distad; clava slightly broadened, about 1.2X as wide as F6, nearly as long as F2-F6 combined, outer suture slightly oblique, sensory area enlarged, extending ventrally about 0.3X length of clava, apex conspicuously obliquely truncate. Relative measurements: HW 70.5, HH 69, FV 8.5, POL 4, OOL 0, OCL 8.5, AOL 10, EL 52, EW 44, MS 28, SL 37, SW 9.

Thorax (Fig. 420) with visible part of mesoscutum about 1.9X as broad as long; scutellum about as long as broad; fore wing with venation and distribution of setae as in Figs 418, 419; mid tibial spur shorter than basitarsus; propodeum (Fig. 420) medially about 0.16X as long as scutellum, with some shallow, irregular sculpture medially; about 7 or 8 setae anterior to and outside spiracle. Relative measurements: FWL 72, FWW 29; HWL 52, HWW 12.

Gaster with hypopygium reaching about 0.5X towards apex (but slightly retracted towards anterior); syntergum about 1.3X as long as mid tibia, with apex very acute; ovipositor slightly exserted, the exserted part about as long as mid tibial spur or 0.25X as long as mid tibia.

Paratype. Funicle with linear sensilla present only on F4-F6; hypopygium Fig, 421; ovipositor Fig. 422. Relative measurements: OL 72, GS 24 [MT 35].

Variation. Females vary in length from 1.29-1.81mm, some funicle segments may be quadrate, the purple area in the position of the malar sulcus may be absent, and there may be only 4 setae outside the propodeal spiracle.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Sta Rosa NP, Hacienda 4-C, 5-26.x.1985 (Janzen & Gauld). Paratypes: **COSTA RICA**, 6♀, **Guanacaste**, Santa Rosa NP, Hacienda, various dates 14.ix.1985-20.xii.1986 (Janzen & Gauld); 1♀, Guanacaste, PN Palo Verde, Cerro Guayacán, LN 260952 385020, 140m, 19.v-15.vi.1999 (I. Jiménez); 3♀, Guanacaste, PN Palo Verde, Sector Palo Verde, Cerro Guayacán, LN 259350 389600, 140m, vii-viii.1999 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sector Palo Verde, Cerro Guayacán, LN 259750 388500, 100m, #57963, 11.vii-10.viii.2000 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sector Palo Verde, Cerro Guayacán, LN 259450 388750, 150m, #53297, 15.vi.1999 (I. Jiménez); 2♀, Guanacaste, PN Palo Verde, Camino Alto Viejo, LN 260770 386300, 40m, ix-x.2000 and 12.x-12.xi.2000 (I. Jiménez); 1♀, **Heredia**, Santo Domingo, 1100m, cafetal, 9.ix.1994 (M. Cerda, P. Hanson). Holotype in MZUCR, paratypes in MZUCR, NHMUK.

Georynus dionysus **sp.nov.**

(Figs 423-427)

DIAGNOSIS. *Female* (length about 1.7mm): fore wing (Fig. 426) mostly hyaline, but weakly infuscate below marginal vein; head without setae medially in front of anterior ocellus; area immediately below eye with some shallow sculpture; antenna (Fig. 425) with scape about 4.5X as long as broad; funicle with segments quadrate or transverse; clava with sensory area extending about 0.5X as long ventral surface; fore wing (Fig. 426) with linea calva closed near posterior margin; costal cell with only a single line of setae on ventral surface in apical half; syntergum about as long as mid tibia; ovipositor about 1.5X as long as mid tibia; gonostylus about 1.5X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.68mm; excluding ovipositor, 1.61mm (CPD).

Head mainly black; frontovertex generally with a metallic green sheen, mixed with some blue reflections; scrobe and temple with a metallic green sheen, scrobe laterally margined coppery purple; interantennal prominence and gena coppery purple; frontovertex, gena and interantennal prominence with short, inconspicuous, translucent, pale brown setae; clava orange-brown; pronotum black with a coppery purple and brassy sheen; propleuron and prosternum dark brown; mesoscutum black with a weak coppery and coppery purple sheen mixed brassy, with some blue reflections; tegula dark brown with a slight purple and brassy sheen; axilla black with a dark purple sheen; scutellum largely metallic dark green, tending to dark blue between axillae and paler green towards apex, extreme apex coppery, side coppery mixed metallic green; dorsum of thorax clothed with slightly translucent, brown setae; metanotum dark brown with a weak brassy sheen; mesopleuron dark purple-brown with a weak brassy sheen; mesosternum dark brown; fore femur proximally white, pale orange distally, tibia and tarsus pale orange; mid femur proximally white, distally pale orange, tibia pale orange, very pale orange medially, spur and tarsus pale orange; hind femur white towards base, otherwise pale orange, tibia and tarsus pale orange; fore wing (Fig. 426) weakly infuscate below marginal vein, with marginal vein dusky pale orange; propodeum dark brown with a weak purple and brassy sheen, setae anterior to and outside spiracle white, translucent and moderately conspicuous; gaster dark brown dorsally mainly with a coppery and purple sheen, Gt1 with some green and brassy reflections, side and venter mainly with a mixed green, blue, brassy, purple and coppery sheen; gonostylus pale orange.

Head about 7.9X as wide as frontovertex, without setae medially in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; ocelli forming an angle of about 35°; temple and gena about as shiny as frontovertex, with slightly shallower, longitudinally elongate, strigose to striate-reticulate sculpture, area immediately below eye with some very shallow sculpture; eye separated from scrobal margin by less than 0.5X diameter of ocellus, area between eye and scrobe with shallow, transversely elongate, imbricate-reticulate sculpture; sculpture on interantennal prominence polygonally reticulate but a little shallower that on frontovertex; antenna as in Fig. 425; scape hardly broadened, about 4.6X as long as broad; all funicle segments quadrate or transverse, with F1 and F4 perhaps very slightly longer than broad,

segments becoming wider distad, linear sensilla present only on F3-F6 or absent from F3; clava hardly broadened, about 1.1X as wide as F6, a little longer than F2-F6 combined, outer suture strongly oblique, sensory area enlarged, extending ventrally about 0.5X length of clava, apex strongly obliquely truncate. Relative measurements: HW 67, HH 68, FV 8.5, POL 4, OOL 0, OCL 8.5, AOL 10, EL 52, EW 42, MS 24, SL 37, SW 8.

Thorax with visible part of mesoscutum about 2X as broad as long; scutellum about as long as broad; fore wing with venation and distribution of setae as in Figs 423, 426; mid tibial spur very slightly shorter than basitarsus; propodeum medially about 0.16X as long as scutellum, with some shallow, irregular sculpture medially; about 5 setae anterior to and outside spiracle. Relative measurements: FWL 86.5, FWW 36; HWL 65.5, HWW 15.

Gaster with hypopygium (Fig. 424) reaching about 0.5X towards apex; syntergum about as long as mid tibia, with apex acute; ovipositor (Fig. 427) slightly exserted, the exserted part about half as long as mid tibial spur or about 0.15X as long as mid tibia. Relative measurements: OL 57, GS 18 [MT 39].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Limón**, [RB Hitoy Cerere], Sendero Espavel hacia el Cerco, LS 400702 570120, 560m, #52200, 19.v-19.vi.1998 (C. Rojas). Holotype in NHMUK.

Genus *PRIONIAS* gen.nov.

Type species: *Prionias nodutus* **sp.nov.** Gender masculine.

Female. Length about 1.7mm.

Body slender, generally dark with a weak to moderate metallic sheen; scape and funicle orange, contrasting with brown clava; palpi off-white; dorsum of thorax with dark setae; tegula dark brown; legs mainly pale yellow to pale orange with some dark areas; wings hyaline, venation pale brown; propodeum dark with a weak metallic sheen, side strongly metallic, a few silvery setae near spiracle; gaster dark with a metallic sheen.

Head in profile about 1.6X as high as deep, anteriorly fairly evenly curved from occipital margin to top of scrobes, more strongly curved or angled at top of scrobes and virtually straight to mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, weakly carinate; frontovertex about one-fifth head width, slightly shiny, with polygonally reticulate sculpture; a very short, longitudinally orientated, shiny-bottomed groove present adjacent to eye margin between each posterior ocellus and occipital margin; ocelli forming an acute angle; eye slightly overreaching occipital margin, clothed with sparse, inconspicuous setae that are slightly shorter than diameter of facet; scrobes shallow, ∩-shaped, weakly margined dorsally and laterally; antenna attached about midway between lower eye margin and mouth, dorsal margin of torulus slightly below lower eye margin; scape subcylindrical. about 5X as long as broad; all funicle segments longer than broad, subequal in length, becoming slightly broader distally, linear sensilla conspicuous and on all segments except F1; clava shorter than funicle, 3-segmented, outer suture slightly oblique, sensory area enlarged, extending a little way along ventral margin of clava, apex distinctly obliquely truncate; malar sulcus absent; mandible tridentate, upper tooth broadly truncate; palp formula 4-3.

Thorax with pronotum short, its posterior margin distinctly concave; mesoscutum without notaular lines, with polygonally reticulate to imbricate-reticulate sculpture; scutellum flat with fairly regular, polygonally reticulate sculpture that is arranged in whorls and conspicuously deeper than sculpture on mesoscutum or axillae, extreme apex and side completely smooth and shiny, a

pair of long subapical setae present, each about half as long as scutellum; mid tibial spur about as long as basitarsus; fore wing fully developed; about 2.6X as long as broad; costal cell with 2 nearly complete lines of setae ventrally and a line of setae dorsally in apical half or so; submarginal vein with an apical hyaline break, parastigma slightly swollen and slightly downwardly curved; marginal vein about 8X as long as broad, about 2X as long as stigmal vein or postmarginal vein; linea calva open; filum spinosum present, consisting of a line of about 4 or 5 stouter setae; posterior margin of mesopleuron reaching level with posterior margin of propodeum; propodeum fairly short, medially with a single median carina; about 10 setae near spiracle.

Gaster with hypopygium not quite reaching apex; paratergites absent; syntergum shorter than mid tibia, apex with a narrow, tongue-like projection; ovipositor slightly exserted; ovipositor longer than mid tibia, second valvifer without subapical setae, proximal part narrowly C-shaped; hypopygium elongate, V-shaped, very clearly as long as broad, mid anterior process long and slender, lateral arms long, each with a shallow but distinct notch on external margin, posterior margin elongate and acute with a shallow median invagination.

Male. Unknown.

DISTRIBUTION. Known only from Costa Rica.

HOSTS. Unknown.

COMMENTS. The sharp occipital margin, tridentate mandible with two acute lower teeth and a distinctly truncate upper tooth, obliquely truncate clava, relatively deep sculpture of the scutellum and elongate marginal vein of the fore wing suggest that *Prionias* may be related to *Hebynthus*. *Prionias* can be distinguished from *Hebynthus* and related genera by the presence of the slightly downwardly curved parastigma and the prominent tongue-like apical projection on the syntergum. The funicle and clava are also relatively slender compared to most species of *Hebynthus* and the sensory area is also relatively short, extending only about one-third along the ventral surface of the clava. In *Hebynthus* the sensory area of the clava extends more than one third along its ventral surface. Perhaps the most important difference from genera related to *Hebynthus* and also to *Dalek* is the elongate, V-shaped hypopygium which has an acutely extended posterior margin. The other genera have the posterior margin of the hypopygium truncate or more or less square.

The shiny-bottomed grooves behind the posterior ocelli, fore wing with a slightly downcurved parastigma and relatively very elongate marginal vein suggest the possibility that *Prionias* may be more closely related to *Prochiloneurus* (Cheiloneurini) because the V-shaped hypopygium is quite similar. However, alongside many other differences between the genera, the hypopygium is even more slender and elongate than in *Prochiloneurus* and the fore wing is hyaline, the scutellum lacks an apical tuft of setae and the apex of the gaster has a narrow tongue-like extension. In *Prochiloneurus* the fore wing is always infuscate, the scutellum usually has an apical tuft of setae and the apex of the syntergum is truncate, even slightly concave.

In some respects *Prionias* is superficially similar to species of *Mahencyrtus* and perhaps even *Comones* Noyes & Woolley (both Cheiloneurini), the latter genus sharing similar fore wing venation to *Prionias*. However, *Prionias* can be separated from both of these genera because they have the antenna attached level with the lower eye margin, the apex of the clava rounded, three distinct teeth in the mandibles and the hypopygium strongly transverse (subrectangular).

See also comments under *Strigenia* (p. 172).

Prionias nodutus **sp.nov.**

(Figs 428-434; Hab. ♀ 69)

Female (holotype): length, including ovipositor, 1.69mm; excluding ovipositor, 1.55mm. (CPD)

Head mainly black, occipital margin with a metallic dark blue sheen, area between occipital margin and posterior ocelli weakly purplish, frontovertex otherwise with a very weak, dark blue sheen, scrobal area with a distinct coppery purple sheen, temple and posterior gena with a weak brassy sheen, lower part of interantennal prominence weakly metallic dark green; piliferous

punctures on frontovertex coppery purple; frontovertex, gena and interantennal prominence with short, moderately conspicuous, dark brown setae; radicle orange-brown margined dark brown, scape pale orange, pedicel ventrally pale orange and at apex, otherwise slightly dusky pale orange; funicle slightly dusky pale orange; clava brown; maxillary palpus off-white; pronotum black with a coppery purple sheen; prosternum dark brown; mesoscutum black with a slight, but distinct, metallic dark blue sheen, in some lights purple, especially posteriorly; tegula dark brown with a slight brassy sheen; scutellum metallic dark green, with some purple reflections, especially in anterior one-third; axilla dark purple-brown; dorsum of thorax clothed with dark brown setae; metanotum dark purple-brown with weak brassy sheen; mesopleuron dark purple-brown with a weak brassy sheen; mesosternum dark brown; fore coxa pale yellow, mid and hind coxae pale orange; legs generally pale yellow to pale orange, mid tibia with a small, dark brown subbasal spot, pretarsi brown; wings hyaline, fore wing venation pale brown; propodeum mainly dark purple-brown with a weak brassy sheen, area below spiracle with distinct metallic green sheen; setae surrounding spiracle white, translucent and silvery; gaster generally dark brown with a coppery purple sheen, Gt1 with a deep blue-green metallic sheen, side of Gt1 with a metallic dark green sheen, otherwise side and venter mainly with a mixed blue, brassy, purple and coppery sheen; gonostylus dark brown with extreme apex pale orange.

Head (Fig. 433) about 4.4X as wide as frontovertex; ocelli forming an angle of about 50°; frontovertex with narrowest point about level with anterior ocellus, sculpture of mesh size much less than diameter eye facet; frontovertex with piliferous punctures shallow, 6 setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena about as shiny as frontovertex, with slightly shallower, longitudinally elongate, strigose to striate-reticulate sculpture, that on temple and posterior part of gena of conspicuously larger mesh; eye separated from scrobal margin by slightly less than diameter of ocellus, area between eye and scrobe with similar sculpture to that on frontovertex; scrobes meeting dorsally, with shallow sculpture; interantennal prominence, well separated from frontovertex, dorsally rounded, sculpture on interantennal prominence polygonally reticulate, about as deep that on frontovertex; antenna as in Fig. 432; scape about 5.3X as long as broad; funicle with linear sensilla present on F2-F6; clava hardly broadened, about 1.2X as wide as F6, nearly as long as F3-F6 combined, clava with sensory area extending not quite one-third along its ventral surface; clypeal margin weakly concave, slightly protuberant medially. Relative measurements: HW 70, HH 66, FV 16, POL 7, OOL 0, OCL 5.5, AOL 8, EL 49, EW 40, MS 22, SL 31.5, SW 6.

Thorax (Fig. 430) with imbricate-reticulate to polygonally reticulate sculpture on pronotum and mesoscutum that is similar in depth to that on frontovertex below anterior ocellus; axilla with polygonally reticulate sculpture that is a little deeper and coarser than that on mesoscutum; posterior margin of pronotum moderately concave; visible part of mesoscutum about 1.4X as broad as long; scutellum about 0.9X as long as broad; fore wing with venation and distribution of setae as in Figs 428, 429; propodeum (Fig. 430) about 0.14X as long as scutellum, with an indistinct, single, longitudinal, median carina. Relative measurements: FWL 72, FWW 27.5; HWL 53, HWW 12.5.

Gaster a little longer than thorax, with hypopygium (Fig. 434) reaching about 0.8X towards apex; syntergum about 0.9X as long as mid tibia, with tongue-like extension a little more than a quarter as long as remainder of syntergum; ovipositor (Fig. 431) exserted, the exserted part about 0.2X as long as gaster or nearly as long as mid tibial spur. Relative measurements: OL 75; GS 22.5 [MT 38].

Variation. Females vary in overall length from 1.69-2.27mm, the paratype is distinctly larger than the holotype and has paler legs that lack the small, dark brown, subbasal spot on the mid tibia, the fore wing has a slight yellow hue, the head is about 5X as wide as the frontovertex, the flagellar segments are a little more slender, F1 has linear sensilla and the propodeum has several irregular carinae medially.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Pitilla (ACG), 700m, MT/YPT, 24.i-27.ii.1996 (J.S. Noyes). Holotype and paratype in NHMUK.

Genus *STRIGENIA* gen.nov.

Type species: *Strigenia laras* **sp.nov.** Gender feminine.

Female. Length about 1.8mm.

Body generally dark brown to black with a weak metallic sheen, scutellum almost matt; scape pale orange; flagellum orange-brown to pale brown; legs largely dark brown with pale orange areas; wings hyaline, fore wing venation brown with submarginal vein partially yellow; hind wing venation yellow.

Head about 3-4X as wide as frontovertex; occipital margin acute, sharp, not carinate; vertex with a slender, shiny bottomed groove, about as long as posterior ocellus, adjacent to eye margin extending from near occipital margin to about level with middle of posterior ocellus; frontovertex with 3 or 4 shallow, piliferous punctures in middle below anterior ocellus; scrobes shallow, but well defined, more or less ∩-shaped, meeting, antenna attached below eye margin, upper margin of torulus below lower eye margin, torulus slightly less than its own length from mouth margin; scape hardly broadened, widest about middle and about 4X as long as broad; pedicel conical, about 1.5X as long as broad, funicle segments subcylindrical, subequal, subquadrate, becoming slightly larger distally, linear sensilla on all segments except F1; clava 3-segmented, slightly wider than funicle; sutures subparallel, sensory area very slightly enlarged giving apex a rounded appearance; eye slightly overreaching occipital margin, clothed in very inconspicuous, short setae that are clearly shorter than diameter of facet; malar sulcus virtually absent, but present dorsally, very shallow and inconspicuous; mandible virtually tridentate, with 2 acute teeth and a slightly concave truncation; palp formula 4-3.

Thorax with pronotum short, narrowly visible behind head with posterior margin strongly concave; posterior margin of mesoscutum medially slightly produced posteriorly so that medially it partially covers the axilla; scutellum convex; mesopleuron slightly expanded posteriorly, but not quite extending past posterior margin of propodeum so that in profile the propodeum and hind coxa meet narrowly; fore wing about 2.3X as long as broad, with a line of setae dorsally in distal half of costal cell and more or less 2 lines ventrally; submarginal vein with parastigma hardly broadened and not downcurved; junction of submarginal vein and marginal vein with a hyaline break; marginal vein about 4X as long as broad, about 1.5X as long as stigmal vein and 2X as long as postmarginal vein; uncus developed, with only 3 campaniform sensilla in a line; basal cell with a triangular naked area, linea calva entire, filum spinosum present, comprised 2 or 3 modified setae; mid tibial spur about as long as basitarsus; mesopleuron not quite reaching posterior margin of propodeum, falling short by about diameter of spiracle, narrowly separated from base of gaster by propodeum and hind coxa; propodeum medially about 0.1X as long as scutellum, about 15 silvery setae outside spiracle and about 20 on side above hind coxa.

Gaster about as long as thorax; hypopygium reaching about halfway along gaster, about 2.5X as broad as long with posterior median invagination about 0.4X as deep as length of hypopygium; ovipositor slightly exserted, a little longer than mid tibia; second valvifer without any subapical setae; gonostylus free; outer plate narrow, subtriangular.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

COMMENTS. I am unable to place *Strigenia* confidently within the current encyrtid classification of the Encyrtinae. As the key suggests, *Strigenia* may be closest to *Caldencyrtus*. The two genera can be separated using the characters given in the key. In addition the posterolateral corner of the propodeum is quite rounded in *Strigenia* and the apex of the stigmal vein has only 3 campaniform sensilla, whilst in *Caldencyrtus* the posterolateral corner of the propodeum it is usually sharp with a short, tooth-like projection and the apex of the stigmal vein has 4 campaniform sensilla .

The presence of a shiny bottomed groove adjacent to the occipital margin between the occipital margin and posterior ocellus, tridentate mandible and the presence of only three campaniform sensilla in a line at the apex of the stigmal vein together suggest that it may be related to *Mahencyrtus*. There is a slight superficial similarity in habitus, but *Strigenia* differs in having similar, fine, coarse polygonally reticulate sculpture of rounded cells on the mesoscutum, axilla and scutellum, the fore wing only about 2.3X as long as broad and completely lacking an expanded parastigma, and the syntergum much broader than long and shorter than the mid tibia. In *Mahencyrtus* the sculpture of the mesoscutum is composed of rounded cells contrasting with the deeper, strongly logitudinally elongate sculpture of the scutellum, the fore wing is at least about 2.8X as long as broad with the parastigma is conspicuously expanded, and the syntergum is much longer than broad and longer than the mid tibia.

Of other genera superficially similar to *Mahencyrtus*, *Strigenia* differs from both *Prionias* and *Georynus* in having the apex of the clava more or less rounded, similar fine polygonally reticulate sculpture on the mesoscutum and scutellum and mesopleuron not quite reaching level with the posterior margin of the propodeum. In both *Prionias* and *Georynus* the apex of the clava is obliquely truncate, the sculpture on the scutellum is clearly much deeper than on the meoscutum and the mesopleuron reaches level with the posterior margin of the propodeum. *Strigenia* also differs from *Prionias* in having the mandible with two teeth and a straight truncation, the apex of the syntergum rounded and the hypopygium strongly transverse with the posterior margin biconvex and with a deep, median invagination, whereas in *Prionias* the mandible is distinctly tridentate with the upper tooth truncate, the apex of the syntergum has a median tongue-like projection and the hypopygium is about as long as broad, strongly V-shaped with the posterior margin acute and with only a very small, shallow median invagination. *Strigenia* further differs from *Georynus* in lacking a pair of submedian, spherical gland-like structures on the anterior margin of TII of the gaster and the syntergum is apically rounded and broader than long and distinctly shorter than the mid tibia. In *Georynus* the anterior margin of TII of the gaster has a pair of submedian, spherical gland-like structures and the syntergum is apically acute and about as long as broad and at least about as long as the mid tibia

***Strigenia laras* sp.nov.**
(Figs 435-441)

Female (holotype): length, including ovipositor, 1.80mm; excluding ovipositor, 1.75mm (CPD).

Head generally black, occiput and frontovertex generally with a very dull, dark green and coppery purple sheen; scrobal area mostly coppery purple, a small dark metallic blue area at top of scrobes above interantennal prominence and between and below toruli, interantennal prominence with a slight violet sheen in part; temple and gena with a slight brassy and coppery purple sheen, lower eye margin mixed metallic blue and purple; radicle dark orange-brown; scape pale orange, a little brownish proximally and along dorsal margin; pedicel dark brown with apex and venter pale orange; flagellum pale orange-brown, apical segments of clava pale brown; mandible amber; maxillary palpi pale orange-brown; frontovertex, gena and interantennal prominence with relatively sparse, scattered, translucent pale brown setae; thorax generally dark brown to black; pronotum with a weak coppery purple sheen; mesoscutum and axilla with a weak brassy and coppery purple sheen; scutellum virtually matt, but generally with some weak brassy reflections, apex and side with a slightly stronger, metallic dark green sheen mixed with some

coppery purple reflections; mesopleuron with a relatively strong coppery purple sheen with some dark blue reflections; setae on dorsum of thorax dark brown and quite conspicuous; all coxae and femora dark brown, fore and mid femora pale orange at distal apex; fore tibia pale orange, with an external, subbasal pale brown area, tarsus pale orange; mid tibia pale yellow with a broad, subbasal brown band to half way along its length; spur and tarsus pale yellow to very pale orange; hind tibia dark brown with extreme, distal apex pale orange, tarsus pale orange, apical tarsomere slightly dusky; wings hyaline, fore wing venation brown, submarginal vein medially yellowish, hind wing venation yellowish; propodeum dark purple-brown with a slight brassy sheen, side with a weak, metallic dark green sheen, setae on side of propodeum translucent and silvery; gaster dark brown, dorsally with a weak coppery purple sheen and brassy, purple and dark green reflections, especially on Gt1, syntergum laterally with a slight dark blue sheen, side and venter with brassy, dark green, blue and purple reflections; gonostylus dark brown, apex pale orange-brown.

Head (Fig. 436) about 3.4X as wide as frontovertex, in profile, about 1.7X as high as deep, weakly rounded from posterior ocellus to just above scrobes, more strongly curved at top of scrobes then virtually straight to mouth margin with interantennal prominence hardly protuberant; ocelli forming an angle of about 70°; inner eye margins slightly diverging in front of anterior ocellus; frontovertex with evenly spaced piliferous punctures along inner eye margins, with moderately deep, fairly regular polygonally reticulate sculpture of subequal mesh size to diameter of eye facet; temple and gena with longitudinally elongate, polygonally reticulate sculpture of similar depth to that on frontovertex; scrobes with shallow, polygonally reticulate sculpture; interantennal prominence rounded dorsally, with shallow, regular, polygonally reticulate sculpture; antenna as in Fig. 435; scape about 4X as long as broad; F1 smallest, but F1-F3 subequal and slightly transverse to quadrate, F4-F6 subequal, quadrate to slightly longer than broad, segments slightly larger distad, linear sensilla present only on F2-F6; clava slightly broadened, about 1.2X as wide as F6, a little longer than F4-F6 combined, sutures hardly oblique; clypeal margin very slightly and evenly concave. Relative measurements: HW 87, HH 85, FV 25.5, POL 14.5, OOL 2, OCL 5, AOL 12.5, EL 56, EW 44, MS 31, SL 30, SW 7.5.

Thorax (Fig. 439) with slightly transversely elongate, polygonally reticulate sculpture on pronotum that is generally of similar mesh size and about as deep as that on frontovertex; mesoscutum with fine, but coarse, polygonally reticulate sculpture that is slightly elongate in anterior 0.7X or so, about as deep as that on frontovertex, but generally of much smaller mesh; axilla and scutellum with similar sculpture to mesoscutum, but generally coarser and of smaller mesh size; visible part of mesoscutum about 1.5X as broad as long; scutellum convex and about as long as broad; setae on mesoscutum moderately dense, separated by less than their own lengths and of more or less uniform length, those on scutellum of similar density, but clearly longer especially towards apex; fore wing with venation and setation as in Figs 437, 438; propodeum (Fig. 439) virtually smooth medially. Relative measurements: FWL 107, FWW 47; HWL 71.5, HWW 23.5.

Gaster about as long as thorax with hypopygium (Fig. 441) reaching about 0.5X along gaster; last tergite about as long as mid tibia, with apex rounded; ovipositor (Fig. 440) slightly exserted, the exserted part about 0.3X as long as mid tibial spur or a little less than 0.1X as long as mid tibia. Relative measurements: OL 110, GL 41 [MT 92].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, RF Golfito, Est. Agujas, LS 526550 276750, 300m, #59157, 1-14.x.2000 (J. Azofeifa). Holotype in NHMUK.

Genus *STADIMA* gen.nov.

Type species: *Stadima moros* **sp.nov.** Gender feminine.

Female. Length about 1.7mm.

Body generally dark brown to black with a metallic green sheen mixed with some brassy and coppery areas; tegula dark brown; legs mostly yellow to pale orange with some dark brown areas; wings virtually hyaline; wing venation pale yellow-brown.

Head about 4X as wide as frontovertex, in profile frontovertex and face both quite flat and forming an angle of about 100° at top of scrobes; occipital margin acute and sharp; malar sulcus absent; clypeal margin very slightly emarginate medially; frontovertex, excluding setae long eye margin, naked in front of anterior ocellus; antennal scrobes shallow, but well defined, broadly ∩-shaped, more or less meeting; antenna attached near mouth margin, well below lowest eye margin, separated from mouth margin by less than half length of torulus; scape strongly broadened and flattened, less than 2X as long as broad, dorsal margin distinctly convexly curved, widest in middle; pedicel about 2.5X as long as broad; funicle segments subequal but gradually increasing in width distally; F1 clearly longer than broad and F6 quadrate, linear sensilla absent from proximal segments; clava slightly wider than funicle, 3-segmented, apical sensory area slightly enlarged forming an oblique truncation; eye reaching occipital margin, clothed in inconspicuous, translucent setae that are clearly shorter than diameter of facet; mandible with 3 teeth, upper tooth short and rounded or truncate; palp formula 4-3.

Thorax with pronotum short and hardly visible behind head, posterior margin strongly concave; dorsum of thorax flat in profile; notaular lines absent; scutellum quite flat, apex and side smooth and shiny, apex acute and slightly overhanging the propodeum medially; mid tibia slightly swollen subbasally, spur about as long as basitarsus; hind femur relatively broadened and flattened; fore wing about 2.8X as long as broad; costal cell dorsally with a single line of setae in apical half, ventrally with a single line of setae; parastigma hardly swollen, hardly downcurved; junction of submarginal and marginal veins with a hyaline break; marginal vein about 6X as long a broad, slightly longer than stigmal vein and about 2.5X as long as postmarginal vein; uncus developed; basal cell evenly setose, linea calva entire, more or less open; filum spinosum present, represented by 6 modified setae; mesopleuron not quite reaching level with posterior margin of propodeum, so that in profile the propodeum is narrowly in contact with hind coxa, the two together separating mesopleuron from base of gaster; propodeum medially less than one-fifth length of scutellum; about 35 dense, silvery setae surrounding spiracle, extending towards posterior margin, but not extending down side.

Gaster slightly longer than head and thorax combined; hypopygium (Fig. 442) V-shaped and reaching apex, extending very slightly past apex of syntergum; ovipositor (Fig. 444) slightly exserted with exserted part shorter than mid tibial spur; second valvifer without any subapical setae; gonostylus free, relatively broad and elongate with apex slightly downcurved; outer plates slender and ribbon like, not triangular, with a single subapical seta.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

COMMENTS. The tridentate mandible, pale wing venation, relatively slender fore wing and elongate marginal vein, suggest a possible relationship with *Mahencyrtus* and *Georynus* (tribe Cheiloneurini). However, the strongly broadened and flattened scape with a convex dorsal margin, scutellum with shallow sculpture with apex slightly overhanging the propodeum medially, hypopygium V-shaped and reaching the apex of the gaster and unusual structure of the ovipositor clearly separates *Stadima* from these and other genera.

***Stadima moros* sp.nov.**
(Figs 442-446; Hab. ♀ 70)

Female (holotype): length, including ovipositor, 1.66mm; excluding ovipositor, 1.61mm (CPD).

Head with occiput moderately shiny metallic green; frontovertex largely with a moderate metallic, dark green sheen, occipital margin, eye margin and area in front of anterior ocellus somewhat coppery; temple, gena and scrobal area distinctly coppery-purple mixed with some violet; frontovertex, gena and interantennal prominence with relatively sparse, scattered, inconspicuous brown setae; radicle dark brown; scape dark brown with a slight brassy and purple sheen; pedicel dark brown, orange-brown at extreme apex; flagellum yellow; mandible dark amber-brown; maxillary palpus pale yellow; thorax generally dark brown to black; pronotum with a brassy and coppery sheen; mesoscutum with a relatively bright, metallic, blue-green sheen in anterior 0.75X, posterior 0.25X coppery; tegula brown with a slight brassy sheen; axilla and anterior 0.8X of scutellum with a coppery purple to coppery sheen, sides and apical 0.2X of scutellum with a distinct metallic brassy and dark green sheen; metanotum and mesopleuron dark purple-brown with a slight brassy sheen; setae on dorsum of thorax dark brown and fairly conspicuous; fore coxa pale yellow; fore femur pale yellow in proximal 0.3X, distally dark brown, fore tibia pale orange with a broad, brown, subbasal band to about 0.5X, tarsus pale orange; mid coxa brown proximally, pale yellow distally; mid femur pale yellow in proximal 0.75X, distally dark brown, tibia pale yellow with a dark brown subbasal band to about 0.4X, spur and tarsus pale orange; hind coxa pale yellow; hind femur pale yellow in proximal 0.4X, distally dark brown, tibia pale yellow at base and apex otherwise dark brown, tarsus pale yellow proximally, pale orange distally, apical tarsomere slightly dusky; wings virtually hyaline, but fore wing (Fig. 443) very weakly infuscate; propodeum slightly shining, dark purple-brown, side metallic green and blue, a distinct group of silvery setae outside spiracle, these not extending down side towards hind coxa; gaster largely dark purple-brown, with some brassy, purple and green reflections, Gt1 dorsally bright metallic green and blue-green with posterior margin broadly coppery mixed with some brassy and purple; gonostylus dark brown.

Head in profile, about 1.4X as high as deep; occipital margin weakly carinate; ocelli forming an angle of about 55°; inner eye margins diverging very slightly in front of anterior ocellus; frontovertex with evenly spaced piliferous punctures along inner eye margins and none in front of anterior ocellus, punctures very shallow and about as wide as eye facet; ocellar area with moderately deep, fairly regular, polygonally reticulate sculpture of slightly smaller mesh than eye facet, sculpture in front of anterior ocellus a little shallower but mostly of slightly larger mesh, but still smaller than facet; temple and gena with irregular, longitudinally elongate, polygonally reticulate sculpture of similar depth to that in ocellar area; scrobes with polygonally reticulate sculpture; interantennal prominence virtually reaching frontovertex, with shallow, regular, polygonally reticulate sculpture; antenna as in Fig. 446; scape about 1.5X as long as broad, dorsal margin clearly convexly curved; F1 clearly longer than broad and F6 quadrate, linear sensilla present only on F4-F6; clava slightly broadened, about 1.3X as wide as F6, about as long as F3-F6 combined, outer suture slightly oblique, sensory area extending about 0.3X along venter of clava. Relative measurements: HW 65, HH 63, FV 16, POL 7.5, OOL 0.5, OCL 6.5, AOL 10, EL 48, EW 36.5, MS 24, SL 30, SW 19.5.

Thorax with slightly transversely elongate, polygonally reticulate sculpture on pronotum that is generally of similar mesh size, and about as deep as that on frontovertex; mesoscutum with polygonally reticulate to imbricate-reticulate sculpture that is about as deep as that on frontovertex, but generally of slightly larger mesh size; axilla and anterior part of scutellum with similar sculpture to that on mesoscutum, apical one-third of scutellum with shallower sculpture; visible part of mesoscutum about 1.5X as broad as long; scutellum about as long as broad with apex acute and slightly overhanging the propodeum medially; setae on mesoscutum moderately dense, separated by a little less than their own lengths and of more or less uniform length, those on scutellum similar, subapical setae clearly longer; hind femur about 3X as long as broad; fore wing with venation and setation as in Figs 443, 445; propodeum medially about 0.16X as long as scutellum, with some regular, moderately deep, polygonally reticulate sculpture in middle 0.3X or so, lateral areas with shallower, irregular sculpture. Relative measurements: FWL 101.5, FWW

36.5; HWL 74, HWW 16.5.

Gaster with syntergum about 0.8X as long as mid tibia, with apex narrowly rounded; ovipositor (Fig. 444) slightly exserted, the exserted part about 0.8X as long as mid tibial spur or about 0.2X as long as mid tibia. Relative measurements: OL 102.5, GL 44.5 [MT 73].

Variation. Very little in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Est. Altamira, LS 331800 572100, 1450m, #62333, 9.iv-9.v.2001 (D. Rubí). Paratypes: **COSTA RICA**, **Puntarenas**, Est. Altamira, Send. Los Gigantes, LS 331700 572200, 1460m, #64228, 9.v-9.vi.2001 (D. Rubí). Holotype in MZUCR, paratype in NHMUK.

Genus *OODIA* gen.nov.

Type species: *Oodia japetus* **sp.nov.** Gender masculine.

Female. Overall length about 1.5mm.

Body robust, generally dark brown with a weak to moderate metallic sheen; wings mainly hyaline, but fore wing partly infuscate, venation orange-brown.

Head subcircular, in facial view, about as long as broad; about 4X as wide as frontovertex; occipital margin acute, sharp and carinate; in profile with frontovertex evenly rounded from occipital margin to just above scrobes, more strongly curved at top of scrobes then virtually straight to mouth margin; eye reaching occipital margin, clothed in fairly conspicuous, translucent setae that are about as long as diameter of facet; dorsal tentorial arms reaching frontovertex about midway between torulus and eye margin, slightly below level of dorsal margin of torulus; scrobes shallow, ∩-shaped; antennal torulus a little below lower eye margin, separated from mouth margin by about its own length; antenna with scape subcylindrical, about 4X as long as broad; funicle 6-segmented with segments at least about as long as broad, becoming slightly shorter and broader distally, with conspicuous linear sensilla on all segments; clava 3-segmented, hardly wider than funicle, sutures subparallel, not oblique; sensory area at apex only giving it a rounded or hardly truncate appearance; malar sulcus present, conspicuous; mouth margin fairly straight; mandible with three very acute teeth; palp formula 4-3.

Thorax with pronotum short with posterior margin evenly concave, just visible behind head; mesoscutum with notaular lines completely absent; axillae more or less meeting medially, but separated by a distinct carina; scutellum convex with fairly dense, evenly distributed setae, those at apex hardly longer than those at base; mid tibial spur about as long as basitarsus; wings fully developed; fore wing about 2.6X as long as broad; costal cell with at least two lines of setae ventrally and a single line of setae dorsally in apical two-fifths; parastigma indistinct, hardly widened; hyaline break present at apex of submarginal vein; marginal vein about 5X as long as broad; stigmal vein nearly as long as marginal, curved subapically with distinct uncus and campaniform sensilla arranged in a line; postmarginal vein about as long as stigmal vein; linea calva dorsally entire and open; filum spinosum distinct, with 5 or 6 peg-like modified setae; mesopleuron separated from base of gaster – posterior margin not extending past posterior margin of propodeum but clearly separating propodeum laterally from hind coxa; mesophragma projecting very slightly into base of gaster; propodeum about 0.2-0.25X as long as scutellum; medially virtually smooth, with shallow sculpture; about 10-12 setae on side in spiracular area.

Petiole about 0.4X as wide as propodeum, anelliform; gaster slightly shorter than thorax; Gt2 anteriorly with a broad, strongly reticulate, submedian area; paratergites absent, outer plate of ovipositor completely separate from syntergum, subtriangular, slender, about 3X as long as broad; hypopygium not reaching apex, about 2X as broad as long, anterolateral and anteromedian

processes short, insignificant, posterior margin with a shallow, median invagination; syntergum V-shaped, shorter than mid tibia, apex forming an angle of about 90°; ovipositor about as long as mid tibia and 4X as long as gonostylus; second valvifer without subapical setae; gonostylus freely articulated.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

COMMENTS. It is difficult to place this genus within the Encyrtinae as there do not appear to be any significant character states that are uniquely shared with any other taxa. Conversely, there are no convenient characters that can be used to separate *Oodia* easily from any other taxa either. However, *Oodia* should be recognisable by the combination of the funicle with conspicuous linear sensilla, the strongly tridentate mandible, the densely hairy, convex scutellum, the weakly infuscate fore wing and the elongate marginal and postmarginal veins. Superficially *Oodia* looks similar to some species of *Rhytidothorax* (Bothriothoracini) but differs in having a strongly tridentate mandible, the mesopleuron nearly touching base of gaster and the gonostylus freely articulated. In *Rhytidothorax* the mandible is generally very slender with only 1 or 2 acute teeth, the mesopleuron is clearly separated from the base of the gaster by the propodeum and hind coxa and the gonostylus is immovably fused to the second valvifer.

Oodia is included in the current volume because the wing venation suggests a possible relationship with the Cheiloneurini, although the complete absence any sort of shiny-bottomed groove or pit adjacent to the eye margin between hind the posterior ocellus and occipital margin indicates that this is unlikely.

***Oodia japetus* sp.nov.**
(Figs 447-453)

Female (holotype): length, including ovipositor, 1.53mm; excluding ovipositor, 1.48mm (CPD).

Head generally black, frontovertex with a weak metallic, dark blue and green sheen mixed with some purple; area above top of scrobes with a dull purple sheen, area between eye and scrobe coppery purple and brassy, area immediately below eye with a relatively strong brassy and coppery lustre; scrobes with a weak metallic dark blue sheen above top of interantennal prominence, this continued weakly towards eye; interantennal prominence dorsally with a weak purple sheen, slightly greenish and brassy between and below toruli; mouth margin and lower gena coppery purple; temple and posterior part of gena relatively dull mixed coppery purple, brassy and metallic green; radicle pale orange, marked brown; scape pale orange, dorsal margin pale brown; pedicel brown, ventrally pale orange; flagellum mostly dark brown, F1-F4 ventrally pale orange, F5 ventrally orange-brown; mandible dark amber; maxillary palpi pale orange; frontovertex, gena and interantennal prominence with relatively sparse, scattered, inconspicuous brown setae; thorax generally dark brown to black; pronotum with a weak brassy and coppery sheen; mesoscutum a moderate, metallic, dark blue sheen mixed with some purple, posterior margin narrowly coppery purple; tegula orange-brown with a slight brassy sheen; axilla and anterior 0.7X of scutellum with a weak coppery purple and brassy sheen, sides and apical 0.3X of scutellum with a distinct metallic brassy and dark green sheen; metanotum and mesopleuron dark purple-brown with a slight brassy sheen; setae on dorsum of thorax dark brown and quite conspicuous; legs, including coxae, pale orange; wings mainly hyaline, but fore wing (Fig. 451) with apex infuscate in the form a wedge-shaped mark; propodeum slightly shining, dark purple-brown, pale orange anteriorly near spiracle, metallic green and copper on side and submedially, about 12 setae outside spiracle, these not extending down side towards hind coxa; gaster largely dark brown, but Gt1 dorsally pale orange, anterolaterally mixed brassy, coppery, green and blue, sternites pale orange, hypopygium translucent, dark brown areas with a brassy and coppery purple sheen with some purple, green and blue reflections; gonostylus dark brown.

Head (Fig. 448) about 3.8X as wide as frontovertex, in profile, about 1.8X as high as deep; inner eye margins slightly diverging in front of anterior ocellus; ocelli forming an angle of about 55°; frontovertex with evenly spaced piliferous punctures along inner eye margins and 7 or 8 below anterior ocellus, punctures moderately deep and each about 1.5-2X as wide as eye facet; ocellar area with moderately deep, fairly regular, polygonally reticulate sculpture of mesh size subequal to eye face, sculpture in front of anterior ocellus more irregular and of slightly larger mesh; temple and gena virtually smooth, but with shallow, irregular, longitudinally elongate, polygonally reticulate sculpture; scrobes shallow, well defined, meeting, with shallow, polygonally reticulate sculpture; interantennal prominence rounded dorsally, with shallow, regular, polygonally reticulate sculpture; antenna as in Fig. 447; scape hardly broadened, widest apically, about 4.3X as long as broad; F1 longest, F6 broadest, segments gradually increasing in width and decreasing in length distad, all at least a little longer than broad, linear sensilla present on all funicle segments; clava hardly broadened, about as wide as F6, a little shorter than F4-F6 combined; clypeal margin very slightly and evenly concave. Relative measurements: HW 79, HH 75, FV 21, POL 8, OOL 1, OCL 4.5, AOL 9, EL 52, EW 39, MS 27.5, SL 39, SW 9.

Thorax (Fig. 452) with slightly transversely elongate, polygonally reticulate sculpture on pronotum that is generally of similar mesh size, but conspicuously shallower than that on frontovertex; mesoscutum with polygonally reticulate to imbricate-reticulate sculpture that is of slightly larger mesh size than that on frontovertex and clearly shallower; axilla with similar sculpture to mesoscutum, but slightly deeper; scutellum with conspicuously deeper and coarser sculpture than that on mesoscutum, but of similar mesh size, apical 0.3X and side with progressively shallower sculpture; visible part of mesoscutum about 1.9X as broad as long; scutellum about 1.1X as long as broad; setae on mesoscutum moderately dense, separated by a little less than their own lengths and of more or less uniform length, those on scutellum of similar density, but clearly longer especially towards apex; fore wing with venation and setation as in Figs 450, 451; propodeum (Fig. 452) medially with some irregular, very shallow sculpture medially in posterior half; setae outside spiracle extending towards posterior margin, but not down side. Relative measurements: FWL 114.5, FWW 44.5; HWL 82, HWW 20.

Gaster very slightly shorter than thorax with hypopygium (Fig. 449) reaching about 0.6X towards apex; syntergum about 0.6X as long as mid tibia; ovipositor (Fig. 453) slightly exserted, the exserted part about 0.2X as long as mid tibial spur or a little less than 0.1X as long as mid tibia. Relative measurements: OL 50.5, GL 13 [MT 47].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Est. Biol. Monteverde, 10°20'N 84°49'W, 1540m, 18-24.ii.2004 (C. Hansson). Holotype in NHMUK.

Genus *LUDESIA* gen.nov.

Type species: *Ludesia hemera* **sp.nov.** Gender feminine.

Female. Overall length about 1.2-1.9mm.

Antenna with clava white, funicle mostly dark brown; maxillary palpus white; mesopleuron partially white; all coxae white, mid coxa sometimes partially brown; fore wing remnant with base and apical one-third or so infuscate.

Head about 4-6X as wide as frontovertex; occipital margin narrowly rounded; eyes conspicuously hairy with dense setae at least about as long as diameter of facet; scrobes moderately deep, narrowly ∩-shaped, meeting, dorsally very smooth but with extremely shallow sculpture

towards outer margins, sharply margined dorsally and laterally, but not carinate; interantennal prominence without median ridge, narrowly rounded dorsally, with shallow, regular, polygonally reticulate sculpture; scape slightly broadened and flattened, about 3-3.5X as long as broad; funicle 6-segmented, segments subcylindrical, becoming progressively shorter and broader distally; clava 3-segmented, apex rounded; clypeus deeply emarginate, about one-third as deep as length of torulus; mandible with two acute lower teeth and a fairly broad truncation, appearing almost tridentate; palp formula 4-3, apical segment of maxillary palpus not enlarged, hardly longer than radicle.

Thorax with pronotum medially about 0.5X as long as mesoscutum; pronotum, mesoscutum and scutellum with fairly uniformly coarse, polygonally reticulate sculpture; mesoscutum without notaular lines; scutellum with relatively dense evenly distributed, conspicuous setae, scutellar tuft absent, apical pair of setae about as long as others on scutellum; mid tibial spur about 0.7X as long as basitarsus; wings shortened, fore wing not reaching TII of gaster, about 3.5X as long a broad, apex oblique; mesopleuron posteriorly enlarged, reaching well past posterior margin of propodeum and touching base of gaster; propodeum with conspicuous course, reticulate sculpture around spiracle.

Gaster with outer plates of ovipositor free, paratergites absent; ovipositor hidden or hardly exserted, gonostylus articulated, second valvifer with 2 or 3 subapical setae; hypopygium subrectangular, transverse, about 2.5X as broad as long.

Male. Overall length about 1.0-1.4mm.

Antenna filiform; funicle 6-segmented, clothed with setae that are mostly about half as long as diameter of segments, linear sensilla numerous on all segments and very prominent; clava 3-segmented; fore wing fully developed, about 2.5X as long as broad; weakly infuscate; costal cell with about 6 setae dorsally at apex; marginal vein about 5X as long as broad, postmarginal vein about half as long a stigmal vein, stigmal vein forming an angle of about 55-65°with anterior margin of wing and about 0.7X as long as marginal vein; linear calva entire; filum spinosum present, represented by 3 or 4 pegs; phallobase with each digitus about 2X as long as broad, with an apical tooth and small outer apical seta, paramere reaching nearly half way towards apex of digitus, with an apical setae, cuspis seta present; aedeagus about 8-9X as long as broad, about 0.4-0.5X as long as mid tibia, with apex angular.

DISTRIBUTION. Neotropical.

HOSTS. Unknown, but probably primary parasitoids of scale insects (Hemiptera: Coccoidea) associated with herbaceous vegetation.

COMMENTS. Females of *Ludesia* superficially looks close to several species of *Cheiloneurus* that may be brachypterous (e.g. *tainus*), as well as brachypterous species of *Diversinervus* (e.g. *cervantesi* (Girault)). This similarity would probably place *Ludesia* in the Cheiloneurini. This is supported by the posteriorly enlarged mesopleuron that extends well past the posterior margin of the propodeum, a character state frequently found in members of this tribe. Females can be distinguished from brachypterous species belonging to either group by the hairy eyes, conspicuously short mid tibial spur which is much shorter than the basitarsus, complete lack of a tuft of setae on the scutellum and the presence of rough, reticulate sculpture around the propodeal spiracle. They further differ from brachypterous species of *Diversinervus* by the complete lack of a frontofacial carina and the mandible having two acute teeth and an upper truncation, whereas all species of *Diversinervus* have a distinct frontofacial carina and three acute teeth in the mandible. On the other hand males can be easily distinguished by the 3-segmented clava and relatively large angle formed by the elongate stigmal vein with the anterior margin of the fore wing. The latter would suggest a closer relationship of *Ludesia* with *Diversinervus* and *Anisophleps* than with *Cheiloneurus*.

One species of the genus is known from Argentina, *Ludesia semifacta* (De Santis, 1972) **comb. nov.** (from *Ectroma*) and another, as yet undescribed, species from Brazil (Bahia) (NHMUK). The latter differs by having distinct reticulate sculpture on gastral tergites Gt1-Gt6 whereas in the three

other known species the gastral tergites are smooth and shiny.

Key to Costa Rican species of *Ludesia*
(Females and males)

1. Wings reduced (Figs 457, 464), fore wing not reaching half way along gaster (females) 2
- Wings fully developed (Fig. 462), fore wing exceeding apex of gaster (males) 3

2 (1) Head and thorax largely black or very dark brown with a weak metallic sheen; frontovertex and posterior part of mesoscutum (Fig. 455) completely smooth and shiny ..... *hemera* **sp.nov.** (p. 180)
- Head and thorax largely orange or orange-brown; frontovertex with distinct punctate-reticulate sculpture and virtually matt; mesoscutum (Fig. 463) with distinct polygonally reticulate sculpture in posterior half or so ..... *amalthea* **sp. nov.** (p. 183)

3 (1) Frontovertex with relatively shallow imbricate-reticulate to polygonally reticulate sculpture that is about as deep as that on mesoscutum (Fig. 456) ..... *hemera* **sp.nov.** (p. 180)
- Frontovertex (Fig. 468) with punctate-reticulate sculpture that is clearly deeper than sculpture on mesoscutum (Fig. 470)..... *amalthea* **sp.nov.** (p. 183)

***Ludesia hemera* sp.nov.**
(Figs 454-462; Hab. ♀ 71, ♂ 72)

DIAGNOSIS. *Female* (length about 1.2-1.9mm): head and thorax largely black or very dark brown with a weak metallic sheen; eye moderately hairy with dense pale setae, each of which is about as long as facet; frontovertex and posterior part of mesoscutum (Fig. 455) completely smooth and shiny; all gastral tergites smooth and shiny. *Male* (length about 1.00-1.4mm): frontovertex with relatively shallow imbricate-reticulate to polygonally reticulate sculpture that is about as deep as that on mesoscutum (Fig. 456).

Female (holotype): length, 1.73mm (CPD).

Head with frontovertex mainly metallic purple, but with some blue areas around anterior ocellus; scrobes metallic green, but slightly brassy or coppery in some lights; interantennal prominence dorsally metallic blue; temple and area between eye and scrobe, metallic green with some weak coppery reflections; gena with a relatively dull brassy and green sheen; lower part of interantennal prominence and mouth margin purple-brown with a weak brassy sheen; radicle and scape dark brown, apical one third of scape dorsally pale orange to slightly dusky orange; pedicel and F1-F5 dark brown, F6 and clava white; frontovertex, gena and interantennal prominence with inconspicuous brown setae; pronotum black with a weak, very dark green sheen, coppery along posterior margin; propleuron and prosternum dark brown with a weak brassy sheen and weak coppery and green reflections; mesoscutum weakly shining, more or less matt black in anterior three-fifths or so, posterior two-fifths similar to frontovertex with a strong purple sheen, with dark metallic blue areas, setae dark brown and conspicuous; tegula dark brown; axilla virtually matt black, but with a very weak purplish or dark blue sheen, clothed with dark brown setae; scutellum virtually matt black, but with a weak, metallic, dark green sheen, clothed with dark brown setae; metanotum black; mesopleuron with anterior half dark brown with a weak brassy and purple sheen, posterior half glossy white; mesosternum white; fore femur white at base, otherwise orange-brown margined dark brown, tibia orange-brown at base, otherwise dark brown, tarsus orange-brown; mid coxa white; proximal two-fifths of femur white, apex dark brown, tibia dark brown, spur and tarsus orange; extreme base of hind femur white, otherwise femur dark brown, extreme base of tibia orange-brown, remainder of tibia dark brown, proximal half of basitarsus dark brown, remainder of tarsus pale orange; fore wing remnant (Fig. 457) hyaline with

a broad, oblique, dark brown, subapical band, venation orange-brown to dark brown; propodeum white, dark brown with some weak brassy reflections around spiracle, a few, inconspicuous setae anterolateral to spiracle; gaster black, Gt1 with a strong coppery, purple and blue sheen, Gt2-Gt5 with a coppery and green sheen, Gt6 with a coppery and blue sheen; syntergum with a brassy and coppery sheen, side and venter of gaster mainly coppery and brassy with some green reflections; visible part of gonostylus orange.

Head about 5.6X as wide as frontovertex, subtriangular in profile, about 1.3X as high as deep, only slightly curved from occipital margin to top of scrobes and then forming a virtual right angle towards mouth margin, with interantennal prominence hidden; ocelli forming an angle of about 55°; frontovertex shiny, completely smooth apart from shallow, scattered piliferous punctures; eye appearing moderately hairy with dense pale setae as long as diameter of facet, eye separated from scrobe by about diameter of facet; area immediately below eye completely smooth, otherwise temple and gena with very shallow imbricate-reticulate sculpture; antenna as in Fig. 458; scape broadened and flattened, widest about middle, about 3X as long as broad; F1-F5 longer than broad, F1 about 3X as long as broad, F5 about 1.3X as long as broad, F6 quadrate, segments shorter and broader distad; clava not broadened, slightly shorter than F4-F6 combined, sensory slightly enlarged, extending ventrally about 0.3X length of clava, apex weakly obliquely truncate; eye not quite reaching occipital margin, separated by about diameter of facet, clothed in very conspicuous, relatively dense setae that are clearly longer than diameter of facet; inner eye margins weakly diverging immediately in front of anterior ocellus; malar sulcus present and distinct; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 90, HH 74, FV 16, POL 13, OOL 0, OCL 10.5, AOL 14.5, EL 61, EW 50.5, MS 28, SL 49, SW 16.5.

Thorax (Fig. 455) in dorsal view with pronotum about as long as mesoscutum, but mostly hidden by head; pronotum dorsally with moderately deep, raised, polygonally reticulate sculpture that is finely granular in appearance, side with shallower sculpture; mesoscutum, axilla and scutellum mainly with similar sculpture to dorsal part of pronotum, but posterior two-fifths of mesoscutum completely smooth and shiny; visible part of mesoscutum about 1.8X as broad as long; scutellum about 1.1X as broad as long; mid tibia without an external carina; hind femur about 5.4X as long as broad; fore wing (Fig. 457) shortened, hardly reaching posterior margin of Gt1, hind wing hardly reaching propodeal spiracle; propodeum (Fig. 455) medially about 0.29X as long as scutellum, virtually smooth but with some shallow, fine polygonally reticulate sculpture. Relative measurements: FWL 75, FWW 20.5.

Gaster with hypopygium reaching about 0.7X along gaster; last tergite about 0.7X as long as mid tibia, with apex rounded; ovipositor hidden.

Paratype. Funicle with linear sensilla present only on F3-F6; hypopygium Fig, 460; ovipositor Fig. 454. Relative measurements: OL 81.5, GL 15 [MT 103].

Variation. Females vary in overall length from 1.16-1.90mm, the frontovertex may be mostly metallic green, mixed purple and blue, the lower part of the interantennal prominence and gena may be coppery, F6 may be yellow, orange-brown or dark brown; the pronotum and scutellum may be dark olive green, the anterior part of the mesoscutum may have dark, metallic blue reflections, the mesopleuron may have only the anterior one-third dark brown and posterior margin of the sculptured area of the mesoscutum may be straight or V-shaped.

Male: length 0.97-1.42mm.

Head generally black with weak coppery, green, blue and brassy reflections; scrobes dorsally with a weak coppery sheen, otherwise metallic green; radicle pale orange, distally dark brown; scape slightly dusky, pale orange, narrowly margined pale brown to brown; pedicel and flagellum testaceous yellow; pronotum dark brown with a weak dark, blue-green sheen, posterior margin coppery; propleuron and prosternum dark brown with a coppery sheen; mesoscutum dark purple-brown with a weak brassy or green sheen; tegula dark brown; axilla and scutellum dark brown with a slight dark green hue and weak brassy reflections, apex of scutellum distinctly coppery and narrowly metallic green along side and extreme apex; metanotum dark brown; anterior two-fifths of mesopleuron dark brown, posterior part white, occasionally whole mesopleuron dark brown; mesosternum white; fore coxa white; fore femur white at base, otherwise orange-brown margined

dark brown, tibia white at base, otherwise orange with a pale brown subbasal band, tarsus orange; mid coxa white; proximal two-fifths of femur white, apex orange-brown, tibia largely orange, but externally mostly brown, spur and tarsus orange; hind coxa white, extreme base of hind femur white, otherwise femur dark brown, extreme base of tibia orange-brown, remainder of tibia dark brown, tarsus orange-brown, sometimes dark brown; fore wing (Fig. 462) with a small infuscate area near base, otherwise hyaline to parastigma, remainder weakly infuscate, more strongly infuscate medially, venation pale brown; gaster dark brown with green, blue, coppery, purple and brassy reflections.

Head about 2.7X as wide as frontovertex, in profile similar in shape to that of female; occipital margin sharp, not carinate; ocelli forming an angle of about 80°; frontovertex shiny, with moderately deep, fairly regular, fine, imbricate-reticulate to polygonally reticulate sculpture of mesh size hardly less than diameter of facet; temple with similar, but shallower sculpture than frontovertex; gena with slightly longitudinally elongate sculpture; interantennal prominence with similar sculpture to frontovertex but slightly shallower; scrobes shallow, ∩-shaped, meeting, largely smooth, not sharply margined; interantennal prominence short, without median ridge, more or less acute dorsally, smooth; antenna as in Fig. 459; torulus at least 1.5X its own length from mouth margin; scape slightly broadened and flattened, widest below middle, about 3.6X as long as broad; all funicle segments at least slightly longer than broad, proximal segments slightly longer, segments clothed with short setae that are generally not more than half as long as diameter of segments; linear sensilla on all funicle segments; clava slender, 3-segmented and with apex rounded; eye reaching occipital margin, clothed in very conspicuous, dense setae that are slightly longer than diameter of facet; malar sulcus present. Relative measurements: HW 62.5, FV 23, POL 9.5, OOL 2.5, OCL 5, AOL 9.5, EL 35, EW 31.5, MS 17, SL 27, SW 7.5.

Thorax (Fig. 456) with imbricate-reticulate sculpture on pronotum that is conspicuously deeper than that on frontovertex; sculpture on mesoscutum that is generally similar to that on frontovertex; scutellum with polygonally reticulate sculpture that is of similar depth to that on pronotum, but extreme apex and side smooth and shiny; sculpture on axilla more or less intermediate between that on mesoscutum and scutellum; visible part of mesoscutum about 1.7X as broad as long; scutellum about as broad as long; hind femur about 4.6X as long as broad; fore wing with venation and setation as in Fig. 462; costal cell with 4 to 8 setae dorsally towards apex. Relative measurements: FWL 65.5, FWW 28; HWL 44, HWW 10.

Gaster with a single of apical hook on digitus, aedeagus slender, rounded at apex (Fig. 461). Relative measurements: AL 34, MT 80.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, [San Vito], Las Cruces, [Wilson Bot. Gdns], MT/YPT, 18-22.iii.1990 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♂, **Guanacaste**, Peñas Blancas, rainforest, YPT, iv.1986 (A Forsyth); 1♂, **Alajuela**, San Ramon BS, 800m, x-xii.1995 (P. Hanson); 2♀, Alajuela, PN Volcán Tenorio, Est. Pilón, 10°43'N 84°59'W, 700m, 13-17.ii.2004 (C. Hansson, J. Azofeifa); 3♂, Alajuela, PN Arenal, Sendero Pilón, 10°27'N 84°43'W, 600m, 20.ii.2003 (J.S. Noyes); 1♀, Alajuela, Peñas Blancas,700m, 1.viii.1987 (E. Cruz); 1♂, **Heredia**, Chilamate, 75m, xii.1989-iii.1990 (Hanson, Godoy); 2♀, Heredia, La Selva BS, 50m, 22.i-3.ii.1991 and ii.1991 (J.S. Noyes); 2♀, Heredia, 3km S Puerto Viejo, OTS La Selva, 100m, xi.1992 and xii.1992 (P. Hanson); 3♀, 1♂, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, iii-iv.1993, x.1995, i.1996 and ix.1996 (ALAS - OET/INBio); 1♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, ii.2002 (J.S. Noyes); 1♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, ii.2005 (J.S. Noyes); 3♀, Heredia, 11km SE La Virgen, 10°20'N 84°04'W, 450-550m, 05/TN/ALL, 13.ii-20.iv.2003 (INBio-OET/ALAS); 1♀, Heredia, 11km SE La Virgen, 10°20'N 84°04'W, 450-550m, 05/M/NOTN, 27.ii-20.iv.2003 (INBio-OET/ALAS); 3♀, Heredia, Braulio Carrillo NP 250-500m, 10.iv.1985 and 11-12.iv.1985 (L. Masner, H. Goulet); 1♀, **Cartago**, Braulio Carrillo NP, 26.iii.1990 (J.S. Noyes); 1♀, Cartago, Pejibaye, Est. Biol. Copal, Sendero Ron, LN 196107 563672, 1090m, #80028, 20.iv.2005 (J. Azofeifa); 1♀, 2♂, Cartago, Turrialba, CATIE, Reventazon, 8.ix.1986 (L. Masner); 2♀, 1♂, Cartago, Turrialba, CATIE, 14-

15.iii.1990 (J.S. Noyes); 3♀, **Puntarenas**, PN Manuel Antonio, 23.vii.1986 and 26.viii.1986 (L. Masner); 3♀, Puntarenas, San Vito, Jardin Bo. Las Cruces, 1200m, vi-vii.1988 (P. Hanson); 3♀, 9♂, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 1500m, 18-22.iii.1990 (J.S. Noyes); 2♀, Puntarenas, RF Golfo Dulce, Est. Agujas, LS 276750 526550, 250-350m, 2-22.x.1999 and 1-11.xi.1999 (J.A. Azofeifa);5♀, 2♂, **Limón**, PN Braulio Carrillo, Est. Quebrada Gonzalez, LN 238380 543100, 400-500m, 21.viii.2002 and 24.ix.2002-15.x.2002 (P. Hanson, C. Godoy); Limón, PN Braulio Carrillo, Est. Quebrada Gonzalez, 10°09'N 83°57'W, 450m, 15.ii.2003 (J.S. Noyes); 1♂, Limón, 16km W Guapiles, 400m, vii-xi.1990 (P. Hanson); 3♂, Limón, 4km NE of Bribri, 50m, ix-xi.1989 and xii.1989-iii.1990 (P. Hanson); 2♂, Limón, 7km W of Bribri, 50m, ix-xi.1989 and i-ii.1990 (P. Hanson); 8♀, 13♂, Limón, RB Hitoy Cerere, 9°40'N 83°02'W, 100m, 14-19.i.1991 and ii.2004 (Noyes); 3♂, Limón, RB Hitoy Cerere, Valle de Estrella, Send. Bobocara, 300m, LN 184250 641800, 18.v-18.vi.1999, 17.ix-10.x.1999 and 14-30.vii.2000 (F. Umaña); 1♂, Limón, RB Hitoy Cerere, Send Espavel hacia el Cerco, LS 400702 570120, 560m, #52200, 19.v-19.vi.1998 (C. Rojas); 1♂, Limón, RB Hitoy Cerere, Valle de la Estrella, Send. Espavel, LS 570460 401558, #61108, 4-18.i.2001 (F. Umaña); 2♂, Limón, RB Hitoy Cerere, LS 569800 401200, 500m, #59089, 19.ix.2000 (F. Umaña); 1♀, Limón, RB Hitoy Cerere, Send. Cascada, LN 643300 184500, 0-100m, #60671, 18-30.xi.2000 (F. Umaña). Holotype in MZUCR, paratypes in NHMUK, MZUCR, TAMU, USNM, LFCI and CNC.

Ludesia amalthea sp.nov.

(Figs 2,463-470; Hab. ♀ 73, ♂ 74)

DIAGNOSIS. *Female* (length about 1.2-1.7mm): Head and thorax largely orange or orange-brown; eye hairy with dense setae, each as long as diameter of facet; frontovertex with distinct, uniform, punctate-reticulate sculpture and virtually matt; mesoscutum with polygonally reticulate sculpture of mesh size about 2X that on frontovertex, posterior half with similar but slightly shallower, sculpture; all gastral tergites smooth and shiny. *Male* (length about 1.0-1.4mm): frontovertex (Fig. 468) with punctate-reticulate sculpture that is clearly deeper than sculpture on mesoscutum (Fig. 470).

Female (holotype): length, including ovipositor, 1.71mm; excluding ovipositor, 1.69mm (CPD).

Head orange, slightly dusky along occipital margin and along inner eye margins dorsally; frontovertex virtually matt, but with very weak brassy and purple reflections; temple and gena with a weak brassy, green and purple sheen; scrobes and interantennal prominence with a weak brassy sheen; radicle orange, dark brown at apex; scape orange with ventral margin orange-brown to brown; pedicel slightly dusky orange; F1-F5 dark brown, F6 pale orange, mixed pale brown proximally; clava white; frontovertex with fairly conspicuous translucent, golden brown setae; gena and interantennal prominence with conspicuous dark brown setae; maxillary palpus white; pronotum orange with weak coppery and brassy reflections, posterior margin with a dark brown mark laterally immediately anterior to mesothoracic spiracle; propleuron and prosternum orange; mesoscutum orange with weak coppery reflections anteriorly and a weak brassy sheen posteriorly; tegula orange with apex orange-brown; axilla orange with weak brassy and coppery reflections and with a few dark brown setae; scutellum dark orange with dark brown setae; metanotum dusky orange; anterior three-fifths of mesopleuron brown with a weak brassy sheen, posterior two-fifths glossy white; mesosternum white; fore coxa white; fore femur white at base, fore leg otherwise orange; mid coxa white; proximal one-third of mid femur white, apex orange, tibia dark orange-brown, apices orange, spur and tarsus orange; hind coxa white; hind femur orange, extreme base of tibia orange-brown, remainder of tibia dark orange-brown, tarsus orange; fore wing (Fig. 464) remnant hyaline with a broad, oblique, dark brown, subapical band, venation orange-brown to dark brown; propodeum white, orange to orange-brown with some weak brassy and purple reflections around spiracle, a few, bristle-like setae anterolateral to spiracle; gaster orange, Gt1 with a brassy sheen with some purple and green reflections, Gt2-Gt6 with a mainly brassy and purple sheen, syntergum with a brassy sheen, side and venter of gaster mainly brassy with some purple and green reflections; visible part of gonostylus very pale orange.

Head about 5.2X as wide as frontovertex, subtriangular in profile, about 1.2X as high as deep, only slightly curved from occipital margin to top of scrobes and then forming a virtual right angle towards mouth margin, with interantennal prominence hidden; occipital margin sharp, weakly

carinate; ocelli forming an angle of about 65°; frontovertex with fine, punctate-reticulate sculpture of mesh size clearly much less than diameter of facet; eye very hairy, clothed with dense setae, each of which is as long as diameter of facet, eye separated from scrobe by about diameter of facet; area immediately below eye completely smooth, otherwise temple and gena with very shallow imbricate-reticulate sculpture; antenna as in Fig. 465; scape broadened and flattened, widest about middle, about 3X as long as broad; F1-F5 longer than broad, F1 about 3X as long as broad, F5 about 1.3X as long as broad, F6 quadrate, segments shorter and broader distad; clava not broadened, slightly shorter than F4-F6 combined, sensory slightly enlarged, extending ventrally about 0.3X length of clava, apex weakly obliquely truncate; eye not quite reaching occipital margin, separated by about diameter of facet, clothed in very conspicuous, relatively dense setae that are clearly longer than diameter of facet; frontovertex narrowest about half way between anterior ocellus and top of scrobes; malar sulcus present but indistinct; clypeal margin deeply emarginate medially. Relative measurements: HW 83, HH 69, FV 16, POL 13.5, OOL 0, OCL 10.5, AOL 14, EL 55, EW 46, MS 27, SL 42, SW 14.5.

Thorax (Fig. 463) in dorsal view with pronotum about as long as mesoscutum, but mostly hidden by head; pronotum dorsally with moderately deep, raised, polygonally reticulate sculpture that is similar in depth to that on frontovertex, but of larger mesh and coarser, side with shallower sculpture; mesoscutum in anterior half or so with sculpture similar to that on pronotum, posterior half with slightly shallower, more regular, polygonally reticulate sculpture of slightly smaller mesh; axilla and scutellum mainly with similar sculpture to dorsal part of pronotum; visible part of mesoscutum about 1.9X as broad as long; scutellum about 1.1X as long as broad; mid tibia without an external carina; hind femur about 5X as long as broad; fore wing shortened, as in Fig. 464, hardly reaching posterior margin of Gt1, hind wing hardly reaching propodeal spiracle; propodeum medially about 0.30X as long as scutellum, with some fairly distinct, slightly coarse, polygonally reticulate sculpture. Relative measurements: FWL 65.5, FWW 17.5.

Gaster with hypopygium reaching about 0.8X along gaster; last tergite about 0.8X as long as mid tibia, with apex rounded; ovipositor virtually hidden.

Paratype. Funicle with linear sensilla present only on F3-F6; hypopygium 468; ovipositor Fig. 469. Relative measurements: OL 78.5, GL 16 [MT 90.5].

Variation. Females vary in overall length from 1.19-1.74mm, the frontovertex may be completely dusky orange, the scape may be almost completely orange-brown, F6 may be white or orange-brown, the scrobes and interantennal prominence may have a slight green or blue-green lustre, the pronotum may be posteriorly slightly dusky with a slight green sheen, the mesoscutum may have a slight purple lustre medially, the scutellum may be slightly dusky with weak to strong metallic blue or olive green reflections, the mesopleuron may be about 80% white, the mid tibia may be largely orange, the hind tibia may be white at base and the gaster may have Gt1-Gt6 dark orange-brown with a distinct coppery and brassy sheen.

Male: length 1.00-1.41mm.

Virtually identical to the male of *hemera* but for relatively deep, punctate-reticulate sculpture on frontovertex (Fig. 468) that is clearly much deeper than that on mesoscutum (Fig. 470). Antenna as in Fig. 466; dorsum of thorax varying from orange-brown with only a slight metallic sheen to dark brown with a distinct metallic sheen, mesopleuron may be completely brown to largely white and hind femur may be orange to completely dark brown; Relative measurements: AL 31, MT 68.5.

DISTRIBUTION. Belize, Guatemala, Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes). Paratypes: **GUATEMALA**, 1♀, Izabal, 2km N Las Escobas, 300m, xi.1986 (M. Sharkey). **BELIZE**, 4♀, 1♂, Las Cuevas, NHM Res. Sta., vi.1995, vii.1995 and ix.1995 (T. King, A. Howe). **COSTA RICA**, 2♀, 1♂, **Guanacaste**, Santa Rosa NP, H10, x.1986 and 20.xii.1986-10.i.1987 (D. Janzen, I.D.

Gauld); 1♀, Guanacaste, Santa Rosa NP, H4C, 8.x-8.xi.1986 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, 12 km SE La Cruz, Cerro El Hacha, LN 329200 368000, 300-400m, 1988 (GNP Biodiv. Survey); 4♀, same data as holotype; 1♀, Guanacaste, Est. Cacao (ACG), 1000-1150m, LN 323150 375500, xi-xii.1996 (A. Masis); 2♀, 2♂, Guanacaste, Maritza (ACG), 700m, MT/YPT, 20.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Est. Maritza (ACG), 10°58'N 85°29'W, 700m, 21.ii.2005 (J.S. Noyes); 1♀, Guanacaste, Cañas, Rio Chiquito, LN 292000 417000, 410m, #74625, 25.vii.2003 (J. Azofeifa); 1♂, Guanacaste, BN Diriá, Ret. Alr. Torre Control de Incendio, LN 238550 358650, 600-700m, #66659, xii.2001-i.2002 (I. Jiménez); 1♀, 1♂, **Alajuela**, Reserva Rincon Forestal, Est. Caribe, 10°53'N 85°18'W, 400m, 19-20.ii.2003 (J.S. Noyes); 2♀, 1♂, **San José**, San Antonio de Escazu, 1700m, ix.1996 (C. Flores, P. Hanson); 1♀, **Puntarenas**, Res. Priv. Karen Mogensen, LN 205300 419750, 315m, #75606, 6.x.2003 (M. Solis). Holotype in MZUCR, paratypes in MZUCR, LFCI and NHMUK.

COMMENTS. *Ludesia amalthea* is the most similar Costa Rican species to *semifacta* (De Santis) as both species have largely orange colouration. It differs from *semifacta* in having fine, uniform punctate-reticulate sculpture on the frontovertex whereas in *semifacta* the ocellar area and occipital margin have polygonally reticulate sculpture and the anterior part of the frontovertex is completely smooth.

Genus *ANGEBRA* gen.nov.

Type species: *Angebra harpalyke* **sp.nov.** Gender feminine.

Female. Length about 1.5-2.0mm.

Body generally orange to orange-brown, with a weak to moderate metallic sheen; mid tibial spur dark brown contrasting with orange md tibia and tarsus; fore wing infuscate from level of proximal part of parastigma towards apex, infuscate area delimited subapically by a darker curved area.

Head in profile with frontovertex weakly and evenly convex from occipital margin to top of scrobes then angled at about 100° at top of scrobes towards mouth and virtually straight; antenna with scape strongly broadened and flattened with dorsal margin distinctly convex; funicle 6-segmented; clava 3-segmented, apex rounded or with a weak, oblique apical truncation; malar sulcus absent; mandible with 3 acute teeth; palp formula 4-3.

Thorax with pronotum short, barely visible behind head; notaular lines absent; scutellum weakly convex, without scale-like setae or subapical tuft of setae; mesoscutum with imbricate-reticulate sculpture contrasting with longitudinally striate to striate-reticulate sculpture of scutellum; mid tibia with a weak dorsal carina along its length; fore wing with parastigma weakly downcurved and hardly broadened; marginal vein about 0.7X as long as broad, stigmal vein long, about 4-6X as long as marginal vein and 2-3X as long as postmarginal vein, lower margin of uncus obliquely truncate and straight, apices of postmarginal and stigmal veins connected by a naked, hyaline streak; filum spinosum present, composed of 2 or 3 peg-like setae; axillae hardly raised above level of scutellum.

Gaster with hypopygium reaching about two-thirds along gaster, about 2X as broad as long; ovipositor slightly exserted, longer than mid tibia, gonostylus free and shorter than mid tibial spur.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown, but probably primary parasitoids of soft scales (Hemiptera: Coccidae).

COMMENTS. *Angebra* belongs to a group of genera that can be characterised by having a strongly infuscate fore wing with the infuscation delimited by a darker, curved subapical brown band and the apices of the postmarginal and stigmal veins being connected by a naked, hyaline streak, viz. *Anicetus* Howard, *Bolangera* Hayat & Noyes, *Anisophleps* Fidalgo and *Cheilopsis* Prinsloo. It can be separated from these genera by the lack of a frontofacial carina (present in *Anicetus*, *Anisophleps*

and *Cheilopsis*), non-flattened flagellum (flattened in *Anicetus* and *Cheilopsis*), scutellum lacking any scale-like setae or apical tuft (present in *Anisophleps* and *Cheilopsis*), marginal vein being broader than long (about 3X as long as broad in *Bolangera*) and sharply tridentate mandible (with 2 acute teeth and a truncation in *Bolangera* and *Anicetus*). *Angebra* is undoubtedly very similar to *Bolangera* and initially the species included below were placed in that genus. However, the fundamental differences in the mandible, length of the marginal vein, shape of the uncus (apically rounded in *Bolangera*) and sculpture of the scutellum (polygonally reticulate in *Bolangera*) suggest that, although probably phylogenetically very close to *Bolangera*, *Angebra* is sufficiently different to warrant separate generic status.

Key to Costa Rican species of *Angebra*
(Females)

1. Antenna (Fig. 472) with pedicel about as long as F1-F3 combined, all funicle segments transverse, F1-F3 subequal, without linear sensilla and smaller than F4-F6, F5 and F6 very pale yellow, contrasting with darker remaining segments and clava .... *praxadike* **sp.nov.** (p. 186)
- Antenna (Fig. 477) with pedicel about as long as F1, all funicle segments longer than broad, subequal and with linear sensilla, F5 pale orange to orange-brown, paler than remaining segments and clava ..... *harpalyke* **sp.nov.** (p. 187)

***Angebra praxadike* sp.nov.**
(Figs 471-476)

DIAGNOSIS. *Female* (length about 1.5mm): head (Fig. 471) about 3.5X as wide as frontovertex; antenna (Fig. 472) with pedicel about as long as F1-F3 combined, all funicle segments transverse, F1-F3 subequal, without linear sensilla and smaller than F4-F6, F5 and F6 very pale yellow and contrasting with darker remaining segments and clava; clava with a weak, slightly oblique apical truncation; fore wing with marginal vein (Fig. 473) about 0.6X as long as broad; linea calva (Fig. 476) open near posterior wing margin; ovipositor (Fig. 474) about 1.6X as long as mid tibia and about 3X as long as gonostylus. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.49mm; excluding ovipositor, 1.35mm (CPD).

Head orange; frontovertex with a weak purple and violet sheen; scrobes, interantennal prominence, temple and gena with a weak brassy sheen, upper gena with a very weak purple sheen; frontovertex with moderately conspicuous, scattered dark brown setae, a line of translucent pale brown setae along inner eye margin, continued below eye, gena and interantennal prominence with scattered dark brown setae; maxillary palpus orange; antenna with radicle orange, dark brown at apex; scape orange with ventral margin broadly dark brown, dorsal margin very slightly dusky; pedicel orange with a complete dark brown, dorso-lateral stripe; funicle with F1-F3 brown, F4 dusky pale orange, F5-F6 pale yellow, almost white; clava dark brown; pronotum orange, neck slightly dusky; propleuron brown; prosternum orange; mesoscutum orange-brown, with a moderate, mixed, olive-green and blue-green sheen, coppery purple along posterior margin, pale orange below pronotum; tegula orange, apex orange-brown; axilla and scutellum orange; setae on dorsum of thorax dark brown or black; metanotum orange; mesopleuron orange with a mixed, weak, brassy, purple, blue and green sheen; mesosternum dark brown; metapleuron orange; fore leg orange, femur dusky along ventral margin, tarsus very slightly dusky; mid leg orange, tibia marked dark brown at base, spur dark brown; hind coxa dark orange-brown, leg otherwise orange; fore wing (Fig. 476) mostly infuscate but hyaline at apex, venation mainly brown, but apically orange; propodeum orange with a weak brassy lustre, side with a very weak purple and blue sheen; gaster generally slightly dusky orange with weak brassy, green and purple reflections, basal tergites slightly brownish and a slightly stronger metallic sheen, syntergum pale orange with apex pale brown; gonostylus pale orange.

Head (Fig. 471) about 3.5X as wide as frontovertex, in profile about 1.6X as high as deep, interantennal prominence hardly protuberant; occipital margin sharp, weakly carinate; inner eye

margins weakly converging anteriorly; ocelli forming an angle of about 95°; frontovertex quite shiny, with shallow, polygonally reticulate sculpture that is of conspicuously smaller mesh size than diameter of eye facet; temple and gena with shallow, longitudinally elongate, polygonally reticulate to imbricate reticulate sculpture that is clearly deeper than that on frontovertex, area immediately below eye completely smooth; scrobes quite smooth; narrowest point between eye and transfacial ridge about 2X diameter of anterior ocellus; scrobes moderately deep, broadly ∩-shaped and weakly margined dorsally and laterally; interantennal prominence dorsally rounded, with shallow, polygonally reticulate sculpture; antenna as in Fig. 472; scape strongly broadened and flattened, only about 1.6X as long as broad, dorsal margin strongly convex; all funicle segments transverse, although some subquadrate, segments larger and broader distad, F1-F3 narrower than pedicel, F4-F6 as wide as pedicel or wider, linear sensilla present only on F4-F6; clava hardly enlarged, about 1.1X as wide as F6 and slightly longer than F3-F6 combined, outer suture slightly oblique, sensory area slightly enlarged about 0.2X as long as clava, apex hardly obliquely truncate; eye reaching occipital margin, clothed in moderately conspicuous setae, each about as long as diameter of facet; clypeal margin medially hardly concave; mandible with 3 acute teeth. Relative measurements: HW 78, HH 64, FVL 42, FV 22, POL 15, OOL 2, OCL 2, AOL 9.5, EL 40, EW 36, MS 30, SL 35, SW 21.5.

Thorax with pronotum hardly exposed behind head, in dorsal view less than 0.5X as long as mesoscutum; pronotum, mesoscutum and axilla with imbricate-reticulate sculpture that is about as deep as that near occipital margin; scutellum with conspicuously deeper, coarser, longitudinally elongate striate-reticulate sculpture; visible part of mesoscutum about 1.7X as broad as long; scutellum about 1.1X as broad as long; hind femur about 3.7X as long as broad; fore wing with venation and setation as in Figs 473, 476; costal cell with a line of setae dorsally in distal half or so; propodeum medially about 0.12X as long as scutellum, virtually smooth. Relative measurements: FWL 94.5, FWW 42; HWL 74, HWW 22.

Gaster with hypopygium (Fig. 477) about 0.6X to apex; last tergite about 0.85X as long as mid tibia, with apex rounded or weakly angular; ovipositor (Fig. 474) slightly exserted, the exserted part very nearly as long as mid tibial spur or about 0.3X mid tibia. Relative measurements: OL 54, GL 18 [MT 34].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, La Pallas, 6km S. Cerro Braun, LN 307450 388700, 950m, 10-24.ii.1996 (J.A. Ugalde). Holotype in NHMUK.

Angebra harpalyke sp.nov.

(Figs 477-481; Hab. ♀ 75)

DIAGNOSIS. *Female* (overall length about 1.5-2.0mm): head about 3X as wide as frontovertex; antenna (Fig. 477) with pedicel about as long as F1, all funicle segments longer than broad, F5 paler than remaining segments and clava; apex of clava more or less rounded; fore wing with marginal vein (Fig. 479) about 0.7X as long as broad; linea calva (Fig. 480) closed near posterior wing margin; ovipositor (Fig 481) about 1.2X as long as mid tibia and about 3.5X as long as gonostylus. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.94mm; excluding ovipositor, 1.84mm (CPD).

Body generally orange with a weak to fairly strong metallic sheen, gaster largely orange-brown to brown; head orange, occiput with a slight brassy sheen and a small brown spot above foramen, frontovertex mostly with a violet sheen with some metallic dark blue, ocellar area mostly

slightly coppery; temple and posterior part of gena with a slight brassy sheen, narrowly coppery along eye; anterior part of gena slightly coppery and with a moderate metallic dark blue and violet sheen below eye; area between scrobe and eye mostly with a violet sheen; scrobal area mostly with a slight metallic dark green and dark blue-green sheen; mouth margin slightly coppery; antenna with radicle orange, apex narrowly dark brown; scape orange with ventral margin quite broadly dark brown; pedicel mostly pale orange, dorsally dark brown towards base; funicle with F1-F4 pale orange-brown, F5 pale orange, F6 dark brown; clava dark brown; mandible orange, apical half moderately dark amber; palpi mostly dark brown, but maxillary palpus proximally and labial palpus pale orange; thorax orange except for brown prosternum and mesosternum; pronotum with a slight brassy sheen; mesoscutum with a moderate metallic dark blue and violet sheen, posterior margin weakly coppery; axilla with a very weak coppery and brassy sheen; scutellum with a slight silky sheen, very slightly brassy with a few coppery reflections, extreme apex slightly coppery; tegula orange with a slight brassy and weak coppery sheen, apex pale orange-brown; setae on dorsum of thorax dark brown or black; mesopleuron mostly with a slight brassy sheen; fore coxa slightly dusky pale orange, some brown and dark brown basally; mid coxa pale orange, orange-brown ventrally, hind coxa dark brown; fore femur pale orange, tibia pale orange, narrowly margined dorsally and ventrally brown, tarsus pale orange, pretarsus dark brown; mid femur, tibia and tarsus pale orange, mid tibial spur dark brown, apical tarsomere dusky; hind femur and tibia slightly dusky pale orange, tarsus pale orange, apical tarsomere orange-brown; fore wing (Fig. 480) almost completely infuscate but apex fairly narrowly hyaline, margin of infuscate area curved, subparallel to wing apex and very slightly darker, hind wing hyaline, venation pale orange to pale orange-brown; propodeum slightly dusky orange with a slight brassy sheen with weak coppery reflections, side with a moderate metallic dark green sheen mixed coppery; gaster dorsally largely with a slight coppery and brassy sheen with coppery red and dark green reflections, TI-TV largely brown with orange anteriorly, TVI and syntergum mostly orange margined pale brown, side and venter brown, mostly slightly metallic dark green and brassy with some coppery red; gonostylus dusky pale orange.

Head about 2.9X as wide as frontovertex, in profile about 1.5X as high as deep, frontovertex virtually flat, very weakly convex from occipital margin to top of scrobes, interantennal prominence fairly protuberant, tangent of frontovertex forming an angle of about 105° with that of face; occipital margin sharp, carinate; a fairly conspicuous, shallow, oval, shiny-bottomed depression adjacent to eye margin virtually level with posterior ocellus; ocelli forming an angle of about 97°; frontovertex, above anterior ocellus with shallow, well-defined, polygonally reticulate sculpture but below anterior ocellus sculpture extremely shallow and appearing fairly smooth and shiny; piliferous punctures fairly sparse and inconspicuous, each very slightly less than diameter of eye facet and separated by much more than their own diameters; temple and posterior part of gena with shallow, longitudinally elongate, polygonally reticulate sculpture, anterior part of gena with shallow longitudinally elongate sculpture, area immediately below eye completely smooth; scrobes shallow but well-defined, broadly ∩-shaped, laterally with shallow transversely elongate sculpture, interantennal prominence with very shallow fine polygonally reticulate sculpture; torulus about 1.2x its own length from mouth margin, its upper margin well below lower eye margin; mouth about 0.4X as wide as head; antenna as in Fig. 479; scape about 1.5X as long as broad, its dorsal margin convex; flagellum subfiliform, all segments a little wider than pedicel; F1 smallest, F2-F6 larger, subequal and subquadrate, F4 widest, other segments very slightly narrower, F1 distinctly smaller than F2, about 0.9X as long as broad, F6 about 0.9X as long as broad, linear sensilla on all funicle segments; clava hardly wider than F6, about 2.5X as long as broad, slightly shorter than F4-F6 combined, sensory area hardly enlarged, at apex only giving it a rounded appearance; eye very slightly overreaching occipital margin, virtually naked but clothed with very sparse, very inconspicuous, short setae that are less than 0.5X as long as diameter of facet; clypeal margin weakly emarginate, medially very weakly concave; mandible with three acute teeth. Relative measurements: HW 126, HH 102, FVL 60, FV 44, POL 27, OOL 3, OCL 3.5, AOL 16, EL 63.5, EW 59, MS 45, SL 49.5, SW 32.5.

Thorax with pronotum hardly exposed behind head; on pronotum with shallow, very slightly transversely elongate polygonally reticulate sculpture of subequal mesh size to eye facet; mesoscutum generally with imbricate-reticulate sculpture that is similar to pronotum but

shallower and of slightly smaller mesh, piliferous punctures a little larger and slightly more numerous than those on frontovertex but separated by much more than their own diameters; axilla with polygonally reticulate sculpture and piliferous punctures similar to mesoscutum; scutellum with deeper sculpture than mesoscutum, mostly longitudinally elongate, striate-reticulate to striate sculpture, medially cells more distinct and polygonal; sculpture very slightly deeper in apical one-third, piliferous punctures similar to those on mesoscutum, apex without a flange but weakly carinate, longitudinal median ridge absent; visible part of mesoscutum about 1.5X as broad as long; scutellum hardly broader than long and hardly convex with apex narrowly rounded; mid tibial spur about 0.9X as long as basitarsus; fore wing with venation and setation as in Figs 479, 480; parastigma very slightly downcurved, hardly swollen and with setae near posterior margin directed slightly backwards; linea calva not interrupted; propodeum medially about 0.13X as long as scutellum and with some shallow irregular sculpture medially, but deeper and more lineolate laterally, about 12-15 conspicuous, bristle-like setae outside spiracle. Relative measurements: FWL 138, FWW 64; HWL 105, HWW 34.

Gaster with hypopygium reaching about 0.7X to apex; last tergite about 0.7X as long as mid tibia, with apex more or less rounded, weakly angular; ovipositor slightly exserted, the exserted part about 0.8X as long as mid tibial spur or 0.2X as long as mid tibia.

Paratype. Hypopygium Fig. 478; ovipositor Fig. 481. Relative measurements: OL 61, GL 17.5 (MT 50).

Variation. Females vary in overall length from 1.47-2.01mm, F5 varies from pale orange to orange-brown and F6 varies from orange-brown to dark brown, otherwise little variation noted in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, Vara Blanca, vii-viii.1990 (P. Hanson). Paratype: COSTA RICA, 1♀, Heredia, 9km NE Vara Blanca, 10°14'N 84°06'W, 1450-1550m, 11/M/TN, ii-iv.2005 (INBio/OET - ALAS); 1♀, **Puntarenas**, Valle Silencio, Cerro Frantzius, LS 334150 574450, 2134m, #66678, 18.i.2002 (D. Rubí). Holotype in MZUCR, paratypes in NHMUK.

Genus *ANISOPHLEPS* Fidalgo

Anisophleps Fidalgo, 1981:37-38. Type species: *Anisophleps alternata* Fidalgo, by original designation and monotypy.

Female. Length about 1.2-1.6mm.

Body mainly orange, often with some weakly metallic or dusky areas; temple and gena with a diagonal brown stripe extending from occipital margin to torulus; mesoscutum posteriorly with a dark, metallic band that contrasts with the orange anterior part; fore wing mainly infuscate from level of proximal part of parastigma, infuscate area delimited subapically by a darker curved area.

Head in profile dorsally hardly convex from occipital margin to just above transfacial carina, bent at right angles at top of transfacial carina and from there virtually straight to mouth margin; transfacial carina strong and uninterrupted, extending to well outside toruli; mandible with 3 acute teeth; palp formula 4-3.

Mesoscutum with at least one or two slender, scale-like setae; notaular lines absent; scutellum with about 10 scattered, slender, scale-like setae in apical half or so, these not forming a compact tuft; sculpture on mesoscutum and scutellum very similar, both with finely striate to striate-reticulate sculpture arranged in concentric whorls around a small imbricate reticulate area in middle; mid tibia with a strong, distinct, subbasal external carina in proximal half; fore wing with apices of postmarginal and stigmal veins connected by a naked, hyaline streak; submarginal

vein with parastigma strongly downcurved and with a weak to moderate triangular expansion at proximal end of parastigma; marginal vein not more than 2.5X as long as broad, at least a little shorter than stigmal vein and about as long as postmarginal vein; axillae strongly raised above level of scutellum.

Gaster with hypopygium reaching about two-thirds along gaster; ovipositor hidden to slightly exserted; gonostylus free.

Male. Length about 1.1mm.

Body generally dark brown with a slight metallic sheen; posterior one-third or so of scutellum with a much stronger metallic sheen; fore wing hyaline; legs mostly white to pale yellow with brown areas on hind femur and mid and hind tibia; head about 2X as wide as frontovertex and without a transfacial carina; antenna with 6 funicle segments, all longer than broad and clothed with setae that are about as long as diameter of segments; clava entire and about as long as F5 and F6 combined; sculpture of mesoscutum and scutellum similar to that of female; fore wing venation similar to that of female but postmarginal vein slightly longer than stigmal vein.

DISTRIBUTION. Neotropical region only (Argentina and Costa Rica).

HOSTS. The type species has been recorded as a parasitoid of *Lecanodiaspis dendrobii* (Douglas) (Hemiptera: Lecanodiaspididae) (Fidalgo, 1981)

COMMENTS. *Anisophleps* can be separated from all other known genera of encyrtids by the unique combination of the infuscate area of the fore wing being delimited by a darker, curved, subapical band and the very unusual whorled sculpture on both the mesoscutum and scutellum. Superficially, the genus is most similar to *Cheilopsis* Prinsloo, 1983 but differs in lacking a distinct tuft of setae on the scutellum, having a much shorter marginal vein; subcylindrical, gradually widening funicle segments and relatively large and wide clava. In *Cheilopsis* the scutellum has a distinct, subapical tuft of setae and the funicle segments are slightly flattened, subequal in width and about as wide as clava. See also comments under *Diversinervus* (p. 492), *Lakshaphagus* (p. 195) and *Ludesia* (p. 179).

IDENTIFICATION. Only three species known, including the two described as new below; see Fidalgo (1981) for description of *alternata*.

Key to Costa Rican species of *Anisophleps* (Females)

1. Scape (Fig. 482) very broad and flat, about 1.2X as long as broad; clava enlarged, nearly 2X as wide as F6 and with a strong, oblique apical truncation, sensory area extending more than 0.5X along ventral margin ..... *aoedis* **sp.nov.** (p. 190)
- Scape (Fig. 488) broad and flat, but about 2X as long as broad; clava enlarged, but not more than 1.2X as wide as F6 and with only a weak, oblique apical truncation, sensory area extending only about 0.2X along ventral margin .... *carpo* **sp.nov.** (p. 192)

***Anisophleps aoedis* sp.nov.**
(Figs 482-487; Hab. ♀ 76)

DIAGNOSIS. *Female* (overall length about 1.8mm): antenna (Fig. 482) with scape very broad and flat, about 1.2X as long as broad, its outer margin very curved and strongly convex; funicle with F4-F6 strongly transverse; clava less than 2X as long as broad with a strong, oblique truncation, sensory area extending more than 0.5X along ventral margin; ovipositor clearly longer than mid tibia; gonostylus slightly longer than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.75mm; excluding ovipositor, 1.69m (CPD).

Head largely dark brown with scrobes and lower part of interantennal prominence pale orange; temple with a broad, slightly dusky, pale orange stripe extending from occipital margin, alongside eye margin to transfacial carina a little above level of torulus, lower gena pale orange; a curved brown line between toruli a little above mouth margin; frontovertex metallic green between and behind ocelli, otherwise with a distinct coppery and brassy sheen, this continued between eye and transfacial carina; pale orange area on temple with a metallic green sheen, this becoming purple below lowest part of eye and weaker metallic green and brassy between lowest part of eye and transfacial carina; darker part of temple and upper gena with a distinct coppery, brassy and green sheen; dorsal part of interantennal prominence with a metallic green and purple sheen; mouth margin with a weak purple and brassy sheen; frontovertex with moderately conspicuous, scattered brown setae, also a line along inner eye margin; interantennal prominence with relatively dense, white, translucent setae; maxillary palpus white; antenna with radicle dark brown; ventral margin of scape narrowly dark brown from base to about 0.75X, this connected by a fainter, diffuse, diagonal brown line to about half way along dorsal margin of scape, these enclosing proximal orange area of scape, apical area white; pedicel white with a complete dark brown, dorso-lateral stripe; funicle largely pale orange, but ventrally mixed brown on outer surface; clava dark brown; pronotum largely orange, but posterior margin translucent and in some lights white and slightly silky in appearance, neck dark brown; prosternum orange-brown; mesoscutum orange in anterior two-thirds, but area below pronotum slightly dusky, posterior one-third slightly dusky laterally to dark brown medially with a strong metallic blue-green and purple sheen; tegula orange, apex orange-brown; axilla and scutellum orange; setae on mesoscutum, axilla and scutellum mainly black, but translucent pale brown or silvery on metallic area of mesoscutum; metanotum orange; mesopleuron orange with a weak brassy sheen, slightly dusky anteriorly and posteriorly with a distinct purple sheen; mesosternum dark brown; fore coxa white; fore leg with coxa white, femur mostly white but pale orange distally, tibia pale orange, tarsus orange; mid leg with coxa white, femur mostly white but orange at apex, tibia white with a slender, oblique dark brown basal/subbasal band, spur and tarsus pale orange; hind leg with coxa white, femur white with apex orange, tibia mostly pale orange, but dark brown at extreme base with a narrow, subbasal white band and a diffuse brownish band distad of this, tarsus dusky orange; fore wing (Fig. 486) mostly infuscate but hyaline towards base and at apex, venation brown; propodeum orange medially, brown laterally with a weak purple and brassy lustre, side brassy and metallic blue and green, a line of dense, conspicuous, silvery setae along antero-lateral margin (possibly originating from metapleuron) to base of hind coxa; gaster dark brown, dorsally with a coppery and purple sheen, Gt1 with a strong metallic green and brassy sheen, mixed coppery, especially along posterior margin, syntergum medially pale orange, side and venter largely with a distinct metallic green and coppery sheen; gonostylus pale orange.

Head about 4.4X as wide as frontovertex, in profile about 1.3X as high as deep; occipital margin sharp, not carinate; ocelli forming an angle of about 75°; frontovertex very shiny, mostly completely smooth, but with shallow, irregular, imbricate reticulate sculpture between posterior ocelli and along occipital margin; temple and gena with shallow, longitudinally elongate, polygonally reticulate to imbricate reticulate sculpture; scrobes quite smooth; narrowest point between eye and transfacial carina about 2X diameter of anterior ocellus; transfacial carina medially quite strongly concave in dorsal view; scrobes deep, broadly ∩-shaped; interantennal prominence dorsally rounded, with very shallow, polygonally reticulate sculpture; antenna as in Fig. 482; scape strongly broadened and flattened, only about 1.3X as long as broad, dorsal margin strongly convex; F1-F2 more or less quadrate, F3-F6 transverse, segments larger and broader distad, linear sensilla present only on F5-6; clava strongly enlarged, about 2X as wide as F6 and slightly longer than funicle, sutures oblique, sensory area enlarged about 0.9X as long as dorsal margin, apex obliquely truncate; eye not quite reaching occipital margin, separated by slightly less than diameter of facet, clothed in moderately conspicuous setae, each a little longer than diameter of facet; inner eye margins strongly converging anteriorly; malar sulcus absent; clypeal margin slightly concave medially; mandible with 3 teeth, upper tooth rounded, lower teeth acute. Relative measurements: HW 71, HH 65, FVL 49, FV 16, POL 7, OOL 1, OCL 4, AOL 7, EL 45, EW 34, MS 35, SL 42, SW 34.

Thorax (Fig. 483) with pronotum hardly exposed behind head, about 0.5X as long as mesoscutum; pronotum, mesoscutum, axilla and scutellum with polygonally reticulate sculpture that is slightly deeper and coarser than that between posterior ocelli; visible part of mesoscutum about 1.8X as broad as long; scutellum about 1.1X as broad as long, without a distinct subapical tuft, but with a subapical group of slightly flattened, elongate, slender, scale-like setae, subapical pair longest and about half as long as scutellum; mid tibia conspicuously swollen subbasally, basal carina extending about 0.4X along its length; hind femur about 4.1X as long as broad; fore wing with venation and setation as in Figs 484, 486; costal cell completely naked; propodeum (Fig. 483) medially about 0.13X as long as scutellum, virtually smooth, but with some extremely shallow, polygonally reticulate sculpture. Relative measurements: FWL 93, FWW 37; HWL 74, HWW 20.5.

Gaster with hypopygium (Fig. 485) reaching about 0.7X to apex; last tergite about 0.7X as long as mid tibia, with apex more or less rounded; ovipositor (Fig. 487) slightly exserted, the exserted part about 0.4X length of mid tibial spur or about 0.1X mid tibia. Relative measurements: OL 88.5, GL 24.5 [MT 74].

Variation. Females vary in overall length from 1.75-1.84mm, otherwise little variation noted in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Cacao (ACG), 1100m, MT/YPT, 26.i-24. ii.1996 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, same data as holotype. Holotype and paratype in NHMUK.

COMMENTS. Of the Costa Rica species, *aoedis* is probably more similar to *alternata* Fidalgo because the scape is less than 1.5X as long as broad and the dorsal margin is strongly convex. However, in *alternata* the clava has a weaker oblique apical truncation with the sensory area extending only about 0.3X along the ventral margin of the clava. Further to this, in *alternata* the triangular expansion of the parastigma is much less pronounced than in either *aoedis* or *carpo* and the frontovertex is completely pale orange.

Anisophleps carpo sp.nov.

(Figs 488-490; Hab. ♀ 77)

DIAGNOSIS. *Female* (length about 1.2-1.3mm): antenna (Fig. 488) with scape broad and flat, about 2X as long as broad, its outer margin more or less straight; funicle with F4-F6 more or less quadrate; clava nearly 3X as long as broad with a weak, oblique apical truncation, sensory area extending about 0.2X along ventral margin; ovipositor as long as mid tibia; gonostylus slightly shorter than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.27mm; excluding ovipositor, 1.25mm (CPD).

Head with frontovertex brown, occiput, scrobes, interantennal prominence and mouth margin pale orange; temple and gena pale orange with a broad, oblique, brown stripe extending from occipital margin to torulus; frontovertex metallic green between and behind ocelli, otherwise with a mixed green and blue-green sheen, this continued between eye and transfacial carina, narrowly bordered blue and purple laterally; pale orange area on temple with a metallic blue and purple sheen, this becoming brassy in area bordered by lowest part of eye and transfacial carina; darker part of temple and upper gena with a distinct coppery, brassy and green sheen; dorsal part of interantennal prominence with a weak brassy and purple sheen; frontovertex with moderately conspicuous, scattered brown setae, also a line along inner eye margin; interantennal

prominence with a few scattered, brown setae; maxillary palpus white; antenna with radicle pale orange, dorsally and laterally margined dark brown; scape pale orange with ventral margin narrowly dark brown from base to about 0.75X, apex white; pedicel white with a complete dark brown, dorso-lateral stripe; funicle largely pale orange, but mixed brown on outer surface; clava dark brown; pronotum largely orange, neck dark brown, side brown; propleuron dark brown; prosternum orange-brown; mesoscutum mostly orange in anterior two-thirds with brassy and coppery reflections, area below pronotum dusky, posterior one-third of mesoscutum slightly dusky with a relatively strong coppery-purple sheen and metallic blue reflections; tegula dusky orange, apex dark orange-brown; axilla and scutellum orange with brassy and coppery reflections, these conspicuously weaker than those on paler part of mesoscutum, base of scutellum pale orange laterally, this area bordered posteriorly by a diagonal, dark brown mark; setae on mesoscutum, axilla and scutellum mainly black, but pale brown or slightly silvery on posterior, metallic area of mesoscutum; metanotum dusky orange; mesopleuron largely orange with a weak brassy and purple sheen and a large dark brown spot in posterior one-third; mesosternum dark orange-brown; fore leg with coxa white, femur mostly white but pale orange distally, tibia pale orange, tarsus orange; mid leg with coxa white, mid femur mostly white but orange at apex, tibia mostly white, narrowly bordered dark brown at base, with a slender, interrupted oblique dark brown basal/subbasal band, apex, spur and tarsus pale orange; hind leg with coxa white, femur white with apex orange, tibia mostly pale orange, but dark brown at extreme base with a narrow, subbasal white band and a diffuse brownish band distad of this, tarsus dusky orange; fore wing (Fig. 489) mostly infuscate but hyaline towards base and at apex, venation pale orange proximally, brown distally; propodeum orange medially, orange-brown laterally with a weak purple and brassy lustre, side dark brown with a metallic purple and green, a line of dense, conspicuous, silvery setae along antero-lateral margin (possibly originating from metapleuron) to base of hind coxa; gaster brown, dark brown dorsally towards base, dorsally with a coppery and purple sheen, Gt1 with a strong metallic green and brassy sheen, mixed coppery, especially along posterior margin, syntergum mostly pale orange with apex brown, side and venter largely with a distinct metallic green and coppery sheen; gonostylus pale orange.

Head about 4.9X as wide as frontovertex, in profile about 1.2X as high as deep; occipital margin sharp, not carinate; ocelli forming an angle of about 50°; frontovertex very shiny, mostly completely smooth, but with shallow, irregular, imbricate reticulate sculpture between posterior ocelli and along occipital margin; temple and gena with shallow, longitudinally elongate, polygonally reticulate to imbricate reticulate sculpture; scrobes quite smooth; narrowest point between eye and transfacial carina about 2X diameter of anterior ocellus; transfacial carina medially quite strongly concave in dorsal view; scrobes deep, broadly ∩-shaped; interantennal prominence dorsally rounded, with very shallow, polygonally reticulate sculpture; antenna as in Fig. 488; scape broadened and flattened, about 2X as long as broad, dorsal margin straight; funicle segments subquadrate, F1-F2 clearly smallest, segments larger and broader distad; clava hardly enlarged, about 1.1X as wide as F6, as long as F3-F6 combined, sutures slightly oblique, sensory area hardly enlarged, only about 0.15X as long as dorsal margin, apex weakly obliquely truncate; eye reaching occipital margin, clothed in very conspicuous setae, each much longer than diameter of facet; inner eye margins strongly diverging in front of anterior ocellus; malar sulcus absent; clypeal margin slightly concave medially; mandible with 3 teeth, upper tooth rounded, lower teeth acute. Relative measurements: HW 59, HH 53, FVL 45, FV 12, POL 4, OOL 0.5, OCL 3, AOL 6, EL 41.5, EW 30, MS 28, SL 33, SW 17.

Thorax with pronotum hardly exposed behind head, about 0.5X as long as mesoscutum; pronotum with polygonally reticulate to imbricate-reticulate sculpture that is similar to deepest sculpture along occipital margin of frontovertex; anterior two-thirds of mesoscutum with polygonally reticulate sculpture that is significantly deeper than sculpture on pronotum, becoming longitudinally elongate, striate-reticulate laterally, posterior one-third of mesoscutum with similar, shallow sculpture to that on frontovertex between occipital margin and posterior ocelli; axilla and scutellum with similar, deep sculpture to that on anterior part of mesoscutum but slightly shallower with more rounded cells; visible part of mesoscutum about 1.7X as broad as long with setae in middle more conspicuous than those laterally; scutellum about as broad as long, without a distinct subapical tuft, but with a subapical group of longer setae, subapical pair longest and about half as

long as scutellum; mid tibia hardly swollen subbasally, basal carina extending about 0.2X along its length; hind femur about 4.6X as long as broad; fore wing with venation and setation as in Figs 489, 490; costal cell largely naked, but with about 5 setae ventrally in distal half; propodeum medially about 0.12X as long as scutellum and virtually smooth. Relative measurements: FWL 63, FWW 25; HWL 50, HWW 13.

Gaster with hypopygium reaching about 0.7X to apex; last tergite about 0.8X as long as mid tibia, with apex rounded; ovipositor hardly exserted, the exserted part about 0.15X length of mid tibial spur or much less than 0.1X mid tibia.

Paratype. Funicle with linear sensilla present only on F4-F6. Relative measurements: OL 61.5, GL 17.5 [MT 60.5].

Variation. The overall length of the female varies from 1.16-1.27mm, otherwise little variation noted in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Est. Cacao (ACG), 1000-1150m, ix.1996 (I. Villegas). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Est. San Cristobal, #51903, 23.ii-25.iii.1996 (F.A. Quezada). Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. See comments under *aoedis* (p. 192).

Genus *LAKSHAPHAGUS* Mahdihassan

Lakshaphagus Mahdihassan, 1931:170. Type species: *Microterys hautfeuilli* Mahdihassan, by original designation and monotypy.

Female. Overall length about 1.0-1.5mm.

Body mainly orange, often with some weakly metallic or dusky areas, especially on mesoscutum; scape orange with ventral margin dark brown, funicle yellow to pale brown, clava dark brown; legs mostly yellow, sometimes with brown bands on all tibiae; fore wing infuscate with much of basal cell, a small area at apex of venation and apex of wing hyaline.

Head with occipital margin sharp; head in profile dorsally hardly convex from occipital margin to just above scrobes, bent at right angles at top of scrobes and from there virtually straight to mouth margin; scrobal area defined dorsally by a continuous transfacial carina that extends laterally to well outside toruli, in dorsal view not straight, but broadly concave and weakly notched medially; scape broadened and flattened; funicle subcylindrical, 6-segmented, clava 3-segmented, apex rounded or with a short, oblique truncation; mandible tridentate, with 2 acute lower teeth and a very short rounded, or truncate upper tooth; palp formula 4-3.

Thorax with fairly shallow, polygonally reticulate sculpture on mesoscutum, notaular lines absent; scutellum dorsally flat or slightly convex, with apical one-third to one-fifth abruptly angled downwards at about 60-90° and very smooth and shiny, flat part with fine, slightly longitudinally elongate, polygonally reticulate sculpture, deeper than that on mesoscutum, and with about 6-11 pairs of coarse, dark bristles arranged transversally in middle and usually a stronger scale-like median pair immediately distad of these; mid tibia with a moderate to strong, distinct, subbasal external carina in proximal half or so; fore wing about 2.4-2.6X as long as broad; submarginal vein with parastigma strongly downcurved and with a moderate triangular expansion at proximal end of parastigma; submarginal vein with an apical hyaline break; marginal vein at least about 3X as long as broad; about as long as stigmal vein and about 2-3X as long as postmarginal vein; stigmal vein curved apically towards wing margin so that its apex is separated from wing margin by about

length of the swollen uncus or much less; apices of postmarginal vein and stigmal vein connected by a naked, hyaline area (Fig. 496); linea calva entire; filum spinosum present, represented by about 3 or 4 modified setae; axillae raised above level of scutellum, posteriorly very smooth and shiny; mesopleuron posteriorly expanded and reaching level with, or a little way past, posterior margin of propodeum, touching, or nearly touching, base of gaster.

Gaster with hypopygium reaching about two-thirds along gaster; paratergites absent; ovipositor hidden to conspicuously exserted; gonostylus free.

Male. Length about 1.2mm.

Body generally dark brown with a slight metallic sheen; antennae yellow, apex of flagellum dusky; legs yellow, mid and hind tibiae with distinct incomplete, brown rings; fore wing hyaline; antenna with 6 funicle segments, all longer than broad and clothed with long setae; clava slightly shorter than F5 and F6 combined.

DISTRIBUTION. USA (Florida), Costa Rica, Palaearctic, Afrotropics, Oriental (see Noyes, 2019).

HOSTS. Recorded as primary parasitoids of a variety of scale insects including species of Asterolecaniidae, Cerococcidae, Coccidae, Kerridae, Kuwaniidae, Lecanodiaspididae, and Pseudococcidae (Hemiptera: Coccoidea) (see Noyes, 2019).

COMMENTS. *Lakshaphagus arnulfoi*, descibed below, may be misplaced in the genus because it differs from all other included species by having a relatively longer, straighter stigmal vein and the infuscate area of the fore wing enclosed subapically by a characteristic curved, more strongly infuscate band as in *Anicetus*. In all other species currently included in the genus, the stigmal vein is conspicously curved apically towards the anterior wing margin and the hyaline area at the apex of the fore wing is not strongly delimited and is subtriangular. The generic diagnosis above has been adapted to make it possible to include *arnulfoi* in *Lakshaphagus*.

Within the Neotropical fauna, *Lakshaphagus* is very close to *Anisophleps*, females of both having the flagellar segments subcylindrical and the infuscate area of the fore wing delimited subapically by a darker curved band. *Lakshaphagus* lacks any scale-like setae on the mesoscutum and the distinctive, fine, whorl-like sculpture on the mesoscutum and scutellum. In *Anisophleps* there are at least 1 or 2 scale-like setae on the mesoscutum and the sculpture on the mesoscutum and scutellum is very characteristic and distinctly fine and whorl-like.

IDENTIFICATION. Ten world species, including the species described as new below. Trjapitzin, 1999 (generic diagnosis, key to 9 species); Singh & Dobhal, 2014 (generic diagnosis, key to 9 species).

Lakshaphagus arnulfoi **sp.nov.**

(Figs 491-497; Hab. ♀ 78)

DIAGNOSIS. *Female* (length about 1.4-1.5mm): mouth margin (Fig. 492) narrowly pale brown and a slightly curved pale brown line between lower margins of toruli; pedicel orange with a complete dark brown, dorso-lateral stripe; mesoscutum orange, with a slight metallic pale blue and violet sheen; mid and hind tibiae pale orange each with a pair of brown bands; infuscate area on fore wing (Fig. 497) delimited subapically by a darker curved band; antenna (Fig. 491) with scape about 1.9X as long as broad, funicle with F5 very slightly longer than broad, segments otherwise transverse or quadrate; scutellum (Fig. 494) with deep, coarse, elongate polygonally reticulate sculpture that is more or less arranged in whorls, apical area with 6 or 7 pairs of shorter bristle-like setae, 3 pairs of longer scale-like setae and 1 pair of very long scale-like apical setae; ovipositor slightly exserted, the exserted part slightly longer than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.35mm; excluding ovipositor, 1.22mm (CPD).

Head orange; frontovertex with a slight metallic pale blue and violet sheen; scrobes and interantennal prominence with a slight brassy sheen; temple and posterior part of gena with a

slight metallic pale green and violet sheen; mouth margin narrowly pale brown and a slightly curved pale brown line between lower margins of toruli; frontovertex with numerous, short, fairly inconspicuous, pale brown setae; mandible pale orange, proximally dark brown, teeth amber; palpi white; antenna with radicle pale orange, dark brown at apex; scape orange with ventral margin narrowly dark brown; pedicel orange with a complete dark brown, dorso-lateral stripe; funicle with F1-F4 dark brown, F5-F6 pale orange, each with a narrow pale brown stripe on inner surface; clava dark brown; pronotum orange, neck slightly dusky, posterior margin with conspicuous dark brown setae; mesoscutum orange, with a slight metallic pale blue and violet sheen; axilla and scutellum orange, more or less matt, but scutellum with weak coppery and brassy reflections; setae on dorsum of thorax dark brown or black; tegula with a slight coppery sheen, largely dusky orange but apex orange-brown; metanotum orange with a slight coppery sheen; mesopleuron orange with a slight brassy sheen; prosternum orange mixed brown; mesosternum orange mixed dark brown; fore and hind coxae white, mid coxae very pale orange; fore femur white in proximal three-fifths, apex pale orange, tibia white at extreme base, otherwise pale orange but for a faint, interrupted pale brown subbasal band, tarsus pale orange; mid femur white in proximal three-fifths, apex pale orange, tibia mostly pale orange, but with knee narrowly dark brown, a small white basal patch, an oblique Y-shaped dark brown mark surrounding white basal patch and a dark brown dorsal spot at about half way along dorsal surface, spur pale orange, tarsus pale orange; hind femur pale orange, tibia pale orange with knee narrowly dark brown and immediately below this a small white area and remnants of a pair of brown rings on dorsal margin at about 0.25X and 0.55X along its length; fore wing (Fig. 497) with extreme base infuscate otherwise basal cell hyaline to level with proximal part of parastigma, area connecting apices of postmarginal and stigmal veins and apex of fore wing hyaline (Fig. 496), wing otherwise infuscate with infuscate area delimited subapically by a darker curved band, hind wing hyaline, venation pale orange with marginal vein dusky; propodeum orange with a weak brassy lustre, side with a very weak violet and pale blue sheen; gaster generally orange, TVI-TVIII pale orange, dark brown patches present on TI, sides of TII-TII and apex of syntergum, darker areas on TI with a strong violet and metallic green sheen, TII-TIII with a metallic green sheen and apex of syntergum violet, side and venter of gaster generally with coppery, violet, brassy and metallic green reflections, apex of outer plate of ovipositor with a metallic dark green and violet sheen; gonostylus pale orange.

Head (Fig. 492) about 7.1X as wide as frontovertex, in profile about 1.4X as high as deep, frontovertex hardly convex from occipital margin to top of scrobes then angled at about 90° at top of scrobes and virtually straight towards mouth with interantennal prominence hardly protuberant; occipital margin sharp, not carinate; ocelli forming an angle of about 58°; frontovertex becoming narrower towards transfacial ridge with narrowest point slightly less than half way from anterior ocellus to transfacial ridge; frontovertex quite shiny, in ocellar area with shallow, fine, polygonally reticulate sculpture of mesh size subequal to diameter of eye facet, elsewhere frontovertex completely smooth; temple and gena with very shallow, fine, longitudinally elongate, polygonally reticulate sculpture, area immediately below eye completely smooth; scrobes quite smooth; narrowest point between eye and transfacial ridge about 1.7X diameter of anterior ocellus; scrobes moderately deep, broadly ∩-shaped, sharply margined dorsally and laterally; interantennal prominence triangular and dorsally acute, with similar sculpture to that in ocellar area; antenna as in Fig. 491; scape strongly broadened and flattened, about 1.9X as long as broad, dorsal margin weakly convex; funicle with F1-F4 smallest, subequal with F1-F2 very slightly longer than broad and F3-F4 very slightly transverse, F5-F6 largest, subequal with F5 very slightly longer than broad and F6 quadrate, linear sensilla present only on F5 and F6; clava slightly enlarged, about 1.25X as wide as F6 and nearly as long as funicle, outer suture slightly oblique, sensory area slightly enlarged but not much more than 0.1X as long as clava, apex hardly obliquely truncate; eye very slightly overreaching occipital margin, clothed in sparse fairly inconspicuous setae, each about as long as diameter of facet; malar sulcus absent; clypeal margin weakly emarginate, medially virtually straight; mandible with 2 acute lower teeth and a short, rounded upper tooth. Relative measurements: HW 96.5, HH 89, FVL 70, FV 13.5, POL 10, OOL 0.5, OCL 4, AOL 10, EL 67, EW 50, MS 45, SL 44, SW 23.5.

Thorax with pronotum exposed behind head; pronotum with similar sculpture to that in ocellar area; mesoscutum almost completely smooth, but with extremely shallow, poorly-

defined, transversely elongate, polygonally reticulate sculpture; axilla with moderately deep, fine, polygonally reticulate sculpture of much smaller mesh than that in ocellar area; scutellum with conspicuously deeper, coarser, elongate polygonally reticulate sculpture that is more or less arranged in whorls, apical area with 6 or 7 pairs of shorter bristle-like setae, 3 pairs of longer scale-like setae and 1 pair of very long scale-like apical setae; visible part of mesoscutum about 2.2X as broad as long; scutellum about 1.15X as broad as long; mid tibial spur hardly shorter than basitarsus; hind femur about 3.5X as long as broad; fore wing with venation and setation as in Figs 496, 497; costal cell without any setae dorsally; metapleuron completely hidden; propodeum (Fig. 494) medially about 0.17X as long as scutellum, virtually smooth. Relative measurements: FWL 87.5, FWW 34; HWL 68, HWW 18.5.

Gaster with hypopygium (Fig. 495) reaching about 0.7X; last tergite about 0.85X as long as mid tibia, with apex broadly angular; ovipositor (Fig. 493) exserted, the exserted part about 1.2X as long as mid tibial spur or about 0.35X mid tibia. Relative measurements: OL 88, GL 28 [MT 64].

Variation. Females vary in overall length from 1.35-1.48mm, the mouth margin and area between the toruli may be completely pale orange and the head varies from 6.5-7.1X as wide as the frontovertex

Male. Unknown.

DISTRIBUTION. USA (Florida), Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 19-20.ii.2009 (J.S. Noyes). Paratypes: **USA**, 1♀, **Florida**, Monroe Co., Big Torch Key, xi.1985-ii.1986 (S. & J. Peck). Holotype and paratype in NHMUK.

COMMENTS. A specimen from Belize may belong to *arnulfoi* but it lacks brown rings on the mid and hind tibia and has a slightly narrower frontovertex than that described for *arnulfoi.*

The species is named in honour of Sr Arnulfo Quiros, a friend and one the hosts at Cerro Escondido, Reserva Privada Karen Mogensen where the holotype was collected.

Genus *CHEILONEURUS* Westwood

Cheiloneurus Westwood, 1833a:343. Type species: *Encyrtus elegans* Dalman, by monotypy.

Chilonevrus Agassiz, 1848. Unjustified emendation of *Cheiloneurus* Westwood.

Chrysopophagus Ashmead, 1894:246. Type species: *Chrysopophagus compressicornis* Ashmead, by monotypy. Synonymy with *Cheiloneurus* by Trjapitzin & Gordh (1978a:365).

Cheloneurus; Förster, 1956:50. Misspelling of *Cheiloneurus*.

Chiloneurus; Förster, 1856:50. Misspelling of *Cheiloneurus*.

Zaomma Ashmead, 1900:401. Type species: *Encyrtus argentipes* Howard, by original designation and monotypy. **syn.nov.**

Blatticida Ashmead, 1904:305. Type species: *Blatticida pulchra* Ashmead, by monotypy. Synonymy with *Cheiloneurus* by Trjapitzin & Gordh (1978b:636).

Apterencyrtus Ashmead, 1905:5. Type species: *Apterencyrtus pulchricornis* Ashmead, by original designation and monotypy. Synonymy with *Zaomma* by Gordh & Trjapitzin (1979:34). **syn.nov.**

Echthrogonatopus Perkins, 1906:256. Type species: *Echthrogonatopus exitiosus* Perkins, by designation of Gahan & Fagan (1923:48). Synonymy with *Cheiloneurus* by Guerrieri & Viggiani (2005:306).

Saronotum Perkins, 1906:269-260. Type species: *Saronotum australiae* Perkins, by original designation. Synonymy with *Cheiloneurus* by Noyes & Hayat (1984:249).

Cristatithorax Girault, 1911:169. Type species: *Cristatithorax pulcher* Girault, by original designation. Synonymy with *Cheiloneurus* by Mercet (1921:637).

Eusemionella Girault, 1915a:78. Type species: *Eusemionella cristata* Girault, by original designation. Synonymy with *Cheiloneurus* by Noyes & Hayat (1984:249).
Chrysopophagoides Girault, 1915a:90. Type species: *Chrysopophagoides westwoodi* Girault, by original designation. Synonymy with *Cheiloneurus* by Noyes & Hayat (1984:249).
Paracheiloneurus Girault: 1915a:119. Type species: *Cheiloneurus perpulcher* Girault, by original designation; subgenus of *Cheiloneurus*. Synonymy with *Cheiloneurus* by Noyes & Hayat (1984:249).
Epicheiloneurus Girault, 1915a:173. Type species: *Epicheiloneurus albicoxa* Girault, by original designation. Synonymy with *Cheiloneurus* by Noyes & Hayat (1984:249).
Metallonoidea Girault, 1915a:170-171. Type species: *Metallonoidea brittanica* Girault, by monotypy. Synonymy with *Zaomma* by Gordh & Trjapitzin (1979:34). **syn.nov.**
Eusemionopsis Girault, 1918:3. Type species: *Eusemionopsis centaurus* Girault, by original designation. Synonymy with *Cheiloneurus* by Noyes & Hayat (1984:249).
Hypergonatopus Timberlake, 1922:142. Type species: *Echthrogonatopus hawaiiensis* Perkins, by original designation. Synonymy with *Cheiloneurus* by Guerrieri & Viggiani (2005:306).
Procheiloneurus Girault, 1920a:39. Type species: *Procheiloneurus triguttatipennis* Girault, by original designation. Synonymy with *Cheiloneurus* by Dahms & Gordh (1997:113-114,115-116).
Chiloneurinus Mercet, 1921:646. Type species: *Chiloneurus microphagus* Mayr, by original designation and monotypy. Synonymy with *Zaomma* by Trjapitzin (1978:310). **syn.nov.**
Aulonops Timberlake, 1922:158-159. Type species: *Aulonops bifasciata* Timberlake, by original designation. Synonymy with *Cheiloneurus* by Guerrieri (2006:2396).
Raphaelana Girault, 1926:66. Replacement name for *Procheiloneurus* Girault, 1920 nec *Prochiloneurus* Silvestri, 1915.
Bekilyia Risbec, 1952:40. Type species: *Bekilyia metallica* Risbec, by monotypy. Synonymy with *Cheiloneurus* by Noyes & Prinsloo (1998:78,84).
Metacheiloneurus Hoffer, 1957b:336. Type species: *Metacheiloneurus moestus* Hoffer, by monotypy. Synonymy with *Cheiloneurus* by Hoffer (1959:33).
Lepidoneurus Hoffer, 1957:340b. Type species: *Chiloneurus kollari* Mayr, by original designation (as subgenus of *Cheiloneurus* Westwood). Synonymy with *Cheiloneurus* by Trjapitzin (1989:305).
Richardsius Alam, 1957:439. Type species: *Apterencyrtus thomsoniscae* Alam, by original designation (as subgenus of *Apterencyrtus* Ashmead). Synonymy with *Zaomma* by Trjapitzin (1989:312). **syn.nov.**
Tobiasia Trjapitzin, 1962:567. Type species: *Tobiasia bifasciata* Trjapitzin, by monotypy. Synonymy with *Cheiloneurus* by Trjapitzin & Triapitsyn (2008:465).
Metapterencyrtus Tachikawa, 1963b:213-214. Type species: *Metapterencyrtus eriococci* Tachikawa, by original designation. Synonymy with *Zaomma* by Gordh & Trjapitzin (1979:34). **syn.nov.**
Cheilonorus; OILB, 1971:20. Misspelling of *Cheiloneurus*.
Cheilioneurus; Noyes, 2010:94. Misspelling of *Cheiloneurus*.

Female. Overall length about 0.8-4.5mm.

Body varying from completely yellow or orange to dark brown and largely metallic green; mesoscutum often posteriorly with a strong metallic dark band clothed with dense silvery setae, sometimes only silvery setae; legs varying from completely yellow or pale orange to mostly dark brown; fore wing rarely completely hyaline, usually distinctly infuscate.

Head with with an oval, shiny bottomed depression adjacent to eye margin between posterior ocellus and occipital margin; malar sulcus absent or very weak, indicated by a slight change in sculpture; antenna with pedicel and flagellum subcylindrical, segments becoming broader distally, clava at least as broad as F1, with apex rounded or with a slight to strong, oblique apical truncation; mandible basically tridentate, varying from 3 very sharp teeth acute teeth, upper tooth sometimes very short, lower teeth sometimes very long; through to 3 subequal, relatively short teeth to 1 tooth and a broad truncation; palp formula 4-3.

Mesoscutum without notaular lines, mostly with imbricate-reticulate or polygonally reticulate

sculpture, cells rarely uniform, mostly at least some anterior cells longitudinally elongate, sometimes all sculpture longitudinally elongate striate-reticulate to striate and slightly diverging posteriorly; scutellum with similar or distinctly deeper polygonally reticulate sculpture, sometimes arranged in whorls; scutellum almost always with a subapical tuft composed of tightly packed, scale-like setae that are scattered and not arranged in distinct straight lines; fore wing fully developed or strongly reduced, sometimes hardly reaching gaster; fully developed fore wing about 2.2-3.3X as long as broad, reduced fore wing up to 3.9X as long as broad; fully developed fore wing mostly infuscate with a naked, hyaline streak connecting apex of postmarginal and stigmal veins; submarginal vein with parastigma at least slightly broadened and frequently downcurved, sometimes strongly; marginal vein long, at least 3X as long as broad, at least 1.5X as long as the stigmal vein and rarely less than 3X as long as the postmarginal vein (in some species with completely hyaline wings the postmarginal vein is as long the stigmal vein and about 0.5X as long as the marginal vein); filum spinosum present.

Gaster sometimes with a pair of gland-like structures on TI and TV; hypopygium not reaching apex of gaster; ovipositor hidden to very strongly exserted; gonostylus free.

Male. Length about 0.6-1.8mm.

Body usually dark brown with a slight metallic sheen, rarely completely or partially yellow; fore wing hyaline, extremely rarely infuscate as in female; antenna with 6 funicle segments, all longer than broad and clothed with whorls of long setae, the longest of which may be up to 8X as long as diameter of segments; clava entire and usually slightly shorter than F5 and F6 combined; sculpture of mesoscutum and scutellum usually similar to that of female; subapical tuft on scutellum very rarely present; fore wing with venation similar to that of female but marginal vein usually relatively shorter; phallobase with parameres short, digiti each about 2-3X as long as broad and with a single apical tooth; aedeagus mostly about half as long as mid tibia, about 10-16X as long as broad but very slightly broadened subapically with apex rounded.

DISTRIBUTION. Cosmopolitan.

HOSTS. Mainly secondary parasitoids of scale insects via other encyrtid primary parasitoids or leaf hoppers via other parasitoids. Some species are recorded as primary parasitoids of predators associated with aphids or other sternorrhynchous hemipterans. *Cheiloneurus aliphera* **sp.nov.** is recorded below from cricket eggs in Colombia, and *Cheiloneurus leptulus* Annecke & Prinsloo is recorded as a parasitoid of the larvae of *Ceratina* Latreille (Hymenoptera: Apidae) in Tanzania (Annecke & Prinsloo, 1977). One species appears to be a gregarious, facultative hyperparasitoid of moth prepupae or pupae (Lepidoptera) via braconid primary parasitoids (Manickavasagam et al., 2008).

COMMENTS. *Zaomma* has long been treated as a distinct genus from *Cheiloneurus* although the included species have very similar biologies and morphology. With a few exceptions, both genera include species that are secondary parasitoids of Coccoidea (Hemiptera), although species of *Zaomma* specialise as secondary parasitoids of smaller scales (Diaspididae) whilst species of *Cheiloneurus* are associated with larger scales (Coccidae, etc.). In general, individuals of *Zaomma* are smaller than those of *Cheiloneurus* and have hyaline fore wings and the scutellum has a weak subapical tuft whilst those of *Cheiloneurus* have infuscate fore wings and the scutellum usually has a distinct subapical tuft. This separation was supported when Prinsloo (1979b) showed that all Afrotropical species of *Zaomma* have paired "gland-like" structures on TI and TV of the gaster which he also found in the common European species, *Zaomma lambinus*. The current work has shown that these structures are also present in *Zaomma argentipes* (Fig. 522), the type species of the genus. No species currently placed in *Cheiloneurus* is known to possess these structures. However, in at least two species described as new here (*dalycera* and *idris*), these gland--like structures are absent, but appear to be indicated by somewhat irregular changes in sculpture. In general respects these species are very similar to *argentipes*. Another species described here as new (*magnolia*; Fig. 504) possesses distinct gland-like structures on TI and TV of the gaster yet has strongly infuscate fore wings (Fig. 499). I therefore think that treating *Zaomma* as a separate

genus from *Cheiloneurus* is untenable and formally propose the synonymy of the two genera (**syn. nov.**). As a result of this synonymy the following new combinations in *Cheiloneurus* are proposed: *abas* (Trjapitzin) (from *Apterencyrtus*); *acaciae* (Risbec) (from *Paralitomastix*); *acanthococci* (Pilipyuk & Trjapitzin) (from *Apterencyrtus*); *argentipes* (Howard) (from *Encyrtus*); *astera* (Hayat) (from *Zaomma*); *carinae* (Prinsloo) (from *Zaomma*); *cestus* (Prinsloo) (from *Zaomma*); *danzigae* (Pilipyuk & Trjapitzin) (from *Apterencyrtus*); *epytus* (Walker) (from *Encyrtus*); *eriococci* (Ferrière) (from *Apterencyrtus*); *ficusae* (Risbec) (from *Adelencyrtus*); *hirsutus* (Ratzeburg) (from *Encyrtus*); *lambinus* (Walker) (from *Encyrtus*); *sitis* (Prinsloo) (from *Zaomma*); *vix* (Prinsloo) (from *Zaomma*); *xhosa* (Prinsloo) (from *Zaomma*) (all **comb.nov.**).

One group of species (related to *hamadryas* **sp.nov.,** see key couplets 17 to 31) appears to form a monophyletic group which might be considered to be out of place within *Cheiloneurus* and deserve separate generic status. The species are characterised by having the mandible with two elongate, sharp, lower teeth and a short or vestigial upper, third tooth (e.g. Figs 610, 617. 620, 638, 644, 669) and a hyaline, or weakly infuscate, fore wing without any indication of a hyaline, naked streak connecting the apices of the postmarginal and stigmal veins (e.g. Figs 604, 608, 613, 670, 677). At present I prefer to include these species within *Cheiloneurus* because all other characters agree with the current definition of the genus.

There is no doubt that *Cheiloneurus*, as understood here, is morphologically an extremely variable genus and probably requires a reassessment of its generic limits. Unfortunately, this is beyond the scope of the current work. This would be an enormous task that would require a holistic approach based on a detailed examination of material from all parts of the world that includes representatives of all genus group names that are currently treated as invalid synonyms.

See comments under *Prochiloneurus* (p. 459) and *Ludesia* (p. 179).

IDENTIFICATION. A very diverse genus with 272 described species worldwide, including 102 described below as new. Identification of species can be difficult with very few revisions or detailed studies available: Gordh & Trjapitzin, 1979 (key to 7 species of *Zaomma*); Guerrieri & Viggiani, 2005 (revision of 14 species of *Cheiloneurus* associated with Hymenoptera, Dryinidae); Gahan, 1914 (key to 8 North American species of *Cheiloneurus*); Trjapitzin & Triapitsyn, 2008 (new species of *Cheiloneurus* from USA, Mexico and Cuba, key to 12 species of *Cheiloneurus* without a scutellar tuft, key to 14 species of *elegans* group); Trjapitzin, 1971 (key to 13 Palaearctic species of *Cheiloneurus*); Trjapitzin, 1989 (key to 21 Palaearctic species of *Cheiloneurus* and 6 species of *Zaomma*); Compere, 1938 (key to 7 Afrotropical species of *Cheiloneurus*); Prinsloo, 1979b (revision of 5 Afrotropical species of *Zaomma*); Hayat, 2006 (key to 33 Indian species of *Cheiloneurus*); Shi et al., 1994 (key to 10 Chinese species of *Cheiloneurus*).

Key to Costa Rican species of *Cheiloneurus*
(Females)

1 Fore wing always fully developed and without a naked, hyaline streak connecting apices of postmarginal and stigmal veins (e.g. Figs 500, 527. 555, 571, 587, 599, 603, 673) 2

\- Brachypterous species or fore wing fully developed with a conspicuous naked, hyaline streak connecting apices of postmarginal and stigmal veins (e.g. Figs 679, 688, 701, 726, 743, 776, 824, 864, 1015, 1090, 1162) 32

2 (1) Either apex of clava more or less rounded (e.g. Fig. 506; 528, 540; 576; sometimes a small, inconspicuous, apical sensory area that extends not more than about 0.1X along ventral surface of clava as in Fig. 502) or all funicle segments at least 1.4X as long as broad (Fig. 558) 3

\- Apex of clava with a conspicuous oblique apical truncation extending at least one-quarter along clava and some funicle segments transverse or quadrate (e.g. Figs 583, 593, 602, 605, 618, 631, 664) 14

3 (2) Fore wing (Fig. 499) conspicuously infuscate below marginal vein with apical half less strongly infuscate, but with a pair of opposite hyaline areas ..... *magnolia* **sp.nov.** (p. 213)
- Fore wing completely hyaline 4

4 (3) Clava at least slightly longer than funicle (e.g. Figs 506, 511, 514, 534), if about as long as funicle then about 4X as long as broad (Fig. 528); funicle with linear sensilla on at most F5-F6 5
- Clava shorter than funicle (e.g. Figs 540, 547, 561, 567) but if about as long then not more than 3.5X as long as broad (Fig. 576); funicle with linear sensilla on at least F4-F6 8

5 (4) Antenna (Figs 506, 511-514), with F2-F5 strongly transverse; F1 and F6 both usually transverse, rarely either segment quadrate; syntergum not longer than broad (visible only on slide-mounted material) 6
- Antenna (Figs 528, 534) with at least F2 quadrate and F1 and F6 at least slightly longer broad; syntergum at least about one-third longer than broad (visible only on slide-mounted material) 7

6 (5) Sculpture on mesoscutum aciculate polygonally reticulate to striate-reticulate; gaster with "glandular" plates on Gt1 separated by hardly more than their own lengths, those on Gt5 more or less touching ..... *vitara* **sp.nov.** (p. 215)
- Sculpture on mesoscutum not aciculate although polygonally reticulate to striate-reticulate; gaster with "glandular" plates on Gt1 separated by at least nearly 2X their own lengths, those on Gt5 separated by at least about 0.3X their own lengths or at least about their own widths ..... *argentipes* (Howard) (p. 216)

7 (5) Antenna with F5 longer than broad, about 2X as long as F4 and with linear sensilla; head about 4.5X as wide as frontovertex ..... *sophocles* **sp.nov.** (p. 219)
- Antenna with F5 transverse, hardly longer than F4 and without linear sensilla; head about 3X as wide as frontovertex ..... *carita* **sp.nov.** (p. 220)

8 (4) Antenna (Fig. 540, 547) with all funicle segments quadrate, at least F2-F6 subequal and with linear sensilla; fore wing (Fig. 542, 553) not more than about 2.3X as long as broad; mandible (Fig. 546) with 1 acute tooth and a broad, slightly concave truncation 9
- Antenna (e.g. Figs 558, 561, 567, 576) with at least F5-F6 longer than broad and larger than basal segments; linear sensilla present on only F4-F6; fore wing (e.g. Fig. 557, 562, 571, 578) at least about 2.4X as long as broad; mandible with three teeth, upper tooth sometimes truncate (Fig. 556) 10

9 (8) Antenna (Fig. 540) with pedicel hardly longer than F1, funicle with F2-F6 wider than pedicel; fore coxa brown ..... *epytus* (Walker) (p. 222)
- Antenna (Fig. 547) with pedicel about as long as F1+F2 combined, funicle with only F5-F6 wider than pedicel, remaining segments at least slightly narrower than pedicel; fore coxa white ..... *danessa* **sp.nov**. (p. 223)

10 (8) All funicle segments at least 1.3X as long as broad (Figs 558, 561) 11
- At least some funicle segments transverse or subquadrate and not more than 1.1X as long as broad (Fig. 567, 573, 576) 12

11 (10) Mandible with two teeth and a broadly truncate upper tooth (Fig. 556); gaster without glands on TI and TV ..... *idris* **sp.nov.** (p. 225)
- Mandible with three acute teeth, upper tooth short; gaster with glands on TI and TV ..... *socrates* **sp.nov.** (p. 227)

12 (10) Hind coxa white; linear sensilla only on F5-F6 (Fig. 567) ..... *roellus* **sp.nov.** (p. 229)
- Hind coxa brown; linear sensilla on F4-F6 (Fig. 573, 576) 13

13 (12) Gaster without gland-like structures on TI and TV; mandible with two sharp teeth and a third, upper tooth with a broad, straight truncation ..... *dalycera* **sp.nov.** (p. 230)
- Gaster with gland-like structures on at least TV; mandible with two sharp teeth and a third, upper tooth with a strongly concave truncation ..... *ection* **sp.nov.** (p. 232)

14 (2) Clava concolorous with funicle or only partially dark brown (Figs 583, 591, 593); mandible with three short teeth (Fig. 581)..... 15
- Clava conspicuously darker than funicle and, excluding sensory apical area, uniformly dark brown, at least F6 pale yellow or pale orange and contrasting with clava (e.g. Figs 598, 605, 611, 634, 668, 678); mandible (e.g. Figs 610, 617. 620, 638, 644, 669) very characteristic with a very deep invagination between middle and lower tooth with a smaller nick at bottom, upper tooth short, sometimes virtually absent 17

15 (14). Legs with femora and tibiae white to pale orange, only hind femur marked dark brown at extreme apex without brown areas; scutellum (Fig. 582) without a subapical tuft of setae ..... *parvus* (Hayat) (p. 234)
- Legs with all femora and tibiae at least partially brown; scutellum with at least a weak subapical tuft of setae (Fg. 592, 596) 16

16 (15) Head at least 8X as wide as frontovertex; scape (Fig. 591) hardly broadened, at least 4X as long as broad; scutellum (Fig. 592) with a sparse subapical tuft composed of about 10 setae that do not extend past apex; mid tibial spur not longer than corresponding basitarsus..... *semis* **sp.nov.** (p. 235)
- Head less than 6X as wide as frontovertex; scape (Fig. 593) strongly broadened and flattened, not more than 2X as long as broad; scutellum (Fig. 596) a dense subapical tuft composed of about 20 setae that clearly extends past apex; mid tibial spur at least 1.2X as long as corresponding basitarsus .... *catreta* **sp.nov.** (p. 237)

17 (14) Scutellum orange 18
- Scutellum metallic green or blue 19

18 (17) Fore wing (Fig. 600) with apical half generally weakly infuscate, without a distinct median streak; scape (Fig. 598) not broadened, about 5X as long as broad; ovipositor more than 2X as long as mid tibia, exserted part longer than mid tibial spur ..... *herndonia* **sp.nov.** (p. 239)
- Fore wing (Figs 601) largely hyaline in apical half, but with a distinct longitudinal, median infuscate streak; scape (Fig. 602) conspicuously broadened, about 3.5X as long as broad; ovipositor less than 2X as long as mid tibia, exserted part not more than half as long as mid tibial spur ..... *exeres* **sp.nov.** (p. 241)

19 (17) Forewing (Fig. 604, 608, 612, 613) with a median, longitudinal orange or orange-brown streak in apical half; sensory area on clava (Figs 605, 611, 618, 619) not reaching more than 0.4X along clava 20
- Fore wing hyaline (e.g. Figs 624, 633, 640, 657 666) or weakly infuscate (Figs 655, 657, 677) without a discernible median, longitudinal orange or orange-brown streak in apical half; sensory area on clava reaching at least 0.45X along clava (e.g. Figs 622, 634, 639. 658, 664, 678) 22

20 (19) Hind femur white in basal half contrasting with dark brown apical half; last tergite of gaster not longer than mid tibia; ovipositor less than 1.5X as long as mid tibia and

more than 3X as long as gonostylus, exserted part about one-third as long as mid tibial spur ..... *fidenas* **sp.nov.** (p. 243)

- Hind femur mostly white or pale orange, slightly darker towards apex, sometimes margined pale brown; last tergite of gaster at least 1.1X as long as mid tibia; ovipositor more than 1.5X as long as mid tibia and less than 3X as long as gonostylus (Fig. 615), exserted part at least two-thirds as long as mid tibial spur 21

21 (20) Antenna (Fig. 611)with funicle segments relatively short so that clava is at least as long as F2-F6 combined; clava relatively enlarged so sensory area is at least 0.9X as long as ventral surface of clava and reaching more than 0.35X along ventral surface ..... *miklo* **sp.nov.** (p. 245)

- Antenna (Figs 618, 619) with funicle segments relatively longer so that clava is at most about as long as F3-F6 combined; clava relatively slender so that sensory is less than 0.7X as long a ventral surface of clava and not more than 0.3X along ventral surface ..... *lamus* **sp.nov.** (p. 247)

22 (19) Scape mostly dark brown 23

- Scape mostly yellow or pale orange 27

23 (22) Scape (Fig. 622) strongly broadened and flattened, about 2.5X as long as broad .... *varablus* **sp.nov.** (p. 249)

- Scape (Figs 625, 631, 634, 639) slightly broadened, at least 3X as long as broad 24

24 (23) Funicle (Fig. 625) with linear sensilla on F2-F6; head not more than 3.8X as broad as frontovertex; hind tibia with less than apical one-quarter yellow .... *myndus* **sp.nov.** (p. 251)

- Funicle (Figs 631, 634, 639) with linear absent from F2-F3, at most present on F4-F6; head at least 3.9X as wide as frontovertex; hind tibia with more than apical one-quarter yellow 25

25 (24) Fore wing (Fig. 633) not more than about 2.5X as long as broad .... *rosea* **sp.nov.** (p. 253)

- Fore wing (Figs 636, 640) at least about 2.65X as long as broad 26

26 (25) Funicle (Fig. 634) with linear sensilla on F4-F6; clava slightly shorter than funicle; syntergum about 1.4X as long as mid tibia; ovipositor about 2X as long as mid tibia with gonostylus about 2X as long as mid tibial spur, exserted part of ovipositor about 0.7X as long as mid tibial spur ..... *salome* **sp.nov.** (p. 255)

- Funicle (Fig. 639) with linear sensilla absent from F4, present only on F5-F6; clava slightly longer than funicle; syntergum about as long as mid tibia; ovipositor less than 1.5X as long as mid tibia and with gonostylus about 1.3X as long as mid tibial spur, exserted part of ovipositor about 0.2X as long as mid tibial spur .... *loresa* **sp.nov.** (p. 257)

27 (22) Scape less than 4.2X as long as broad (usually not more than 4.0X) 28

- Scape more than 4.3X as long as broad (usually at least 4.5X) 29

28 (27) Scutellum (Fig. 648) without a subapical tuft of setae; clava (Fig. 647) shorter than funicle; fore wing (Fig. 645) hyaline; hind femur proximally white to pale orange, dark brown in at least apical half ..... *onestas* **sp.nov.** (p. 259)

- Scutellum (Fig. 653) with a distinct, but short apical tuft of setae; clava (Fig. 650) slightly longer than funicle; fore wing (Fig. 655) weakly infuscate below marginal and stigmal veins, the infuscation extending across wing; hind femur white to pale orange, brown at extreme apex only ..... *mirabel* **sp.nov.** (p. 262)

29 (27) Fore wing (Fig. 657) with area beneath marginal vein infuscate ..... *mantua* **sp.nov.** (p. 264)
- Forewing (Figs 666, 670, 674, 677) completely hyaline 30

30 (29) Hind femur white with apical half dark brown ..... *hamadryas* **sp.nov.** (p. 265)
- Hind femur white to pale orange 31

31 (30) Scutellum with a distinct subapical tuft of setae; clava longer than F2-F6 combined (Fig. 675); head width greater than flagellum length ..... *mardor* **sp.nov.** (p. 268)
Scutellum without a subapical tuft of setae; funicle segments relatively elongate so that clava is shorter than F2-F6 combined (Fig. 678); head width less than flagellum length ..... *extillus* **sp.nov.** (p. 270)

32 (1) Mesopleuron white with an incomplete, submedian, vertical brown stripe (Hab. 101, 102, 103) 33
- Mesopleuron sometimes white or pale orange, but never with a vertical brown stripe 35

33 (22) Scape (Fig. 681) not more than 2X as long as broad ..... *racidia* **sp.nov.** (p. 272)
- Scape (Fig. 684, 687) at least 3X as long as broad 34

34 (23) Temple and gena with a distinct diagonal dark brown stripe; scape (Fig. 684) about 4X as long as broad; clava much shorter than funicle; apex of fore wing (Fig. 683) with a subtriangular hyaline area ..... *miranda* **sp.nov.** (p. 274)
- Temple and gena with at most a very faint brown stripe; scape (Fig. 687) about 3X as long as broad; clava longer than pedicel and funicle combined; apex of fore wing (Fig. 685) without a subtriangular hyaline area, infuscate area of wing curved and subparallel to apical margin ..... *scolopax* **sp.nov.** (p. 276)

35 (32) Fully winged forms only, fore wing (Figs 692, 700, 705, 711, 715, 725) with apical hyaline area connected to hyaline post venational streak by a narrow hyaline strip along anterior wing margin (fully winged forms only) 36
- Either fully winged forms without a narrow hyaline strip along anterior margin of fore wing between apex of venation and wing apex (e.g. Figs 730, 746, 801, 810,834, 997, 1030, 1108) or brachypterous forms (Figs 966, 980, 986, 998, 1006) 41

36 (35) Head at least about 9X as wide as frontovertex (Fig. 695)..... 37
- Head at most about 7X as wide as frontovertex (Figs 707, 708, 716, 720, 729) 38

37 (36) Funicle completely white (Fig. 693) ..... *genys* **sp.nov.** (p. 278)
- Funicle mixed pale yellow and dark brown (Fig. 699) ..... *fabius* **sp.nov.** (p. 281)

38 (36) Antenna (Figs 703, 709) with scape more than 4X as long as broad; pedicel and flagellum uniformly brown, or at most with F5 and F6 partially orange 39
- Antenna (Figs 718, 722) with scape less than 3X as long as broad; pedicel white to pale orange with a dark brown dorsal stripe, most funicle segments partially pale orange, clava dark brown 40

39 (38) Head and thorax mostly pale orange, mesoscutum (Fig. 702) with a transverse, median pale brown band with a very weak metallic blue and purple sheen ..... *nintra* **sp.nov.** (p. 283)
- Head (Fig. 708) and thorax (Fig. 710) dark brown to black mostly with a metallic dark blue-green sheen ..... *santaros* **sp.nov.** (p. 286)

40 (38) Mouth margin (Fig. 716) dark brown; interantennal prominence clothed in sparse, inconspicuous silvery setae ..... *simus* **sp.nov.** (p. 288)

- Mouth margin (Fig. 720) pale orange; interantennal prominence clothed in relatively dense, conspicuous silvery setae ..... *marcius* **sp.nov.** (p. 290)

41 (35) Scape (e.g. Figs 727, 731, 739, 749, 792, 805, 827, 830, 66, 893, 930) largely white with a dark brown area at apex on internal surface that extends part way along dorsal margin towards base, ventral margin narrowly dark brown from base nearly to apex, not marked orange or hardly so; scape not less than 2.8X and never more than 5.2X as long as broad; pedicel usually completely dark brown, but sometimes mostly dark brown with pale-brown or off-white areas, never partly orange 42
- Scape (e.g. Figs 937, 960, 977, 990) completely orange, or virtually completely pale orange, or pale orange with a complete brown streak on inner surface that contrasts with pale orange remainder; scape from less than 2.5X to more than 6X, as long as broad; pedicel never completely dark brown, always with paler areas, often pale orange, or pale yellow or orange with a dark brown dorso-lateral stripe or brown with only apex or venter orange 72

42 (41) Area between scrobe and eye with deep continuous polygonally reticulate sculpture, without any completely smooth area (Fig. 729) ..... *castalia* **sp.nov.** (p. 293)
- Area between scrobe and eye largely completely smooth and shiny without sculpture, contrasting with conspicuous sculpture on frontovertex and gena (e.g. Figs 735, 747, 752, 775, 785) 43

43 (42) Hind coxa brown and more or less concolorous with femur 44
- Hind coxa clearly paler than femur and contrasting, completely white to very pale orange, occasionally with a small pale brown area ventrally, femur usually brown, but occasionally orange-brown 52

44 (43) Fore wing (Fig. 734, 737, 746) with an infuscate area immediately below distal part of submarginal vein 45
- Fore wing (e.g. Figs 751, 758, 766, 770, 775) with area immediately below distal part of submarginal vein hyaline 47

45 (44) Ovipositor slightly exserted, the exserted part at least nearly half as long as mid tibial spur, gonostylus a little longer than mid tibial spur; infuscate area below parastigma (Fig. 734) not enclosing any setae, although there may be a few inconspicuous, pale setae distad of this ..... *dipsas* **sp.nov.** (p. 295)
- Ovipositor not exserted, gonostylus about half as long as mid tibial spur; infuscate area below parastigma(Figs 737, 746) enclosing some dark setae 46

46 (45) Infuscate area below parastigma (Fig. 737) enclosing not more than 5 setae; mesoscutum with setae virtually reaching posterior margin ..... *medusa* **sp.nov.** (p. 297)
- Infuscate area below parastigma (Fig. 746) enclosing at least 10 dark brown setae; posterior two-fifths or so of mesoscutum devoid of setae apart from a pair of long submedian setae ..... *amadeus* **sp.nov.** (p. 300)

47 (44) Head (Fig. 752, 756) at least 5.8X as wide as frontovertex 48
- Head (Fig. 760, 774, 783) not more than 5.7X as wide as frontovertex 49

48 (47) Rough sculpture immediately above antennal scrobes carinately delimited and forming a strong angle at top of scrobes (Fig. 752); marginal vein of fore wing (Fig. 750) about as long as apical seta of postmarginal vein ..... *grimus* **sp.nov.** (p. 302)
- Rough sculpture immediately above scrobes not carinately delimited and forming a more or less straight line across top of scrobes (Fig. 756); marginal vein of fore wing (Fig. 759) at least about 2X as long as apical seta of postmarginal vein .... *herxius* **sp.nov.** (p. 304)

49 (47) Marginal vein of fore wing (Fig. 762) only about as long as seta at end of postmarginal vein; apical part of fore wing (Fig. 766) distad of venation relatively longer, more than 0.4X overall length of wing; ovipositor (Fig. 763) with apical extension on semicircular sheet at proximal part of second valvifer narrowly subrectangular or subtriangular ..... *seius* **sp.nov.** (p. 307)
- Marginal vein of fore wing at least 1.5X as long as seta at end of postmarginal vein; apical part of fore wing distad of venation, not more than 0.4X overall length of wing; ovipositor (Fig. 767, 777, 782) with apical extension on semicircular sheet of second valvifer filamentous 50

50 (49) Antenna (Fig. 768) more slender, combined length of pedicel and funicle greater than head width, F1 about 2X as long as broad and F5 longer than broad; OCL greater than AOL ..... *moloch* **sp.nov.** (p. 309)
- Antenna (Figs 772, 781) with combined length of pedicel and funicle less than head width, F1 about 1.5X as long as broad, F5 transverse; OCL not greater than AOL 51

51 (50) Fore coxa completely white, without dusky or brown areas ..... *poeana* **sp.nov.** (p. 311)
- Fore coxa at least partially brown ..... *oshtan* **sp.nov.** (p. 314)

52 (43) Fore wing with not more than 4 setae below proximal part of parastigma (Figs 788, 798, 801) 53
- Fore wing (e.g. Figs 810, 812, 867, 880, 920, 933) with at least 8, sometimes very pale, setae forming a group below proximal part of parastigma, this often connecting to most posterior part of delta formed by dark, bristle-like setae along proximal margin of linea calva below distal part of submarginal vein 55

53 (52) Clava entire (Fig. 790); scape less than 3.5X as long as broad; posterior two-thirds of mesoscutum (Fig. 786) with conspicuous piliferous punctures that are separated by much less than their own diameters..... *munda* **sp.nov.** (p. 317)
- Clava 3-segmented (Figs 792, 801); scape more than 3.5X as long as broad; mesoscutum (Fig. 797) without conspicuous piliferous punctures; 54

54 (53) Antenna (Fig. 792) with F2-F6 transverse; sculpture on mesoscutum (Fig. 797) similar to that on scutellum so that they are of similar appearance; fore wing (Fig. 798) about 2.3X as long as broad, with apex completely infuscate; frontovertex with at least about 24 setae medially between anterior ocellus and top of scrobes (Fig. 796) ..... *varus* **sp.nov.** (p. 319)
- Antenna (Fig. 799) with only F5-F6 transverse; mesoscutum with distinctly shallower sculpture than that on scutellum and thus more shiny; fore wing (Fig. 801) at least 2.7X as long as broad, with a small, triangular hyaline area at apex; frontovertex (Fig. 803) with at most about five setae medially between anterior ocellus and top of scrobes ..... *iphigenes* **sp.nov.** (p. 322)

55 (52) Fore wing (Fig. 810) slender, at least 3.2X as long as broad; scrobes (Fig. 807) not sharply margined ..... *solon* **sp.nov.** (p. 324)
- Fore wing (e.g. Figs 814, 825, 857, 890, 921) not more than about 3X as long as broad; scrobes (e.g. Figs 815,822, 860, 885, 926) sharply margined 56

56 (55) Head (Fig. 815) at least 10X as wide as frontovertex which is not wider than diameter of anterior ocellus; fore coxa orange-brown ..... *pometia* **sp.nov.** (p. 327)
- Head (e.g. Figs 822, 833, 847, 885, 911) not more than 7X as wide as frontovertex which is at least about 2X as wide as diameter of anterior ocellus; fore coxa white 57

57 (56) Ovipositor very strongly exserted, the exserted part at least 1.5X as long as mid tibia .... *genua* **sp.nov.** (p. 329)
- Ovipositor hidden to moderately exserted, the exserted part less than 0.5X as long as mid tibia 58

58 (57) Funicle (Fig. 827) with F3 and F4 completely white or yellow .... *goldus* **sp.nov.** (p. 331)
- Funicle with F3 and F4 dark brown (e.g. Figs 859, 871, 893) or at least F3 yellow partially marked brown (e.g. Fig. 830, 844, 855, 914) 59

59 (58) Funicle (Fig. 830) with F4 completely pale yellow; ovipositor moderately exserted with exserted part more than 0.4X as long as mid tibia ..... *aliphera* **sp.nov.** (p. 334)
- Funicle with F4 dark brown or at least partially marked brown, or, if F4 appears to be completely yellow (some inconspicuous dark setae dorsally towards apex) then exserted part of ovipositor is less than 0.25X as long as mid tibia 60

60 (59) Fore wing (Fig. 834, 850, 853, 857) with a distinct and relatively large, subtriangular, hyaline area at apex, at least slightly wider at wing margin than length of marginal vein 61
- Fore wing (e.g. Figs 862, 875, 890, 902, 933, without a subtriangular apical, hyaline area or with only a relatively small or poorly defined area that at apical wing margin is much less wide than length of marginal vein 63

61 (60) Antenna with linear sensilla present on F1 (Fig. 836) ..... *mago* **sp.nov.** (p. 336)
- Antenna without linear sensilla on F1 (Figs 840, 841, 844, 855)..... 62

62 (61) Antenna (Figs 840, 841, 844) with at least F5 and F6 transverse; exserted part of ovipositor shorter than mid tibial spur, gonostylus less than 1.2X as long as mid tibial spur ..... *mckenziei* **sp.nov.** (p. 339)
- Antenna (Fig. 855) with all funicle segments longer than broad, F6 subquadrate; exserted part of ovipositor much longer than mid tibial spur; gonostylus more than 1.5X as long as mid tibial spur ..... *origo* **sp.nov.** (p. 342)

63 (60) Scape (Fig. 859, 866) less than 3.2X as long as broad; head (Fig. 860) never longer than broad in facial view 64
- Scape (e.g. Figs 871, 878, 908, 930) at least 3.5X as long as broad; head usually longer than broad in facial view (e.g. Figs 877, 883, 897, 910) 65

64 (63) Frontovertex with a distinct metallic green sheen; mesoscutum (Fig. 861) narrowly orange anteriorly and largely with fine, elongate, lineolate sculpture, strongly contrasting with more regular, polygonally reticulate sculpture posteriorly .... *argos* **sp.nov.** (p. 344)
- Frontovertex with a weak brassy sheen; mesoscutum (Fig. 868) entirely dark brown and with fairly uniform, fine, polygonally reticulate sculpture .... *feritas* **sp.nov.** (p. 347)

65 (63) Mid tibial spur dark brown contrasting with white basitarsus; mid femur orange-brown, without any white areas proximally; mesoscutum (Fig. 873) uniformly dark brown with fine, longitudinally striate to striate-reticulate sculpture in anterior half .... *paean* **sp.nov.** (p. 349)
- Mid tibial spur yellow, more or less concolorous with basitarsus; mid femur largely white, normally with at least proximal half white; mesoscutum either entirely dark brown with fairly uniform polygonally reticulate sculpture (Fig. 927), or dark brown with orange or orange-brown areas (Figs 882, 884, 892, 906) the paler areas having obliquely elongate, coarse, striate-reticulate sculpture 66

66 (65) Fore wing (Fig. 880) with an infuscate area below proximal part of parastigma; gonostylus (Fig. 881) at least about 2X as long as mid tibia spur .... *bion* **sp.nov.** (p. 352)
- Fore wing without an infuscate area below parastigma (e.g. Figs 890, 895, 902, 920); gonostylus (e.g. Figs 887, 896, 903, 935) at most about as long a mid tibial spur 67

67(66) Anterior half or so of mesoscutum (Figs 884, 892) matt orange contrasting with posterior half which is dark brown with a distinct dark blue and purple sheen especially along posterior margin 68
- Mesoscutum uniform dark brown (Fig. 927) with a weak metallic lustre, occasionally anterior areas mixed dark orange (Fig. 906, 932)..... 69

68 (67) Gaster orange-brown with syntergum orange and with a weak metallic sheen .... *zephyrus* **sp.nov.** (p. 354)
- Gaster entirely dark brown with a moderate metallic sheen ..... *pherus* **sp.nov.** (p. 356)

69 (67) Antenna (Figs 908, 912, 913, 914) with clava enlarged, at least about 3X as wide as pedicel and either as long as scape or at least slightly longer than F3-F6 combined; sensory area of clava (truncate part) at least 1.25X as long diameter of F6 .... *lydia* **sp.nov.** (p. 358)
- Antenna (Fig. 915, 925, 930, 931) with clava relatively smaller, at most 2.5X as wide as pedicel and either clearly shorter than scape or not longer than F3-F6 combined; sensory area of clava usually much shorter than diameter of F6, occasionally as much as 1.1X 70

70 (69) Ovipositor not exserted or hardly so, the exserted part less than 0.3X length of mid tibial spur, gonostylus (Fig. 916) less than 0.8X as long as mid tibia spur .... *parnisa* **sp.nov.** (p. 361)
- Ovipositor clearly exserted, the exserted part at least 0.4X length mid tibial spur, gonostylus (Figs 924, 934, 935) at least as long as mid tibial spur 71

71 (70) Antenna (Fig. 925) with funicle segments not unicolorous, F5 and F6 dark brown and at least F2-F3 marked with some dusky yellow; proximal funicle segments less slender and uniformly increasing in width distally, F3 usually not more than 1.5X as long as broad; head (Fig. 926) in facial view with the gena more convergent above level of lower torular margins ..... *horocles* **sp.nov.** (p. 363)
- Antenna (Figs 930, 931) with funicle segments unicolorous dark brown without any segments marked dusky yellow; proximal funicle segments slender with F4-F6 much wider, F3 usually at least about 2X as long as broad; head (Fig. 928) in facial view with gena less convergent above level of lower torular margins ....*longisetaceus* De Santis (p. 366)

72 (41) Mouth margin completely yellow or pale orange below and between toruli; dorsal part of interantennal prominence sometimes connected to frontovertex, but always rounded, never carinate; includes brachypterous forms 73
- Mouth margin dark brown below and between toruli or with a subparallel, curved brown line connecting lower margins of toruli, in rare cases (some *fautrix* and perhaps *amethes*) where the mouth margin is yellow, the dorsal part of the interantennal prominence has a longitudinal carinate ridge that connects narrowly with frontovertex; no brachypterous forms known 88

73 (72) Scape (Figs 937, 940, 947, 952, 960, 967, 969) relatively stout, sometimes broadened and flattened, not more than about 5X as long as broad 74
- Scape (e.g. Figs 974, 977, 995, 999, 1008, 1014, 1034) slender and subcylindrical, at least about 6X as long as broad 80

74 (73) Ovipositor strongly exserted, the exserted part at least about 4X as long as mid tibial spur ..... *numida* **sp.nov.** (p. 368)
- Ovipositor less strongly exserted, the exserted part not more than about as long as mid tibial spur 75

75 (74) Scape (Fig. 940) less than 3X as long as broad; clava at least as long as funicle .... *aunes* **sp.nov.** (p. 370)
- Scape (Figs 947, 952, 960, 967, 969) more than 3X as long as broad; clava clearly shorter F2-F6 combined 76

76 (75) Clava with apex pale yellow to pale orange (Fig. 947, 952), clearly paler than distal dark brown funicle segments, concolorous or paler than proximal funicle segments 77
- Clava uniformly dark brown (Fig. 960, 967, 969), concolorous with distal dark brown funicle segments, darker than paler proximal funicle segments 78

77 (76) Clava (Fig. 947) brown, with only apical segment dusky orange and not paler than proximal funicle segments; funicle with linear sensilla present at most on F4-F6 . ..... *elegans* (Dalman) (p. 372)
- Clava (Fig. 952) proximally brown with at least two apical segments white or pale yellow, clearly paler than proximal funicle segments; funicle with linear sensilla present on F3-F6 ..... *tainus* Trjapitzin & Triapitsyn (p. 374)

78 (76) Ventral margin of scape (Fig. 960) distinctly marked brown in proximal 0.6X; gonostylus pale yellow with apex broadly brown ..... *leda* **sp.nov.** (p. 377)
[Only fully winged forms known]
- Scape uniformly pale orange (Figs 967, 969); gonostylus uniform pale yellow or pale orange 79
[Only brachypterous forms known]

79 (78) Frontovertex with fewer than 10 setae in front of anterior ocellus, excluding those along inner eye margins; frontovertex clearly narrower than an eye in facial view; eye about 2.2X as long as malar space; scutellar tuft not more than 0.5X as long as scutellum (Fig. 965)..... *luceres* **sp.nov.** (p. 379)
Frontovertex (Fig. 968) with more than 30 setae in front of anterior ocellus, excluding those along inner eye margins; frontovertex at least as wide as an eye in facial view; eye about 2.7X as long as malar space; scutellar tuft at least about 0.7X as long as scutellum(Fig. 971) ..... *perses* **sp.nov.** (p. 381)

80 (73) Funicle (Figs 974, 977, 990, 995) with at least two white segments contrasting with dark brown remainder 81
- Funicle (Figs 999, 1003, 1008, 1013, 1014, 1023) uniformly dark brown, occasionally some proximal segments partly pale orange to dark orange-brown 84

81 (80) Mesoscutum (Fig. 976) mostly or entirely dark brown 82
- Mesoscutum (Fig. 982) entirely pale orange 83

82 (81) Funicle (Fig. 974) with proximal segments white or marked with white, distal segments dark brown ..... *albinotatus* De Santis (p. 383)
- Funicle (Fig. 977) with distal segments white or marked with white, proximal segments dark brown ..... *dymorus* **sp.nov.** (p. 384)

83 (81) Antenna (Fig. 990) with F4-F6 completely white; funicle segments relatively shorter so that F3 is subquadrate and pedicel and funicle combined are about as long as width of head; head (Fig. 991) at least about 1.35X as high as wide; fully winged forms

(Fig. 987) with parastigma only moderately curved downwards so that widest part of costal cell is not more than 1.5X as wide as parastigma .... *glycon* **sp.nov.** (p. 386)

- Antenna (Fig. 995) with F4-F6 white to pale yellow, F4 always partially marked brown or orange-brown; funicle segments relatively long so that F3 is at least about 2X as long as broad and pedicel and funicle combined are more than 1.1X as long as width of head; head (Fig. 996) not more than about 1.2X as high as wide; fully winged forms(Fig. 997) with parastigma strongly curved downwards so that widest part of costal cell is very nearly 3X as wide as parastigma .... *meryae* **sp.nov.** (p. 389)

84 (80) Funicle segments (Figs 999, 1003) gradually increasing in width distad so that neither F4 or F5 are wider than F6 and at least a little narrower than clava..... 85

- Funicle segments (Figs 1008, 1013, 1014, 1023) with F4 or F5 are broadest and at least as wide as F6 or clava or a little wider 86

85 (84) Head width (Fig. 1000) at least 1.1X length of funicle; ovipositor clearly exserted, the exserted part nearly as long as mid tibial spur; mid tibia pale orange .... *zeno* **sp.nov.** (p. 391)

- Head width (Fig. 1001) less than length of funicle; ovipositor not exserted or hardly so; mid tibia dark brown ..... *cupreicollis* Ashmead (p. 393)

86 (84) Ovipositor well exserted with exserted part at least about as long as mid tibial spur; mid tibia less than 2X as long as gonostylus; propodeum with setae present on side and submedially; only brachypterous form known ..... *repola* **sp.nov.** (p. 395)

- Ovipositor slightly exserted with exserted part not more than about half as long as mid tibial spur; mid tibia at least 3X as long as gonostylus; propodeum with setae present only on side near spiracle; only fully winged form known 87

87 (86) Hind coxa concolourous with fore coxa, white or pale-yellow; apex of clava conspicuously asymmetric (Fig. 1013, 1014) ..... *compressicornis* (Ashmead) (p. 397)

- Hind coxa dark orange-brown contrasting with pale-orange fore coxa; apex of clava symmetrically rounded (Fig. 1023) ..... *leone* **sp.nov.** (p. 399)

88 (72) Clava longer than funicle (Fig. 1027, 1034, 1041, 1045, 1053) 89

- Clava not longer than funicle (e.g. Figs 1060, 1062, 1075, 1092, 1106, 1120, 1152) 93

89 (78) Scape (Figs 1027, 1034) less than 2X as long as broad; costal cell virtually naked, but with a few setae ventrally in proximal one-third 90

- Scape (Fig. 1041, 1045, 1053) more than 2X as long as broad; costal cell with a complete line of setae ventrally, at most narrowly interrupted in distal half 91

90 (89) Clava (Fig. 1027) longer than pedicel and funicle combined; head not more than 6X as wide as frontovertex; F6 mostly pale orange, clearly paler than clava and not darker than other funicle segments ..... *betes* **sp.nov.** (p. 401)

- Clava (Fig. 1034) very slightly shorter than pedicel and funicle combined; head (Fig. 1035) at least 8X as wide as frontovertex; F6 dark brown, concolourous with clava and clearly darker than other funicle segments ..... *diaces* **sp.nov.** (p. 403)

91 (89) Posterior half of mesoscutum pale orange-brown with a weak metallic sheen and hardly contrasting with anterior half ..... *ariston* **sp.nov.** (p. 406)

- Posterior half of mesoscutum dark brown with a distinct metallic sheen, contrasting strongly with anterior half 92

92 (91) Fore wing (Fig. 1044) below parastigma with a group of about 15 pale setae not arranged in lines, but which continue in a single line along cubital vein towards based of wing; mesoscutum with only anterior half pale orange contrasting with dark brown posterior half ..... *jeroba* **sp.nov.** (p. 408)
- Fore wing (Fig. 1050) below parastigma with a line of 5 or 6 dark setae which continues towards base of wing along cubital vein; mesoscutum (Fig. 1052) with anterior two-thirds pale orange contrasting with dark brown posterior one-third .... *letos* **sp.nov.** (p. 410)

93 (88) Clava (Figs 1060, 1062) with sensory part reaching more than half-way along its ventral surface 94
- Clava (e.g. Figs 1072, 1075, 1081, 1092, 1106, 1120, 1152) with sensory part not reaching half-way along its ventral surface 95

94 (93) Head (Fig. 1056) about 5X as wide as frontovertex ..... *cero* **sp.nov.** (p. 413)
- Head (Fig. 1066) at least 10X as wide as frontovertex ..... *finator* **sp.nov.** (p. 415)

95 (93) Scape (Figs 1072, 1073, 1075) at least 3.3X as long as broad 96
- Scape (e.g. Figs 1081, 1088, 1096, 1104, 1106, 1131, 1152,) less than 3.3X as long as broad 97

96 (95) Head (Fig. 1067) not more than 6X as wide as frontovertex; interantennal prominence clothed with conspicuous dense setae arranged in 3 or 4 lines on either side .... *idifex* **sp.nov.** (p. 418)
- Head more than 8X as wide as frontovertex; interantennal prominence clothed with inconspicuous sparse setae arranged in 1 or 2 lines on either side .... *orbona* **sp.nov.** (p. 420)

97 (95) Mesoscutum (Fig. 1080, 1087) without a distinct brown band in posterior half, completely orange or with posterior half very slightly dusky orange with a weak metallic sheen 98
- Mesoscutum (e.g. Figs 1095, 1100, 1105, 1121, 1129) in posterior half, with a distinct, complete, brown band with a distinct metallic sheen 99

98 (97) Posterior half of mesoscutum orange (Fig. 1080) without a noticeable metallic sheen and very few silvery setae; clava (Fig. 1081) with a weak truncation with sensory part extends only about 0.15X along ventral surface ..... *fautrix* **sp.nov.** (p. 422)
- Posterior half of mesoscutum (Fig. 1087) dusky orange with a weak metallic blue and purple sheen and clothed in dense silvery setae; clava (Fig. 1088) with a relatively strong truncation with sensory part reaching at least 0.3X along ventral surface .. .. *aesernia* **sp.nov.** (p. 425)

99 (97) Ventral surface of costal cell (Figs 1093, 1101, 1108) with complete line of setae that are evenly spaced and separated by much less than their own lengths 100
- Ventral surface of costal cell (e.g. Figs 1112, 1115, 1126, 1130, 1139, 1147, 1159) in many cases virtually naked, but mostly with line of setae broadly interrupted above parastigma and frequently separated by more than their own lengths 103

100 (99) Head (Figs 1091, 1094, 1097) at least 5.5X as wide as frontovertex 101
- Head not more than 5X as wide as frontovertex 102

101 (100) Scrobal margin (Figs 1091, 1094) generally sharp, carinate below eye; scape (Fig. 1092) about 2.5X as long as broad; sensory area extending about half way along ventral surface of clava; anterolateral surface of propodeum anterior to spiracle with distinct, polygonally reticulate sculpture ..... *gyges* **sp.nov.** (p. 427)

- Scrobal margin (Fig. 1097) rounded; scape (Fig. 1096) about 3.2X as long as broad; sensory area of clava extending not more than one-third along ventral surface; anterolateral surface of propodeum anterior to spiracle devoid of sculpture .... *lexovus* **sp.nov.** (p. 429)

102 (100) Fore wing (Fig. 1101) with line of setae below proximal part of parastigma completely separate from group forming proximal margin of linea calva; hyaline area at apex of fore wing smaller, extending into wing disc for a distance less than length of marginal vein; scape (Fig. 1104) about 2.5X as long as broad .... *numitor* **sp.nov.** (p. 432)
- Fore wing (Fig. 1108) with line of setae below proximal part of parastigma connected to group forming proximal margin of linea calva by several scattered setae; hyaline area at apex of fore wing larger and extending into wing disc a distance more than length of marginal vein; scape (Fig. 1106) about 3X as long as broad .... *mora* **sp.nov.** (p. 434)

103 (99) Scape (Figs 1111, 1120) less than 2.4X as long as wide 104
- Scape (Figs 1125, 1131, 1132, 11424, 1146, 1152, 1158) more than 2.4X as long as wide 105

104 (103) Scape (Fig. 1111) less than 2X as long as broad; clava with sensory area relatively small, not reaching more than 0.2X along its ventral surface .... *ceiba* **sp.nov.** (p. 436)
- Scape (Fig. 1120) more than 2X as long as broad; clava with sensory part large and reaching at least 0.3X along its ventral surface ..... *nasica* **sp.nov.** (p. 439)

105 (103) Head (Figs 1123, 1127, 1137) at least 7.5X as wide as frontovertex 106
- Head Figs 1133, 1153) not more than 6.5X as wide as frontovertex 108

106 (105) Antenna (Fig. 1125) with F6 mostly pale orange, contrasting with dark brown clava; interantennal prominence (Fig. 1123) dorsally keel-like but not connected to frontovertex ..... *alopes* **sp.nov.** (p. 441)
- Antenna (Figs 1131, 1132) with F6 dark brown and more or less concolourous with clava; interantennal prominence (Fig. 1127, 1137) dorsally keel-like and connected to frontovertex 107

107 (106) Head (Fig. 1127) about 7.7-8X as wide as frontovertex; antenna (Fig. 1131) with scape more than 3X as long as broad and funicle largely pale orange contrasting with dark brown clava; gaster largely pale orange with Gt1-Gt3 dark brown with a moderate metallic sheen, extreme apex of syntergum dark brown .... *janzeni* **sp.nov.** (p. 444)
- Head (Fig. 1137) about 10-11.5X as wide as frontovertex; antenna (Fig. 1132) with scape less than 3X as long as broad and flagellum unicolourous dark brown; gaster entirely dark brown with a strong to moderate metallic sheen .... *dirce* **sp.nov.** (p. 446)

108 (105) Head (Fig. 1144) with area between eye and scrobe hardly wider than diameter of anterior ocellus; scrobes sharply margined below eye 109
- Head (Fig. 1153) with area between eye and scrobe about 2X as wide as diameter of anterior ocellus; scrobes with rounded margin below eye 110

109 (108) Hyaline area at apex of fore wing (Fig. 1139) very extensive, extending along wing margin for most of the apex or more than 3X the length of the marginal vein; anterior half or so of mesoscutum (Fig. 1145) with fine striate sculpture; gonostylus (Fig. 1141) longer than mid tibial spur ..... *amethes* **sp.nov.** (p. 448)

- Hyaline area at apex of fore wing (Fig. 1147) very small, extending along wing margin for hardly more than length of marginal vein; anterior half of mesoscutum (Fig. 1150) composed of coarse striate-reticulate sculpture; gonostylus shorter than mid tibial spur ..... *metheus* **sp.nov.** (p. 451)

110 (108) Hyaline area on apical part of fore wing (Fig. 1155) not triangular but extending across most of the apex; mesoscutum (Fig. 1151) in anterior half with lineolate-reticulate to striate sculpture; clava (Fig. 1152) with sensory area relatively large, reaching at least 0.3X along its ventral surface ..... *omorus* **sp.nov.** (p. 453)
- Hyaline area on apical part of fore wing (Fig. 1159) more or less triangular and confined to extreme apex; mesoscutum in anterior two-thirds with fine striate sculpture; clava (Fig. 1158) with sensory area relatively small, not reaching 0.2X along its ventral surface ..... *nebucha* **sp.nov.** (p. 455)

Cheiloneurus magnolia **sp.nov.**
(Figs 498-505; Hab. ♀ 79)

DIAGNOSIS. *Female* (length about 1.0mm): body generally dark brown with a weak to moderate metallic sheen; posterior part of mesoscutum with translucent or silvery setae that contrast with dark brown anterior setae; fore wing (Fig. 499) infuscate across wing below marginal vein, apex weakly infuscate with a pair of opposite hyaline areas distad of venation, postmarginal and stigmal veins not connected by a naked, hyaline stripe; all coxae white; head (Fig. 498) 5-6X as wide as frontovertex; antenna (Fig. 502) with pedicel slightly shorter than F1-F3 combined; F1-F4 quadrate or transverse, F5-F6 longer than broad; linear sensilla on F5-F6; clava about as long as F2-F6 combined, with a very short, weak, oblique apical truncation; mandible with an acute lower tooth and a broad upper truncation; mesoscutum(Fig. 501) anteriorly with obliquely elongate, imbricate reticulate sculpture, polygonally reticulate near posterior margin; scutellum with longitudinally elongate, lineolate sculpture and with a weak tuft of setae medially; fore wing (Fig. 499) about 2.7X as long as broad; parastigma hardly downcurved; apex of stigmal vein with four campaniform sensilla; gaster (Fig. 504) with "glands" on Gt1 and Gt5, those on Gt1 continuous, not separate, those on Gt5 separated by about 0.2X their own lengths; syntergum slightly broader than long. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.02mm; excluding ovipositor, 0.95mm (CPD).

Head dark brown with a metallic sheen; occiput with a slight coppery purple sheen; frontovertex with a slight coppery purple sheen and a few metallic dark blue reflections; temple and gena with a strong metallic dark green sheen adjacent to eye margin, otherwise with a moderate coppery purple sheen; scrobal area with a moderate coppery purple sheen; setae on head dark brown; antenna (Fig. 502) with radicle dark brown; scape yellow, extreme base slightly dusky; pedicel yellow, slightly dusky dorsally towards base; funicle yellow; clava with basal segment yellow, apical segments pale brown; palpi white; thorax dark brown with a metallic sheen; pronotum with slight coppery purple sheen; anterior two-fifths of mesoscutum with a moderate coppery purple sheen, posterior three-fifths with a moderate metallic dark blue sheen, medially very narrowly violet, posterior margin coppery purple, metallic blue area clothed in relatively sparse, very conspicuous, silvery setae, remainder clothed in dark brown setae, tegula dark brown with a slight coppery sheen; axilla with a moderate coppery purple sheen; scutellum mostly matt with hardly a coppery purple sheen, extreme side and apex with a strong metallic dark green and coppery sheen, setae dark brown; metanotum with a slight coppery purple sheen; mesopleuron with a moderate coppery sheen; coxae white; femora mostly white, but extreme apex of hind femur narrowly brown; fore tibia and tarsus very pale orange; mid tibia white becoming very pale orange distally, spur and tarsus very pale orange; hind tibia white becoming very pale orange distally, extreme base very narrowly brown, tarsus very pale orange; fore wing (Fig. 499) weakly infuscate at extreme base and hyaline from base to level with proximal part of marginal vein and also in apical one-fifth, strongly infuscate immediately below marginal vein and generally infuscate distad of proximal part of marginal vein with a subrectangular hyaline area at apex of venation and another

opposite adjacent to hind margin, submarginal vein mostly pale orange otherwise venation brown; propodeum dark brown with a slight coppery purple and brassy sheen, side metallic dark green and coppery red, 2 pale brown or silvery setae outside spiracle; gaster mainly dark brown, dorsally with a slight coppery sheen with some coppery red and dark metallic green reflections, Gt1 dorsally mostly with a strong metallic dark blue-green sheen, side and venter of gaster with fairly strong metallic green, blue-green, coppery and coppery red reflections; gonostylus brown with apex orange.

Head (Fig. 498) in facial view about 6.3X as wide as frontovertex with gena convex and converging, in profile subtriangular and about 1.4X as high as deep, frontovertex fairly evenly curved from occipital margin to top of scrobes, strongly angled at top of scrobes and fairly straight to mouth margin, with interantennal prominence slightly protuberant; ocelli forming an angle of about 30°; inner eye margins converging anteriorly, narrowest part of frontovertex about midway between anterior ocellus and scrobes; frontovertex with a few scattered setae in ocellar area and a line of setae along eye margin, otherwise naked; a few scattered setae on lower gena and interantennal prominence; occipital margin sharp, not carinate; a very short, shallow groove present on eye margin between posterior ocellus and occipital margin; frontovertex with moderately deep, polygonally reticulate sculpture of mesh size much smaller than eye facet, area between eye and scrobe smooth and shiny ventrally; temple and upper gena completely smooth adjacent to eye, posterior areas with very shallow, longitudinally elongate, strigose to striate-reticulate sculpture; anterior part of lower gena with moderately deep, elongate, polygonally reticulate sculpture; scrobes with shallow, slightly elongate, polygonally reticulate sculpture, bottoms smooth; interantennal prominence with shallow, polygonally reticulate sculpture; narrowest part between eye and scrobal margin slightly less than diameter of anterior ocellus, scrobes moderately deep, meeting dorsally, well-defined but not sharply margined, broadly ∩-shaped, interantennal prominence dorsally rounded, without a median ridge; antenna as in Fig. 502; scape hardly broadened, broadest slightly below middle, about 5.0X as long as broad; funicle with F1 very slightly longer than broad, F2-F4 subequal and slightly transverse, F5-F6 slightly longer than broad, F6 longest; clava hardly broader than F6, slightly longer than F3-F6 combined, outer suture very slightly oblique, sensory area hardly enlarged, giving apex a very slight obliquely truncate appearance; eye reaching occipital margin, with extremely short, sparse, inconspicuous setae, each much shorter than diameter of facet; malar sulcus absent; clypeal margin medially emarginate. Relative measurements: HW 69, HH 65, FV 11, POL 5, OOL 0, OCL 11.5, AOL 10.5, EL 48.5, EW 44, MS 29, SL 35, SW 7.

Thorax (Fig. 501) with pronotum exposed behind head and about half as long as mesoscutum; pronotum with shallow, fine, imbricate-reticulate to polygonally reticulate sculpture that is about as deep as sculpture on frontovertex; mesoscutum mainly with fine polygonally reticulate sculpture that is a about as deep as that on pronotum, sculpture anteriorly slightly longitudinally elongate; axilla with polygonally reticulate sculpture that is of similar depth to that on mesoscutum; scutellum mostly with fine, slightly elongate polygonally reticulate sculpture that is clearly deeper than that on mesoscutum and more or less arranged in whorls, apex and extreme side mirror shiny and smooth; visible part of mesoscutum about 1.9X as broad as long; scutellum nearly 1.1X as broad as long, without a subapical tuft; hind femur about 4.2X as long as broad; fore wing with venation and setation as in Figs 499, 500; apex of stigmal vein with 4 campaniform sensilla; costal cell with 2 setae dorsally; apices of postmarginal and stigmal veins not connected by a naked, hyaline streak; mid tibia without a carina; propodeum (Fig. 501) medially about 0.13X as long as scutellum and smooth. Relative measurements: FWL 72, FWW 26.5; HWL 57, HWW 12.

Gaster with hypopygium reaching about 0.4X to apex; last tergite about 0.7X as long as mid tibia, with apex broadly angular; ovipositor exserted, the exserted part about 0.6X as long as mid tibial spur or 0.17X as long as mid tibia.

Paratype. Antenna with linear sensilla present only on F5-6; mandible with 1 tooth and a broad truncation; gaster (Fig. 504) with "glands" on Gt1 and Gt5, those on Gt1 continuous, not separate, those on Gt5 separated by about 0.2X their own lengths; hypopygium Fig. 505; ovipositor Fig. 503. Relative measurements: OL 62, GL 17 [MT 49].

Variation. Females vary in overall length from 0.92-1.02mm, the head varies from 5.7-6.3X as wide as the frontovertex and there may be 1 or 2 setae dorsally at apex of costal cell.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, 13km NE Dominical, RB Rio Magnolia, 9°20'N 83°47'W, 800m, 22-24.ii.2015 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Limón**, PN Cahuita, 9°43'N 82°49'W, 10m, 24.ii.2010 (J.S. Noyes). Holotype and paratype in NHMUK.

COMMENTS. The combination of infuscate fore wing and presence of "glands" on TI and TV of the gaster is unique in *Cheiloneurus*. It is also the only species of the genus that has a strongly infuscate fore wing but no obvious naked, hyaline streak connecting the apices of the postmarginal and stigmal veins.

Cheiloneurus vitara **sp.nov.**

(Figs 506-509)

DIAGNOSIS. *Female* (overall length about 0.8mm): body dark brown with a weak to moderate metallic sheen; posterior part of mesoscutum with only a few translucent, silvery setae that contrast with dark brown anterior setae; fore wing hyaline; fore coxa white; head about 3X as wide as frontovertex; antenna (Fig. 506) with pedicel nearly as long as F1-F4 combined; all funicle segments transverse; linear sensilla on F6 only; clava about as long as pedicel and funicle combined, apex rounded; mandible with 3 teeth, upper tooth truncate; mesoscutum (Fig. 507) with aciculate, longitudinally elongate, lineolate sculpture, some polygonally reticulate sculpture medially near posterior margin; scutellum with longitudinally elongate, lineolate sculpture; scutellum without a tuft of setae; fore wing (Fig. 509) about 2.4X as long as broad; parastigma not downcurved; stigmal vein with 3 campaniform sensilla at apex; gaster with "glands" on Gt1 and Gt5, those on Gt1 separated by about 1.1X their own lengths, those on Gt5 touching; syntergum broader than long. *Male*: unknown.

Female **(**holotype**)**: length, including ovipositor, 0.79mm; excluding ovipositor, 0.73mm (CPD).

Head dark brown to black with a weak metallic lustre; frontovertex coppery purple behind posterior ocelli, area around anterior ocellus dull, metallic dark blue mixed coppery purple, area above scrobes purple; temple and gena with a dull dark blue and coppery purple sheen, area immediately below lowest part of eye relatively shiny green; scrobal area coppery purple mixed metallic dark blue; a line of inconspicuous, brown setae along inner eye margin continuing below eye to gena and along position of malar sulcus; radicle brown; scape with proximal 0.6X dark brown, apex pale yellow; pedicel brown with venter and apex narrowly dusky pale yellow; F1-F5 dusky pale orange, F6 mostly very pale orange, mixed slightly dusky externally; clava brown; thorax dark brown to black; pronotum with a weak, coppery purple and brassy sheen; mesoscutum virtually matt, but with a very weak coppery purple and brassy sheen, mostly clothed with brown setae, but with 3 or 4 silvery setae on each side in posterior one-third; tegula dark brown; axilla similarly coloured to mesoscutum; scutellum matt black; mesopleuron with a weak, metallic blue, purple and brassy sheen; fore coxa white; fore femur white with a fairly broad, incomplete, brown, subapical band, tibia pale yellow with a broad, subbasal brown band, tarsus dusky pale yellow, apical tarsomere pale brown; mid coxa dark brown; mid femur white with a narrow, subapical brown band in distal half, tibia white with a narrow, subbasal brown band in basal half, spur and tarsus white; hind coxa dark brown; hind femur dark brown, narrowly white basally, tibia mostly dark brown with apices white, tarsus white with apical tarsomere brown; wings hyaline, venation pale yellow; propodeum dark brown with a weak brassy and purple sheen, side with a dull, metallic green sheen mixed coppery and brassy, outside spiracle with 2 or 3 inconspicuous brown setae; gaster dark purple-brown, dorsally with a coppery purple sheen, Gt1 mixed with a slight green sheen, side and venter with coppery, blue, brassy and green reflections; gonostylus

completely dark brown.

Head about 3.0X as wide as frontovertex, in profile about 1.3X as high as deep, tangent to frontovertex above scrobes forming an angle of about 75° with face below top of scrobes; a very small, oval depression adjacent to eye very near occipital margin; ocelli forming an angle of about 75°; frontovertex narrowest a little behind posterior ocelli, relatively dull, with relatively deep, polygonally reticulate to imbricate-reticulate sculpture, in ocellar area of mesh size a little larger than eye facet, subequal elsewhere; temple and gena with sculpture of similar depth to anterior part of frontovertex, but more longitudinally elongate imbricate-reticulate to polygonally reticulate; area immediately below lowest part of eye completely smooth; scrobes with relatively shallow, irregular, elongate sculpture; interantennal prominence and mouth margin with shallow, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, narrowly ∩-shaped; interantennal prominence dorsally indistinctly acute; antenna as in Fig. 506; scape slightly broadened and flattened, about 3.3X as long as broad; all funicle segments transverse, increasing in width distad, F1-F5 anelliform, F6 subquadrate, linear sensilla present only on F6; clava about as long as pedicel and funicle combined, sutures parallel, sensory area small, at apex only giving it a pointed or slightly rounded appearance; eye not reaching occipital margin, separated by at least about 2X diameter of facet, naked; malar sulcus partially present, weakly indicated medially; mandible tridentate, with 2 teeth and a truncate upper tooth. Relative measurements: HW 40, HH 30, FV 13.5, POL 5.5, OOL 1.5, OCL 5, AOL 5, EL 18, EW 19, MS 15, SL 16, SW 4.8.

Thorax (Fig. 507) with imbricate-reticulate to polygonally reticulate sculpture on pronotum that is about as deep as that in ocellar area; mesoscutum with very fine, aciculate, longitudinally elongate, polygonally reticulate to striate sculpture of silky appearance that is about as deep as sculpture on pronotum, posterior part with more rounded, polygonally reticulate cells; scutellum with slightly deeper, polygonally reticulate sculpture composed of rounded or very slightly longitudinally elongate cells, extreme side and apex completely smooth; setae on anterior part of mesoscutum about as dense as those on posterior part; scutellum without a distinct, subapical tuft of longer setae; visible part of mesoscutum about 1.9X as broad as long; scutellum about 1.2X as broad as long; fore wing with venation and setation as in Figs 508, 509; costal cell with 4 or 5 dorsal setae at apex. Relative measurements: FWL 113, FWW 47; HWL 79.5, HWW 20.

Gaster with hypopygium reaching about 0.6X towards apex; last tergite about as long as mid tibia, with apex virtually truncate; "glands" present on Gt1 and Gt5, those on Gt1 separated by about 1.1X their own lengths, those on Gt5 touching; ovipositor slightly exserted, the exserted part about 0.6X length of mid tibial spur or about 0.25X mid tibia. Relative measurements: OL 58.5, GL 13 [MT 64].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Limón**, RB Hitoy Cerere, 9°40'N 83°02'W, 100m, ii.2004 (J.S. Noyes). Holotype in NHMUK.

Cheiloneurus argentipes (Howard) comb.nov.

(Figs 510-525; Hab. ♀ 80-82)

Encyrtus argentipes Howard *in* Riley, Ashmead & Howard, 1894:95. Holotype ♀, St Vincent (WI), USNM, examined.
Zaomma argentipes (Howard), Ashmead, 1900:401.

DIAGNOSIS. *Female* (length about 0.7-1.2mm): specimens from lower, seasonally dry areas are generally smaller and paler than those originating from higher altitudes; head dark brown with a

blue to coppery purple sheen; interantennal prominence with a narrow, curved, purple, dark blue and green band between toruli, this continuing below torulus towards base of mandible; scape dark brown with apex narrowly white, occasionally almost completely pale orange; pedicel largely dark brown; funicle completely white or with F1-F5 very slightly dusky to pale brown, clava brown, sometimes paler medially; mesoscutum dark brown with silvery setae in posterior half contrasting with dark brown anterior setae; fore coxa varying from completely white to completely brown, other coxae dark brown, legs otherwise white to pale yellow with dark a brown bands on each femur and tibia; fore wing hyaline; head (Fig. 510) about 4-5.5X as wide as frontovertex; tangent of frontovertex forming an angle of about 85° with face; antenna (Figs 511-514) with scape about 3.3-3.6X as long as broad; pedicel about as long as F1-F3 combined or nearly as long; all funicle segments transverse, occasionally F1 or F6 quadrate; linear sensilla only on F6, sometimes also on F5 in larger specimens; clava at least a little longer than funicle, occasionally as long as pedicel and funicle combined, about 2-3.5X as long as broad, larger specimens with a relatively more slender clava (as in Fig. 514); sensory area on clava varying from small, at apex only, to fairly large and giving apex of clava a slightly obliquely truncate appearance; mandible tridentate, with 2 teeth and a truncate upper tooth; mesoscutum (Figs 518-521) with longitudinally elongate, lineolate sculpture, some elongate imbricate to polygonally reticulate sculpture medially and polygonally reticulate near posterior margin; scutellum with longitudinally elongate, lineolate sculpture, usually a few cells anteriorly near axillae, mostly a weak tuft of setae medially in apical half; fore wing (Fig. 517) about 2.2-2.5X as long as broad; parastigma slightly expanded and weakly downcurved; apex of stigmal vein (Figs 515, 516) with 3 campaniform sensilla; propodeum with 2-17 setae near spiracle; gaster (Fig. 522) with "glands" on Gt1 and Gt5, those on Gt1 separated by about 1.5-2.5X their own lengths, those on Gt5 separated by about 0.3-0.8X their own lengths; syntergum not longer than broad; hypopygum Fig. 523; ovipositor (Figs 524, 525) about 1.2-1.8X as long as mid tibia or 4.2-4.8X as long a gonostylus. *Male*: unknown.

DISTRIBUTION. St. Vincent and Costa Rica (**new record)**

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype of *Encyrtus argentipes*: on card "Encyrtus argentipes n. How" "St. Vincent W.I. H.H. Smith 241"; head, antennae and left fore wing on slide "Encyrtus argentipes Howard ♀ type" "Holotype V.A. Trjapitzin" "U.S.N.M. 2723" (USNM).

Non type material. **COSTA RICA**, 7♀, **Guanacaste**, Santa Rosa NP, various localities and dates 27.iv.1985-25.iv.1987 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, Est. Cacao, 2km S Cerro Cacao, LN 323300 375700, 1100-1200m, xi-xii.1990 (C. Chaves); 1♀, Guanacaste, Guanacaste NP, Cacao Est. xi-xii.1990 (P. Hanson); 1♀, Guanacaste, Est. Cacao (ACG), 10°55'N 85°30'W, 1100m, 22.ii.2003 (J.S. Noyes); 1♀, Guanacaste, Est. Cacao (ACG), 10°55'N 83°30'W, 1100m, 19-20.ii.2005 (J.S. Noyes); 6♀, Guanacaste, Maritza (ACG), MT/YPT, 20.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Est. Maritza (ACG), 10°58'N 85°29'W, 700m, 23.ii.2003 (J.S. Noyes); 1♀, Guanacaste, Est. Maritza (ACG), 10°58'N 85°29'W, 700m, 21.ii.2005 (J.S. Noyes); 1♀, Guanacaste, Est. Pitilla (ACG), 700m, 10°59'N 85°25'W, 4-7.i.2001 (C. Moraga, P.N. Thomas); , 2♀, Guanacaste, Murcielago (ACG), 75m, MT, 24.i-4.ii.1996 (J. Ugalde); 1♀, Guanacaste, Guanacaste NP (error for Santa Rosa NP), Playa Naranjo, MT, 2-10.iii.1990 (J.S. Noyes); 3♀, Guanacaste, ZP Nosara, Fila Maravilla, LN 221350 381700, 800m, vi-vii.2001 and viii-ix.2001 (I. Jiménez); 1♀, Guanacaste, RF Monte Alto, Send. La Ceiba, LN 221200 382950, 600m, #65008, 21.ix-22.x.2001 (I. Jiménez); 1♀, Guanacaste, Lomas Barbudal Biol. Res., 15km SW Bagaces, 28.ii.1990 (J.S. Noyes); 2♀, Guanacaste, PN Marino Las Baulas, LN 332690 258040, 0m, #60711, 14.xii.2000 (Y. Cardenas); 1♀, Guanacaste, BN Diriá, Ret. Air Torre Control de Incendio, LN 238550 358650, 600-700m, xii.2001-i.2002 (I. Jiménez); 1♀, Guanacaste, BN Diriá, Vista del Mar, LN 233900 358750, 890m, #64582, viii-ix.2001 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sector Palo Verde, Campo Aterrizaje, LN 388400 259050, 10m, 12.iii-9.iv.2001 (I. Jiménez); 1♀, **Alajuela**, Fa Sn Gabriel, 2km W Dos Rios, 600m, vii.1988 (I.D. Gauld, P. Mitchell); 2♀, Alajuela, Peñas Blancas, 9.vi.1987 (E. Cruz); 2♀, Alajuela, Est. Cabro Muco, 10°43'N 85°09'W, 1100m, 13.ii.2004 (C. Hansson, J. Azofeifa); 1♀, Alajuela, PN Arenal, Sect. la Peninsula, LN 453800 271500, 600m, T. Amarilla, #56556, 17.vi.2000 (G. Carballo); 1♀, Alajuela, PN Arenal, Sendero Mena, LN 454170 271800, 600m, 17.iv-

19.v.2001 (G. Carballo); 2♀, Alajuela, PN Volcán Arenal, Sendero Pilón, LN 458050 269200, 650m, #61216, 8.xi-7.xii.2000 (G. Carballo); 1♀, Alajuela, PN Arenal, Sendero Pilón, 600m, 26.ii.2003 (J.S. Noyes); 1♀, Alajuela, San Ramon BS, 700m, viii-ix.1995 (P. Hanson); 1♀, **Heredia**, San Joaquin de Flores, LN 220900 519700, 1054m, #5487.vi-2.ix.1995 (C. Viquez); 1♀, Heredia, 3km S. Puerto Viejo, OTS-La Selva, 100m, ii-iii.1993 (P. Hanson); 1♀, Heredia, La Selva BS, 10°26'N 84°01'W, 50-150m, fog *Carapa guianensis*, FOT/02, 5.iii.1993; 1♀, Heredia, La Selva BS, 10°26'N 84°01'W, 50-150m, fog *Pentaclethra macroloba*, FPM/03, 6.iii.1993 (INBio-OET); 2♀, Heredia, OTS La Selva, 100m, canopy fog *Pentaclethra*, FPM/12, 5.ix.1993; 1♀, Heredia, OTS-La Selva, 10°26'N 84°01'W, 100m, canopy fog, *Goethalsia melantha*, vii.1993 (ALAS project); 1♀, Heredia, RB La Selva, 10°26'N 84°01'W, 14.xii.1995 (INBio/OET-ALAS); 1♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, 50-150m, canopy fog *Eugenia* sp., FOT/76/1-40, 5.i.2000 (INBio/OET); 2♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, ii.2003 (J.S. Noyes); 1♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, 25.ii.2016 (J.S. Noyes); 2♀, Heredia, 16km SSE La Virgen, 10°16'N 85°05'W, 11/TN/ALL, 11.ii-21.iv.2001 (INBio/OET – ALAS); 1♀, Heredia, 11km SE La Virgen, 10°20'N 84°04'W, 450-550m, 05/N/TN, 22.ii-20.iv.2003 (INBio-OET-ALAS); 3♀, Heredia, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/TN, ii.2002 and iv.2002 (INBio-OET-ALAS); 1♀, Heredia, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/NOTN, ii.2002 (INBio-OET-ALAS); 3♀, Heredia, Est. La Esperanza, 2500m, 24.iii.2002 (J. Azofeifa); 1♀, Heredia, Santa Rosa de Heredia, INBio, LN 217400 526250, 1100m, #58654, 5.ix-5.x.2000 (R. Zuñiga); 2♀, Heredia, INBio Parque, 100m, LN 217300 526200, iii.2000 and v.2001 (R. Zuniga); 2♀, Heredia, Santo Domingo, INBio Parque, LN 526250 217400, 1100m, iii.2002 (J.A. Azofeifa, J.S. Noyes); 1♀, Heredia, Santo Domingo, INBio Parque, LN 526250 217400, 1100m, 1-12.iv.2002 (D. Rubí, J.S. Noyes); 1♀, Heredia, Santo Domingo, INBio Parque, 9°59'N 84°06'W, 1100m, 11-26.ii.2006 (J.S. Noyes); 1♀, Heredia, Santo Domingo, INBio Parque, 9°59'N 84°06'W, 1100m, 13.ii.2016 (J.S. Noyes); 1♀, **San José**, San Antonio de Escazu, 1700m, ix.1996 (C. Flores, P. Hanson); 21♀, San José, Zurqui de Moravia, 1600m, various dates v.1991-i.1996 (P. Hanson); 1♀, San José, 19km S, 3km W Empalme, 9°39'N 83°52'W, x-xii.1993 (P. Hanson); 1♀, San José, 19km S. Empalme, Mirador Quetzal, 9°39'N 83°52'W, 2600m, iv.2000 (P. Hanson); 1♀, San José, Cerro de la Muerte, 6km N San Gerardo, 2800m, v.1993 (P. Hanson); 1♀, San José, 6km N San Gerardo, 2800m, vii.1993 (P. Hanson); 2♀, Cartago, Dulce Nombre, Vivero Linda Vista, 1300m, viii-x.1993 and viii-ix.1994 (P. Hanson); 1♀, San José, Cerro de la Muerte, 19km S, 3km W Empalme, 2600m, 9°39'N 83°52'W, iv-vii.1992 (P. Hanson, C. Godoy); 2♀, San José, 6km N San Gerardo, 2800m, xii.1992-ii.1993 (P. Hanson); 2♀, **Cartago**, PN Tapanti, 9°45'N 83°47'W, 1200-1500m, 20.iii-10.iv.2000 (C. Hansson, D. Rubí); 1♀, Cartago, PN Tapanti, Sendero Arboles Caidos, LN 561400 192500, 1500m, #61070, viii-ix.2000 (D. Rubí); 1♀, Cartago, PN Tapanti-Macizo de la Muerte, Torre ICE #31, LN 561800 188500, 1800m, #61071, viii-ix.2000 (D. Rubí); 1♀, Cartago, Turrialba, CATIE, 22.ii.1991 (J.S. Noyes); 1♀, Cartago, La Cangreja, 9°48'N 83°58'W, 1950m, ix-xii.1992 (P. Hanson); 1♀, **Puntarenas**, Monteverde, 15-16.vii.1986 (L. Masner); 1♀, Puntarenas, Monteverde, St Luis Valley, 1400m, 12.viii.1986 (L. Masner); 1♀, Puntarenas, Monteverde, Finca Canada Res., 22.viii-1.ix.1992 (D.C. Currie); 1♀, Puntarenas, 13km NE Dominical, RB Rio Magnolia, 9°20'N 83°47'W, 800m, 22-24.ii.2015 (J.S. Noyes); 6♀, Puntarenas, Est. Altamira, Cerro Frantzius, LS 334150 574450, 2134m, various dates vi.2000-xi.2001 (D. Rubí); 1♀, Puntarenas, Est. Altamira, Cerro Quemado, LS 332200 575560, #65165, 16.ix-16.x.2001 (D. Rubí); 1♀, Puntarenas, Buenos Aires, Est. Altamira, Send. a Casa Coca, LS 332800 575250, 1800m, #62337, iv-v.2001 (D. Rubí); 1♀, Puntarenas, Est. Altamira, Send. los Gigantes, LS 331800 572100, 1460m, ii.2002 (C. Hansson, D. Rubí); 2♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 1500m, 18-22. iii.1990 (J.S. Noyes); 3♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 8°46'N 82°57'W, 1300m, 15-16.ii.2006 (J.S. Noyes); 1♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 8°46'N 82°57'W, 7-19. ii.2007 (C. Hansson); 3♀, Puntarenas, Pen. Osa, Puerto Jimenez, 8°32'N 83°19'W, 10m, v.1991, ii.1992 and iii.1992 (P. Hanson); 1♀, Puntarenas, RF Golfo Dulce, 3km SW Rincon, 10m, ii.1993 (P. Hanson); 1♀, Puntarenas, Golfito, Est. Agujas, LS 526550 276750, 10m, #57901, 21.ii.2000 (J. Azofeifa); 2♀, Puntarenas, PN Corcovado, Los Patos, 8°33'N 83°30'W, 200m, ii.2000 (J.S. Noyes, J.A. Azofeifa); 1♀, Puntarenas, PN Corcovado, Est. Agujas, Queb. La Bonanza, LS 275700 524800, 500m, #59159, ii-iv.2001 (J. Azofeifa); 1♀, **Limón**, PN Braulio Carrillo, Est. Quebrada Gonzalez, LN 238380 543100, 400-500m, #6999, no date (P. Hanson, C. Godoy); 1♀, Limón, 19km W Guapiles, vii-ix.1989 (P. Hanson). Material in MZUCR, CNC, USNM and NHMUK.

COMMENTS. It is possible that more than one species has been included here under the name *argentipes*. Amongst the material cited above, there is a large amount of variation in the relative

sizes of the flagellar segments, especially the clava. In most cases F1-F5 are broad, strongly transverse and more or less anelliform, but occasionally these segments are narrower and nearly quadrate, in some specimens F5 is nearly as large as F6 and has linear sensilla. The clava is usually fairly slender and about 3-3.5X as long as broad, but in smaller specimens the clava may be broader and can be as little as 2X as long as broad, especially if it has collapsed, which is often the case in slide-mounted material. The area of the sensory part of the clava is sometimes relatively very large in smaller specimens. Normally, it is at the apex of the clava giving it the appearance of being rounded or even pointed, but in smaller specimens it may be enlarged and form a distinct very slightly oblique truncation as can be seen in holotype of *argentipes* (Gordh & Trjapitzin, 1979, Fig. 1) which is a very small slide-mounted specimen where the clava is very badly collapsed.

***Cheiloneurus sophocles* sp.nov.**
(Figs 526-532)

DIAGNOSIS. *Female* (length about 1.3mm): body generally dark brown with a weak to moderate metallic sheen; mesoscutum with dark brown setae in anterior one-third and silvery setae in posterior two-thirds; fore wing (Fig. 526) hyaline; fore coxa white; head about 4.5X as wide as frontovertex; antenna (Fig. 528) with pedicel slightly longer than F1-F2 combined; F1 and F5-F6 a little longer than broad, F2-F4 quadrate or transverse; linear sensilla on F5-F6; clava about as long as funicle, apex narrowly rounded; mandible with 3 acute teeth; mesoscutum (Fig. 530) with longitudinally elongate, lineolate sculpture, some polygonally reticulate sculpture medially and near posterior margin; scutellum with longitudinally elongate, lineolate sculpture, some polygonally reticulate sculpture medially; scutellum without a tuft of setae medially; fore wing (Fig. 526) about 2.5X as long as broad; parastigma slightly swollen, not downcurved; stigmal vein (Fig. 527) with 3 campaniform sensilla at apex; gaster (Fig. 532) with "glands" on Gt1 and Gt5, those on Gt1 separated by about 1.5X their own lengths, those on Gt5 separated by less than 0.2X their own lengths; syntergum about 1.3X as long as broad. *Male*: unknown.

Female **(**holotype**)**: length, including ovipositor, 1.32mm; excluding ovipositor, 1.27mm (CPD).

Head dark brown to black with a moderate metallic lustre; frontovertex coppery purple behind posterior ocelli, area around anterior ocellus dull, metallic dark green and blue-green, area above scrobes coppery purple, this delimited above by a narrow dark blue area; temple and gena with a mixed metallic dark green, blue-green and coppery purple sheen; scrobal area coppery purple, lower part of interantennal prominence and area below torulus metallic dark green, dorsally margined dark blue, mouth margin medially coppery purple; a line of inconspicuous, brown setae along inner eye margin continuing below eye to gena and along position of malar sulcus; radicle brown; scape largely pale orange, but margined dark brown and proximally brown internally; pedicel brown with venter and apex narrowly dusky pale yellow; F1-F4 brown, F5-F6 pale orange; clava mostly orange-brown, basal segment partially brown, terminal segment brown; thorax dark brown to black; pronotum with a weak, coppery purple and brassy sheen; mesoscutum virtually matt, but with a very weak coppery purple and brassy sheen, anterior one-third with dark brown setae, posterior two-thirds with silvery setae; tegula dark brown; axilla similarly coloured to mesoscutum; scutellum virtually matt, but with a weak coppery purple sheen and some very weak dark green reflections, extreme apex and side shining, metallic dark green and coppery; mesopleuron with a weak, metallic blue, purple and brassy sheen; fore coxa white; fore femur white with a fairly broad, incomplete, brown, subapical band, tibia pale yellow with a broad, incomplete, subbasal brown band, tarsus dusky pale yellow, apical tarsomere pale brown; mid coxa dark brown; mid femur white with a narrow, subapical brown band tibia white with a narrow, subbasal brown band, spur and tarsus white; hind coxa dark brown; hind femur dark brown, narrowly white basally, tibia mostly dark brown with apices white, tarsus white with apical tarsomere brown; wings hyaline, venation pale yellow, marginal vein a little dusky; propodeum dark brown with a weak brassy and purple sheen, a little coppery laterally, side with metallic green sheen mixed coppery and brassy, outside spiracle with about 10 conspicuous silvery setae; gaster dark purple-brown, dorsally with a coppery purple sheen, Gt1 proximally mixed with a green and

blue-green sheen, side and venter with coppery, blue, brassy and green reflections; gonostylus dark brown, apex dusky pale orange.

Head about 4.3X as wide as frontovertex, in profile about 1.5X as high as deep, tangent to frontovertex above scrobes forming an angle of about 90° with face below top of scrobes; an inconspicuous, very small, oval depression adjacent to eye very near occipital margin; ocelli forming an angle of about 60°; frontovertex narrowest a little behind posterior ocelli and a little in front of anterior ocellus, quite shiny, with relatively deep, polygonally reticulate to imbricate-reticulate sculpture, in ocellar area of mesh size slightly smaller than eye facet, subequal elsewhere; temple and gena with sculpture of similar depth to anterior part of frontovertex, but more longitudinally elongate imbricate-reticulate to polygonally reticulate; area immediately below lowest part of eye with similar sculpture; scrobes with relatively shallow, irregular, elongate sculpture; interantennal prominence and mouth margin with shallow, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, narrowly ∩-shaped; interantennal prominence dorsally indistinctly acute; antenna as in Fig. 528; scape hardly broadened and flattened, about 4.1X as long as broad; all funicle segments slightly longer than broad except F4 which is quadrate, segments increasing in width distad, linear sensilla present only on F5-F6; clava about as long as funicle, sutures parallel, sensory area small, at apex only giving it a pointed or slightly rounded appearance; eye more or less reaching occipital margin, with very inconspicuous, sparse setae that each much shorter than diameter of facet; malar sulcus absent; mandible with 3 acute teeth. Relative measurements: HW 58, HH 49.5, FV 13.5, POL 6, OOL 1, OCL 5.5, AOL 6, EL 33, EW 31, MS 22, SL 24, SW 5.8.

Thorax (Fig. 530)with imbricate-reticulate to polygonally reticulate sculpture on pronotum that is about as deep as that in ocellar area; mesoscutum with fine, longitudinally elongate, polygonally reticulate to striate-reticulate sculpture that is perhaps a little deeper than sculpture on pronotum; scutellum with slightly finer, deeper, polygonally reticulate sculpture composed of rounded or very slightly longitudinally elongate cells, extreme side and apex completely smooth and shiny; setae on anterior part of mesoscutum about as dense as those on posterior part; scutellum with a sparse, subapical tuft of longer setae; visible part of mesoscutum about 1.8X as broad as long; scutellum about 1.2X as broad as long; fore wing with venation and setation as in Figs 526, 527; costal cell with 5 or 6 dorsal setae at apex. Relative measurements: FWL 73.5, FWW 29.5; HWL 55, HWW 13.

Gaster with hypopygium (Fig. 529) reaching about 0.4X towards apex; syntergum about 1.3X as long as broad and about 1.2X as long as mid tibia, with apex acute; "glands" (Fig. 532) present on Gt1 and Gt5, those on Gt1 separated by about 1.5X their own lengths, those on Gt5 separated by less than 0.2X their own lengths; ovipositor (Fig. 531) slightly exserted, the exserted part about 0.3X length of mid tibial spur or about 0.1X mid tibia. Relative measurements: OL 56, GL 14.5 [MT 31].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, BN Diriá, Ret. Alr. Torre Control de Incendio, LN 238550 358650, 600-700m, #66659, xii.2001-i.2002 (I. Jiménez). Holotype in NHMUK.

Cheiloneurus carita **sp.nov.**

(Figs 533-539; Hab. ♀ 83)

DIAGNOSIS. *Female* (overall length about 0.9mm): body generally dark brown mostly matt but with weakly metallic areas; mesoscutum with uniform brown setae; fore wing (Fig. 535) hyaline; fore coxa white; head (Fig. 537) about 3.2X as wide as frontovertex; antenna (Fig. 534) with pedicel nearly as long as F1-F3 combined; F1 and F6 very slightly longer than broad, F2-F5

quadrate or transverse; linear sensilla on F6; clava slightly longer than funicle, apex narrowly rounded; mandible with 3 teeth, upper tooth narrowly truncate; mesoscutum (Fig. 539) with longitudinally elongate, lineolate sculpture, some imbricate to polygonally reticulate sculpture near posterior margin; scutellum with longitudinally elongate, lineolate sculpture, some enclosed cells near axillae and medially; scutellum without a tuft of setae medially; fore wing (Fig. 535) about 2.5X as long as broad; parastigma hardly swollen, not downcurved; stigmal vein (Fig. 533) with 3 apical campaniform sensilla; gaster with "glands" on Gt1 and Gt5, those on Gt1 separated by slightly more than 2X their own lengths, those on Gt5 separated by about 0.25X their own lengths; syntergum longer than broad. *Male*: unknown.

Female (holotype): length, including ovipositor, 0.94mm; excluding ovipositor, 0.90mm (CPD).

Head dark brown to black with a weak metallic lustre; frontovertex coppery purple behind posterior ocelli, occipital margin medially metallic very dark blue, area around anterior ocellus metallic dark blue, area above scrobes coppery and purple; temple and gena largely metallic dark blue, posteriorly broadly coppery, eye margin narrowly coppery; scrobal area coppery purple, area between eye and scrobe metallic dark blue, interantennal prominence metallic blue between lower parts of toruli, mouth margin coppery; a line of translucent, silvery setae along inner eye margin continuing below eye to gena and along position of malar sulcus; radicle pale orange; scape dark brown with apical one-quarter white; pedicel dark brown, apical one-third white; funicle with F1-F5 very slightly dusky, very pale orange, F6 very pale yellow; clava pale brown; thorax dark brown to black; pronotum with a slight coppery sheen; mesoscutum fairly matt, but slightly silky in appearance with a very weak coppery hue, posterior margin slightly more coppery; axilla with a slight coppery purple sheen; scutellum generally similar in appearance to mesoscutum but extreme apex and side with a fairly strong metallic dark green sheen; dorsum of thorax mostly with dark brown setae but posterior half of mesoscutum clothed in sparse, conspicuous, silvery setae; tegula dark brown with a slight coppery sheen; mesopleuron with a moderate coppery purple sheen; fore coxa white, mid and hind coxa dark brown; fore femur mostly dark brown, with apices white, tibia dark brown with apices white, tarsus pale testaceous; mid femur white with a broad, subapical brown band in distal half, tibia white with a broad, subbasal brown band in basal two-fifths, spur and tarsus very pale yellow; hind femur dark brown, extreme apex white, tibia mostly dark brown with extreme base and apical one-third white, tarsus white with apical tarsomere brown; wings hyaline, venation pale yellow, marginal vein dusky orange; propodeum dark brown with a weak brassy and purple sheen, side with a strong metallic blue-green sheen, outside spiracle with only 1 or 2 silvery setae; gaster dark purple-brown, dorsally with a coppery purple sheen mixed slightly brassy and green, Gt1 with a distinct dark metallic dark blue sheen, side and venter with coppery, blue, brassy and green reflections; gonostylus dark brown, extreme apex pale orange-brown.

Head (Fig. 537) about 3.2X as wide as frontovertex, in profile about 1.35X as high as deep, tangent to frontovertex above scrobes forming an angle of about 90° with face below top of scrobes; a small, broadly oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 60°; frontovertex narrowest about level with posterior ocelli, relatively dull, with relatively deep, polygonally reticulate sculpture of mesh size mainly subequal eye facet, deepest and more polygonally reticulate in ocellar area; temple and gena with slightly shallower, longitudinally elongate imbricate-reticulate to polygonally reticulate sculpture; scrobes with relatively shallow, irregular, elongate sculpture; interantennal prominence and mouth margin with shallow, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, narrowly ∩-shaped; interantennal prominence dorsally broadly rounded; antenna as in Fig. 534; scape hardly broadened and flattened, about 4X as long as broad; funicle with F1-F5 smaller, subequal, F1 very slightly longer than broad, F2-F5 slightly transverse, F6 clearly largest and broadest but slightly longer than broad; linear sensilla only on F6; clava slightly longer than pedicel and funicle combined, sutures parallel, sensory area small, at apex only giving it a pointed or slightly rounded appearance; eye not quite reaching occipital margin, separated by less than diameter of facet, more or less naked, clothed with extremely inconspicuous setae, each much less than 0.5X diameter of facet; malar sulcus absent; mandible tridentate, upper tooth narrowly truncate. Relative measurements: HW 61, HH 52, FV 19, POL 8, OOL 1, OCL 6, AOL 7.5, EL 34, EW 28, MS 25, SL 24, SW 6.

Thorax (Fig. 539) with imbricate-reticulate to polygonally reticulate sculpture on pronotum that is about as deep as that in ocellar area, posterior margin quite smooth; mesoscutum throughout with fine, longitudinally elongate, striate-reticulate sculpture that is about as deep as sculpture on pronotum, anteriorly much finer and of narrower cells than posterior one-fifth; scutellum with similar, but much finer, slightly longitudinally elongate, polygonally reticulate sculpture, extreme side and apex completely smooth; setae on mesoscutum fairly sparse but quite evenly distributed; scutellum with a weak subapical tuft of only 4 or 5 setae; visible part of mesoscutum about 1.7X as broad as long; scutellum about 1.2X as broad as long; fore wing with venation and setation as in Figs 533, 535; costal cell with 5 or 6 dorsal setae at apex. Relative measurements: FWL 62, FWW 24.5; HWL 45, HWW 10.5.

Gaster with hypopygium reaching about 0.6X; syntergum about 1.4X as long as broad and 1.2X as long as mid tibia, with apex acute; "glands" (Fig. 551) present on Gt1 and Gt5, those on Gt1 separated by slightly more than 2X their own lengths, those on Gt5 separated by about 0.25X their own lengths; hypopygium Fig. 549; ovipositor (Fig. 538) slightly exserted, the exserted part about 0.5X length of mid tibial spur or about 0.18X mid tibia. Relative measurements: OL 80, GL 18.5 [MT 41].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, 18km N Liberia, Buena Vista Lodge, 10°48'N 85°24'W, 770m, 15-17.ii.2016 (J.S. Noyes). Holotype in NHMUK.

Cheiloneurus epytus (Walker) comb.nov.
(Figs 540-546; Hab. ♀ 84)

Encyrtus epytus Walker, 1839:69. Lectotype ♀ (designated by Noyes, 1980:235), Brazil (Bahia), NHMUK, examined.
Aphidencyrtus epytus (Walker); Ashmead, 1904:497.
Zaomma epytus (Walker); Noyes, 1980:235.

DIAGNOSIS. *Female* (overall length about 0.7-1.0mm): head generally metallic green and coppery; maxillary palpi white; scape dark brown in proximal 0.8X, apex pale yellow; pedicel mainly dark brown, apex very pale orange; flagellum slightly dusky, very pale orange, clava with distal segments slightly more dusky; mesoscutum dark brown with a weak metallic lustre, setae brown; scutellum dark brown, matt; fore coxa brown; legs mostly white with some dark brown areas on all femora and tibiae; hind femur almost completely dark brown; fore wing hyaline (Fig. 542); tangent of frontovertex forming an angle of about 105° with that of face; head (Fig. 546) about 2.4-2.9X as wide as frontovertex; malar sulcus present, but very indistinct; antenna (Fig. 540) with scape about 3.5X as long as broad; pedicel slightly longer than F1; all funicle segments more or less quadrate; linear sensilla on all funicle segments; clava about as long as F3-F6 combined, apex rounded; mandible with 1 acute tooth and a broad, upper truncation; mesoscutum (Fig. 544) with fine, longitudinally elongate, striate sculpture, some elongate, polygonally reticulate sculpture medially and less elongate reticulate sculpture near posterior margin; scutellum with similar sculpture and a few cells adjacent to axillae and in middle; scutellum without a tuft of setae medially, with only 4 or 5 pairs of setae, apical pair long; fore wing (Figs 542, 543) about 2.2-2.3X as long as broad; parastigma slightly swollen, not downcurved; stigmal vein (Fig. 543) with 3 campaniform sensilla at apex; gaster (Fig. 541) with "glands" on Gt1 and Gt5, those on Gt1 nearly touching, almost continuous, those on Gt5 separated by less than 0.2X their own lengths;

syntergum slightly broader than long; hypopygium Fig. 545; ovipositor about 1.7X as long as mid tibia or 4.4X as long as gonostylus . *Male*: unknown.

DISTRIBUTION. Costa Rica (**new record**), Brazil.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Lectotype ♀: "Lectotype" "Encyrtus Epytus" "1303 a" "♀ Encyrtus epytus Walker det J.S. Noyes, 1979 LECTOTYPE" "Bahia" "B.M. TYPE HYM 5.2879" "Specimen collected by C.R. Darwin" "NHMUK 013457715" (NHMUK).

Non type material. **COSTA RICA**, 1♀, **Guanacaste**, ZP Nosara, Send. Las Orquideas, LN 221650 382750, 500m, #67701, 12.iv.2002 (I. Jiménez Morera); 1♀, **Alajuela**, PN Arenal, Sendero Pilón, 650m, T. Malaise, #59234, 5.ix-7.x.2000 (G. Carballo); 1♀, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 14-15.ii.2005 (J.S. Noyes); 2♀, Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 17-18.ii.2011 (J.S. Noyes); 1♀, Puntarenas, Golfo Dulce, 10km W Piedras Blancas, ii-iii.1989 (P. Hanson); 1♀, Puntarenas, Golfo Dulce, 10km W PanAmer Hwy, vi-vii.1989 (P. Hanson); 4♀, Puntarenas, RF Golfo Dulce, 24km W Piedras Blancas, 8°46'N 83°24'W, 200m, xii.1990, i-iii.1991 and ix.1992 (P. Hanson); 1♀, Puntarenas, PN Corcovado, Los Patos/Sirena, LS 514200 276500, La Casona, 100m, #61695, 13.ii-18.iii.2001 (J.A. Azofeifa); 1♀, **Limón**, RB Hitoy-Cerere, 9°40'N 83°02'W, 100m, ii.2004 (J.S. Noyes). Material in NHMUK, MZUCR and USNM.

COMMENTS. *Cheiloneurus epytus* was described from probably a single female specimen collected in Bahia, Brazil by Charles Darwin in 1832-1833. The lectotype is very badly collapsed and poorly mounted on a card and thus a detailed comparison is very difficult. However, after careful examination I feel fairly confident that the specimens listed above from Costa Rica are conspecific. The lectotype of *epytus* has the fore coxa dark brown as in the Costa Rican material, but the funicle segments look more slender. However, as they are badly collapsed it is likely that they would normally be relatively wider. It will be necessary to collect fresh material of *epytus* before a proper comparison can be made.

Cheiloneurus danessa **sp.nov.**

(Figs 547-553; Hab. ♀ 85)

DIAGNOSIS. *Female* (length about 0.9 mm): body generally dark brown with a weak to moderate metallic sheen; mesoscutum with uniform brown setae; fore wing (Fig. 553) hyaline; fore coxa white; head about 2.7X as wide as frontovertex; antenna (Fig. 547) with pedicel about as long as F1-F2 combined; all funicle segments very slightly longer than broad and with linear sensilla; clava slightly longer than F4-F6 combined, with apex rounded; mandible with 1 acute tooth and a broad, upper truncation; mesoscutum (Fig. 552) with longitudinally elongate, lineolate sculpture, some elongate, polygonally reticulate sculpture medially and rounded cells near posterior margin; scutellum with longitudinally elongate, lineolate sculpture, a few polygonally reticulate cells in middle; scutellum without tuft of setae medially in apical half; fore wing (Fig. 553) about 2.3X as long as broad; parastigma slightly swollen, not downcurved; stigmal vein (Fig. 550) with 3 campaniform sensilla at apex; gaster (Fig. 551) with "glands" on Gt1 and Gt5, those on Gt1 continuous, not separated, those on Gt5 separated by less than 0.2X their own lengths; syntergum broader than long. *Male*: unknown.

Female **(**holotype**)**: length, including ovipositor, 0.90mm; excluding ovipositor, 0.86mm (CPD).

Head dark brown to black with a metallic sheen; occiput with a weak coppery sheen, some metallic blue-green reflections below occipital margin; frontovertex generally slightly shiny with a weak coppery purple sheen along occipital margin and above scrobes, some dull coppery purple elsewhere, with some hardly discernible metallic dark blue-green; scrobal area with a moderate coppery purple sheen, area between eye and scrobes dull coppery purple with a hint of metallic dark blue-green; temple and gena with a dull coppery purple sheen; frontovertex, gena and

interantennal prominence with a few scattered, inconspicuous, pale brown setae; palpi white; radicle orange-brown; scape mostly dark brown on external surface with apical 0.4X ventrally pale orange, internal surface similar but with most of apical half pale orange; pedicel mainly dark brown, apex very pale orange; flagellum slightly dusky, yellow, clava dusky pale orange; thorax dark brown to black with a weak to moderate metallic lustre; pronotum with a moderate coppery sheen; mesoscutum quite dull with a slight brassy and weak purple sheen, posteriorly a little more shiny and coppery along posterior margin; tegula dark brown with a slight coppery sheen; axilla with a weak to moderate coppery purple sheen; scutellum dorsally about as shiny as mesoscutum, medially with a weak coppery purple sheen, laterally mixed with weak to moderate metallic dark blue-green, extreme side and apex with a moderate metallic dark blue-green sheen mixed coppery; mesopleuron fairly shiny with a slight brassy and coppery purple sheen with a hint of metallic dark blue-green; fore coxa white, mid and hind coxae dark brown; fore femur white to very pale yellow with a very thin dark brown line along dorsal margin in middle half and a very faint, shorter one opposite, tibia white at extreme base, otherwise pale orange with a very weak dusky spot subbasally on outer surface, tarsus pale orange with apical tarsomere slightly dusky; mid femur white with a narrow, incomplete, dark brown subapical band, tibia white with knee very narrowly dark brown and with a narrow, dark brown subbasal band, spur very pale yellow, tarsus white to very pale yellow; hind femur dark brown with extreme base and apex white, tibia dark brown with extreme base white and apical two-fifths white, tarsus white to pale yellow with apical tarsomere dusky; wings hyaline; propodeum dark brown with a weak purple sheen, side with a moderate coppery sheen; gaster dark brown with coppery purple, brassy, green and blue reflections; gonostylus brown.

Head about 2.7X as wide as frontovertex, in profile about 1.4X as high as deep, tangent to frontovertex forming an angle of about 95° with that of face; occipital margin sharp, not carinate; no distinct oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 80°; inner eye margins subparallel; frontovertex with moderately deep, polygonally reticulate sculpture of mesh size generally subequal to eye facet, not shallower above top of scrobes; temple and gena with shallower, fine, elongate, polygonally reticulate sculpture; top of scrobes with shallow, regular, polygonally reticulate sculpture, scrobes smooth; interantennal prominence and mouth margin with slightly shallower, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, broadly ∩-shaped; interantennal prominence dorsally narrowly rounded; antenna as in Fig. 547; scape relatively short and stout, slightly broadened and flattened, about 3.4X as long as broad; funicle with segments all slightly longer than broad and becoming progressively larger distad so that F6 is largest; linear sensilla present on all funicle segments; clava about 3.2X as long as broad and about 1.1X as wide as F6, not curved downwards towards apex, slightly longer than F4-F6 combined, sutures parallel, sensory area small, at apex only giving it a rounded appearance; eye slightly overreaching occipital margin, appearing naked; malar sulcus absent; clypeal margin weakly concave; mandible with one tooth and a broad, slightly oblique, truncation. Relative measurements: HW 79, HH 61, FV 29, POL 14.5, OOL 2, OCL 4, AOL 9, EL 42, EW 38.5, MS 24, SL 27.5, SW 8.

Thorax (Fig. 552) with pronotum hardly exposed behind head, its posterior margin broadly concave, with a shallow median invagination; pronotum with shallower, finer polygonally reticulate sculpture than ocellar area; mesoscutum with conspicuously longitudinally lineolate striate-reticulate to striate sculpture that is finer than that in ocellar area and about as deep, a few rounded cells near posterior margin; axilla with slightly transversely elongate, polygonally reticulate sculpture that is slightly shallower than that on mesoscutum; scutellum dorsally with striate to striate-reticulate sculpture that is slightly deeper and coarser than that on mesoscutum, cellular sculpture along mid-line more rounded, extreme side and apex quite smooth and shiny; visible part of mesoscutum about 1.8X as broad as long; scutellum about 1.2X as broad as long, apex with a pair of slender, elongate setae; hind femur about 3.4X as long as broad; fore wing with venation and setation as in Figs 550, 553; linea calva entire and open; propodeum (Fig. 552) medially less than 0.1X as long as scutellum. Relative measurements: FWL 67.5, FWW 29.5; HWL 47.5, HWW 11.

Gaster with hypopygium reaching about 0.5X to apex; last tergite about 0.9X as long as mid tibia, with apex acute; “glands” (Fig. 551) present on Gt1 and Gt5, those on Gt1 continuous, not

separated, those on Gt5 separated by less than 0.2X their own lengths; hypopygium Fig. 551; ovipositor (Fig. 548) slightly exserted, the exserted part about 0.5X as long as mid tibial spur or about 0.15X as long as mid tibia. Relative measurements: OL 75, GL 20 [MT 48].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, 18km N. Liberia, Buena Vista Lodge, 10°48'N 85°24'W, 770m, 15-17.ii.2016 (J.S. Noyes). Holotype in NHMUK.

COMMENTS. The holotype has the right flagellum missing but is otherwise in good condition.

***Cheiloneurus idris* sp.nov.**
(Figs 554-560; Hab. ♀ 86)

DIAGNOSIS. *Female* (length about 1.5-2.0mm): body generally dark brown to black with a weak to moderate metallic sheen; scape from mostly orange to mostly dark brown with apex orange; pedicel dark brown; funicle pale brown; clava dark brown; posterior two-thirds of mesoscutum with silvery setae; fore coxa white, mid and hind coxa dark brown; hind tibia dark brown, legs otherwise white to pale orange mixed dark brown; fore wing hyaline; head about 5-8X as wide as frontovertex, in facial view about 1.2X as broad as long, subcircular, gena moderately and fairly evenly curved; frontovertex with two or three setae medially below anterior ocellus; area between eye and scrobe much narrower than diameter of anterior ocellus, with distinct sculpture, scrobal margin rounded; interantennal prominence dorsally rounded with only a few setae; mandible with two sharp lower teeth and a broad upper truncation; antenna (Fig. 558) with scape about 5X as long as broad; funicle with all segments clearly longer than broad; head about as wide as combined length of F3-F6 and clava; linear sensilla on F3-F6; clava 3-segmented, about as long as F3-F6 combined, sensory area at apex only; mesoscutum with polygonally reticulate sculpture; scutellum with a weak apical tuft of setae; wings fully developed; fore wing about 2.5-2.6X as long as broad; parastigma slightly swollen and very slightly curved downwards; apex of stigmal vein with 4 campaniform sensilla at apex; costal cell dorsally with 10 or 11 setae at apex and a single complete line of setae ventrally; area below proximal part of parastigma with a group of about 40-50 pale setae; apices of postmarginal and stigmal veins not connected by a naked hyaline area; apical bristle of postmarginal vein about 0.3X as long as marginal vein; mid tibial spur very slightly shorter than basitarsus; propodeum with about 9 setae around each spiracle, none on side; gaster without "glands" on Gt1 and Gt5; syntergum a little shorter than mid tibia; ovipositor about 3.9X gonostylus or 1.4X mid tibia; gonostylus very slightly shorter than mid tibial spur; exserted part of ovipositor about 0.5X mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.82mm; excluding ovipositor, 1.71mm (CPD).

Head black, with a weak, dark, metallic green sheen on frontovertex with slight purplish reflections, slightly coppery in ocellar area and near occipital margin; scrobal area mostly with a distinct, deep, purple sheen; lower part of interantennal prominence and near mouth margin dull metallic blue-green, coppery purple above with mouth margin medially orange; frontovertex with inconspicuous dark brown setae; temple adjacent to eye metallic green; posterior part of temple and gena purple, mixed coppery; antenna (Fig. 558) with radicle dark brown; scape mostly dark brown, orange towards apex; pedicel dark brown; flagellum dark brown; thorax mostly dark brown to black, pronotum with a dull purple sheen; anterior part of mesoscutum similar to pronotum but remainder slightly more shiny and slightly brassy; anterior one-third or so of mesoscutum clothed in dark brown setae, posterior two-thirds clothed in moderately dense, slightly silvery, translucent

setae, posterior margin dark purple; tegula dark brown; scutellum clothed with dark brown setae, with a metallic green sheen and some weak blue reflections immediately posterior to axillae, along sides and at apex, the latter also with weak coppery, purple and green reflections; metanotum with slight purple sheen; mesopleuron dark purple-brown with green and coppery reflections; fore coxa white; fore femur and tibia white to pale orange, slightly dusky brown anteriorly; mid coxa dark brown, slightly metallic; mid femur white to pale orange with a faint, pale brown, subapical ring; mid tibia white with a brown subbasal band, spur white; hind coxa dark brown, slightly metallic; hind femur white proximally, distal half dark brown; hind tibia dark brown, extreme base and distal one-third or so pale orange; fore tarsi pale dusky orange; mid and hind tarsi white to very pale yellow; pretarsi brownish; fore wing completely hyaline, venation pale yellow-brown; propodeum dark purple-brown; sides very weakly metallic green with conspicuous silvery setae in spiracular area; gaster dark purple-brown, Gt1 largely metallic blue-green; remainder of gaster mixed purple and brassy; gonostylus dark brown, apex pale orange.

Head (Fig. 556) about 5X as wide as frontovertex, subtriangular in profile, occipital margin more or less rounded, occiput with a shallow groove from middle of occipital margin to foramen; ocelli forming an angle of about 50°; frontovertex slightly shiny, with conspicuous reticulate sculpture of mesh size generally slightly smaller than diameter of eye facet; scrobes, interantennal prominence and mouth margin with shallower sculpture; temple and gena with distinct irregular, reticulate sculpture, of larger mesh than frontovertex and distinctly elongate posteriorly; scrobes shallow, not meeting, dorsal and lateral margins weakly rounded; antenna as in Fig. 558; scape hardly broadened and flattened, about 5X as long as broad; all funicle segments clearly longer than broad; clava about as long as F3-F6 combined, sutures not oblique, sensory area small and at apex only giving it a rounded or slightly truncate appearance; eye slightly overreaching occipital margin and clothed with inconspicuous, short setae that are each slightly shorter than diameter of facet; inner eye margins slightly converging anteriorly so that frontovertex is narrowest just above scrobes; malar sulcus absent; mandible with two acute, lower teeth and a broadly truncate upper tooth. Relative measurements: HW 83.5, HH 73, FV 16.5, OD 6, POL 7.5, OOL 1, OCL 9.5, AOL 10, EL 49, EW 47, MS 33, SL 45, SW 9.

Thorax (Fig. 560) with shallow, irregular, polygonally reticulate sculpture on pronotum, generally of mesh size subequal to diameter of facet; sculpture on mesoscutum slightly coarser and more regular than that on pronotum, but slightly more elongate anteriorly and towards the sides; sculpture on axilla and scutellum similar to that on mesoscutum; apex and sides very narrowly completely smooth; visible part of mesoscutum about 1.5X as broad as long; scutellum about as long as broad, without a distinct subapical tuft, subapical setae about one-third as long as scutellum; hind femur about 3.6X as long as broad; fore wing with venation and setation as in Figs 555, 557; costal cell with 8 or 9 setae dorsally at apex; no naked streak present between apices of postmarginal and stigmal veins; propodeum (Fig. 560) with numerous setae in spiracular area, side naked, medially about 0.1X as long as scutellum and medially with a small area of fine, very shallow, polygonally reticulate sculpture. Relative measurements: FWL 93.5, FWW 37; HWL 69, HWW 18.

Gaster with hypopygium reaching about half-way to apex; ovipositor hardly exserted, the exserted part about half as long as mid tibial spur; syntergum slightly shorter than mid tibia.

Paratype. Funicle with linear sensilla present only on F3-F6; gaster without “glands” on Gt1 and Gt5; gonostylus about 0.9X as long as mid tibial spur; hypopygium Fig. 559; ovipositor Fig. 554. Relative measurements: OL 67, GL 17 [MT 47].

Variation. Females vary in overall length from 1.48-2.00mm, the scape varies from almost entirely pale orange with only ventral and dorsal margins dark brown to almost completely dark brown; the scutellum varies from almost completely matt, dark coppery brown with hardly a metallic sheen with only extreme anterior part metallic blue or blue-green, to the anterior half or so being metallic blue or blue-green with posterior half distinctly coppery (see also comments below); the head may be about 4.2-8X as wide as the frontovertex; the scutellar tuft may be very sparse, or even absent and the fore wing may be 2.4-2.6X as long as broad.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, San Ramon, 4.5km WSW Dos Rios de Upula, LN 318500 381200, 720m, iii.1996 (F. Quezada); 1♀, Guanacaste, Bosq. Nac. Diriá, Vista del Mar, LN 233900 358750, #65010, 18.ix-18.x.2001 (I. Jiménez); 1♀, **Alajuela**, San Carlos, RF Arenal, Send. Pilón, LN 269100 457900, 600m, #56656, 9.iii-7.iv.2000 (G. Carballo); 1♀, **Heredia**, OTS La Selva BS, 10°26'N 84°01'W, 100m, canopy fog *Pentaclethra*, FPM/08, 4.iv.1993; 2♀, Heredia, OTS La Selva, FOT 2, 13.x.1994 (ALAS); 1♀, Heredia, OTS La Selva, FVK 24, 15.x.1994 (ALAS); 1♀, Heredia, OTS La Selva, iii.1996 (ALAS); 2♀, **San José**, Zurqui de Moravia, 1600m, iv.1992 and ix.1995 (P. Hanson); 1♀, **Cartago**, PN Barbilla, 24km S. Rio Barbilla, Camino a Moravia, LN 598200 212485, 800m, #60767, 27.x-24.xi.2000 (E. Rojas); 1♀, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 95°03'W, 305m, 11-21.ii.2005 (C. Hansson); 1♀, Puntarenas, Reserva Absoluta Cabo Blanco, 9°35'N 85°06'W, 30m, 16-17.ii.2009 (J.S. Noyes); 1♀, Puntarenas, R.F. Golfo Dulce, 24km W Piedras Blancas, vi.1991 (P. Hanson). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

COMMENTS. Note that the apparent discrepancy in the colour of the axillae and scutellum described above and the specimen illustrated in Fig. 560 is due to an anomaly caused during clearing whilst slide-making. The colour descibed above is correct.

Cheiloneurus idris is superficially very similar to *ection*. Apart from lacking the dorsal gastral "glands", it differs from *ection* in having relatively longer funicle segments. In *idris*, all funicle segments at least about 1.5X as long as broad, whereas in *ection* F1-F3 are quadrate and F4-F6 are hardly longer than broad.

Cheiloneurus socrates **sp.nov.**
(Figs 561-566)

DIAGNOSIS. *Female* (length about 1.5mm): body generally black with a weak metallic sheen on frontovertex; mesoscutum with uniformly distributed translucent, silvery setae; fore wing (Fig. 562) hyaline; fore coxa white; head about 4.8X as wide as frontovertex; antenna (Fig. 561) with pedicel very nearly as long as F1-F2 combined; all funicle segments clearly longer than broad; linear sensilla on F4-F6; clava very slightly shorter than F3-F6 combined, apex more or less narrowly rounded; mandible with 3 acute teeth, upper teeth short; mesoscutum (Fig. 564) with longitudinally elongate, lineolate striate-reticulate sculpture, medially and posteriorly distinctly cellular, cells rounded near posterior margin; scutellum with longitudinally elongate, striate sculpture; scutellum without a subapical tuft of setae; fore wing (Fig. 562) about 2.5X as long as broad; parastigma slightly swollen and slightly downcurved; stigmal vein (Fig. 563) with 3 campaniform sensilla at apex; gaster with "glands" on Gt1 and Gt5, those on Gt1 separated by slightly more than their own lengths, those on Gt5 separated by a little less than 0.2X their own lengths; syntergum about as long as broad. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.45mm; excluding ovipositor, 1.40mm (CPD).

Head black with a weak, dark, metallic green sheen on frontovertex with slight purplish reflections, slightly coppery in ocellar area and near occipital margin; scrobal area largely with a distinct, deep, purple sheen, otherwise metallic dark green; lower part of interantennal prominence and near mouth margin dull metallic blue-green, mouth margin coppery purple; frontovertex with inconspicuous dark brown setae; temple adjacent to eye metallic green; posterior part of temple and gena purple, mixed coppery; antenna (Fig. 561) with radicle dark brown; scape white margined dark brown; pedicel dark brown, white in apical half; flagellum dark brown; thorax mostly dark brown to black, pronotum with a dull purple sheen; mesoscutum largely similar to pronotum but anterolaterally more shiny and with a dull dark blue sheen; mesoscutum with more or less uniformly distributed, weakly translucent, silvery setae; tegula dark brown; scutellum clothed with

dark brown setae, virtually matt, with a weak purple-brown sheen, sides narrowly with a moderate dark blue sheen; metanotum with slight purple sheen; mesopleuron dark purple brown; fore coxa white; fore femur and tibia white to pale orange, tibia slightly dusky subbasally; mid coxa dark brown, slightly metallic; mid femur white to pale orange with an interrupted, subapical, brown ring; mid tibia white with a brown subbasal band, spur white; hind coxa dark brown, slightly metallic; hind femur dark brown, extreme apices white; hind tibia dark brown, extreme base and distal one-third or so white; fore tarsi pale dusky orange; mid and hind tarsi white to very pale yellow; pretarsi brownish; fore wing (Fig. 562) completely hyaline, venation pale yellow-brown; propodeum dark purple-brown; sides very weakly metallic green with conspicuous silvery setae in spiracular area; gaster dark purple-brown, Gt1 with a small metallic blue-green area medially; remainder of gaster mixed purple and brassy; gonostylus dark brown.

Head about 4.8X as wide as frontovertex, in profile about 1.4X as high as deep and subtriangular; occipital margin more or less rounded, occiput with a shallow groove from middle of occipital margin to foramen; ocelli forming an angle of about 50°; frontovertex slightly shiny, with conspicuous reticulate sculpture of mesh size in ocellar area generally slightly larger than diameter of eye facet, smaller in front of anterior ocellus; scrobes, interantennal prominence and mouth margin with shallower sculpture; temple and gena with distinct irregular, reticulate sculpture, of larger mesh than frontovertex and distinctly elongate posteriorly; scrobes shallow, not meeting, dorsal and lateral margins weakly rounded; antenna as in Fig. 561; scape hardly broadened and flattened, about 4.5X as long as broad; all funicle segments clearly longer than broad, linear sensilla present only on F4-F6; clava hardly shorter than F3-F6 combined, sutures not oblique, sensory area small and at apex only giving it a rounded or slightly truncate appearance; eye slightly overreaching occipital margin and naked; inner eye margins slightly converging anteriorly so that frontovertex is narrowest just above scrobes; malar sulcus absent; mandible with three acute teeth, upper teeth short. Relative measurements: HW 62, HH 57, FV 13, OD 5, POL 7.5, OOL 0.5, OCL 9.5, AOL 10, EL 37, EW 33, MS 28, SL 27, SW 6.

Thorax (Fig. 564) with shallow, irregular, polygonally reticulate sculpture on pronotum, generally of mesh size a little smaller than diameter of facet; mesoscutum with striate-reticulate sculpture that is slightly deeper than that on pronotum and much more longitudinally elongate, clearly cellular with cells more rounded near posterior margin; sculpture on axilla similar to that on pronotum; sculpture on scutellum of similar depth to that on mesoscutum but finer and striate, apex and sides very narrowly completely smooth; visible part of mesoscutum about 1.7X as broad as long; scutellum about 1.25X as broad as long, without a subapical tuft, longest subapical setae about 0.4X as long as scutellum; hind femur about 3.5X as long as broad; fore wing with venation and setation as in Figs 562, 563; costal cell with 8 or 9 setae dorsally at apex; propodeum (Fig. 564) with numerous setae in spiracular area, side naked, medially about 0.1X as long as scutellum and with a small area of fine, very shallow, polygonally reticulate sculpture. Relative measurements: FWL 73.5, FWW 29.5; HWL 53, HWW 13.

Gaster with hypopygium reaching about half way towards apex; "glands" (Fig. 566) present on Gt1 and Gt5, those on Gt1 separated by slightly more than their own lengths, those on Gt5 separated by a little less than 0.2X their own lengths; ovipositor (Fig. 565) hardly exserted, the exserted part about 0.4X as long as mid tibial spur or about 0.15X as long as mid tibia; last tergite about as long as mid tibia. Relative measurements: OL 55, GL 14 [MT 32].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 95°03'W, 305m, 14-15.ii.2005 (J.S. Noyes). Holotype in NHMUK.

***Cheiloneurus roellus* sp.nov.**
(Figs 567-571; Hab. ♀ 87)

DIAGNOSIS. *Female* (length about 1.2-1.3mm): body generally dark brown to black with a weak to moderate metallic sheen; scape (Fig. 567) dark brown, apex yellow; pedicel brown, apex yellow; funicle and clava pale testaceous yellow; mesoscutum with pale, silvery setae; coxae white, mid coxa brown proximally; legs otherwise white to pale orange with brown areas; fore wing hyaline; head about 3.7X as wide as frontovertex, in facial view about as broad as broad as long, subcircular, gena weakly and evenly curved; frontovertex naked medially below anterior ocellus; area between eye and scrobe about 2X as wide as diameter of anterior ocellus, with distinct sculpture, scrobal margin rounded; interantennal prominence dorsally rounded with only a few long setae; mandible with three sharp teeth, upper tooth shortest; antenna (Fig. 567) with scape about 4X as long as broad; funicle with all segments subquadrate, becoming larger distad; head about as wide as length of flagellum; linear sensilla on F5-F6; clava 3-segmented, about as long as F2-F6 combined, sensory area small, extending less than 0.1X along ventral margin; mesoscutum(Fig. 568) with polygonally reticulate sculpture; scutellum with a distinct apical tuft of setae; wings fully developed; fore wing (Fig. 571) about 2.7X as long as broad; parastigma slightly swollen, not curved downwards; apex of stigmal vein with 4 campaniform sensilla; costal cell dorsally with only 1 or 2 setae at apex and a single, complete line of setae ventrally; area below proximal part of parastigma with a group of about 15 pale setae; apices of postmarginal and stigmal veins not connected by a naked hyaline area (Fig. 570) ; apical bristle of postmarginal vein about 0.5X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with about 15 setae around each spiracle, not extending down side; gaster without "glands" on Gt1 and Gt5; syntergum about 1.2X as long as mid tibia; ovipositor about 2.7X gonostylus or 1.7X mid tibia; gonostylus about 1.8X as long as mid tibial spur; exserted part of ovipositor about 0.4X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.21mm; excluding ovipositor, 1.18mm (CPD).

Head black with weak, blue and coppery purple reflections on frontovertex; scrobal area mostly with a purple sheen merging to coppery laterally on gena; mouth margin with a slight metallic green sheen; temple metallic green; frontovertex with inconspicuous dark brown setae; antenna (Fig. 567) with radicle dark brown; scape dark brown, apical one-third yellowish; pedicel brown, apical one-third yellow; flagellum pale testaceous-yellow; thorax mostly dark brown to black; pronotum with a slight purple sheen; mesoscutum clothed in pale, silvery setae and with a weak, blue sheen mixed purple and posterior margin dark purple; tegula dark brown; axilla with a weak dark blue and purple sheen; scutellum matt, clothed with dark brown setae, sides and apex shining green with a distinct dark blue and purple sheen; metanotum with slight purple sheen; mesopleuron in posterior half with a coppery-purple sheen, anterior half with a weak violet sheen; fore coxa white; fore femur white proximally, apical half dark brown, tibia narrowly white proximally, remainder of basal half dark brown, apex very pale orange; mid coxa brown proximally, otherwise white; mid femur white in proximal one-third, and extreme apex, otherwise dark brown, tibia narrowly white proximally, a dark brown subbasal band extending a little less than half-way, remainder very pale orange; hind coxa white; hind femur white in proximal one-third, otherwise dark brown, tibia narrowly white proximally, a dark brown subbasal band extending a little more than half-way, remainder white; pretarsus slightly dusky; fore wing completely hyaline (Fig. 571), venation mostly pale yellow-brown, submarginal vein partially hyaline; propodeum dark purple-brown; sides metallic green with conspicuous silvery setae in spiracular area; gaster dark purple-brown, Gt1 largely dark metallic blue with some violet reflections; remainder of gaster mixed purple and brassy; gonostylus dark brown.

Head about 3.7X as wide as frontovertex, not subtriangular in profile, occipital margin sharp, occiput without a shallow, median groove; ocelli forming an angle of about 65°; frontovertex slightly shiny, with conspicuous reticulate sculpture of mesh size generally very slightly smaller than diameter of eye facet; scrobes and mouth margin with shallower sculpture; gena with elongate sculpture; temple almost smooth, with shallow irregular, reticulate sculpture, of larger mesh than frontovertex and distinctly elongate posteriorly; scrobes shallow, meeting dorsally, dorsal and

lateral margins weakly rounded; antenna as in Fig. 567; scape slightly broadened and flattened, about 4X as long as broad; all funicle segments subquadrate, broader and larger distad; clava slender, about as long as F2-F6 combined, sutures not oblique, sensory area small, at apex only and giving it a rounded appearance; eye very nearly reaching occipital margin, separated by less than diameter of a facet, clothed with conspicuous setae that are each at least as long as diameter of facet; inner eye margins not converging anteriorly; malar sulcus absent; mandible with three sharp teeth, upper tooth shortest. Relative measurements: HW 48, HH 49, FV 13, OD 3.5, POL 6.5, OOL 1, OCL 5, AOL 7.5, EL 33, EW 26.5, MS 21, SL 27.5, SW 7.

Thorax (Fig. 568) with shallow, irregular, polygonally reticulate sculpture on pronotum, generally of mesh size subequal to diameter of facet; sculpture on mesoscutum generally of similar depth to that on pronotum, but more regular and of smaller mesh; sculpture on axilla similar to that on mesoscutum, but slightly deeper; scutellum with conspicuously deeper, polygonally reticulate sculpture; apex and sides narrowly completely smooth; visible part of mesoscutum about 2X as broad as long; scutellum very slightly broader than long, with a distinct subapical tuft, setae about half as long as scutellum; hind femur about 3.5X as long as broad; fore wing with venation and setation as in Figs 570, 571; costal cell with only 1 seta dorsally at apex; no naked streak present between apices of postmarginal and stigmal veins; propodeum (Fig. 568) with numerous setae in spiracular area, side naked, medially about 0.1X as long as scutellum and without distinct sculpture. Relative measurements: FWL 55, FWW 20.5; HWL 44, HWW 10.

Gaster with hypopygium reaching about half-way to apex; syntergum slightly longer than mid tibia and with apex acute; ovipositor slightly exserted, the exserted part about 0.4X as long as mid tibial spur.

Paratype. Funicle with linear sensilla present only on 5-F6; gaster without "glands" on Gt1 and Gt5; ovipositor as in Fig, 569, gonostylus about 2X as long as mid tibial spur. Relative measurements: OL 45.5, GL 17 [MT 27].

Variation. Females vary in overall length from 1.21-1.27mm, otherwise little in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Pitilla (ACG), 700m, MT/YPT, 24.i-27.ii.1996 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Estac. Pitilla, 9km S Santa Cecilia, 700m, iv.1989 (I. Gauld). Holotype in MZUCR, paratype in NHMUK.

Cheiloneurus dalycera sp.nov.

(Figs 572-575; Hab. ♀ 88)

DIAGNOSIS. *Female* (overall length about 1.1-1.2mm): body dark brown to black with a weak metallic sheen; anterior part of mesoscutum clothed in dark brown setae, posterior part clothed in conspicuous, silvery white setae; fore wing hyaline (Fig. 575); fore coxa white; head about 4-4.1X as wide as frontovertex; antenna (Fig. 573) with pedicel slightly longer than F1-F2 combined; funicle with F1-F3 quadrate or transverse, F4-F6 larger and longer than broad; linear sensilla on F4-F6 or absent on F4; clava about as long as F2-F6 combined, apex rounded; mandible with 2 acute teeth and a truncate upper tooth; mesoscutum (Fig. 572) with longitudinally elongate, lineolate sculpture, some more rounded, cellular sculpture medially and near posterior margin; scutellum with coarse, longitudinally elongate, striate-reticulate sculpture; scutellum without a subapical tuft of setae; fore wing (Fig. 575) about 2.5X as long as broad; parastigma swollen and slightly downcurved; gaster without "glands" on Gt1 or Gt5; syntergum about as long as broad. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.07mm; excluding ovipositor, 0.97mm (CPD).

Head dark brown to black with a weak metallic lustre; frontovertex coppery purple behind posterior ocelli, area around anterior ocellus dull, metallic dark green mixed coppery purple, area above scrobes purple; temple with a dull metallic green and coppery sheen, area immediately below lowest part of eye relatively shiny green, gena coppery purple mixed dark blue; scrobal area coppery purple, mouth margin coppery, lower part of interantennal prominence mixed metallic dark blue; a line of translucent, brown setae along inner eye margin continuing below eye to gena and along position of malar sulcus; radicle brown; antenna (Fig. 573) with scape largely pale orange, but brown proximally and along dorsal and ventral margins; pedicel dark brown with apex narrowly dusky pale orange; funicle orange-brown, F5-F6 very slightly paler; clava brown; thorax dark brown to black; pronotum with a weak, coppery purple and brassy sheen; mesoscutum generally with a weak coppery purple sheen, but side and posterior one-third or so with weak metallic, dark blue reflections, anterior part clothed in dark brown setae, posterior part clothed in conspicuous, silvery white setae; tegula dark brown; axilla similarly coloured to mesoscutum; scutellum relatively bright, dorsally with metallic green, blue-green and coppery reflections, extreme side and apex with a strong metallic green and coppery sheen; mesopleuron with a weak, metallic blue, purple and brassy sheen; fore coxa white; fore femur white with dorsal and ventral margins marked with brown in distal half, tibia pale yellow with a dorsal, brown subbasal streak, tarsus dusky pale yellow; mid coxa dark brown; mid femur white with a narrow, subapical brown band in distal half, tibia white with a narrow, subbasal brown band in basal half, spur and tarsus white to very pale yellow; hind coxa dark brown; hind femur dark brown, narrowly white basally, tibia mostly dark brown with apices white, tarsus white with apical tarsomere brown; wings hyaline, venation pale yellow; propodeum dark brown with a weak brassy and purple sheen, a little coppery laterally, side with a metallic green sheen mixed coppery and brassy, outside spiracle with 3 inconspicuous brown setae; gaster dark purple-brown, dorsally with a coppery purple sheen, Gt1 mixed metallic dark blue, green and brassy, side and venter with coppery, blue, brassy and green reflections; gonostylus dark brown, apex pale orange.

Head about 4.1X as wide as frontovertex, in profile about 1.4X as high as deep, tangent to frontovertex above scrobes forming an angle of about 80° with face below top of scrobes; a very small, oval depression adjacent to eye near occipital margin; ocelli forming an angle of about 65°; frontovertex narrowest a little above scrobes, relatively dull, with relatively deep, polygonally reticulate to imbricate-reticulate sculpture, in ocellar area of mesh size conspicuously larger than eye facet, subequal elsewhere; temple and gena with sculpture of similar depth to anterior part of frontovertex, but more longitudinally elongate imbricate-reticulate to polygonally reticulate; area immediately below lowest part of eye completely smooth; scrobes with relatively shallow, irregular, elongate sculpture; interantennal prominence and mouth margin with shallow, polygonally reticulate sculpture; scrobes shallow, indistinctly margined, narrowly ∩-shaped; interantennal prominence dorsally indistinctly acute; antenna as in Fig. 573; scape hardly broadened and flattened, about 4.5X as long as broad; all funicle segments slightly longer than broad, increasing in width distad; clava about as long as F2-F6 combined, sutures parallel, sensory area small, at apex only giving it a pointed or slightly rounded appearance; eye more or less reaching occipital margin, clothed with very inconspicuous setae, each much shorter than diameter of facet; malar sulcus absent; mandible with 2 teeth and a truncate upper tooth. Relative measurements: HW 57, HH 46, FV 14, POL 7, OOL 1, OCL 7, AOL 7, EL 32, EW 32, MS 23, SL 27, SW 6.

Thorax (Fig. 572) with imbricate-reticulate to polygonally reticulate sculpture on pronotum that is about as deep as that in ocellar area; mesoscutum in anterior half or so with fine, longitudinally elongate, polygonally reticulate sculpture that is a little deeper than sculpture on pronotum, sculpture anterolaterally more striate reticulate, posterior part with more rounded cells; scutellum with slightly deeper, polygonally reticulate sculpture composed of less elongate cells, extreme side and apex completely smooth; setae on anterior part of mesoscutum about as dense as those on posterior part; scutellum with a distinct, but relatively sparse, subapical tuft of setae; visible part of mesoscutum about 2.0X as broad as long; scutellum about 1.1X as broad as long; fore wing with venation and setation as in Figs 574, 575; costal cell with 5 or 6 dorsal setae at apex. Relative measurements: FWL 58, FWW 23; HWL 43, HWW 10.

Gaster with hypopygium reaching about 0.6X towards apex; last tergite about as long as mid tibia, with apex acute; ovipositor slightly exserted, the exserted part about 0.6X length of mid tibial spur or about 0.25X mid tibia.

Paratype. Funicle with linear sensilla present only on F4-F6 or absent from F4; gaster without "glands" on Gt1 or Gt5. Relative measurements: OL 90, GL 21.5 [MT 58].

Variation. Females vary in overall length from 1.07-1.24mm, the lateral parts of the mesoscutum may have distinct metallic purple and dark blue reflections, some of the funicle segments appear to be quadrate, otherwise very little variation noted in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste,** Est. Pitilla, 9km S. Santa Cecilia, LN 329950 380450, 700m, iv.1993 (C. Moraga). Paratypes: **COSTA RICA**, 2♀, **Guanacaste**, Maritza (ACG), 700m, MT/YPT, 20.i-24.ii.1996 (J.S. Noyes). Holotype in MZUCR, paratype in NHMUK.

Cheiloneurus ection sp.nov.

(Figs 576-580)

DIAGNOSIS: *Female* (overall length about 1.5mm): body black with a weak to moderate metallic sheen; anterior one-third or so of mesoscutum clothed in dark brown setae, posterior two-thirds clothed in moderately dense, slightly silvery, translucent setae; fore wing (Fig. 578) hyaline; fore coxa mostly white, proximally brown; head about 5X as wide as frontovertex; antenna (Fig. 576) with pedicel about as long as F1-F2 combined; all funicle segments very slightly longer than broad, F1-F3 smaller and subquadrate; linear sensilla on F4-F6; clava slightly longer than F2-F6 combined, with apex rounded; mandible with a long, acute lower tooth, rounded middle tooth and short, obtuse upper tooth; mesoscutum (Fig. 580) mostly with slightly longitudinally elongate, polygonally reticulate sculpture, some rounded, polygonally reticulate sculpture medially near posterior margin; scutellum with coarse, fairly regular, polygonally reticulate sculpture in middle, laterally and apically striate-reticulate; scutellum without a subapical tuft of setae; fore wing (Fig. 578) about 2.4X as long as broad; parastigma slightly swollen and very weakly downcurved; apex of stigmal vein with 3 campaniform sensilla; gaster with "glands" on TV separated by about one-third their own lengths; syntergum broader than long. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.47mm; excluding ovipositor, 1.41mm (CPD).

Head black with a moderate, metallic green sheen on frontovertex with slight purplish reflections, slightly coppery in ocellar area and near occipital margin; scrobal area mostly with a distinct, deep, purple sheen; lower part of interantennal prominence and mouth margin metallic green to blue-green; frontovertex with inconspicuous dark brown setae; temple adjacent to eye metallic green; posterior part of temple and gena purple, mixed coppery; antenna (Fig. 576) with radicle dark brown; scape dark brown with extreme apex pale orange; pedicel dark brown in proximal two-thirds or so, apex pale orange; funicle pale brown, distal segments mixed pale orange, especially ventrally; clava dark brown; thorax mostly dark brown to black; pronotum with a dull purple sheen; mesoscutum with a dull purple sheen mixed with blue reflections, especially laterally; anterior one-third or so clothed in dark brown setae, posterior two-thirds clothed in moderately dense, slightly silvery, translucent setae, posterior margin dark purple; tegula dark brown; scutellum clothed with dark brown setae and with a distinct metallic green sheen that contrasts with the relatively dull mesoscutum, this mixed with coppery reflections, especially medially and posteriorly, sides and apex shining metallic green with some coppery reflections; metanotum with slight purple sheen; mesopleuron dark purple-brown with a weak, but distinct blue-green sheen in anterior two-thirds or so; fore coxa mostly white, but proximally brown; fore

femur dark brown with apices white; tibia brown, distally pale orange-brown, narrowly white proximally; mid coxa dark brown, slightly metallic; mid femur white with a dark brown, subapical band; mid tibia white with a brown subbasal band, spur white; hind coxa dark brown, slightly metallic; hind femur almost completely dark brown but with extreme apices white; hind tibia dark brown with apices narrowly white; fore tarsi pale orange-brown; mid and hind tarsi white; pretarsi brownish; fore wing (Fig. 578) completely hyaline, venation pale yellow-brown; propodeum dark purple-brown; sides weakly metallic green with conspicuous silvery setae in spiracular area; gaster dark purple-brown, Gt1 distinctly metallic blue; remainder of gaster mixed purple and brassy; gonostylus dark brown.

Head about 5X as wide as frontovertex, subtriangular in profile, occipital margin more or less rounded, occiput with a shallow groove from middle of occipital margin to foramen; ocelli forming an angle of about 45°; frontovertex slightly shiny, with conspicuous reticulate sculpture of mesh size generally slightly smaller than diameter of eye facet; scrobes, interantennal prominence and mouth margin with shallower sculpture; temple and gena with distinct irregular, reticulate sculpture, of larger mesh than the frontovertex and distinctly elongate posteriorly; scrobes shallow, not meeting, dorsal and lateral margins indistinct, weakly rounded; antenna as in Fig. 576; scape slightly broadened and flattened, about 3.6X as long as broad; funicle segments subquadrate, F1-F3 quadrate, F4-F6 larger and slightly longer than broad; linear sensilla present only on F4-F6; clava slightly longer than F2-F6 combined, sutures not oblique, sensory area moderately large, about half as wide as clava, at apex only giving it a rounded appearance; eye slightly overreaching occipital margin and clothed with inconspicuous, short setae that are each slightly shorter than diameter of facet; frontovertex narrowest near posterior ocelli, slightly wider near anterior ocellus; malar sulcus absent; mandible with a long, acute lower tooth, rounded middle tooth and short, obtuse upper tooth. Relative measurements: HW 66, HH 57, FV 14.5, OD 4.5, POL 6.5, OOL 0.5, OCL 9.5 AOL 9, EL 39, EW 35, MS 27, SL 29, SW 8.

Thorax (Fig. 580) with shallow, irregular, polygonally reticulate sculpture on pronotum, generally of mesh size subequal to diameter of facet; sculpture on anterior part of mesoscutum slightly coarser and finer than that on pronotum and more longitudinally elongate, but posterior part with polygonally reticulate sculpture similar to that on pronotum; sculpture on axilla slightly coarser and reticulate; scutellum with coarse, fairly regular, polygonally reticulate sculpture in middle, laterally and apically striate-reticulate, extreme apex and sides completely smooth; visible part of mesoscutum about 1.5X as broad as long; scutellum about as long as broad, subapical tuft sparse composed only 5 or 6 setae and indistinct, but setae about one-third as long as scutellum; hind femur about 3.8X as long as broad; fore wing with venation and setation as in Figs 577, 578; costal cell with 6 setae dorsally at apex; propodeum (Fig. 580) with about 15 setae in spiracular area, side naked, medially about 0.1X as long as scutellum and smooth. Relative measurements: FWL 83, FWW 34; HWL 61, HWW 17.

Gaster with hypopygium reaching about half-way to apex; ovipositor hardly exserted, the exserted part about one-quarter as long as mid tibial spur; "glands" present on TV, separated by about one-third their own lengths; syntergum about as long as mid tibia; ovipositor as in Fig. 577, gonostylus about 0.6X as long as mid tibial spur. Relative measurements: OL 48, GL 10 [MT 36].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Sta, Rosa NP, Bosq. Hum. 9-0, 23.iii-13. iv.1986 (Janzen, Gauld). Holotype in NHMUK.

COMMENTS. Unfortunately, it is not possible to identify Gt1 of the gaster on the slide mounted holotype and therefore the presence or absence of "glands" on this tergite is unknown.

Cheiloneurus parvus (Hayat)
(Figs 581-587)

Metapterencyrtus parvus Hayat, 1980:643-644,645. Holotype ♀, India, NHMUK, examined.
Echthrogonatopus parvus (Hayat); Hayat & Subba Rao, 1981:111.
Cheiloneurus parvus (Hayat); Guerrieri & Viggiani, 2005:306.

DIAGNOSIS. *Female* (length about 0.8-1.2mm): body generally black with a moderate to strong green, blue, purple or coppery metallic sheen; antenna slightly dusky pale orange; mesoscutum with moderately dense silvery setae; legs, including coxae, pale orange; wings (Fig. 586) hyaline; head (Fig. 581) about 4.2-5.7X as wide as frontovertex, in facial view very slightly longer than broad, subcircular, genae weakly curved, more strongly curved near mouth margin; frontovertex naked medially above scrobes; eye separated from scrobe by about diameter of anterior ocellus, area between eye and scrobe with shallow sculpture, scrobes shallow and weakly margined; interantennal prominence with about 10 inconspicuous setae and dorsally rounded; mandible tridentate; antenna (Fig. 583) with scape about 4.8-5.3X as long as broad; F1 quadrate, remaining segments transverse; linear sensilla on F5-F6; clava 3-segmented, a little longer than funicle, sensory area enlarged, extending about 0.7X along ventral surface of clava giving it a strong, obliquely truncate appearance; head width slightly greater than length of flagellum; mesoscutum (Fig. 582) generally with squamiform reticulate sculpture, slightly longitudinally elongate laterally; scutellum without an apical tuft of setae; wings fully developed; fore wing (Fig. 586) about 2.8X as long as broad; parastigma very weakly downcurved; costal cell dorsally naked, ventrally with a complete line of setae; basal cell uniformly setose with setae arranged in 7 or 8 lines with only extreme proximal area naked; apices of postmarginal and stigmal veins (Fig. 587) not connected by a naked area; seta at apex of postmarginal vein about 0.4X as long as marginal vein; mid tibial spur slightly shorter than basitarsus; propodeum with about 20 setae adjacent to spiracle, these not extending down side; gaster without "gland-like" structures on Gt1 or Gt5; syntergum about 0.8X as long as mid tibia; hypopygium Fig. 585; ovipositor (Fig. 584) about 3.4X gonostylus or about 0.8X as long as mid tibia; gonostylus about as long as mid tibial spur; ovipositor not exserted. *Male* (length about 0.77-0.85mm): similar to female; frontovertex slightly more than half head width; antenna with funicle segments subequal and each at least 3X as long as broad, clothed in whorls of long setae that are about 3X as long as the length of segment; aedeagus about 0.7X as long as mid tibia.

DISTRIBUTION. Costa Rica (**new record**), India.

HOSTS. Unknown, but very probably a parasitoid of dryinids (Hymenoptera: Dryinidae) parasitizing delphacids (Hemiptera: Delphacidae).

MATERIAL EXAMINED.

Type material. Holotype ♀: "INDIA, U.P. Aligarh 13.v.1977 on grass M. Hayat"; "*Metapterencyrtus parvus* Hayat Holotype ♀". Holotype in NHMUK.

Non type material. **COSTA RICA**, **Puntarenas**, Pen. Osa, Puerto Jimenez, 8°32'N 83°19'W, i.1992 (P. Hanson). **INDIA**, 1♀, 1♂, **Uttar Pradesh**, Dehra Dun, x.1979 (Z. Bouček); 3♀, Uttar Pradesh, Aligarh, 8-10.xi.1979 (J.S. Noyes); 6♀, 3♂, **Delhi**, IARI area, x.1979 (Z. Bouček); 2♀, 1♂, **Kerala**, Periyar A[nimal] Sanc[tuary], 5-15.x.1979 (J.S. Noyes). Material in NHMUK.

COMMENTS. *Cheiloneurus parvus* is very close to *exitiosus* Perkins which is a hyperparasitoid of Delphacidae via dryinids. In all respects, the specimen from Costa Rica falls within the range of variation exhibited by the above series of *parvus* from India. In general, the scape of *parvus* is a little more than 5X as long a broad, but one specimen from India has the scape about 4.8X as long as broad, identical in width to that of the Costa Rica specimen. I therefore have no hesitation in identifying the Costa Rica specimen as *parvus*.

See also comments under *semis* (p. 237).

***Cheiloneurus semis* sp.nov.**
(Figs 588-592; Hab. ♀ 89)

DIAGNOSIS. *Female* (length about 0.9-1.3mm): body generally dark brown to black with a weak to moderate metallic sheen; antenna (Fig. 591) with scape brown proximally, pale orange distally; pedicel mostly pale orange, dorsally dark brown proximally; flagellum pale orange; mesoscutum mostly with dense silvery setae; coxae white; legs almost completely white to pale orange with brown areas near knees; fore wing (Fig. 588) mostly hyaline with a barely visible, very weakly infuscate area in middle of apical half; head about 8-10X as wide as frontovertex, in facial view slightly longer than broad, subcircular, genae converging, weakly curved, more strongly so towards mouth margin; frontovertex naked medially below anterior ocellus; eye nearly touching scrobe, area between eye and scrobe with shallow sculpture, scrobal margin rounded; interantennal prominence dorsally rounded with only a few long setae; mandible with three subequal teeth; antenna (Fig. 591) with scape about 4.1-4.4X as long as broad; funicle with F1 slightly longer than broad, remaining segments transverse; head width nearly equal to length of pedicel and flagellum combined; linear sensilla on F5-F6; clava 3-segmented, slightly longer than funicle, sensory area large and forming an oblique truncation, extending slightly more than 0.4X along ventral margin; mesoscutum (Fig. 592) mostly with polygonally reticulate sculpture, but anterior one-third or so with longitudinally elongate, striate-reticulate sculpture; scutellum with a distinct, but sparse apical tuft of setae; wings fully developed; fore wing (Fig. 588) about 2.6-2.7X as long as broad; parastigma very weakly curved downwards; costal cell dorsally with 1 to 4 setae at apex and ventrally with a single complete line of setae; area below proximal part of parastigma with a group of about 7-9 setae; apices of postmarginal and stigmal veins (Fig. 590) not connected by a naked hyaline area; apical bristle of postmarginal vein about 0.5X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum with about 15-20 setae around each spiracle, side naked; syntergum about 0.8X as long as mid tibia; ovipositor about 3.3X gonostylus or hardly longer than mid tibia; gonostylus about as long as mid tibial spur; ovipositor not exserted. *Male*: unknown.

Female (holotype): length 0.90mm (CPD).

Head black with a weak blue, green, brassy and coppery reflections on frontovertex, more coppery between posterior ocelli and occipital margin; occiput with a very slight blue and purple sheen; scrobal area largely with a coppery purple sheen mixed blue laterally and above mouth margin; temple and area immediately below eye mixed coppery, brassy and metallic green; gena relatively dull coppery, purple and brassy; frontovertex with inconspicuous dark brown setae; antenna (Fig. 591) with radicle dark brown; scape proximally brown, apically pale orange; pedicel mostly very pale orange, basal half or so brown dorsally; flagellum very pale orange; thorax dark brown to black; pronotum mainly purple-brown with a slight sheen; mesoscutum hardly shiny, but with blue and purple reflections, posterior margin weakly coppery purple, setae mostly dense and silvery, sparser and dark brown along anterior and posterior margins; tegula brown; axilla and scutellum similar to mesoscutum and clothed in dark brown setae, subapical tuft black, extreme apex and sides coppery and metallic green; metanotum with a slight purple sheen; mesopleuron purple-brown with a slight brassy sheen, anteriorly with some faint bluish reflections; fore coxa white; fore femur white, pale orange distally and brown externally in distal half, tibia pale orange with a small, brown, subbasal spot externally; mid coxa white; mid femur white to very pale yellow, with a narrow, brown subapical ring, tibia pale orange with a brown subbasal ring; hind coxa white; hind femur very pale yellow, pale brown in distal one-third, tibia pale orange; tarsi pale orange, fore tarsus darkest, pretarsi slightly dusky; fore wing (Fig. 588) mostly hyaline with a very weakly infuscate area in middle of apical half; venation pale brown, submarginal vein mostly pale yellow; propodeum dark purple-brown; sides with about 15 conspicuous silvery setae in spiracular area; gaster dark purple-brown, Gt1 with a metallic blue sheen, mixed coppery and purple, dorsum otherwise slightly coppery, mixed purple and brassy, sides and outer plate of ovipositor additionally with some metallic green; gonostylus dark brown.

Head a little more than 8X as wide as frontovertex, in profile anteriorly almost evenly rounded in profile, helmet-shaped and only about 1.6X as high as deep; occipital margin acute,

occiput with a shallow, incomplete median groove above foramen, not reaching occipital margin; ocelli forming an angle of about 40°; frontovertex slightly shiny, with conspicuous reticulate sculpture of mesh size generally very slightly smaller than diameter of eye facet; scrobal area and mouth margin with shallower sculpture; narrowest point between eye and scrobe about 1.5X diameter of anterior ocellus and with relatively shallow sculpture; gena and temple with more elongate sculpture of larger mesh, area immediately below and behind eye quite smooth and shiny; scrobes shallow, meeting dorsally, dorsal and lateral margins weakly rounded; antenna as in Fig. 591; scape hardly broadened and flattened, about 4.4X as long as broad; F1 very slightly longer than broad, remaining funicle segments transverse, segments broadest distad; clava hardly broadened, a little longer than funicle, only outer suture clearly oblique, sensory area enlarged, extending slightly less than half-way along clava ventrally, giving it a distinct, obliquely truncate appearance; eye almost reaching occipital margin, separated by less than diameter of facet, clothed with conspicuous setae, each very slightly longer than diameter of facet; inner eye margins clearly converging anteriorly; malar sulcus absent; mandible with 3 acute teeth, middle tooth longest. Relative measurements: HW 46, HH 50, FV 5.5, OD 4, POL 4, OOL 0, OCL 3, AOL 7, EL 35.5, EW 28, MS 23, SL 24, SW 5.5.

Thorax (Fig. 592) with shallow, irregular, polygonally reticulate sculpture on pronotum, generally of mesh size subequal to diameter of facet; sculpture on most of mesoscutum generally similar to that on pronotum, but more regular, anterior one-third or so with coarse, longitudinally elongate striate-reticulate sculpture; sculpture on axilla similar to that on mesoscutum, but slightly deeper; scutellum with conspicuously deeper, polygonally reticulate sculpture, much more elongate on sides; extreme apex and sides completely smooth and shiny; visible part of mesoscutum about 2.1X as broad as long; scutellum very slightly broader than long, with a sparse subapical tuft, longest setae hardly more than about one-quarter as long as scutellum; hind femur about 4.5X as long as broad; fore wing with venation and setation as in Figs 588, 590; costal cell with 2 setae dorsally at apex; no naked streak present between apices of postmarginal and stigmal veins; propodeum (Fig. 592) with moderately dense setae in spiracular area, side naked, medially less than 0.1X as long as scutellum and with a very little shallow, irregular polygonally reticulate sculpture. Relative measurements: FWL 48, FWW 18.5; HWL 38, HWW 8.

Gaster with hypopygium reaching about half-way to apex; syntergum about 0.8X as long as mid tibia, with apex more or less rounded; ovipositor hidden.

Paratype. Linear sensilla present only on F5-F6; gaster without "gland-like" structures on Gt1 or Gt5; hypopygium Fig. 589. Relative measurements: OL 26.5, GL 8 [MT 26].

Variation. Females vary in overall length from 0.90-1.08mm, the infuscate area in apical half of fore wing may be very faint and barely visible, the gonostylus may be pale orange-brown, the head varies from about 8-10X as wide as the frontovertex, the scape varies from about 4.1-4.4X as long as broad, otherwise little in material available.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, RF Golfo Dulce, 24km W. Piedras Blancas, 200m, ii.1992 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **Heredia**, La Selva BS, 10 26'N 841'W, ii.2001 (J.S. Noyes); 1♀, **Heredia**, Est. Biol. La Selva, 10 26'N 841'W, iii.2002 (M. Gates); 1♀, Heredia, Est. Biol. La Selva, 10 26'N 841'W, 75m, ii.2003 (J.S. Noyes); 1♀, Heredia, OTS La Selva, 10°26'N 84°01'W, 75m, 23.ii.2006 (J.S. Noyes); 1♀, Heredia, Estacion Biologica La Selva, 10°26'N 84°01'W, 75m, 24-25.ii.2011 (J.S. Noyes); 2♀, **Puntarenas**, NP Manuel Antonio, 23-28.viii.1986 and 26.viii.1986 (L. Masner); 1♀, Puntarenas. 13km NE Dominical, RB Rio Magnolia, 9°20'N 83°47'W, 800m, 22-24.ii.2015 (J.S. Noyes); 2♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 18-22.iii.1990 (J.S. Noyes); 2♀, Puntarenas, San Vito, 1200m, coffee, iii-iv.1996 (P. Hanson); 1♀, Puntarenas, PN Piedras Blancas, Est. El Bonito, 8°43'N 83°13'W, 100m, 13-14.ii.2012 (J.S. Noyes); 1♀, **Limón**, Parque Nac. Cahuita, 0m, 29.v.1988 (P. Hanson); 2♀, Limón,

RB Hitoy-Cerere, 100m, 14-19.i.1991 (J.S. Noyes). Holotype in MZUCR, paratypes in NHMUK, MZUCR and CNC.

COMMENTS. The general habitus of *Cheiloneurus semis* suggests that it belongs to a group of species that includes parasitoids of Dryinidae. Of the Costa Rica species it is closest *parvus* and *nintra*. It differs from *parvus* in having the frontovertex narrowing strongly in front of the anterior ocellus to less than 0.15X head width, the fore wing weakly infuscate and the legs with dark brown markings. In *parvus* the frontovertex does not strongly narrow in front of the anterior ocellus and is more than 0.17X head width, the fore wing is completely hyaline and the legs are completely yellow. *Cheiloneurus semis* differs from *nintra* in having the body generally dark brown, the fore wing weakly infuscate, whereas in *nintra* the body is largely orange and the fore wing is strongly infuscate. Of the extralimital species, *semis* is most similar to *pachycephalus* (Perkins) from North America. It differs from *pachycephalus* in lacking a distinctly infuscate area across the wing from the marginal vein and having distinct dark brown markings on the legs. In *pachycephalus* the wings have a weak, infuscate, curved band from the marginal vein and the legs completely yellow.

***Cheiloneurus catreta* sp.nov.**
(Figs 593-596; Hab. ♀ 90)

DIAGNOSIS. *Female* (length about 1.2-1.4mm): body generally dark brown to black with a metallic sheen; antenna (Fig. 593) with scape dark brown with apex white; pedicel dorsally dark brown, orange-brown ventrally, apex white; funicle white to pale orange-brown; clava pale orange, proximally brownish; posterior part of mesoscutum with silvery setae; all coxae white; hind tibia dark brown, legs otherwise white to pale orange mixed dark brown; fore wing (Fig. 595) hyaline; head about 5.2X as wide as frontovertex, in facial view very slightly longer than broad and subcircular, gena weakly and fairly evenly curved; frontovertex naked medially below anterior ocellus; area between eye and scrobe about 1.5X as wide as anterior ocellus, with distinct sculpture, scrobal margin rounded; interantennal prominence dorsally rounded with only a few setae; mandible with two long, acute, lower teeth and a slightly shorter upper tooth; scape about 2X as long as broad; funicle with F1 and F2 quadrate, other segments transverse; flagellum very slightly longer than head width; linear sensilla on F5-F6; clava 3-segmented, slightly longer than funicle, sensory area extending slightly less than 0.5X along ventral surface; mesoscutum (Fig. 596) mainly with polygonally reticulate sculpture; scutellum with distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 595) about 2.8-3.0X as long as broad; parastigma not curved downwards; costal cell dorsally with two or three setae at apex and a single complete line of setae ventrally; area below proximal part of parastigma with a group of about 10 pale setae; apices of postmarginal and stigmal veins (Fig. 594) not connected by a naked hyaline area; apical bristle of postmarginal vein about 0.5X as long as marginal vein; mid tibial spur clearly longer than basitarsus; propodeum (Fig. 596) with about 15-18 setae around each spiracle, none down side; syntergum about as long as mid tibia; ovipositor about 3.6X gonostylus or 1.3X mid tibia; gonostylus about as long as mid tibial spur; exserted part of ovipositor about 0.25X mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.35mm; excluding ovipositor, 1.31mm (CPD).

Head black with a very dull, dark metallic green sheen on frontovertex with slight purplish reflections, entire scrobal area with a distinct, deep, purple sheen; frontovertex with inconspicuous dark brown setae; temple and posterior part of gena below eye metallic green mixed brassy; remainder of malar space coppery; antenna (Fig. 593) with radicle dark brown; scape dark brown with apex white; pedicel dorsally dark brown in proximal two-thirds or so, apex white, orange-brown ventrally; funicle with F1-F2 white, F2 dusky distally; F3-F5 dusky yellow to pale orange-brown, F6 pale orange; clava pale orange with basal segment brownish proximally; thorax mostly dark brown to black; pronotum with a dull coppery-purple sheen; anterior one-third or so of mesoscutum relatively dull and clothed in dark brown setae, posterior two-thirds with slight metallic blue and purple reflections and clothed in moderately dense, slightly silvery, translucent

setae, posterior margin dark purple; tegula dark brown; scutellum clothed with dark brown setae, mostly matt, posteriorly with a coppery purple sheen, sides and apex shining metallic green with some coppery reflections; metanotum with slight purple sheen; mesopleuron dark purple-brown; fore coxa white; fore femur white with a broad, subapical brown band; tibia with a broad subbasal brown band, narrowly pale orange proximally, distal half pale orange; mid coxa white, brown towards base; mid femur white with a narrow, dark brown, subapical band; mid tibia white with a brown subbasal band; hind coxa white; hind femur white with apical half dark brown; hind tibia dark brown, narrowly pale yellow proximally, apical one-third or so white; all tarsi very pale orange; pretarsi brownish; fore wing (Fig. 595) completely hyaline, venation pale yellow-brown; propodeum dark purple-brown; sides weakly metallic green with conspicuous silvery setae in spiracular area; gaster dark purple-brown, Gt1 distinctly metallic blue; remainder of gaster mixed brassy, sides of apical tergites weakly metallic green with purple reflections; gonostylus dark brown.

Head about 5.2X as wide as frontovertex with occipital margin sharp and without a median groove to foramen; ocelli forming an angle of about 45°; frontovertex slightly shiny, with conspicuous reticulate sculpture of mesh size generally slightly smaller than diameter of eye facet; scrobes, interantennal prominence and mouth margin with shallower sculpture; temple and gena with distinct irregular, reticulate sculpture, of larger mesh than the frontovertex and distinctly elongate posteriorly; scrobes moderately deep, not meeting, dorsal and lateral margins weakly rounded; antenna as in Fig. 593; scape strongly broadened and flattened, about 2X as long as broad; funicle with F1 and F2 more or less quadrate; remaining segments transverse; clava about long as funicle, both sutures slightly oblique, sensory area forming an oblique truncation that extends about half-way along clava; eye reaching occipital margin and clothed in fairly conspicuous setae that are each slightly longer than diameter of facet; malar sulcus absent; mandible with 2 long, acute lower teeth and short upper, third tooth. Relative measurements: HW 52, HH 53, FV 10, OD 4, POL 5, OOL 0.5, OCL 6, AOL 9.5, EL 38, EW 29, MS 27, SL 31, SW 16.

Thorax (Fig. 596) with shallow, irregular, polygonally reticulate sculpture on pronotum, generally of mesh size a little larger than diameter of facet; sculpture on anterior part of mesoscutum coarser and finer than that on pronotum, but posterior part with shallower sculpture similar to that on pronotum; sculpture on axilla slightly coarser and reticulate; scutellum mostly with coarse, slightly longitudinally elongate, polygonally reticulate sculpture, extreme apex and sides completely smooth; visible part of mesoscutum about 2X as broad as long; scutellum about as long as broad, subapical tuft distinct, setae about half as long as scutellum; hind femur about 3.5X as long as broad; fore wing with venation and setation as in Figs 594, 595; costal cell with 2 or 3 setae dorsally at apex; no naked streak present between apices of postmarginal and stigmal veins (Fig. 594); propodeum (Fig. 596) with numerous setae in spiracular area, side naked, medially about 0.1X as long as scutellum and medially with a small area of fine, very shallow, polygonally reticulate sculpture. Relative measurements: FWL 59, FWW 20; HWL 47, HWW 10.

Gaster with hypopygium reaching about half-way to apex; ovipositor hardly exserted, the exserted part about one-quarter as long as mid tibial spur; syntergum about as long as mid tibia.

Paratype. Funicle with linear sensilla present only on F5-F6; gaster without "gland-like" structures on Gt1 or Gt5; gonostylus about as long as mid tibial spur. Relative measurements: OL 41, GL 11.5 [MT 31].

Variation. Females vary in overall length from 1.21-1.44mm, the clava may be hardly dusky basally and the fore wing may be 2.8-3.0X as long as broad, otherwise very little in material available.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, Est. Biol. La Selva, 10°24'N 84°01'W, 50-150m,

canopy fog *Eugenia* sp., FOT/76/1-40, 5.i.2000 (INBio/OET). Paratypes: **COSTA RICA**, 2♀, **Heredia**, OTS La Selva, 10°26'N 84°01'W, xi.1993 and ix.1995 (ALAS). Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. The holotype appears to have F1 and F2 partially fused on both antennae, but is otherwise in perfect condition.

Cheiloneurus herndonia sp.nov.
(Figs 597-600)

DIAGNOSIS. *Female* (length about 2.8mm): body generally dark brown to black with a weak to strong metallic sheen; axillae and scutellum orange (see Fig. 597); antenna (Fig. 598) with scape pale orange; pedicel mostly pale orange, dorsally dark brown proximally; funicle pale orange, proximally slightly dusky; clava dark brown; mesoscutum with pale, almost silvery setae in posterior two-thirds; coxae white; hind tibiae pale orange with a pale brown subbasal ring, legs otherwise yellowish with a few indistinct brown areas; fore wing (Fig. 600) hyaline proximally but distally generally weakly infuscate, slightly more strongly so below marginal and stigmal veins and along margin of linea calva; head about 4.2X as wide as frontovertex, in facial view about as broad as long, subcircular, genae converging, weakly and evenly curved; frontovertex with 4 or 5 setae medially below anterior ocellus; area between eye and scrobe about as wide as diameter of anterior ocellus, with shallow sculpture, scrobal margin rounded; interantennal prominence dorsally rounded with only a few long setae; mandible with two long, sharp lower teeth and a shorter, rounded, upper tooth; antenna (Fig. 598) with scape about 4.7X as long as broad; funicle with F1 slightly longer than broad, remaining segments transverse; head width slightly less than length of flagellum; linear sensilla on F4-F6; clava 3-segmented, about as long as F2-F6 combined, sensory area large and forming an oblique truncation, extending about 0.7X along ventral margin; mesoscutum (Fig. 597) with polygonally reticulate sculpture; scutellum with a sparse but distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 600) about 2.7X as long as broad; parastigma not curved downwards; costal cell dorsally with 8 or 9 setae forming a line in distal 0.4X and ventrally with almost two complete lines of setae; area below proximal part of parastigma with a group of about 35 setae; apices of postmarginal and stigmal veins not connected by a naked hyaline area (Fig. 599); apical bristle of postmarginal vein about 0.25X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum (Fig. 597) with about 35 setae around each spiracle, side naked; syntergum about 1.6X as long as mid tibia; ovipositor about 2.3X gonostylus or 2.4X mid tibia; gonostylus about 3.9X as long as mid tibial spur; exserted part of ovipositor slightly longer than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 2.79mm; excluding ovipositor, 2.56mm (CPD).

Head black with a very weak blue and purple sheen on frontovertex, slightly coppery between posterior ocelli and occipital margin; occiput with a blue, green and purple sheen; scrobal area purple mixed blue-green, a Λ-shaped purple line between toruli; mouth margin coppery purple, medially clearly mixed orange-brown; gena and temple blue-green mixed brassy and a little coppery, especially near upper eye margin; malar sulcus indicated by a weak coppery line; frontovertex with inconspicuous dark brown setae; antenna (Fig. 598) with radicle pale orange, mixed brown distally; scape pale orange; pedicel mostly pale orange, basal half or so dark brown dorsally; funicle pale orange, F1-F3 very slightly dusky; clava dark brown; thorax (Fig. 597) mostly dark brown to black, axillae dark orange-brown, scutellum orange; pronotum mainly dull purple-brown, posteriorly coppery; mesoscutum with a bright metallic blue-green sheen with some strong brassy and weak coppery reflections, especially towards anterior and posterior margins, posterior margin coppery purple, setae dark brown in anterior one-third, posterior two thirds with uniform, translucent, pale brown, almost silvery setae; tegula dark brown; scutellum clothed in dark brown setae; metanotum with a slight purple sheen; mesopleuron in posterior half with a coppery-purple and brassy sheen, anterior half mixed blue, dark green, coppery and brassy, these narrowly separated by a coppery, dark blue and violet sheen; fore coxa white; fore femur white, pale orange distally with an elongate brown, subapical spot externally, fore tibia pale orange with a small brown, subbasal spot; mid coxa white; mid femur white, distally pale

orange, tibia pale orange with a brown, subbasal spot; hind coxa white; hind femur white, pale orange in distal half, tibia mostly pale orange with a faint, pale brown, subbasal ring; fore tarsus pale orange-brown, mid and hind tarsi pale orange, pretarsi slightly dusky; fore wing (Fig. 600) hyaline proximally, apical two-thirds very weakly infuscate, but slightly more strongly infuscate immediately below marginal and stigmal veins and along anterior part of linea calva; venation brown; propodeum dark purple-brown; sides metallic green with a few conspicuous silvery setae in spiracular area; gaster dark purple-brown, Gt1 proximally metallic blue-green, dorsum slightly coppery, mixed purple and brassy, sides and outer plate of ovipositor mixed metallic green, blue, coppery and brassy; gonostylus dark orange-brown, extreme apex pale orange.

Head about 4.2X as wide as frontovertex, not subtriangular in profile; occipital margin acute, occiput without a median groove above foramen; ocelli forming an angle of about 60°; frontovertex slightly shiny, with conspicuous reticulate sculpture of mesh size generally very slightly smaller than diameter of eye facet; scrobal area and mouth margin with shallower sculpture; area immediately below eye almost completely smooth; gena and temple with more elongate sculpture of larger mesh; scrobes shallow, meeting dorsally, dorsal and lateral margins weakly rounded; antenna as in Fig. 598; scape hardly broadened and flattened, about 4.7X as long as broad; F1 a little longer than broad, F2-F6 transverse, funicle with linear sensilla present only on F4-F6; clava clearly broadened, slightly longer than F2-F6 combined; both sutures clearly oblique, sensory area enlarged, extending about two-thirds along clava ventrally and giving it a distinct, obliquely truncate appearance; eye virtually reaching occipital margin, clothed with fairly conspicuous setae, each very slightly longer than diameter of facet; inner eye margins slightly converging anteriorly; malar sulcus weakly indicated; mandible with two, relatively long, acute, lower teeth, and a short, upper tooth. Relative measurements: HW 82, HH 82, FV 19.5, OD 7.5, POL 9.5, OOL 0.5, OCL 8, AOL 9.5, EL 51.5, EW 44, MS 35, SL 49, SW 10.5.

Thorax (Fig. 597) with shallow, irregular, polygonally reticulate sculpture on pronotum, generally of mesh size subequal to diameter of facet; sculpture on mesoscutum mostly of similar depth to that on pronotum, but more regular and of smaller mesh; sculpture on axilla similar to that on mesoscutum, but slightly deeper; scutellum with conspicuously deeper, polygonally reticulate sculpture, more elongate on sides; extreme apex and sides completely smooth and shiny; visible part of mesoscutum about 1.6X as broad as long; scutellum about as long as broad, with a relatively sparse, but distinct subapical tuft, setae about one-quarter as long as scutellum; hind femur about 4.9X as long as broad; fore wing with venation and setation as in Figs 599, 600; costal cell with 6 setae dorsally at apex; no naked streak present between apices of postmarginal and stigmal veins (Fig. 599); propodeum (Fig. 597) with moderately dense setae in spiracular area, side naked, medially about 0.1X as long as scutellum and with some shallow polygonally reticulate sculpture. Relative measurements: FWL 119, FWW 44; HWL 85, HWW 21.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium reaching about one-third towards apex; syntergum about 1.6X as long as tibia, with apex produced and very acute; ovipositor exserted, the exserted part very slightly longer than mid tibial spur. Relative measurements: OL 134.5, GL 59.5 [MT 56].

Variation. Known only from holotype.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Zurqui de Moravia, 1600m, ix.1995 (P. Hanson). Holotype in NHMUK.

COMMENTS. *Cheiloneurus herndonia* is generally quite similar to *exeres*, *fidenas*, *lamus* and *miklo*, all species being generally with a moderate metallic sheen, a weak, subapical tuft of setae on the scutellum and weakly infuscate fore wings. Apart from the characters in the key it can be

separated from the other named species by the slightly more numerous setae in the basal cell, from *fidenas*, *miklo* and *lamus* by lacking the weakly infuscate median streak in the apical half of the fore wing (present in the other three species) and from *fidenas* and *lamus* by having the ovipositor more than 2X as long as the mid tibia. In the other two species the ovipositor is less than 2X as long as the mid tibia. It can be further separated from *fidenas* by having the scape at least about 5X as long as broad, whereas in *fidenas* the scape is about 4X as long as broad.

***Cheiloneurus exeres* sp.nov.**
(Figs 601-603; Hab. ♀ 91)

DIAGNOSIS. *Female* (length about 1.9-2.4mm): body generally dark brown to black with a weak to moderate metallic sheen; axillae and scutellum orange; antenna (Fig. 602) with scape externally pale orange, dark brown internally with apex pale orange; pedicel mostly pale orange, dorsally dark brown proximally; funicle pale orange, proximally slightly dusky; clava dark brown; mesoscutum with silvery setae; coxae white; hind tibiae with a broad, dark brown, subbasal band, legs otherwise yellowish with some dark brown markings; fore wing (Fig. 601) largely hyaline but weakly infuscate below marginal and stigmal veins and with a weak, infuscate median streak in apical half; head about 3.7X as wide as frontovertex, in facial view very slightly broader than long, subcircular, genae converging, moderately and evenly curved; frontovertex naked medially below anterior ocellus, but with about 5-10 setae medially immediately above scrobes; area between eye and scrobe about as 2X as wide as diameter of anterior ocellus, with shallow sculpture, scrobal margin rounded; interantennal prominence dorsally rounded with only a few long setae; mandible with two long, sharp lower teeth and a shorter, sharp, upper tooth; antenna (Fig. 602) with scape about 3.5X as long as broad; funicle with F1 slightly longer than broad, remaining segments subquadrate; head width slightly less than length of flagellum; linear sensilla on F4-F6; clava 3-segmented, slightly longer than F3-F6 combined, sensory area large and forming an oblique truncation, extending about 0.4X along ventral margin; mesoscutum with polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed; fore wing about 2.4-2.5X as long as broad; parastigma very weakly curved downwards; costal cell dorsally with 3 to 7 setae at apex and a single, complete line of setae ventrally; area below proximal part of parastigma with a group of about 15 setae; apices of postmarginal and stigmal veins not connected by a naked hyaline area; apical bristle of postmarginal vein about 0.4X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum with about 40 setae around each spiracle, side naked; syntergum about as long as mid tibia; ovipositor about 3.3X gonostylus or 1.7X mid tibia; gonostylus about 1.4X as long as mid tibial spur; exserted part of ovipositor about 0.4X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.97mm; excluding ovipositor, 1.87mm (CPD).

Head black with a weak blue and purple sheen on frontovertex, more strongly blue in ocellar area; occiput dull dark green; scrobal area mostly purple with some dark blue reflections especially on scrobes and interantennal prominence with a broad, purple band between toruli; mouth margin purple, above this metallic blue and blue-green; temple adjacent to eye margin brassy, green and coppery; gena duller and more distinctly purple and coppery; frontovertex with inconspicuous dark brown setae; antenna (Fig. 602) with radicle dark brown; scape externally mostly pale orange margined dark brown except at apex, internally mostly dark brown with apical one-third pale orange; pedicel mostly pale orange, basal half or so dark brown dorsally; funicle pale orange, F1-F3 slightly dusky; clava dark brown; thorax mostly dark brown to black, axillae and scutellum orange; pronotum mainly dull purple-brown, posterior margin coppery; mesoscutum with a distinct metallic blue sheen with green reflections, slightly coppery anteriorly, posterior margin coppery purple, setae uniform and silvery, dark brown immediately behind posterior margin of pronotum; tegula dark brown; each axilla narrowly bordered brown posteriorly; scutellum matt, brown medially at apex, clothed anteriorly with pale brown setae, posteriorly with dark brown setae; metanotum with a slight purple sheen; mesopleuron in posterior half with a coppery-purple and brassy sheen, anterior half mixed blue, dark green, coppery and brassy, these narrowly

separated by a coppery, dark blue and violet sheen; fore coxa white; fore femur white, pale orange distally, fore tibia pale orange with a small brown, subbasal spot; mid coxa white; mid femur pale yellow, pale orange towards apex and with a diffuse, subapical, brown spot, tibia pale orange with a diffuse, brown, subbasal spot; hind coxa white; hind femur white, pale brown apically, tibia mostly pale orange with an incomplete, brown, subbasal ring; tarsi pale orange-brown, pretarsi slightly dusky; fore wing (Fig. 601) largely hyaline, weakly infuscate immediately below marginal and stigmal veins and along anterior part of linea calva, and with a weakly infuscate, median streak distad of pale brown venation; propodeum dark purple-brown; sides metallic green with a few conspicuous silvery setae in spiracular area; gaster dark purple-brown, dorsum slightly coppery, mixed purple and brassy, sides and outer plate of ovipositor mixed metallic green, blue, coppery and brassy; gonostylus dark brown, extreme apex pale orange.

Head about 3.7X as wide as frontovertex, not subtriangular in profile, anteriorly more or less evenly rounded in profile; occipital margin carinate, occiput without a median groove above foramen; ocelli forming an angle of about 65°; frontovertex slightly shiny, with conspicuous reticulate sculpture of mesh size generally very slightly smaller than diameter of eye facet; scrobal area and mouth margin with shallower sculpture; area immediately below eye almost completely smooth; gena and temple with more elongate sculpture of larger mesh; scrobes shallow, meeting dorsally, dorsal and lateral margins weakly rounded; antenna as in Fig. 602; scape hardly broadened and flattened, about 3.5X as long as broad; F1 a little longer than broad, F2-F3 quadrate; F4-F6 slightly longer than broad; clava hardly broadened, almost as long as F2-F6 combined; only outer suture noticeably oblique, sensory area enlarged, extending about one-third along clava ventrally and giving it an obliquely truncate appearance; eye not quite reaching occipital margin, separated by slightly less than diameter of facet, clothed with fairly conspicuous setae, each very slightly longer than diameter of facet; inner eye margins slightly converging anteriorly; malar sulcus absent; mandible with two, relatively long, acute, lower teeth, and a short, upper tooth. Relative measurements: HW 75.5, HH 74, FV 20.5, OD 5.5, POL 10, OOL 2, OCL 7, AOL 11, EL 47, EW 38, MS 31, SL 44, SW 12.5.

Thorax with shallow, irregular, polygonally reticulate sculpture on pronotum, generally of mesh size subequal to diameter of facet; sculpture on mesoscutum generally of similar depth to that on pronotum, but more regular and of smaller mesh; sculpture on axilla similar to that on mesoscutum, but slightly deeper; scutellum with conspicuously deeper, polygonally reticulate sculpture, more elongate on sides; extreme apex and sides completely smooth and shiny; visible part of mesoscutum about 2X as broad as long; scutellum about as long as broad, with a distinct subapical tuft, setae about 0.4X as long as scutellum; hind femur about 4.8X as long as broad; fore wing with venation and setation as in Figs 601, 603; costal cell with 3 setae dorsally at apex; no naked streak present between apices of postmarginal and stigmal veins (Fig. 603); propodeum with moderately dense setae in spiracular area, side naked, medially about 0.1X as long as scutellum and with some shallow polygonally reticulate sculpture. Relative measurements: FWL 106, FWW 42; HWL 85.5, HWW 22.

Gaster with hypopygium reaching about half-way to apex; syntergum hardly longer than mid tibia, with apex acute; ovipositor slightly exserted, the exserted part about 0.4X as long as mid tibial spur.

Paratype. Funicle with linear sensilla present only on F4-F6; gaster without “gland-like” structures on TI or TV. Relative measurements: OL 83, GL 25.5 [MT 50].

Variation. Females vary in overall length from 1.94-2.39mm, otherwise very little in material examined, except that the ocellar angle may be only about 50°, the legs may be darker than in holotype with brown areas of the legs more extensive and the fore wing may vary from 2.4-2.5X as long as broad.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Cerro de la Muerte, 19km S, 3km W Empalme, 9°39'N 832'W, 2600m, iv-vii.1992 (P. Hanson, C. Godoy). Paratypes: **COSTA RICA**, 1♀, **San José**, Carret. Interamer., Villa Mills, 3000m, i-ii.1989 (P. Hanson); 2♀, San José, Hwy 2, km 95, 9°36'N 83°44'W, 3200m, 3.iv.1986 (L. Masner, H. Goulet); 4♀, **Alajuela**, Volcán Poas NP, 2500m, 6-28.vi.1996 (S. & J. Peck). Holotype in MZUCR, paratypes NHMUK, CNC.

COMMENTS. *Cheiloneurus exeres* is similar to *fidenas*, *lamus* and *miklo* in that all four species all have a distinct median, longitudinal, infuscate streak in the apical half of the fore wing. Apart from the colour of the scutellum, *exeres* can be separated the other species by having the scape less than 4X as long as broad, whereas in the other species it is more than 4X as long as broad. It can also be separated from *lamus* and *miklo* by having the ovipositor more than 3X as long as the gonostylus, whereas in *lamus* and *miklo* it is less than 3X as long.

See also comments under *herndonia* (p. 240).

Cheiloneurus fidenas **sp.nov.**

(Figs 604-607; Hab. ♀ 92)

DIAGNOSIS. *Female* (length about 1.6-1.9mm): body generally dark brown to black with a weak to moderate metallic sheen; antenna (Fig. 605) with scape pale orange margined brown, proximally brown; pedicel mostly pale orange, proximally dark brown dorsally; funicle pale orange, proximally slightly dusky; clava dark brown; mesoscutum with uniform pale brown setae that appear silvery in some lights; coxae white; hind tibia mostly dark brown, legs otherwise white to pale orange with brown areas; fore wing (Fig. 604) almost completely hyaline but weakly infuscate immediately below marginal and stigmal veins and an infuscate median streak in apical half; head about 4.1X as wide as frontovertex, in facial view about as broad as long, subcircular, genae converging, moderately and evenly curved; frontovertex naked medially below anterior ocellus; area between eye and scrobe about 1.5X as wide as diameter of anterior ocellus, with shallow sculpture, scrobal margin rounded; interantennal prominence dorsally rounded with only a few long setae; mandible with two long, sharp lower teeth and a slightly shorter, sharp, upper tooth; antenna (Fig. 605) with scape about 4.2X as long as broad; funicle with segments quadrate or slightly longer than broad, becoming larger distad; head width about equal to length of flagellum; linear sensilla on F3-F6; clava 3-segmented, slightly shorter than F2-F6 combined, sensory area large and forming an oblique truncation, extending about 0.4X along ventral margin; mesoscutum (Fig. 607) with polygonally reticulate sculpture; scutellum with a distinct, but short apical tuft of setae; wings fully developed; fore wing (Fig. 604) about 2.5X as long as broad; parastigma very weakly curved downwards; costal cell dorsally with 5 to 7 setae at apex and a single, complete line of setae ventrally; area below proximal part of parastigma with a group of about 18 setae; apices of postmarginal and stigmal veins (Fig. 603) not connected by a naked hyaline area; apical bristle of postmarginal vein about 0.5X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum (Fig. 607) with about 20 setae around each spiracle, side naked; syntergum 0.9X as long as mid tibia; ovipositor about 3.3X gonostylus or 1.3X mid tibia; gonostylus about 1.2X as long as mid tibial spur; exserted part of ovipositor about 0.3X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.71mm; excluding ovipositor, 1.66mm (CPD).

Head black with a weak blue and purple sheen on frontovertex, more strongly purple anteriorly; scrobal area largely purple with scrobes and interantennal prominence largely metallic green with a purple band connecting toruli; mouth margin purplish; area below eye strongly metallic brassy, green and coppery; temple brassy and coppery; gena purple and brassy; frontovertex with inconspicuous dark brown setae; antenna (Fig. 605) with radicle dark brown, pale orange ventrally; antenna with scape mostly pale orange, proximally brown, dorsal and ventral margins brown; pedicel mostly pale orange, basal two-thirds dark brown dorsally; funicle pale orange, F1-F3 very slightly dusky; clava dark brown; thorax mostly dark brown to black; pronotum mainly dull, dark green mixed purple, posterior margin coppery; mesoscutum with a metallic green to blue-green

sheen with coppery and brassy reflections, posterior margin coppery purple, setae uniform and translucent pale brown and appear silvery in some lights; tegula dark brown; axilla dull, dark purple-brown with coppery reflections; scutellum noticeably less shiny than mesoscutum, but with a distinct dark blue sheen, medially strongly coppery, clothed with dark brown setae, extreme sides and apex shining green mixed coppery, especially at apex; metanotum with slight purple sheen; mesopleuron in posterior half with a coppery-purple and brassy sheen, anterior half mixed blue, green, coppery and brassy, these narrowly separated by a coppery, dark blue and violet sheen; fore coxa white; fore femur white to pale yellow, with an elongate brown spot dorsally in distal half; fore tibia pale orange with an incomplete subbasal brown band; mid coxa white; mid femur white to pale yellow with an elongate brown spot externally in distal half, tibia pale orange with a narrow, elongate, brown, subbasal spot; hind coxa white; hind femur white in proximal half or so, otherwise dark brown, tibia mostly pale orange with a broad, diffuse brown, subbasal ring in proximal half or so; fore tarsus pale orange-brown, mid and hind tarsi pale orange, pretarsi slightly dusky; fore wing (Fig. 604) almost completely hyaline but weakly infuscate immediately below marginal and stigmal veins, and a weakly infuscate median streak distad of pale brown venation; propodeum dark purple-brown; sides metallic green with a few conspicuous silvery setae in spiracular area; gaster dark purple-brown, dorsum slightly coppery, mixed purple and brassy, sides towards apex and outer plates of ovipositor mixed metallic blue, green, coppery and brassy; gonostylus dark brown, extreme apex orange-brown.

Head about 4.1X as wide as frontovertex, not subtriangular in profile, occipital margin carinate, occiput without a median groove above foramen; ocelli forming an angle of about 55°; frontovertex slightly shiny, with conspicuous reticulate sculpture of mesh size generally very slightly smaller than diameter of eye facet; scrobal area and mouth margin with shallower sculpture; gena and temple with more elongate sculpture of larger mesh; scrobes shallow, meeting dorsally, dorsal and lateral margins weakly rounded; antenna as in Fig. 605; scape hardly broadened and flattened, about 4.2X as long as broad; F1 and F4-F6 each a little longer than broad, F2-F3 quadrate, segments broadest distad; clava hardly broadened, slightly longer than F3-F6 combined; only outer suture noticeably oblique, sensory area enlarged, extending about one-third along clava ventrally and giving it an obliquely truncate appearance; eye reaching occipital margin, clothed with inconspicuous setae, each about as long as diameter of facet; inner eye margins not converging anteriorly; malar sulcus absent; mandible with three acute teeth, upper tooth shortest. Relative measurements: HW 70, HH 69, FV 17, OD 5.5, POL 10.5, OOL 0.5, OCL 6, AOL 11, EL 45, EW 36, MS 29, SL 38, SW 9.

Thorax (Fig. 607) with shallow, irregular, polygonally reticulate sculpture on pronotum, generally of mesh size subequal to diameter of facet; sculpture on mesoscutum generally of similar depth to that on pronotum, but more regular and of smaller mesh; sculpture on axilla similar to that on mesoscutum, but slightly deeper; scutellum with conspicuously deeper, polygonally reticulate sculpture; apex and sides completely smooth and shiny; visible part of mesoscutum about 1.8X as broad as long; scutellum very slightly broader than long, with a short subapical tuft, setae about one-third to two-fifths as long as scutellum; hind femur about 4.4X as long as broad; fore wing with venation and setation as in Figs 604, 606; costal cell with only 3 setae dorsally at apex; no naked streak present between apices of postmarginal and stigmal veins; propodeum (Fig. 607) with moderately dense setae in spiracular area, side naked, medially less than 0.1X as long as scutellum and with some shallow polygonally reticulate sculpture. Relative measurements: FWL 89, FWW 36; HWL 70, HWW 18.

Gaster with hypopygium reaching about half-way to apex; syntergum nearly as long as mid tibia, with apex acute; ovipositor slightly exserted, the exserted part about one-third as long as mid tibial spur.

Paratype. Funicle with linear sensilla present only on F3-F6; gaster without “gland-like” structures on Gt1 or Gt5. Relative measurements: OL 55, GL 16.5 [MT 41].

Variation. Females vary in overall length from 1.55-1.87mm, otherwise little in material examined except that F1-F4 may be orange-brown.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Zurqui de Moravia, 1600m, iv.1992 (P. Hanson). Paratypes: **COSTA RICA**, 6♀, **San José**, same data as holotype but various dates iv.1992-i.1996; 1♀, **Heredia**, 6km ENE Vara Blanca, 10°11'N 84°01'W, 2000m, 20/M/TN, ii.2002 (INBio-OET-ALAS). Holotype in MZUCR, paratypes in NHMUK and MZUCR.

COMMENTS. See comments under *herndonia* (p. 240), *exeres* (p. 243) and *miklo* (p. 247).

***Cheiloneurus miklo* sp.nov.**
(Figs 608-611; Hab.♀ 93)

DIAGNOSIS. *Female* (length about 2.4mm): body generally dark brown to black with a weak to moderate metallic sheen; antenna (Fig. 611) with scape pale orange, dorsally margined brown; pedicel mostly pale orange, dorsally dark brown proximally; funicle pale orange; clava dark brown; mesoscutum with uniform pale brown setae that appear silvery in some lights; coxae white; mid and hind tibiae each with a narrow, dark brown, subbasal band, legs otherwise yellowish with some dark brown areas; fore wing (Fig. 608) largely hyaline but weakly infuscate below marginal and stigmal veins and with a weak, infuscate median streak in apical half; head (Fig. 610) about 4.4X as wide as frontovertex, in facial view very slightly broader than long, subcircular, genae converging, moderately and evenly curved; frontovertex naked medially below anterior ocellus; area between eye and scrobe about as wide as diameter of anterior ocellus, with distinct sculpture, scrobal margin rounded; interantennal prominence dorsally rounded with only a few long setae; mandible with two long, sharp lower teeth and a short, sharp, upper tooth; antenna (Fig. 611) with scape about 4.6X as long as broad; funicle with F1 slightly longer than broad, remaining segments slightly transverse; head width slightly greater than length of flagellum; linear sensilla on F4-F6; clava 3-segmented, about as long as F2-F6 combined, sensory area large and forming an oblique truncation, extending about 0.4X along ventral margin; mesoscutum with polygonally reticulate sculpture; scutellum with a distinct, but short apical tuft of setae; wings fully developed; fore wing (Fig. 608) about 2.5-2.6X as long as broad; parastigma very weakly curved downwards; costal cell dorsally with about 5 to 11 setae at apex and a single, complete line of setae ventrally; area below proximal part of parastigma with a group of about 35 setae; apices of postmarginal and stigmal veins (Fig. 609) not connected by a naked hyaline area; apical bristle of postmarginal vein about 0.4X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum with about 35 setae around each spiracle, side naked; syntergum about 1.3X as long as mid tibia; ovipositor about 2.7X gonostylus or 2.1X mid tibia; gonostylus about 2.3X as long as mid tibial spur; exserted part of ovipositor about 0.8X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 2.38mm; excluding ovipositor, 2.22mm (CPD).

Head black with a weak blue and purple sheen on frontovertex, more strongly purple anteriorly; occiput with a blue sheen; scrobal area mostly purple with some dark blue reflections, interantennal prominence with a coppery purple band connecting toruli; mouth margin metallic blue-green; gena and temple strongly metallic blue-green with some weak purple and coppery reflections; frontovertex with fairly conspicuous dark brown setae; antenna (Fig. 611)with radicle dark brown; scape mostly pale orange with a narrow, proximal brown ring and dorsal margin brown except at extreme apex; pedicel mostly pale orange, basal half or so dark brown dorsally; funicle pale orange; clava dark brown; thorax mostly dark brown to black; pronotum mainly dull, dark green with a slight brassy sheen, posterior margin coppery; mesoscutum with a blue to blue-green sheen with purple reflections, posterior margin coppery purple, setae uniform and translucent pale brown, but silvery in some lights; tegula dark brown; axilla dull, dark purple-brown with coppery reflections; scutellum noticeably less shiny than mesoscutum, but with a distinct dark blue sheen, medially strongly coppery, clothed with dark brown setae, extreme sides

and apex shining green mixed coppery, especially at apex; metanotum with slight purple sheen; mesopleuron in posterior half with a coppery purple and brassy sheen, anterior half mixed blue, green, coppery and brassy, these narrowly separated by a coppery, dark blue and violet sheen; fore coxa white; fore femur white, pale orange distally, fore tibia pale orange with an inconspicuous pale brown, subbasal spot; mid coxa white; mid femur white, pale orange towards apex, tibia pale orange with a dark brown, subbasal spot; hind coxa white; hind femur white, pale orange towards apex, tibia mostly pale orange with an incomplete, brown, subbasal ring; fore tarsus pale orange-brown, mid and hind tarsi pale orange, pretarsi slightly dusky; fore wing (Fig. 608) almost completely hyaline but weakly infuscate immediately below marginal and stigmal veins, and with an extremely weakly infuscate median streak distad of pale brown venation; propodeum dark purple-brown; sides metallic green with a few conspicuous silvery setae in spiracular area; gaster dark purple-brown, Gt1 metallic green proximally, dorsum slightly coppery, mixed purple and brassy, sides and outer plate of ovipositor mixed metallic green, blue, coppery and brassy; gonostylus slightly dusky, pale orange.

Head (Fig. 610) about 4.4X as wide as frontovertex, not subtriangular in profile, occipital margin carinate, occiput without a median groove above foramen; ocelli forming an angle of about 75°; frontovertex slightly shiny, with conspicuous reticulate sculpture of mesh size generally very slightly smaller than diameter of eye facet; scrobal area and mouth margin with shallower sculpture; area immediately below eye almost completely smooth; gena and temple with more elongate sculpture of larger mesh; scrobes shallow, meeting dorsally, dorsal and lateral margins weakly rounded; antenna as in Fig. 611; scape hardly broadened and flattened, about 4.6X as long as broad; F1 a little longer than broad, F2-F6 at least slightly transverse; clava hardly broadened, almost as long as F2-F6 combined; only outer suture noticeably oblique, sensory area enlarged, extending about two-fifths along clava ventrally and giving it an obliquely truncate appearance; eye reaching occipital margin, clothed with fairly conspicuous setae, each slightly longer than diameter of facet; inner eye margins not converging anteriorly; malar sulcus absent; mandible with two, relatively long, acute, lower teeth, and a short, upper tooth. Relative measurements: HW 87, HH 85, FV 20, OD 8, POL 10, OOL 1, OCL 5.5, AOL 11, EL 56, EW 54, MS 32, SL 46, SW 10.

Thorax with shallow, irregular, polygonally reticulate sculpture on pronotum, generally of mesh size subequal to diameter of facet; sculpture on mesoscutum generally of similar depth to that on pronotum, but more regular and of smaller mesh; sculpture on axilla similar to that on mesoscutum, but slightly deeper; scutellum with conspicuously deeper, polygonally reticulate sculpture; apex and sides completely smooth and shiny; visible part of mesoscutum about 1.6X as broad as long; scutellum about as long as broad, with a short subapical tuft, setae about one-fifth to one-quarter as long as scutellum; hind femur about 4X as long as broad; fore wing with venation and setation as in Figs 609, 611; costal cell with about 5 setae dorsally at apex; no naked streak present between apices of postmarginal and stigmal veins (Fig. 609); propodeum with moderately dense setae in spiracular area, side naked, medially about 0.1X as long as scutellum and with some shallow polygonally reticulate sculpture. Relative measurements: FWL 109, FWW 42.5; HWL 85, HWW 23.

Gaster with hypopygium reaching about half-way to apex; syntergum about 1.3X as long as mid tibia, with apex acute; ovipositor slightly exserted, the exserted part about 0.75X as long as mid tibial spur.

Paratype. Funicle with linear sensilla only on F4-F6; gaster without “gland-like” structures on Gt1 or Gt5. Relative measurements: OL 107, GL 40 [MT 51].

Variation. Very little in material examined, but the fore wing varies from about 2.5-2.6X as long as broad.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Zurqui de Moravia, 1600m, i.1995 (P. Hanson). Paratype: **COSTA RICA**, 1♀, **San José**, same data as holotype but vii.1992. Holotype in MZUCR, paratype in NHMUK.

COMMENTS. As the key suggests, *Cheiloneurus miklo* is quite similar to *fidenas*, *lamus* and *rosea.* In addition to the characters given in the key it can be separated from both *fidenas* and *lamus* by the lack of linear sensilla on F3. In both *fidenas* and *lamus* linear sensilla are present on F3. Also, in *miklo* the sensory area of the clava extends about 0.4X along ventral surface of the clava whereas in *fidenas* it extends only about 0.3X along ventral surface. It can be separated from *rosea* on the colour of the hind femur and relative proportions of the ovipositor. In *miklo* the hind femur is completely yellow, the ovipositor is about 2X as long as the mid tibia and less than 3X as long as the gonostylus whereas in *rosea* the hind femur is apically marked brown and the ovipositor is about 1.5X as long as the mid tibia and more than 3X as long as the gonostylus.

See also comments under *herndonia* (p. 240), *exeres* (p. 243) and *myndus* (p. 253).

***Cheiloneurus lamus* sp.nov.**

(Figs 612-619; Hab. ♀ 94)

DIAGNOSIS. *Female* (length about 1.8-2.3mm): body generally dark brown to black with a weak to moderate metallic sheen; antenna (Figs 628, 619) with scape pale orange margined brown, proximally brown; pedicel mostly pale orange, proximally dark brown dorsally; funicle pale orange, proximally slightly dusky; clava dark brown; mesoscutum with uniform, silvery setae; coxae white to pale yellow; hind tibia partially dark brown, legs otherwise white to pale orange with a few brown areas; fore wing (Figs 612, 613) almost completely hyaline but weakly infuscate immediately below marginal and stigmal veins and usually with a weak, infuscate median streak nearly to apex; head (Fig. 617) about 3.9-4.5X as wide as frontovertex, in facial view about as broad as long, subcircular, genae converging, moderately and evenly curved; frontovertex naked medially below anterior ocellus; area between eye and scrobe about 1.5-2.0X as wide as diameter of anterior ocellus, with shallow sculpture, scrobal margin rounded; interantennal prominence dorsally rounded without a median ridge and with only a few long setae; mandible with two long, sharp lower teeth and a short, sharp, upper tooth; santenna (Figs 618, 619) with scape about 4.8-5.1X as long as broad; funicle with F1 longer than broad, other segments slightly longer than broad, subquadrate, becoming larger distad; head about 0.9X as wide as length of flagellum; linear sensilla on F2-F6; clava 3-segmented, about as long as F3-F6 combined, sensory area large and forming an oblique truncation, extending about 0.45X along ventral margin; mesoscutum with polygonally reticulate sculpture; scutellum with a distinct, but short apical tuft of setae; wings fully developed; fore wing (Figs 612, 613) about 2.5-2.6X as long as broad; parastigma very weakly curved downwards; costal cell dorsally with 2 to 5 setae at apex and a single, complete line of setae ventrally; area below proximal part of parastigma with a group of about 15-20 setae connecting to a line of five setae along cubital vein track; apices of postmarginal and stigmal veins (Fig. 614) not connected by a naked hyaline area; apical bristle of postmarginal vein about 0.5X as long as marginal vein; mid tibial spur very slightly longer than basitarsus; propodeum with about 30-40 setae around each spiracle, side naked; syntergum nearly 1.2X as long as mid tibia; ovipositor (Fig. 615) about 2.8-3.7X gonostylus or 1.6-1.7X mid tibia; gonostylus about 1.6-1.7X as long as mid tibial spur; exserted part of ovipositor about 0.6X as long as mid tibial spur to about as long. *Male*: unknown.

Female (holotype): length, including ovipositor, 2.23mm; excluding ovipositor, 2.08mm (CPD).

Head black with weak, blue and purple reflections on frontovertex; ocellar area more strongly purple; scrobal area mostly with a stronger blue-green sheen, mixed with purple, interantennal prominence with a coppery purple line between toruli; mouth margin purplish; gena and temple with a brighter, slightly brassy metallic green sheen, strongest immediately below eye, some coppery reflections on lower gena; frontovertex with inconspicuous dark brown setae; antenna (Figs 619) with radicle dark brown; scape largely pale orange, proximally brown, dorsal and

ventral margins brown; pedicel mostly pale orange, basal half dark brown dorsally; funicle pale orange, F1-F3 very slightly dusky; clava dark brown; thorax mostly dark brown to black; pronotum mainly green with purple and brassy reflections, posterior margin coppery; mesoscutum clothed with uniform, translucent silvery setae and with a metallic green to blue-green sheen with coppery and brassy reflections, posterior margin coppery purple; tegula dark brown; axilla dull, dark purple-brown with coppery reflections; scutellum noticeably less shiny than mesoscutum, but with a distinct blue-green sheen and distinct coppery reflections medially, clothed with dark brown setae, extreme sides and apex shining green mixed coppery; metanotum with slight purple sheen; mesopleuron in posterior half with a coppery-purple and brassy sheen, anterior half mixed blue, green, coppery and brassy, these narrowly separated by a coppery, dark blue and violet sheen; fore coxa white; fore femur white to pale yellow, with a small, apical, brown spot externally; fore tibia pale orange with a small, subbasal, brown spot externally; mid coxa white; mid femur white to pale yellow with a subapical brown spot internally, tibia pale orange with a narrow, subbasal brown ring; hind coxa white; hind femur white in proximal half or so, otherwise pale orange, extreme apex brown, tibia mostly pale orange with a broad, diffuse brown ring proximally; tarsi pale orange, pretarsi slightly dusky; fore wing (Fig. 613) almost completely hyaline but weakly infuscate immediately below marginal and stigmal veins, a very weakly infuscate median streak distad of pale brown venation; propodeum dark purple-brown; sides metallic green with a few conspicuous silvery setae in spiracular area; gaster dark purple-brown, Gt1 narrowly metallic blue-green proximally; remainder of dorsum of gaster slightly coppery, mixed purple and brassy, sides of gaster towards apex and outer plates of ovipositor mixed metallic blue, green, coppery and brassy; gonostylus dark brown, extreme apex orange-brown.

Head (Fig. 617) about 4.5X as wide as frontovertex, not subtriangular in profile, occipital margin carinate, occiput without a median groove above foramen; ocelli forming an angle of about 50°; frontovertex slightly shiny, with conspicuous reticulate sculpture of mesh size generally very slightly smaller than diameter of eye facet; scrobal area and mouth margin with shallower sculpture; gena and temple with more elongate sculpture of larger mesh; scrobes shallow, meeting dorsally, dorsal and lateral margins weakly rounded; antenna as in Fig. 619; scape hardly broadened and flattened, about 4.8X as long as broad; F1 nearly twice as long as broad, other funicle segments subquadrate and at least slightly longer than broad, segments broadest distad; clava hardly broadened, hardly longer than F4-F6 combined; only outer suture noticeably oblique, sensory area enlarged, extending nearly one-third along clava ventrally and giving it an obliquely truncate appearance; eye reaching occipital margin, clothed with inconspicuous setae, each of which is about as long as diameter of facet; inner eye margins not converging anteriorly; malar sulcus absent; mandible with two long, acute, lower teeth and a short upper tooth. Relative measurements: HW 72, HH 72, FV 16, OD 5.5, POL 8.5, OOL 0.5, OCL 6, AOL 11, EL 45, EW 37, MS 30, SL 43, SW 9.

Thorax with shallow, irregular, polygonally reticulate sculpture on pronotum, generally of mesh size subequal to diameter of facet; sculpture on mesoscutum generally of similar depth to that on pronotum, but more regular and of smaller mesh; sculpture on axilla similar to that on mesoscutum, but slightly deeper; scutellum with conspicuously deeper, polygonally reticulate sculpture; apex and sides narrowly completely smooth; visible part of mesoscutum about 1.8X as broad as long; scutellum about as broad as long, with a short subapical tuft, setae about one-third as long as scutellum; hind femur about 4.3X as long as broad; fore wing with venation and setation as in Figs 613, 614; costal cell with only 2 or 3 setae dorsally at apex; no naked streak present between apices of postmarginal and stigmal veins (Fig. 614); propodeum with moderately dense setae in spiracular area, side naked, medially less than 0.1X as long as scutellum and with some shallow polygonally reticulate sculpture. Relative measurements: FWL 94.5, FWW 37; HWL 73, HWW 20.

Gaster with hypopygium reaching about half-way to apex; syntergum about 1.4X as long as mid tibia, with apex acute; ovipositor slightly exserted, the exserted part about as long as mid tibial spur. Relative measurements: GL 72, [MTS 31].

Paratype. Funicle with linear sensilla present only on F2-F6; gaster without “gland-like” structures on Gt1 or Gt5; hypopygium Fig. 616; ovipositor Fig. 615. Relative measurements: OL 72, GL 19.5 [MT 46].

Variation. Females vary in overall length 1.18-2.32mm, the coxae vary from white to very pale yellow, the apical half of the fore wing usually has a weak median, subapical infuscate streak, the area between eye and scrobe varies from about 1.5-2.0X as wide as the diameter of the anterior ocellus, the scape varies from about 4.8-5.1X as long as broad, the fore wing varies from about 2.5-2.6X as long as broad, the area below the proximal part of parastigma normally has a group of about 15-20 setae connecting to a line of five setae along cubital vein track, the propodeum has about 30-40 setae around each spiracle, the ovipositor varies from about 2.8-3.7X as long as the gonostylus and the exserted part of ovipositor varies from about 0.6X as long as the mid tibial spur to about as long.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Est. Altamira, Cerro Frantzius, LS 334150 5744450, 2134mm, #60660, 21.x-22.xi.2001 (D. Rubí). Paratypes: **COSTA RICA**, 1♀, **San José**, Zurqui de Moravia, 1600m, viii.1995 (P. Hanson); 1♀, San José, San Gerardo de Dota, El Manantial, 9°34'N 83°48'W, 2250m, 18-20.ii.2010 (J.S. Noyes); 1♀, **Puntarenas**, Monteverde, 1550m, 16.viii.1986 (L. Masner); 1♀, Puntarenas, Monte Verde [=Monteverde] Reserva, 1550m, 16.viii.1986 (L. Masner); 1♀, Puntarenas, Est. Altamira, Send. a Casa Coca, LS 331750 574400, 1700m, ii.2002 (C. Hansson, D. Rubí, J. Azofeifa); 1♀, Puntarenas, Las Alturas BS, 2000m, 8°57'N 82°50'W, i-iii.1995 (P. Hanson). Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. Superficially *Cheiloneurus lamus* is close to *mantua*, both species being of generally similar habitus and colouration. Apart from the extent of the infuscation of the fore wing (see key), *lamus* has all funicle segments subquadrate so that the clava is hardly longer than F3-F6 combined, linear sensilla present on F3-F6, setae of the scutellar tuft about one-third as long as the scutellum and the ovipositor less than 3X as long as the gonostylus. In *mantua* all the funicle segments are strongly transverse so that the clava is at least as long as the funicle, linear sensilla are present only on F5-F6, the setae of the scutellar tuft are only about one-quarter as long as the scutellum and the ovipositor is more than 3X as long as the gonostylus.

See also comments under *herndonia* (p. 240), *exeres* (p. 243) and *miklo* (p. 247).

Cheiloneurus varablus **sp.nov.**

(Figs 620-624; Hab. ♀ 95)

DIAGNOSIS. *Female* (length about 1.9mm): body dark brown to black, with a weak to moderate metallic sheen; antenna (Fig. 622) with scape dark brown, apex white; pedicel dark brown with some white; funicle proximally orange-brown, distally pale yellow; clava dark brown; mesoscutum with sparse, translucent setae that may appear silvery; fore and hind coxae white, mid coxa dark brown, apex white; legs largely white to pale orange with dark brown areas on femora and tibiae; fore wing (Fig. 624) hyaline; head (Fig. 620) about 3.7X as wide as frontovertex, in facial view slightly broader than long, subcircular, genae evenly curved, converging; frontovertex with 1 seta medially between anterior ocellus and scrobes; eye separated from scrobe by about 1.5X diameter of anterior ocellus, area between eye and scrobe with conspicuous sculpture; scrobes moderately deep, not sharply margined, interantennal prominence with about 13 inconspicuous setae, dorsally rounded, without a median ridge; mandible tridentate; antenna (Fig. 622) with scape about 2.4X as long as broad; funicle with F1 subquadrate, F2-F6 clearly transverse; clava 3-segmented, about as long as F2-F6 combined; sensory area enlarged, extending ventrally about 0.4X length of clava, apex obliquely truncate; head width very slightly greater than flagellum length; mesoscutum (Fig. 621) anteriorly with distinctly obliquely elongate reticulate to striate-reticulate sculpture in

anterior half, posteriorly with regular polygonally reticulate sculpture; scutellum with an distinct, relatively short, subapical tuft of setae; wings fully developed, fore wing (Fig. 624) about 2.6X as long as broad; parastigma not downcurved; costal cell dorsally with 3 or 4 apical setae, ventrally with a complete line of setae; area below proximal part of parastigma with a group of about 17 uniform, fine setae connecting with a line of 2 or 3 setae along cubital vein track towards base of wing; apices of postmarginal and stigmal veins (Fig. 623) not connected by a naked hyaline area; apical bristle of postmarginal vein about 0.3X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum with about 20 inconspicuous setae adjacent to spiracle, side naked; syntergum about 1.2X as long as mid tibia with apex acute; ovipositor about 3.0X gonostylus or about 1.9X as long as mid tibia; gonostylus about 1.8X as long as long mid tibial spur; exserted part of ovipositor about as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.89mm; excluding ovipositor, 1.78mm (CPD).

Head black with a dull metallic green and purple sheen on frontovertex with some slightly brassy areas, scrobal area with a distinct, deep, purple sheen that extends to lower part of interantennal prominence where it is delimited by a narrow blue line between lower parts of toruli, metallic green below this; mouth margin metallic green; purple area of scrobes extending between eye and scrobe and becoming slightly coppery on lower gena, shining metallic green and coppery purple outside this; temple predominantly shining metallic green mixed with some coppery and brassy areas; gena metallic blue-green immediately below eye, otherwise coppery purple; frontovertex clothed with inconspicuous dark brown setae; antenna (Fig. 622) with radicle dark brown; scape mostly dark brown with apical one-fifth white; pedicel dark brown in proximal two-thirds, apex and venter white; funicle with F1-F3 orange-brown, F4 dusky pale orange, F5 dusky yellow, F6 pale yellow; clava dark brown; palpi white; thorax mostly dark brown to black; pronotum with a dull coppery-purple sheen with some dull metallic dark blue; mesoscutum clothed with fairly conspicuous, evenly distributed, silvery, translucent setae and metallic dark blue-green with some dark green, posterior margin coppery purple; tegula dark brown; axilla dark brown, matt; scutellum clothed with dark brown setae, more or less matt but with a very slight metallic dark blue sheen, extreme apex and side with a strong metallic dark green and coppery sheen; metanotum with slight purple sheen; mesopleuron in anterior half with a metallic dark green sheen and some coppery areas, posterior half with a coppery sheen; fore coxa white, proximal half of femur white, distal half of femur dark brown, tibia white at extreme base, dark brown area to about 0.6X, apex pale orange, tarsus dusky pale orange; mid coxa dark brown in proximal half, apical half white, mid femur white in proximal half, apical half dark brown with extreme apex white, tibia with a small dark brown spot at extreme base, a narrow, white subbasal ring, dark brown to about 0.4X, and apex pale orange, spur pale orange, tarsus pale orange, apical tarsomere orange-brown; hind coxa white, femur with proximal one-third white, apex dark brown, tibia with a narrow subbasal white band, dark brown to about 0.7X apex pale orange, tarsus dusky pale orange, apical tarsomere orange-brown; fore wing (Fig. 624) virtually completely hyaline but with a faint yellow-brown area immediately below marginal vein, venation pale brown; propodeum dark brown, medially dark purple-brown with a brassy sheen, laterally and on side with a metallic green and coppery sheen, with conspicuous silvery setae in spiracular area; gaster dark brown, mainly with a coppery sheen on dorsum, Gt1 distinctly metallic dark blue mixed metallic dark blue-green, remainder of gaster mixed brassy with coppery, coppery red and dark green, sides of apical tergites metallic green; outer plates of ovipositor purple and dark green; gonostylus dark brown.

Head (Fig. 620) about 3.7X as wide as frontovertex about 1.7X as high as deep; occipital margin sharp and without a median groove to foramen; ocelli forming an angle of about 60°; frontovertex slightly shiny, with conspicuous, fairly deep, polygonally reticulate sculpture of mesh size about equal to diameter of eye facet; scrobes, interantennal prominence and mouth margin with shallow sculpture, almost smooth; temple and posterior gena completely smooth adjacent to eye margin but otherwise with shallow, irregular, longitudinally elongate polygonally reticulate sculpture; scrobes moderately deep, meeting dorsally, dorsal and lateral margins weakly rounded; narrowest part between eye and scrobal margin equal to 1.5X diameter of anterior ocellus, scrobes moderately deep, meeting dorsally, well-defined but not sharply margined, broadly ∩-shaped,

interantennal prominence dorsally rounded, without a median ridge; antenna as in Fig. 622; scape conspicuously broadened and flattened, about 2.4X as long as broad; funicle with F1 subquadrate, all other segments transverse and broadening distad, linear sensilla present only on F4-F6; clava about as long as F2-F6 combined, both sutures slightly oblique, sensory area about 0.7X as long as ventral surface, forming an oblique truncation that extends about 0.4X along clava; eye virtually reaching occipital margin, separated by much less than diameter of facet and clothed in fairly inconspicuous setae that are each slightly shorter than diameter of facet; malar sulcus absent mandible with 2 long, acute lower teeth and very short upper, third tooth that originates from about one-third along middle tooth. Relative measurements: HW 90, HH 88, FV 24.5, OD 7, POL 11.5, OOL 2.5, OCL 6.5, AOL 12, EL 57, EW 45, MS 35, SL 48.5, SW 20.

Thorax (Fig. 621) with irregular, polygonally reticulate sculpture on pronotum, about as deep as that on frontovertex but generally of slightly larger mesh; sculpture on posterior half of mesoscutum largely similar but obliquely elongate in anterior half where it becomes laterally distinctly striate-reticulate; sculpture on axilla coarser and reticulate; scutellum mostly with coarse, longitudinally elongate, reticulate sculpture more or less arranged in whorls, extreme apex and sides completely smooth; visible part of mesoscutum about 1.6X as broad as long; scutellum about as long as broad, subapical tuft distinct, setae about 0.4X as long as scutellum; hind femur about 3.8X as long as broad; fore wing with venation and setation as in Figs 623, 624; costal cell with 4 setae dorsally at apex; no naked streak present between apices of postmarginal and stigmal veins (Fig. 623); propodeum (Fig. 621) with about 17 setae in spiracular area, side naked, medially about 0.1X as long as scutellum and medially with a small area of fine, shallow, polygonally reticulate sculpture. Relative measurements: FWL 129, FWW 50; HWL 100, HWW 25.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium reaching about 0.4X to apex; syntergum about 1.2X as long as mid tibia, apex acute; ovipositor exserted, the exserted part about as long as mid tibial spur or about 0.22X as long as mid tibia. Relative measurements: OL 70, GL 23.5 [MT 37.5].

Variation. Females vary in overall length from 1.78-1.89mm, the scape varies from about 2.1-2.4X as long as broad and the exserted part of the ovipositor varies from about 0.6X as long the mid tibial spur to about as long.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, 9km NE Vara Blanca, 10°14'N 84°06'W, 1450-1550m, 15/TN/20/010, 20.iii.2005 (INBio/OET-ALAS). Paratype: **COSTA RICA**: 1♀, **San José**, Zurqui de Moravia, 1600m, i.1995 (P. Hanson). Holotype and paratype in NHMUK.

COMMENTS. As the key suggests *Cheiloneurus varablus*, *rosea* and *salome* are very similar. Apart from the conspicuously wider scape, *varablus* can be distinguished additionally from *rosea* by having the anterior half of the mesopleuron largely with a metallic dark green sheen contrasting with the coppery posterior half, whereas in *rosea* the mesopleuron is dark purple with some blue reflections anteriorly.

***Cheiloneurus myndus* sp.nov.**

(Figs 625-630; Hab. ♀ 96)

DIAGNOSIS. Female (length about 1.7-2.3mm): body generally dark brown to black with a weak to moderate metallic sheen; antenna (Fig. 625) with scape dark brown, apical one-third yellow; pale orange; pedicel dorsally dark brown, venter and apex yellowish; funicle pale orange, slightly dusky proximally; clava dark brown; mesoscutum with uniform, silvery setae; coxae white,

mid coxa proximally dark brown; hind tibia mostly dark brown, legs otherwise white to pale orange with extensive dark brown areas; fore wing (Fig. 626) almost completely hyaline but weakly infuscate immediately below marginal and stigmal veins; head about 3.8X as wide as frontovertex, in facial view about as broad as long, subcircular, genae converging, weakly and evenly curved; frontovertex naked medially below anterior ocellus; area between eye and scrobe about as wide as diameter of anterior ocellus, with distinct sculpture, scrobal margin rounded; interantennal prominence dorsally rounded with only a few long setae; mandible with two long, sharp lower teeth and a very short, sharp, upper tooth; antenna (Fig. 625) with scape about 3.3X as long as broad; funicle with F1 slightly longer than broad, other segments subquadrate, becoming larger distad; head very slightly wider than length of funicle; linear sensilla on F2-F6; clava 3-segmented, slightly longer than F2-F6 combined, sensory area large and forming an oblique truncation, extending nearly 0.5X along ventral margin; mesoscutum (Fig. 628) with polygonally reticulate sculpture; scutellum with a distinct apical tuft of setae; wings fully developed; fore wing (Fig. 626) about 2.4-2.5X as long as broad; parastigma not curved downwards; costal cell dorsally with 4 to 6 setae at apex and a single, complete line of setae ventrally; area below proximal part of parastigma with a group of about 15-20 setae; apices of postmarginal and stigmal veins (Fig. 630) not connected by a naked hyaline area; apical bristle of postmarginal vein about 0.7X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum (Fig. 628) with about 30 setae around each spiracle, side naked; syntergum about as long as mid tibia; ovipositor (Fg. 628) about 3.7X gonostylus or 1.6X mid tibia; gonostylus about 1.1X as long as mid tibial spur; exserted part of ovipositor about 0.5X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 2.05mm; excluding ovipositor, 1.95mm (CPD).

Head black with weak, blue and purple reflections on frontovertex; scrobal area mostly with a purple sheen; scrobes with a blue sheen; torulus connected to eye margin and other torulus by a narrow, metallic blue line; mouth margin narrowly purplish; gena and area above mouth margin coppery; temple adjacent to eye and gena immediately below eye metallic green and brassy, posterior temple coppery; frontovertex with inconspicuous dark brown setae; antenna (Fig. 625) with radicle dark brown; scape dark brown, apical one-third yellowish; pedicel dorsally dark brown, apical one-third pale orange, venter pale yellow; funicle pale orange, F1-F4 slightly dusky dorsally; clava dark brown; thorax mostly dark brown to black; pronotum with a slight coppery, green and brassy sheen; mesoscutum clothed with uniform, translucent silvery setae and with a weak, dark blue sheen with pale green reflections, posterior margin dark purple-brown; tegula dark brown; axilla dull purple with dark blue reflections; scutellum weak metallic, dark blue, slightly coppery medially, clothed with dark brown setae, sides and apex shining blue; metanotum with slight purple sheen; mesopleuron in posterior half with a coppery purple and brassy sheen, anterior half mixed blue and brassy, these narrowly separated by a coppery, dark blue and violet sheen; fore coxa white; fore femur white proximally, apical half dark brown, extreme apex white, tibia narrowly white proximally, remainder of basal half dark brown, apex pale orange; mid coxa dark brown, apex white; mid femur white in proximal half and extreme apex, otherwise dark brown, tibia narrowly white proximally, a dark brown subbasal band extending a little less than half-way, remainder very pale orange; hind coxa white; hind femur white in proximal half, otherwise dark brown, tibia narrowly white at apices, otherwise dark brown; fore and mid tarsi pale orange, hind tarsus white to pale yellow; pretarsi slightly dusky; fore wing (Fig. 626) almost completely hyaline but weakly infuscate immediately below marginal and stigmal veins, venation pale brown; propodeum dark purple-brown; sides, including area around spiracle, metallic green with conspicuous silvery setae in spiracular area; gaster dark purple-brown, Gt1 largely dark metallic blue with some golden and coppery reflections; remainder of gaster mixed purple and brassy, syntergum mixed distinctly bluish, sides of gaster towards apex mixed metallic green and blue, outer plates of ovipositor dull, dark blue-green; gonostylus dark brown, extreme apex orange.

Head about 3.8X as wide as frontovertex, not subtriangular in profile, occipital margin carinate, occiput with a partial, very shallow, median groove immediately above the foramen not reaching the occipital margin; ocelli forming an angle of about 80°; frontovertex slightly shiny, with conspicuous reticulate sculpture of mesh size generally very slightly smaller than diameter of eye facet; scrobes, mouth margin, gena and temple with shallower sculpture; gena and temple with

more elongate sculpture; scrobes shallow, meeting dorsally, dorsal and lateral margins weakly rounded; antenna as in Fig. 625; scape broadened and flattened, about 3.3X as long as broad; all funicle segments subquadrate, broader and larger distad, only F1 slightly longer than broad; clava moderately broad, about as long as F2-F6 combined, sutures oblique, sensory area enlarged, extending about half-way along clava ventrally and giving it an obliquely truncate appearance; eye reaching occipital margin, clothed with fairly conspicuous setae, each of which is about as long as diameter of facet; inner eye margins not converging anteriorly; malar sulcus absent; mandible with two long, acute, lower teeth and a short upper tooth. Relative measurements: HW 80, HH 80, FV 21, OD 5.5, POL 13.5, OOL 1, OCL 5, AOL 11, EL 51, EW 40, MS 30, SL 44, SW 13.5.

Thorax (Fig. 628) with shallow, irregular, polygonally reticulate sculpture on pronotum, generally of mesh size subequal to diameter of facet; sculpture on mesoscutum generally of similar depth to that on pronotum, but more regular and of smaller mesh; sculpture on axilla similar to that on mesoscutum, but slightly deeper; scutellum with conspicuously deeper, polygonally reticulate sculpture; apex and sides narrowly completely smooth; visible part of mesoscutum about 1.8X as broad as long; scutellum about as long as broad, with a distinct subapical tuft, setae about one-third as long as scutellum; hind femur about 3.4X as long as broad; fore wing with venation and setation as in Figs 626, 630; costal cell with only 4 setae dorsally at apex; no naked streak present between apices of postmarginal and stigmal veins (Fig. 630); propodeum (Fig. 628) with numerous setae in spiracular area, side naked, medially about 0.15X as long as scutellum and with shallow irregular sculpture. Relative measurements: FWL 100, FWW 40; HWL 76, HWW 21.

Gaster with hypopygium reaching about half-way to apex; syntergum hardly longer than mid tibia and with apex acute; ovipositor slightly exserted, the exserted part about 0.5X as long as mid tibial spur.

Paratype. Funicle with linear sensilla present only on F2-F6; gaster without "gland-like" structures on Gt1 or Gt5; hypopygium Fig, 629; ovipositor (Fig. 627) with gonostylus about 1.1X as long as mid tibial spur. Relative measurements: OL 72, GL 19.5 [MT 46].

Variation. Females vary in overall length from 1.68-2.26mm, the fore wing varies from 2.4-2.5X as long as broad, otherwise little in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Zurqui de Moravia, 1600m, vi.1995 (P. Hanson). Paratypes: **COSTA RICA**, 10♀, **San José**, same data as holotype but various dates i.1989-x.1995; 1♀, **Heredia**, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/TN/ALL, iii.2002 (INBio-OET-ALAS). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

COMMENTS. *Cheiloneurus myndus* is superficially similar to *miklo*. Apart from the lack of an infuscate streak in the apical half of the fore wing *Cheiloneurus myndus* differs from *miklo* in having the scape and hind tibia mostly dark brown, the scape about 3.3X as long as broad, linear sensilla on F2-F6, and the scutellum with a distinct apical tuft that is nearly half as long as the scutellum. In *miklo* the scape is mostly pale orange, the hind tibia is yellowish with a narrow subbasal dark brown band, the scape is about 4.6X as long as broad, linear sensilla are present only on F4-F6 and the scutellum with a weak apical tuft of setae that is only about one-quarter as long as the scutellum.

***Cheiloneurus rosea* sp.nov.**

(Figs 631-633; Hab. ♀ 97)

DIAGNOSIS. *Female* (length about 1.3-2.1mm): body generally dark brown to black with a metallic; antenna (Fig. 631) with scape dark brown with apex pale orange; pedicel brown proximally, pale orange apically; funicle orange to orange-brown, clava dark brown; mesoscutum

with pale setae; fore and hind coxae white, mid coxa dark brown; hind tibia dark brown, legs otherwise white to pale orange mixed dark brown; fore wing (Fig. 633) hyaline; head about 4X as wide as frontovertex, in facial view about as broad as long and subcircular, gena weakly and fairly evenly curved; frontovertex without setae medially below anterior ocellus; area between eye and scrobe slightly wider than anterior ocellus, with shallow sculpture, scrobal margin dorsally and laterally rounded; interantennal prominence dorsally rounded with only a few inconspicuous setae; mandible with two long, acute, lower teeth and a very short upper tooth; antenna (Fig. 631) with scape about 3.6X as long as broad; funicle segments mostly transverse; flagellum about as long as head width; linear sensilla on F4-F6; clava 3-segmented, about as long F2-F6 combined, sensory area extending about 0.4X along ventral surface; mesoscutum mainly with polygonally reticulate sculpture; scutellum with distinct apical tuft of setae; wings fully developed; fore wing (Fig. 633) about 2.5X as long as broad; parastigma not curved downwards; costal cell dorsally with one or two setae at apex and a single complete line of setae ventrally; area below proximal part of parastigma with a group of about 10 pale setae; apices of postmarginal and stigmal veins (Fig. 632) not connected by a naked hyaline area; apical bristle of postmarginal vein not more than one-third as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with about 15 setae around each spiracle, side naked; syntergum about 1.1X as long as mid tibia; ovipositor about 3.3X gonostylus or 1.6X mid tibia; gonostylus about 1.3X mid tibial spur; exserted part of ovipositor 0.2X mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 2.01mm; excluding ovipositor, 2.03mm (CPD).

Head black with a dull metallic green sheen on frontovertex, scrobal area with a distinct, deep, purple sheen, top of scrobes mixed dark, metallic blue; frontovertex with some coppery reflections, especially along eye margins and clothed with inconspicuous dark brown setae; mouth margin metallic green mixed coppery and purple; temple and posterior part of gena below eye bright metallic green and brassy mixed with some coppery; remainder of malar space coppery purple; antenna (Fig. 631) with radicle dark brown, mixed pale orange-brown; scape dark brown in basal half or so with apical one-third pale orange; pedicel brown in proximal half, pale orange apically; funicle with F1-F4 pale orange-brown, F5-F6 pale orange; clava dark brown; thorax mostly dark brown to black; pronotum with a dull coppery-purple sheen; mesoscutum clothed with fairly conspicuous, evenly distributed, pale, translucent setae and metallic blue-green with some brassy reflections, especially posteriorly, posterior margin coppery purple; tegula dark brown; scutellum clothed with dark brown setae, mostly matt, posteriorly with a coppery purple sheen, sides and apex shining metallic green with some coppery reflections; metanotum with a slight purple sheen; mesopleuron largely dark purple with some blue reflections anteriorly; fore coxa and femur white, femur with a broad subapical brown band; fore tibia pale orange with a diffuse brown subbasal band; mid coxa dark brown, apically very pale yellow or white; mid femur white with a broad subapical dark brown band in apical one-third; mid tibia pale orange with a broad, brown subbasal band in proximal one-third; hind coxa white; hind femur white with apical half dark brown; hind tibia dark brown, narrowly dusky pale yellow proximally, apical one-third pale orange; all tarsi pale orange; pretarsi brownish; fore wing (Fig. 633) completely hyaline, venation pale brown; propodeum dark purple-brown; sides metallic green with conspicuous silvery setae in spiracular area; gaster dark purple-brown, Gt1 distinctly metallic green; remainder of gaster mixed brassy, sides of apical tergites metallic green; outer plates of ovipositor blue-green; gonostylus dark brown.

Head about 4X as wide as frontovertex, with occipital margin sharp and without a median groove to foramen; ocelli forming an angle of about 60°; frontovertex slightly shiny, with conspicuous reticulate sculpture of mesh size about equal to diameter of eye facet; scrobes, interantennal prominence and mouth margin with shallow sculpture, almost smooth; temple and posterior gena completely smooth adjacent to eye margin but posteriorly with shallow, irregular sculpture; scrobes moderately deep, meeting dorsally, dorsal and lateral margins weakly rounded; antenna as in Fig. 631; scape slightly broadened and flattened, about 3.6X as long as broad; funicle with F1 subquadrate, all other segments transverse and broadening distad; clava about as long as F2-F6, both sutures slightly oblique, sensory area forming an oblique truncation that extends a little less than 0.3X along clava; eye virtually reaching occipital margin, separated by much

less than diameter of facet and clothed in fairly conspicuous setae that are each about as long as diameter of facet; malar sulcus absent; mandible with 2 long, acute lower teeth and a very short upper tooth. Relative measurements: HW 80, HH 79, FV 20, OD 6.5, POL 10, OOL 1, OCL 7, AOL 12, EL 51, EW 41, MS 34, SL 43, SW 12.

Thorax with shallow, irregular, polygonally reticulate sculpture on pronotum, of mesh size subequal to diameter of facet; sculpture on mesoscutum largely similar but anteriorly and on sides more obliquely elongate; sculpture on axilla coarser and reticulate; scutellum mostly with coarse, longitudinally elongate, reticulate sculpture almost forming whorls, extreme apex and sides completely smooth; visible part of mesoscutum about 1.5X as broad as long; scutellum about as long as broad, subapical tuft distinct, setae about one-third as long as scutellum; hind femur about 3.9X as long as broad; fore wing with venation and setation as in Figs 632, 633; costal cell with 3 or 4 setae dorsally at apex; no naked streak present between apices of postmarginal and stigmal veins (Fig. 632); propodeum with numerous setae in spiracular area, side naked, medially about 0.1X as long as scutellum and medially with a small area of fine, shallow, polygonally reticulate sculpture. Relative measurements: FWL 96, FWW 38; HWL 70, HWW 20.

Gaster with hypopygium reaching about half-way to apex; ovipositor hardly exserted, the exserted part about one-fifth as long as mid tibial spur; syntergum very slightly longer than mid tibia.

Paratype. Funicle with linear sensilla present only on F4-6; gaster without "gland-like" structures on Gt1 or Gt5; gonostylus about 1.3X as long as mid tibial spur. Relative measurements: OL 88, GL 27 [MT 55].

Variation. Females vary in overall length from 1.32-2.10mm, otherwise very little in material available except that the ovipositor may be completely hidden.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Est. Altamira, Send. a Casa Coca, LS 331750 574400, 1700m, ii.2002 (C. Hansson, D. Rubi, J. Azofeifa). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Guanacaste NP, below Pitilla, 6.iii.1990 (J.S. Noyes); 1♀, Guanacaste, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Valle Miravalles, Est. Cabro Muco, LN 299769 411243, 100m, #74102, 4.vii.2003 (J.D. Gutierrez); 1♀, Guanacaste, Nandayure, Cerro Azul, LN 214769 397000, 1050m, #72539, 20.x.2002-15.i.2003 (W. Porras); 1♀, **Alajuela**, Peñas Blancas, viii.1987 (E. Cruz); 1♀, San José, Zurqui de Moravia, 1600m, i.1995 (P. Hanson); 1♀, **Cartago**, PN Tapanti-Macizo de la Muerte, Torre ICE #31, LN 556800 188500, 1800m, #61075, 18.ix-19.x.2000 (D. Rubi); 7♀, **Puntarenas**, same data as holotype; 3♀, Puntarenas, Est. Altamira, Send. los Gigantes, LS 331800 572100, 1460m, ii.2002 (C. Hansson, D. Rubi); 1♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 1500m, 18-22.iii.1990 (J.S. Noyes); 1♀, Puntarenas, PN Corcovado, Est. Agujas, LS 526550 276750, 300m, 11.ii.2002 (J. Azofeifa). Holotype in MZUCR, paratypes in MZUCR, NHMUK, USNM, CNC, MLP.

COMMENTS. See comments under *varablus* (p. 251), *miklo* (p. 247), *loresa* (p. 259) and *salome* (p. 257).

Cheiloneurus salome **sp.nov.**

(Figs 634-636)

DIAGNOSIS. *Female* (length about 1.8mm): body generally dark brown to black with a metallic sheen; antenna (Fig. 634) with scape dark brown with apex pale orange; pedicel dark brown proximally, venter and apex pale orange; funicle orange to orange-brown, clava dark brown; mesoscutum with slightly silvery setae; fore and hind coxae white, mid coxa dark brown mixed white; hind tibia dark brown, legs otherwise white to pale orange mixed dark brown; fore wing

(Fig. 636) hyaline; head about 4X as wide as frontovertex, in facial view hardly broader than long and subcircular, gena weakly and fairly evenly curved; frontovertex without setae medially below anterior ocellus; area between eye and scrobe about as wide as anterior ocellus, with shallow sculpture, scrobal margin dorsally and laterally rounded; interantennal prominence dorsally rounded with only a few inconspicuous setae; mandible with two long, acute, lower teeth and a very short upper tooth; antenna (Fig. 634) with scape about 3.1X as long as broad; funicle segments mostly transverse; flagellum about as long as head width; linear sensilla on F4-F6; clava 3-segmented, about as long as funicle, sensory area extending about 0.4X along ventral surface; mesoscutum mainly with polygonally reticulate sculpture; scutellum with distinct apical tuft of setae; wings fully developed; fore wing (Fig. 636) about 2.7X as long as broad; parastigma not curved downwards; costal cell dorsally with two or three setae at apex and a single complete line of setae ventrally; area below proximal part of parastigma with a group of about 15 pale setae; apices of postmarginal and stigmal veins (Fig. 635) not connected by a naked hyaline area; apical bristle of postmarginal vein not more than one-third as long as marginal vein; mid tibial spur very slightly longer than basitarsus; propodeum with about 20 setae around each spiracle, side naked; syntergum about 1.4X as long as mid tibia; ovipositor about 2.9X gonostylus or 2X mid tibia; gonostylus about 2.2X mid tibial spur; exserted part of ovipositor 0.7X mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.80mm; excluding ovipositor, 1.71mm (CPD).

Head black with a dull metallic green and purple sheen on frontovertex, scrobal area with a distinct, deep, purple sheen that extends to lower part of interantennal prominence where it is delimited by a narrow blue line between lower parts of toruli, metallic green below this; mouth margin metallic green; purple area of scrobes extending between eye and scrobe and delimited by a narrow blue line about level with top of torulus, shining metallic green and coppery purple outside this; temple predominantly shining metallic green mixed with some copper along eye margin and brassy areas; gena metallic green immediately below eye, otherwise coppery purple; frontovertex clothed with inconspicuous dark brown setae; antenna (Fig. 634) with radicle dark brown; scape mostly dark brown with apical one-third pale orange; pedicel dark brown in proximal two-thirds, apex and venter pale orange; funicle with F1-F3 pale orange, F4-F6 yellow; clava dark brown; thorax mostly dark brown to black; pronotum with a dull coppery-purple sheen; mesoscutum clothed with fairly conspicuous, evenly distributed, silvery, translucent setae and metallic dark blue with some blue-green reflections, especially posteriorly, posterior margin coppery purple; tegula dark brown; scutellum clothed with dark brown setae, mostly matt, posteriorly with a coppery purple sheen, sides and apex shining metallic green with some coppery reflections; metanotum with slight purple sheen; mesopleuron largely dark purple with some blue reflections anteriorly; fore coxa and femur white, femur with a subapical, dorsal, brown spot; fore tibia pale orange with a diffuse brown subbasal band, tarsus dusky pale orange; mid coxa proximally dark brown, a little more than apical half white; mid femur white with a broad subapical dark brown band in apical one-third; mid tibia pale orange with a broad, brown subbasal band in proximal one-third, spur and tarsus pale orange; hind coxa white; hind femur white with apical half dark brown; hind tibia dark brown, narrowly white proximally, apical 0.4X pale yellow to pale orange, tarsus pale yellow to pale orange; all pretarsi brownish; fore wing (Fig. 636) completely hyaline, venation pale brown; propodeum dark purple-brown; sides metallic green with conspicuous silvery setae in spiracular area; gaster dark purple-brown, Gt1 distinctly metallic dark blue, concolourous with most of mesoscutum, remainder of gaster mixed brassy, sides of apical tergites metallic green; outer plates of ovipositor blue-green; gonostylus dark brown.

Head about 4.2X as wide as frontovertex, about 1.6X as high as deep; occipital margin sharp and without a median groove to foramen; ocelli forming an angle of about 50°; frontovertex slightly shiny, with conspicuous reticulate sculpture of mesh size about equal to diameter of eye facet; scrobes, interantennal prominence and mouth margin with shallow sculpture, almost smooth; temple and posterior gena completely smooth adjacent to eye margin but posteriorly with shallow, irregular sculpture; scrobes moderately deep, meeting dorsally, dorsal and lateral margins weakly rounded; antenna as in Fig. 634; scape slightly broadened and flattened, about 3.1X as long as broad; funicle with F1 subquadrate, all other segments transverse and broadening distad,

linear sensilla present only on F4-6; clava about as long as funicle, both sutures slightly oblique, sensory area nearly 1.2X as long as ventral surface, forming an oblique truncation that extends a little more than half-way along clava; eye virtually reaching occipital margin, separated by much less than diameter of facet and clothed in fairly conspicuous setae that are each about as long as diameter of facet; malar sulcus absent; mandible with 2 long, acute lower teeth and a very short upper tooth. Relative measurements: HW 66.5, HH 63, FV 16, OD 5, POL 6.5, OOL 1, OCL 6.5, AOL 9.5, EL 43.5, EW 35, MS 25, SL 35.5, SW 10.

Thorax with shallow, irregular, polygonally reticulate sculpture on pronotum, of slightly larger mesh size than on frontovertex; sculpture on mesoscutum largely similar but anteriorly and laterally more obliquely elongate; sculpture on axilla coarser and reticulate; scutellum mostly with coarse, longitudinally elongate, reticulate sculpture almost forming whorls, extreme apex and sides completely smooth; visible part of mesoscutum about 1.7X as broad as long; scutellum about as long as broad, subapical tuft distinct, setae about one-third as long as scutellum; hind femur about 3.5X as long as broad; fore wing with venation and setation as in Figs 635, 636; costal cell with 3 setae dorsally at apex; no naked streak present between apices of postmarginal and stigmal veins (Fig. 635); propodeum with numerous setae in spiracular area, side naked, medially about 0.1X as long as scutellum and medially with a small area of fine, shallow, polygonally reticulate sculpture. Relative measurements: FWL 77.5, FWW 29; HWL 56, HWW 14.5.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium reaching about 0.4X to apex; ovipositor exserted, the exserted part about 0.7X as long as mid tibial spur or about 0.25X as long as mid tibia; syntergum about 1.35X as long as mid tibia. Relative measurements: OL 78.5, GL 27 [MT 40].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Est. Cacao (ACG), LN 323150 375500, 1000-1150m, xi-xii.1996 (A. Masis). Holotype in NHMUK.

COMMENTS. Apart from the relatively slightly narrower fore wing (see key), *salome* differs from *rosea* in having a relatively longer syntergum and ovipositor. In *salome* the syntergum is about 1.4X as long as the mid tibia, the ovipositor is about 2X as long as the mid tibia and gonostylus 2X as long as the mid tibial spur In *rosea* the syntergum is about 0.9-1.1X as long as the mid tibia, the ovipositor is about 1.4-1.6X as long as the mid tibia and the gonostylus is about 1.0-1.2X as long as the mid tibial spur. This generally means that the ovipositor is slightly more exserted in *salome* than in *rosea*. In salome the exserted part of the ovipositor is about 0.7X as long as the mid tibial spur, whereas in *rosea* it is at most about 0.2X as long as the mid tibial spur.

Cheiloneurus salome is also very similar to *varablus*, but can be separated by the conspicuously narrower scape (see key).

Cheiloneurus loresa **sp.nov.**

(Figs 637-643)

DIAGNOSIS. *Female* (length about 1.5mm): body generally dark brown to black with a metallic sheen; antenna (Fig. 639) with scape dark brown with apex pale orange; pedicel dark brown proximally, venter and apex pale orange; funicle yellow to pale orange, clava dark brown; mesoscutum with translucent, slightly silvery setae; fore and hind coxae white, mid coxa dark brown mixed white or pale yellow; hind tibia dark brown, legs otherwise white to pale orange mixed dark brown; fore wing (Fig. 640) hyaline; head (Fig. 638) about 4.7X as wide as frontovertex, in facial view about as broad as long and subcircular, gena weakly and fairly

evenly curved; frontovertex without setae medially below anterior ocellus; area between eye and scrobe about as wide as anterior ocellus, with shallow sculpture, scrobal margin dorsally and laterally rounded; interantennal prominence dorsally rounded with only a few inconspicuous setae; mandible with two long, acute, lower teeth and a very short upper tooth; antenna (Fig. 639) with scape about 3.5X as long as broad; funicle segments mostly transverse. F1 subquadrate; flagellum about as long as head width; linear sensilla on F5-F6; clava 3-segmented, slightly longer than funicle, sensory area extending very nearly 0.5X along ventral surface; mesoscutum (Fig. 641) with imbricate reticulate sculpture; scutellum with distinct apical tuft of setae; wings fully developed; fore wing (Fig. 640) about 2.7X as long as broad; parastigma not curved downwards; costal cell dorsally with 5 or 6 setae at apex and a single complete line of setae ventrally; area below proximal part of parastigma with a group of about 10 pale setae; apices of postmarginal and stigmal veins (Fig. 643) not connected by a naked hyaline area; apical bristle of postmarginal vein not more than one-third as long as marginal vein; mid tibial spur hardly longer than basitarsus; propodeum (Fig. 641) with about 15 setae around each spiracle, side naked; syntergum about as long as mid tibia; ovipositor (Fig. 642) about 3.2X gonostylus or 1.4X mid tibia; gonostylus about 1.2X mid tibial spur; exserted part of ovipositor 0.2X mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.45mm; excluding ovipositor, 1.43mm (CPD).

Head black with a dull metallic green and purple sheen on frontovertex, scrobal area mostly with a purple sheen with some copper above mouth margin; purple area of scrobes extending between eye and scrobe, shining metallic green and coppery purple outside this; temple predominantly shining metallic green mixed with some copper along eye margin and brassy areas; gena metallic green immediately below eye, otherwise coppery purple; frontovertex clothed with inconspicuous dark brown setae; antenna (Fig. 639) with radicle dark brown; scape mostly dark brown with apical one-third pale orange; pedicel dark brown in proximal two-thirds, apex and venter pale orange; funicle with F1-F3 pale orange, F4-F6 yellow; clava dark brown; thorax mostly dark brown to black; pronotum with a dull coppery-purple sheen; mesoscutum clothed with fairly conspicuous, evenly distributed, pale, translucent setae and metallic blue-green with some brassy reflections, especially posteriorly, posterior margin coppery purple; tegula dark brown; scutellum clothed with dark brown setae, mostly matt, posteriorly with a coppery purple sheen, sides and apex shining metallic green with some coppery reflections; metanotum with a slight purple sheen; mesopleuron largely dark purple with some blue reflections anteriorly; fore coxa white, femur proximally white but mostly brown in apical half; fore tibia pale orange with a diffuse brown subbasal band; mid coxa dark brown, apically very pale yellow or white; mid femur white with a broad subapical dark brown band in apical one-third; mid tibia pale orange with a broad, brown subbasal band in proximal one-third; hind coxa white; hind femur white with apical half dark brown; hind tibia dark brown, narrowly dusky pale yellow proximally, slightly more than apical one-third pale yellow; all tarsi pale orange; pretarsi brownish; fore wing (Fig. 640) completely hyaline, venation pale brown; propodeum dark purple-brown; sides metallic green with conspicuous silvery setae in spiracular area; gaster dark purple-brown, Gt1 distinctly metallic green; remainder of gaster mixed brassy, sides of apical tergites metallic green; outer plates of ovipositor blue-green; gonostylus dark brown.

Head (Fig. 638) about 4.7X as wide as frontovertex with occipital margin sharp and without a median groove to foramen; ocelli forming an angle of about 40°; frontovertex slightly shiny, with conspicuous reticulate sculpture of mesh size slightly smaller than diameter of eye facet; scrobes, interantennal prominence and mouth margin with shallow sculpture, almost smooth; temple and posterior gena completely smooth adjacent to eye margin but posteriorly with shallow, irregular sculpture; scrobes moderately deep, meeting dorsally, dorsal and lateral margins weakly rounded; antenna as in Fig. 639; scape slightly broadened and flattened, about 3.5X as long as broad; funicle with F1 subquadrate, all other segments transverse and broadening distad, linear sensilla present only on F5-6; clava slightly longer than funicle, both sutures slightly oblique, sensory area hardly longer than ventral surface, forming an oblique truncation that extends a little less than half-way along clava; eye virtually reaching occipital margin, separated by much less than diameter of facet and clothed in fairly conspicuous setae that are each about as long as diameter of facet; malar sulcus absent; mandible with 2 long, acute lower teeth and a very short upper tooth. Relative

measurements: HW 74.5, HH 74, FV 16, OD 5.5, POL 7.5, OOL 1, OCL 7, AOL 10.5, EL 49, EW 39, MS 28, SL 40, SW 11.5.

Thorax (Fig. 641) with shallow, irregular, polygonally reticulate sculpture on pronotum, of slightly larger mesh size than on frontovertex; sculpture on mesoscutum largely similar but imbricate reticulate and very slightly obliquely elongate anteriorly; sculpture on axilla coarser and reticulate; scutellum mostly with coarse, longitudinally elongate, reticulate sculpture almost forming whorls, extreme apex and sides completely smooth; visible part of mesoscutum about 2X as broad as long; scutellum about as long as broad, subapical tuft distinct, setae about one-third as long as scutellum; hind femur about 3.5X as long as broad; fore wing with venation and setation as in Figs 640, 643; costal cell with 6 setae dorsally at apex; no naked streak present between apices of postmarginal and stigmal veins (Fig. 643); propodeum (Fig. 641) with 12 or 13 setae in spiracular area, side naked, medially about 0.1X as long as scutellum and smooth. Relative measurements: FWL 82, FWW 30.5; HWL 63, HWW 14.5.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium (Fig. 637) reaching about 0.4X to apex; ovipositor (Fig. 642) hardly exserted, the exserted part about 0.2X as long as mid tibial spur or about 0.1X as long as mid tibia; syntergum about as long as mid tibia. Relative measurements: OL 50, GL 15.5 [MT 36].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Alajuela**, PN Arenal, Sect. la Peninsula, LN 271500 453800, 600m, #54382, i.2000 (G. Carballo). Holotype in NHMUK.

COMMENTS. *Cheiloneurus loresa* is very similar to *rosea* and, apart from the relatively narrower fore wing (see key), differs in lacking linear sensilla on F4 and having a relatively longer hypopygium. In *loresa* the hypopygium is at least 0.6X as long as broad, whilst in *rosea* it is not more than 0.5X as long as broad.

Cheiloneurus onestas **sp.nov.**

(Figs 644-649; Hab. ♀ 98)

DIAGNOSIS. *Female* (length about 1.4-1.5mm): body black with a weak to moderate metallic sheen; antenna (Fig. 647) with scape pale orange, dorsal margin very pale brown and extreme base dark brown; pedicel dark brown with some pale orange; funicle pale orange; clava dark brown; mesoscutum with only dark brown setae; coxae white, mid and hind coxa with some pale yellow; legs mostly white to pale orange with some dark brown areas on mid and hind legs; fore wing (Fig. 645) hyaline; head (Fig. 644) about 3.4-3.7X as wide as frontovertex, in facial view clearly broader than long, subrectangular, genae hardly curved, converging; frontovertex naked medially between anterior ocellus and scrobes; eye separated from scrobe by about 0.8-0.9X diameter of anterior ocellus, area between eye and scrobe with shallow sculpture; scrobes moderately deep, not sharply margined, interantennal prominence with about 10 inconspicuous setae, dorsally rounded, without a median ridge; mandible tridentate; antenna (Fig. 647) with scape about 3.7-4.1X as long as broad; funicle with all segments transverse; clava 3-segmented, hardly longer than F2-F6 combined; sensory area enlarged, extending ventrally about 0.4X length of clava, apex obliquely truncate; head width slightly greater than length of pedicel and flagellum combined; mesoscutum (Fig. 648) with fairly regular, polygonally reticulate sculpture, but anterior half laterally with fine, striate-reticulate sculpture; scutellum without a distinct, subapical tuft of setae; wings fully developed, fore wing (Fig. 645) about 2.3-2.4X as long as broad; parastigma not downcurved; costal cell dorsally with 5-9 apical setae, ventrally with a complete line of setae; area below

proximal part of parastigma with a group of about 17-25 uniform setae more or less connecting to a line of 3 or 4 setae along cubital vein track; apices of postmarginal and stigmal veins (Fig. 649) not connected by a naked hyaline area; apical bristle of postmarginal vein about 0.4X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with about 10 inconspicuous setae adjacent to spiracle, side naked; syntergum about 1.1X as long as mid tibia, apex acute; ovipositor (Fig. 646) about 4.6-5.0X gonostylus or about 1.7-1.8X as long as mid tibia; gonostylus about as long as long mid tibial spur; exserted part of ovipositor about 0.5X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.46mm; excluding ovipositor, 1.38mm (CPD).

Head black with a fairly dull, violet sheen frontovertex, area around anterior ocellus with a very weak metallic dark blue sheen; area between scrobe and eye with a dull violet sheen; scrobal area shiny with a strong metallic blue-green sheen; mouth margin dark brown with a weak violet sheen; frontovertex with inconspicuous dark brown setae; posterior part of temple and posterior part of gena both with a moderate coppery sheen, area behind and below eye with a moderate blue-green sheen with some slightly brassy and violet reflections, lower part of posterior gena coppery, anterior part of gena with a moderate metallic dark blue-green sheen with some weak violet reflections; antenna (Fig. 645) with radicle orange-brown, apex narrowly dark brown; scape mostly pale orange with dorsal margin very pale brown in basal two-thirds and extreme base narrowly dark brown; pedicel dorsally brown with extreme apex and venter pale orange; funicle pale orange; clava dark brown; thorax mostly dark brown to black; pronotum with a dull coppery-purple sheen; mesoscutum clothed with fairly conspicuous dark brown setae and with a moderate, metallic dark blue-green sheen with some coppery reflections, posterior margin coppery; tegula dark brown with a slight coppery sheen; scutellum clothed with dark brown setae, mostly with a slightly silky, moderate dark blue sheen, ridges of sculpture purple, midline appearing slightly darker, extreme apex and side with a strong mixed metallic dark green, dark blue, coppery and brassy sheen; metanotum with slight coppery purple sheen; mesopleuron anteriorly with a moderate metallic dark blue sheen, ridges of reticulate sculpture purple, dark blue becoming progressively less distinct posteriorly, posterior two-fifths with a moderate coppery sheen mixed brassy; fore coxa and femur white, apex of femur pale orange, tibia pale orange with a small, faint brown subbasal spot externally, tarsus pale orange, apical tarsomere slightly dusky; mid coxa largely very pale yellow or white, but mixed brown proximally and mostly dark brown ventrally, femur white with a narrow, dark brown, subapical band; mid tibia white to pale orange with a narrow, dark brown, subbasal band, spur and tarsus pale orange; hind coxa white, very pale orange anteriorly, femur white to very pale orange in proximal half, apex dark brown, tibia dirty white at extreme base otherwise dark brown in proximal two-fifths, apex pale orange, tarsus pale orange, apical tarsomere orange-brown; fore wing (Fig. 645) completely hyaline, venation orange-brown; propodeum dark purple-brown with a slight coppery sheen; sides metallic dark blue-green and coppery, spiracular area with a few fairly conspicuous silvery setae; gaster dark brown with a moderate coppery sheen, Gt1 distinctly metallic blue-green with some violet; side and venter of gaster with metallic dark blue, dark green, brassy and coppery reflections, lateral extensions of apical tergites largely metallic blue-green; outer plates of ovipositor with a moderate metallic dark blue sheen; gonostylus dark brown, extreme apex orange-brown.

Head (Fig. 644) about 3.5X as wide as frontovertex, in profile about 1.55X as high as deep; occipital margin sharp and without a median groove to foramen; ocelli forming an angle of about 70°; frontovertex very slightly shiny, with conspicuous reticulate sculpture of mesh size generally subequal to diameter of eye facet; scrobes, interantennal prominence and mouth margin with shallow sculpture, scrobes almost smooth; temple and posterior gena with shallow, but distinct, sculpture adjacent to eye becoming progressively deeper, longitudinally elongate polygonally reticulate posteriorly; eye separated from scrobe by about 0.9X diameter of anterior ocellus, area between eye and scrobe with distinct sculpture; scrobes moderately deep, meeting dorsally, dorsal and lateral margins weakly rounded, interantennal prominence dorsally rounded; antenna as in Fig. 647; scape hardly broadened and flattened about 4.1X as long as broad; funicle with F1-F3 subequal, transverse but F1 slightly longest and subquadrate, F4-F6 larger, transverse, becoming

progressively wider and larger distad; clava hardly longer than F2-F6 combined, both sutures slightly oblique, sensory area extending ventrally about 0.4X along clava; eye reaching occipital margin and clothed with inconspicuous setae that are each less than 0.5X as long as diameter of facet; malar sulcus absent; mandible with 2 long, acute lower teeth and very short upper, tooth. Relative measurements: HW 103.5, HH 92, FVL 60, FV 30, POL 15, OOL 1.5, OCL 5, AOL 14, EL 63.5, EW 56, MS 31, SL 41, SW 10.

Thorax (Fig. 648) with shallow, irregular, polygonally reticulate sculpture on pronotum, of mesh size a little smaller than diameter of facet; mesoscutum mostly with regular polygonally reticulate sculpture that is slightly shallower than that on frontovertex, anterior half laterally with conspicuous, fine, striate-reticulate sculpture; sculpture on axilla slightly coarser and reticulate; scutellum hardly convex, with relatively deep, longitudinally elongate, striate-reticulate sculpture, somewhat arranged in whorls, extreme apex and sides completely smooth; visible part of mesoscutum about 1.8X as broad as long; scutellum about as long as broad, subapical tuft absent; hind femur about 3.6X as long as broad; fore wing with venation and setation as in Figs 645, 649; costal cell with 6 setae dorsally at apex; no naked streak present between apices of postmarginal and stigmal veins; propodeum (Fig. 648) with about 10 setae in spiracular area, side naked, medially slightly less than 0.1X as long as scutellum and medially quite smooth. Relative measurements: FWL 93.5, FWW 39; HWL 71, HWW 19.

Gaster with hypopygium reaching a little more than one-third to apex; syntergum about 1.1X as long as mid tibia, apex acute; ovipositor slightly exserted, the exserted part about one-half as long as mid tibial spur.

Paratype. Funicle with linear sensilla only on F4-F6; gaster without "gland-like" structures on Gt1 or Gt5; ovipositor as in Fig. 646, gonostylus about as long as mid tibial spur. Relative measurements: OL 58, GL 12.5 [MT 33.5].

Variation. Females vary in overall length from 1.36-1.51mm, the head varies from 3.4-3.7X as wide as the frontovertex, the scape varies from 3.7-4.1X as long as broad and the ovipositor varies from about 4.6-5.0X as long as the gonostylus.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 23-24.ii.2007 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, PN Bosque Diría, 10°10'N 85°34'W, 200m, 14-15.ii.2011 (J.S. Noyes); 1♀, **Alajuela**, PN Arenal, Sendero Mena, LN 454170 271800, 600m, 17.iv-19.v.2001 (G. Carballo); 1♀, **Heredia**, OTS La Selva, 10°26'N 84°01'W, 100m, vii.1995 (ALAS project); 1♀, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 11-21.ii.2005 (C. Hansson); 1♀, Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 23-24.ii.2013 (J.S. Noyes); 2♀, Puntarenas, Reserva Absoluta Cabo Blanco, 9°35'N 85°06'W, 30m, 16-17.ii.2009 (J.S. Noyes); 1♀, Puntarenas, Manuel Antonio NP, iii.1986 (L. Masner). Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. In many respects *Cheiloneurus onestas* is very similar in habitus to *hamadryas*. *Cheiloneurus onestas* can be distinguished by having shallow but distinct sculpture adjacent to eye on temple and posterior part of gena (in *hamadryas* completely smooth adjacent to eye on temple and posterior part of gena), and the ovipositor more than 4.5X as long as the gonostylus (in *hamadryas* not more than 4X as long as the gonostylus). There also appears to be differences in colour, i.e. *onestas* has a violet sheen on the frontovertex (in *hamadryas* dull dark metallic green), the mesoscutum clothed with dark brown setae (in *hamadryas* pale, translucent setae) and the scutellum has a moderate dark blue sheen (in *hamadryas* coppery purple).

See also comments under *extillus* (p. 271).

***Cheiloneurus mirabel* sp.nov.**
(Figs 650-655)

DIAGNOSIS. *Female* (length about 2.0mm): body generally dark brown to black with a weak to moderate metallic sheen; antenna (Fig. 650) with scape very pale orange; pedicel mostly yellow, proximally dark brown dorsally; funicle yellow; clava dark brown; mesoscutum with uniform, silvery setae; coxae white; hind tibia mostly pale orange, legs otherwise white to pale orange with a few brown areas; fore wing (Fig. 655) almost completely hyaline but weakly infuscate immediately below marginal and stigmal veins; head (Fig. 654) about 4.5X as wide as frontovertex, in facial view about 1.1X as broad as long, subcircular, genae converging, moderately and evenly curved; frontovertex naked medially below anterior ocellus; area between eye and scrobe hardly wider than diameter of anterior ocellus, with distinct sculpture, scrobal margin rounded; interantennal prominence dorsally rounded with only a few long setae; mandible with two long, sharp lower teeth and a very short, sharp, upper tooth; antenna (Fig. 650) with scape about 3.9X as long as broad; funicle with F1 subquadrate, other segments strongly transverse, becoming larger distad; head about 1.1X as wide as length of flagellum; linear sensilla on F4-F6; clava 3-segmented, slightly longer than funicle, sensory area large and forming an oblique truncation, extending about 0.5X along ventral margin; mesoscutum (Fig. 653) with polygonally reticulate sculpture; scutellum with a distinct, but very short apical tuft of setae; wings fully developed; fore wing (Fig. 655) about 2.7X as long as broad; parastigma not curved downwards; costal cell dorsally with 4 or 5 setae at apex and a single, complete line of setae ventrally; area below proximal part of parastigma with a group of about 20 setae; apices of postmarginal and stigmal veins (Fig. 651) not connected by a naked hyaline area; apical bristle of postmarginal vein about 0.4X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum (Fig. 653) with about 15 setae around each spiracle, these not extending down side; syntergum very slightly longer than mid tibia; ovipositor (Fig. 652) about 2.7X gonostylus or 2.2X mid tibia; gonostylus about 2.3X as long as mid tibial spur; exserted part of ovipositor about 0.7X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.97mm; excluding ovipositor, 1.84mm (CPD).

Head black with weak dark blue and purple reflections on frontovertex; scrobal area mostly with a stronger blue-green sheen, mixed with purple, especially on interantennal prominence between toruli; mouth margin narrowly purplish; gena and temple with a brighter, slightly brassy metallic blue and green sheen, strongest immediately below eye, coppery posteriorly; frontovertex with inconspicuous dark brown setae; antenna (Fig. 650) with radicle pale orange, apex with a dark brown ring; scape very pale orange, proximally with a narrow, dark brown ring; pedicel largely yellow, proximally dark brown dorsally; funicle yellow; clava dark brown; thorax mostly dark brown to black; pronotum coppery with green and brassy reflections; mesoscutum clothed with uniform, translucent silvery setae and with a metallic blue-green sheen with weak purple reflections, posterior margin coppery purple; tegula dark brown; axilla dull, dark purple-brown with coppery reflections; scutellum clothed with dark brown setae, hardly less shiny than mesoscutum, anterior one third with a dark blue sheen, middle one-third blue-green, apical one-third coppery, extreme sides and apex coppery mixed shining blue-green; metanotum with a slight purple sheen; mesopleuron in posterior half with a coppery-purple and brassy sheen, anterior half mixed blue and brassy, these narrowly separated by a coppery, dark blue and violet sheen; fore coxa white; fore femur white to pale yellow, with a subapical, brown spot externally; fore tibia pale orange with a very small, subbasal, brown spot externally; mid coxa white; mid femur white to pale yellow with a subapical brown spot externally, tibia pale orange with a subbasal brown spot externally; hind coxa white; hind femur white in proximal half or so, otherwise pale orange, brown at extreme apex, tibia mostly pale orange with an incomplete, narrow, subbasal brown ring; tarsi pale orange, pretarsi slightly dusky; fore wing (Fig. 655) almost completely hyaline but weakly infuscate immediately below marginal and stigmal veins; propodeum dark purple-brown; sides metallic green with a few conspicuous silvery setae in spiracular area; gaster dark purple-brown, Gt1 metallic blue-green anteriorly; remainder of dorsum of gaster slightly coppery, mixed

purple and brassy, sides of gaster towards apex and outer plates of ovipositor mixed metallic green, coppery and brassy; gonostylus dark brown, extreme apex orange.

Head (Fig. 654) about 4.5X as wide as frontovertex, in profile about 1.6X as high as deep, not subtriangular in profile, occipital margin carinate, occiput without a conspicuous, median groove above foramen; a very narrow, elongate groove adjacent to eye margin between posterior ocellus and occipital margin; ocelli forming an angle of about 55°; frontovertex slightly shiny, with conspicuous reticulate sculpture of mesh size generally very slightly smaller than diameter of eye facet; scrobal area and mouth margin with shallower sculpture; gena and temple with more elongate sculpture of larger mesh; scrobes shallow, meeting dorsally, dorsal and lateral margins weakly rounded; antenna as in Fig. 650; scape hardly broadened and flattened, about 3.9X as long as broad; F1 subquadrate, remaining segments strongly transverse and broadest distad, linear sensilla present only on F4-F6; clava moderately broad, slightly longer than funicle, sutures oblique, sensory area enlarged, about 1.5X as long as ventral surface and extending about half-way along clava giving it a strong, obliquely truncate appearance; eye reaching occipital margin, clothed with inconspicuous setae, each a little shorter than diameter of facet; inner eye margins not converging anteriorly; malar sulcus absent; mandible with two long, acute, lower teeth and a short, acute, upper tooth. Relative measurements: HW 75, HH 69, FV 16.5, OD 6, POL 7.5, OOL 1, OCL 6, AOL 9, EL 48, EW 40, MS 27, SL 35, SW 9.

Thorax (Fig. 653) with shallow, irregular, polygonally reticulate sculpture on pronotum, generally of mesh size subequal to diameter of facet; sculpture on mesoscutum generally of similar depth to that on pronotum, but more regular and of smaller mesh; sculpture on axilla similar to that on mesoscutum, but slightly deeper and a little transverse; scutellum with conspicuously deeper, polygonally reticulate sculpture; apex and sides narrowly completely smooth; visible part of mesoscutum about 1.9X as broad as long; scutellum hardly broader than long, with a very short subapical tuft, setae about one-quarter as long as scutellum; hind femur about 3.8X as long as broad; fore wing with venation and setation as in Figs 651, 655; costal cell with 3 or 4 setae dorsally at apex; no naked streak present between apices of postmarginal and stigmal veins (Fig. 651); propodeum (Fig. 653) with moderately dense setae in spiracular area, side naked, medially much less than 0.1X as long as scutellum and with some shallow polygonally reticulate sculpture. Relative measurements: FWL 75, FWW 28; HWL 59, HWW 15.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium reaching about half-way to apex; syntergum about 1.15X as long as mid tibia and with apex acute; ovipositor (Fig. 652) clearly exserted, the exserted part about 0.7X as long as mid tibial spur or about 0.2X as long as mid tibia. Relative measurements: OL 84, GL 31 [MT 38.5].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, La Selva BS, 10°26'N 84°01'W, FVK 34, 10.xi.1994. Holotype in NHMUK.

COMMENTS. *Cheiloneurus mirabel* is most similar to *mantua* and *mardor* and, apart from the characters given in the key, it can be separated from both these species by having the ovipositor less than half as long as the mid tibia or less than 3X as long as the gonostylus whereas in both *mantua* and *mardor* the ovipositor is at least 0.6X as long as the mid tibia and more than 3X as long as the gonostylus. It can also be separated from *mardor* by having the subapical tuft on the scutellum about one-quarter as long as the scutellum and not more than about 20 setae on side of the propodeum near the spiracle whereas in *mardor* the subapical tuft of setae is about one-third as long as the scutellum and there are at least about 40 setae near the spiracle.

***Cheiloneurus mantua* sp.nov.**
(Figs 656-660; Hab. ♀ 99)

DIAGNOSIS. *Female* (length about 1.5-1.9mm): body generally dark brown to black with a weak to moderate metallic sheen; antenna (Fig. 658) with scape pale orange, dorsal margin brown proximally; pedicel mostly pale orange, proximally dark brown; funicle pale orange; clava dark brown; mesoscutum with uniform, silvery setae; coxae white; hind tibia mostly pale orange, legs otherwise white to pale orange with a few brown areas; fore wing (Fig. 657) almost completely hyaline but weakly infuscate immediately below marginal and stigmal veins, a hint of a weakly infuscate median streak in apical half; head (Fig. 656) about 4X as wide as frontovertex, in facial view nearly 1.1X as broad as long, subcircular, gena weakly and evenly curved; frontovertex naked medially below anterior ocellus; area between eye and scrobe slightly narrower than diameter of anterior ocellus, with distinct sculpture, scrobal margin rounded; interantennal prominence dorsally rounded with only a few long setae; mandible with two long, sharp lower teeth and a very short upper tooth; antenna (Fig. 658) with scape about 4.5X as long as broad; funicle with F1 subquadrate, other segments strongly transverse, becoming larger distad; head about as wide as length of pedicel and flagellum combined; linear sensilla on F5-F6; clava 3-segmented, slightly longer than funicle, sensory area large and forming an oblique truncation, extending about 0.5X along ventral margin; mesoscutum (Fig. 660) with polygonally reticulate sculpture; scutellum with a distinct, but very short apical tuft of setae; wings fully developed; fore wing (Fig. 657) about 2.5X as long as broad; parastigma not curved downwards; costal cell dorsally with 2 or 3 setae at apex and a single, complete line of setae ventrally; area below proximal part of parastigma with a group of about 15 setae; apices of postmarginal and stigmal veins (Fig. 659) not connected by a naked hyaline area; apical bristle of postmarginal vein about 0.4X as long as marginal vein; mid tibial spur very nearly as long as basitarsus; propodeum (Fig. 660) with about 15 setae around each spiracle, not extending down side; syntergum about as long as mid tibia; ovipositor about 3.2X gonostylus or 1.6X mid tibia; gonostylus about 1.8X as long as mid tibial spur; exserted part of ovipositor about 0.4X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.84mm; excluding ovipositor, 1.77mm (CPD).

Head black with weak, blue and purple reflections on frontovertex; ocellar area more strongly purple; scrobal area mostly with a stronger blue-green sheen, mixed with purple, especially on interantennal prominence between toruli; mouth margin narrowly purplish; gena and temple with a brighter, slightly brassy metallic green sheen, strongest immediately below eye, some coppery reflections on lower gena; frontovertex with inconspicuous dark brown setae; antenna (Fig,. 658) with radicle pale orange, apex with a dark brown ring; scape pale orange, proximally with a narrow, dark brown ring, dorsal margin brown in proximal two-thirds or so; pedicel mostly pale orange, proximally dark brown; funicle pale orange; clava dark brown; thorax mostly dark brown to black; pronotum coppery with green and brassy reflections; mesoscutum clothed with uniform, translucent silvery setae and with a metallic green to blue-green sheen mixed with coppery and brassy reflections, posterior margin coppery purple; tegula dark brown; axilla dull, dark purple-brown with coppery reflections; scutellum noticeably less shiny than mesoscutum, but with blue-green and coppery reflections, clothed with dark brown setae, extreme sides and apex shining green mixed coppery; metanotum with slight purple sheen; mesopleuron in posterior half with a coppery-purple and brassy sheen, anterior half mixed blue and brassy, these narrowly separated by a coppery, dark blue and violet sheen; fore coxa white; fore femur white to pale yellow, with a subapical, brown spot externally; fore tibia pale orange with a very small, subbasal, brown spot externally; mid coxa white; mid femur white to pale yellow with a subapical brown spot externally, tibia pale orange with a subbasal brown spot externally; hind coxa white; hind femur white in proximal half or so, otherwise pale orange-brown, tibia mostly pale orange with an incomplete, narrow, subbasal brown ring; tarsi pale orange, pretarsi slightly dusky; fore wing (Fig. 657) almost completely hyaline but weakly infuscate immediately below marginal and stigmal veins, a hint of a weakly infuscate median streak distad of pale brown venation; propodeum dark purple-brown; sides metallic green with a few conspicuous silvery setae in spiracular area; gaster dark purple-brown, Gt1 largely metallic blue-green; remainder of dorsum of gaster slightly coppery, mixed purple and brassy, sides of gaster towards apex and outer plates of ovipositor mixed metallic

green, coppery and brassy; gonostylus dark brown, extreme apex orange.

Head (Fig. 656) about 4X as wide as frontovertex, not subtriangular in profile, occipital margin carinate, occiput without a median groove above foramen; ocelli forming an angle of about 50°; frontovertex slightly shiny, with conspicuous reticulate sculpture of mesh size generally very slightly smaller than diameter of eye facet; scrobal area and mouth margin with shallower sculpture; gena and temple with more elongate sculpture of larger mesh; scrobes shallow, meeting dorsally, dorsal and lateral margins weakly rounded; antenna as in Fig. 658; scape hardly broadened and flattened, about 4.5X as long as broad; F1 subquadrate, remaining segments strongly transverse and broadest distad; clava moderately broad, about as long as funicle, sutures oblique, sensory area enlarged, extending about one-third along clava ventrally and giving it an obliquely truncate appearance; eye reaching occipital margin, clothed with inconspicuous setae, each of which is about as long as diameter of facet; inner eye margins not converging anteriorly; malar sulcus absent; mandible with two long, acute, lower teeth and a short upper tooth. Relative measurements: HW 71, HH 66, FV 18, OD 6, POL 7.5, OOL 1, OCL 6, AOL 9, EL 44, EW 38, MS 28, SL 35, SW 8.

Thorax (Fig. 660) with shallow, irregular, polygonally reticulate sculpture on pronotum, generally of mesh size subequal to diameter of facet; sculpture on mesoscutum generally of similar depth to that on pronotum, but more regular and of smaller mesh; sculpture on axilla similar to that on mesoscutum, but slightly deeper; scutellum with conspicuously deeper, polygonally reticulate sculpture; apex and sides narrowly completely smooth; visible part of mesoscutum about 1.7X as broad as long; scutellum slightly broader than long, with a very short subapical tuft, setae about one-quarter as long as scutellum; hind femur about 3.7X as long as broad; fore wing with venation and setation as in Figs 657, 659; costal cell with only 3 setae dorsally at apex; no naked streak present between apices of postmarginal and stigmal veins (Fig. 659); propodeum with moderately dense setae in spiracular area, side naked, medially less than 0.1X as long as scutellum and with some shallow polygonally reticulate sculpture. Relative measurements: FWL 73, FWW 29; HWL 58, HWW 16.

Gaster with hypopygium reaching about half-way to apex; syntergum about as long as mid tibia and with apex acute; ovipositor slightly exserted, the exserted part about 0.4X as long as mid tibial spur.

Paratype. Funicle with linear sensilla present only on F5-F6; gaster without "gland-like" structures on Gt1 or Gt5; gonostylus about 1.8X as long as mid tibial spur. Relative measurements: OL 54, GL 17 [MT 33].

Variation. Females vary in overall length from 1.48-1.84mm, otherwise little in type material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Las Cruces, MT/YPT, 18-22.iii.1990 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Puntarenas**, same data as holotype; 1♀, Puntarenas, San Vito, 1200m, coffee, iii-iv.1996 (P. Hanson). Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. See comments under *mirabel* (p. 263).

Cheiloneurus hamadryas **sp.nov.**

(Figs 661-672; Hab. ♀ 100)

DIAGNOSIS. *Female* (length about 1.3-1.9mm): body generally dark brown to black with a metallic sheen; antenna (Fig. 664, 668) with scape mostly pale orange margined pale brown; pedicel dorsally brown, pale orange ventrally and apically; funicle orange, sometimes dusky with F6 brown; clava dark brown; mesoscutum with pale setae; fore and hind coxae white, mid

coxa mostly white but partially brown; hind femur and tibia partially dark brown; legs otherwise white to pale orange mixed dark brown; fore wing hyaline; head (Fig. 669) 4.2-4.8X as wide as frontovertex, in facial view about as broad as long and subcircular, gena weakly and fairly evenly curved; frontovertex more or less naked medially below anterior ocellus; area between eye and scrobe nearly 2X as wide as anterior ocellus, with shallow sculpture, scrobal margin rounded; interantennal prominence dorsally rounded with only a few setae; mandible with two long, acute, lower teeth and a very short upper tooth; antenna (Figs 664, 668) with scape about 4.5-5X as long as broad; funicle with F1 slightly longer than broad, quadrate or transverse, other segments transverse; flagellum about as long as head width; linear sensilla on F3-F6 or absent from F3; clava 3-segmented, at least as long F2-F6 combined, sensory area extending about 0.5X along ventral surface; mesoscutum mainly with polygonally reticulate sculpture; scutellum with a short, apical tuft of setae, this sometimes absent; wings fully developed; fore wing (Fugs 666, 670) about 2.4-2.5X as long as broad; parastigma not curved downwards; costal cell dorsally with 6-8 setae at apex and a single complete line of setae ventrally; area below proximal part of parastigma with a group of about 15-40 pale setae; apices of postmarginal and stigmal veins not connected by a naked hyaline area (Figs 663m, 665); apical bristle of postmarginal vein very nearly one-third as long as marginal vein; mid tibial spur longer than basitarsus; propodeum (Figs 661, 662) with about 20-40 setae around each spiracle and extending down side; syntergum about as long as mid tibia; ovipositor (Fig. 667) about 3.5-3.9X gonostylus or 1.5X mid tibia; gonostylus about 1.1-1.3X mid tibial spur; exserted part of ovipositor not more than 0.5X mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.89mm; excluding ovipositor, 1.84mm (CPD).

Head black with a very dull, dark metallic green sheen on frontovertex slightly brighter towards scrobes, scrobal area with a distinct, deep, purple sheen, top of scrobes marked dark, metallic blue-green; some dark blue reflections outside scrobal area; mouth margin metallic dark green mixed coppery and purple; frontovertex with inconspicuous dark brown setae; temple and posterior part of gena below eye metallic green mixed brassy and coppery; remainder of malar space brassy mixed coppery purple; antenna (Fig. 668) with radicle dark brown mixed pale orange; scape pale orange with a faint, incomplete, pale brown stripe along dorsal margin, another proximally along ventral margin; pedicel dorsally brown in proximal two-thirds, pale orange ventrally and apically; funicle pale orange, proximal segments slightly dusky; clava dark brown; thorax mostly dark brown to black; pronotum with a dull coppery purple sheen; mesoscutum, except anteriorly, clothed with fairly conspicuous, evenly distributed, pale, translucent setae and dull, metallic blue-green with some purple reflections, posterior margin dark purple; tegula dark brown; scutellum clothed with dark brown setae, mostly matt, posteriorly with a coppery purple sheen, sides and apex shining metallic green with some coppery reflections; metanotum with slight purple sheen; mesopleuron largely dark purple-brown with some metallic blue and purple reflections in anterior one-third or so; fore coxa white, femur pale orange, femur brown on dorsal margin subapically; fore tibia pale orange with a small, faint brown subbasal spot anteriorly; mid coxa largely brown, apically and ventrally white; mid femur white with an incomplete, narrow subapical dark brown band; mid tibia pale orange with a narrow, incomplete, brown subbasal band; hind coxa white; hind femur white with apical half dark brown; hind tibia dark brown, narrowly pale yellow proximally, apical one-third pale yellow; all tarsi very pale orange; pretarsi brownish; fore wing (Fig. 670) completely hyaline, venation brown; propodeum dark purple-brown; sides metallic blue-green with conspicuous silvery setae in spiracular area; gaster dark purple-brown, Gt1 distinctly metallic blue-green; remainder of gaster mixed brassy, sides of apical tergites metallic blue-green; outer plates of ovipositor dull, dark green; gonostylus dark brown, extreme apex pale orange.

Head (Fig. 669) about 4.8X as wide as frontovertex with occipital margin sharp and without a median groove to foramen; ocelli forming an angle of about 45°; frontovertex slightly shiny, with conspicuous reticulate sculpture of mesh size generally slightly smaller than diameter of eye facet; scrobes, interantennal prominence and mouth margin with shallow sculpture, almost smooth; temple and gena with distinct irregular, reticulate sculpture, distinctly elongate posteriorly; scrobes moderately deep, meeting dorsally, dorsal and lateral margins weakly rounded; antenna

as in Fig. 668; scape hardly broadened and flattened, about 5X as long as broad; funicle with F1 a little longer than broad; all other segments slightly longer than broad to slightly transverse; clava slightly shorter than funicle, both sutures slightly oblique, sensory area forming an oblique truncation that extends about 0.6X along clava; eye reaching occipital margin and clothed in fairly conspicuous setae that are each about as long as diameter of facet; malar sulcus absent; mandible with 2 long, acute lower teeth and a very short upper tooth. Relative measurements: HW 78.5, HH 75, FV 16.5, OD 5, POL 8, OOL 0.5, OCL 6, AOL 13.5, EL 49, EW 42, MS 32, SL 44.5, SW 9.

Thorax (Fig. 661) with shallow, irregular, polygonally reticulate sculpture on pronotum, of slightly smaller mesh size than diameter of facet; sculpture on mesoscutum largely similar, hardly elongate anteriorly or laterally; sculpture on axilla slightly coarser and reticulate; scutellum mostly with coarse, slightly longitudinally elongate, polygonally reticulate sculpture, extreme apex and sides completely smooth; visible part of mesoscutum about 1.6X as broad as long; scutellum about as long as broad, subapical tuft distinct, but short, setae about one-quarter as long as scutellum; hind femur about 4.3X as long as broad; fore wing with venation and setation as in Figs 665, 670; costal cell with 5 setae dorsally at apex; no naked streak present between apices of postmarginal and stigmal veins (Fig. 675); propodeum (Fig. 661) with numerous setae in spiracular area, side naked, medially slightly less than 0.1X as long as scutellum and medially with a small area of fine, shallow, polygonally reticulate sculpture. Relative measurements: FWL 88, FWW 35; HWL 66, HWW 19.

Gaster with hypopygium reaching a little less than half-way to apex; ovipositor hardly exserted, the exserted part a little less than one-fifth as long as mid tibial spur; syntergum very nearly as long as mid tibia.

Paratype. Funicle with linear sensilla present only on F4-F6; gaster without "gland-like" structures on Gt1 or Gt5; gonostylus about 1.1X as long as mid tibial spur; hypopygium Fig. 671; ovipositor Fig. 667. Relative measurements: OL 80.5, GL 20.5 [MT 53].

Variation. Females vary in overall length from 1.34-1.94mm, the funicle is pale orange to slightly dusky orange with F6 brown, the mesoscutum varies from dull metallic blue-green to moderately bright, metallic green, the head is 4.2-4.8X as wide as the frontovertex, the scape may be 4.5-5X as long as broad, F1 may be transverse, subquadrate (Fig. 664) or slightly longer than broad (Fig. 668), the clava may be about as long as funicle or slightly shorter, the subapical tuft of setae on the scutellum may be absent, the area below the proximal part of the parastigma may have 15-40 pale setae, the marginal vein may vary in relative length (Figs 670, 674), the number of pegs in the filum spinosum varies (Figs 670, 674), the hypopygium varies a little in shape (Figs 671, 672), the ovipositor varies from 3.5-3.9X as long as the gonostylus, the gonostylus is 1.1-1.3X as long as the mid tibial spur and the ovipositor may be hardly exserted or may have the exserted part up to 0.5X as long as the mid tibial spur.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Santa Rosa NP, Hacienda 2-C, 14.vi-5.vii.1986 (D. Janzen, I.D. Gauld); 1♀, same data as holotype; 1♀, Guanacaste, ZP Nosara, Fila Maravilla, LN 221350 381700, 800m, #66663, xi-xii.2001 (I. Jiménez); 1♀, **Alajuela**, PN Arenal. Sendero Pilón, 10°27'N 84°43'W, 600m, 26.ii.2003 (J.S. Noyes); 1♀, **Heredia**, Est. Biol. La Selva, 10°24'N 84°01'W, 50-150m, canopy fog *Eugenia* sp., FOT/76/1-40, 5.i.2000 (INBio/OET); 1♀, **Puntarenas**, San Vito, Las Cruces, Wilson Bot. Gdns, 1500m, 18-22.iii.1990 (J.S. Noyes); 1♀, **Limón**, R.B. Hitoy-Cerere, Send. Bobocara, LN 184250 641800, 300m, #53494, 2-14.x.1999 (F. Umaña). Holotype in MZUCR, paratypes in MZUCR, NHMUK.

COMMENTS. See comments under *onestas* (p. 261) and *extillus* (p. 271).

***Cheiloneurus mardor* sp.nov.**
(Figs 673-675)

DIAGNOSIS. *Female* (length about 2.0mm): body generally dark brown to black with a weak to moderate metallic sheen; antenna (Fig. 675) with scape pale orange, dorsal and ventral margins largely dark brown; pedicel mostly pale orange, dark brown dorsally; funicle pale orange; clava dark brown; mesoscutum with uniform, silvery setae; coxae white, mid coxa dark brown proximally; hind tibia mostly dark brown, legs otherwise white to pale orange with a few brown areas; fore wing (Fig. 674) hyaline; head about 4.2X as wide as frontovertex, in facial view very slightly broader than long, subcircular, gena weakly and evenly curved; frontovertex naked medially below anterior ocellus; area between eye and scrobe about as wide as diameter of anterior ocellus, with shallow sculpture, scrobal margin rounded; interantennal prominence dorsally rounded with only a few long setae; mandible with two long, sharp lower teeth and a vestigial, virtually absent, upper tooth; antenna (Fig. 675) with scape about 4.6X as long as broad; funicle with F1 subquadrate, other segments strongly transverse, becoming larger distad; head about 1.1X as wide as length of flagellum; linear sensilla on F4-F6; clava 3-segmented, about as long as funicle, sensory area large and forming an oblique truncation, extending about 0.5X along ventral margin; mesoscutum with polygonally reticulate sculpture; scutellum with a distinct, but very short apical tuft of setae; wings fully developed; fore wing about 2.4X as long as broad; parastigma not curved downwards; costal cell dorsally with 3 or 4 setae at apex and a single, complete line of setae ventrally; area below proximal part of parastigma with a group of about 25 setae; apices of postmarginal and stigmal veins (Fig. 673) not connected by a naked hyaline area; apical bristle of postmarginal vein about 0.5X as long as marginal vein; mid tibial spur very nearly as long as basitarsus; propodeum with about 45 setae around each spiracle, these not extending down side; syntergum about as long as mid tibia; ovipositor about 3.4X gonostylus or 1.6X mid tibia; gonostylus about 1.2X as long as mid tibial spur; exserted part of ovipositor about 0.3X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.95mm; excluding ovipositor, 1.87mm (CPD).

Head black with weak blue-green and purple reflections on frontovertex; area in front of anterior ocellus more strongly purple; upper part of scrobal area purple, below this metallic green mixed with some purple especially on interantennal prominence between toruli; mouth margin weakly and narrowly purplish; gena and temple with a bright metallic brassy, blue and green sheen, strongly coppery posteriorly, more strongly shining immediately below eye; frontovertex with inconspicuous dark brown setae; antenna (Fig. 675) with radicle orange-brown, apex with a dark brown ring; scape pale orange, proximally with a narrow, dark brown ring, dorsal and ventral margins narrowly dark brown in proximal three-quarters or so; pedicel largely pale orange, mostly dark brown dorsally; funicle pale orange; clava dark brown; thorax mostly dark brown to black; pronotum coppery with green and brassy reflections; mesoscutum clothed with uniform, translucent silvery setae and with a dull, metallic dark green sheen with coppery and brassy reflections, posterior margin coppery purple; tegula dark brown; axilla dull, dark purple-brown with coppery reflections; scutellum noticeably less shiny than mesoscutum, but with dark blue and coppery reflections, clothed with dark brown setae, extreme sides and apex shining dark blue mixed coppery; metanotum with slight purple sheen; mesopleuron in posterior half with a coppery-purple, purple and weak brassy sheen, anterior half mixed blue and brassy, these narrowly but distinctly separated by a coppery, dark blue and violet sheen; fore coxa white; fore femur white to pale yellow; fore tibia pale orange with a very small, subbasal, brown spot externally; mid coxa dark brown in proximal half, apex white; mid femur white to pale yellow, tibia pale orange with a subbasal brown spot externally; hind coxa white; hind femur white in proximal half or so, otherwise pale orange, tibia with a broad, subbasal brown ring for about two-thirds its length, base and apex pale yellow; tarsi pale yellow to pale orange, pretarsi slightly dusky; fore wing (Fig. 674) hyaline; propodeum dark purple-brown; sides metallic green with a few conspicuous silvery setae in spiracular area; gaster dark purple-brown, Gt1 largely metallic blue-green and green; remainder of dorsum of gaster slightly coppery, mixed purple and brassy, sides of gaster towards apex and outer plates of ovipositor mixed metallic green, coppery and brassy; gonostylus dark

brown, extreme apex orange.

Head about 4.2X as wide as frontovertex, about 1.8X as high as deep, not subtriangular in profile, occipital margin carinate, occiput with short, inconspicuous, shallow, median groove above foramen; ocelli forming an angle of about 60°; frontovertex slightly shiny, with conspicuous reticulate sculpture of mesh size generally very slightly smaller than diameter of eye facet; vertex with a distinct, elongate, shiny-bottomed depression adjacent to eye between posterior ocellus and occipital margin; scrobal area and mouth margin with shallower sculpture; gena and temple with more elongate sculpture of larger mesh; scrobes shallow, meeting dorsally, dorsal and lateral margins weakly rounded; antenna as in Fig. 675; scape hardly broadened and flattened, about 4.6X as long as broad; F1 subquadrate, remaining segments strongly transverse and broadest distad, linear sensilla present only on F4-F6; clava moderately broad, about as long as funicle, sutures oblique, sensory area enlarged, about 1.4X as long a ventral surface of clava, extending about 0.6X along clava ventrally, giving it a strongly obliquely truncate appearance; eye reaching occipital margin, clothed with inconspicuous setae, each of which is about as long as diameter of facet; inner eye margins not converging anteriorly; malar sulcus absent; mandible with two long, acute, lower teeth and a vestigial, virtually absent upper tooth. Relative measurements: HW 89, HH 86, FV 21, OD 6.5, POL 10.5, OOL 0.5, OCL 7, AOL 12, EL 54, EW 44, MS 32, SL 46, SW 10.

Thorax with shallow, irregular, polygonally reticulate sculpture on pronotum, generally of mesh size subequal to diameter of facet; sculpture on mesoscutum generally of similar depth to that on pronotum, but more regular and of smaller mesh; sculpture on axilla similar to that on mesoscutum, but slightly deeper and more transverse; scutellum with conspicuously deeper, polygonally reticulate sculpture; apex and sides narrowly completely smooth; visible part of mesoscutum about 1.6X as broad as long; scutellum hardly broader than long, with a very short subapical tuft, setae about one-third as long as scutellum; hind femur about 4X as long as broad; fore wing with venation and setation as in Figs 673, 674; costal cell with 3 or 4 setae dorsally at apex; no naked streak present between apices of postmarginal and stigmal veins; propodeum with moderately dense setae in spiracular area, side naked, medially less than 0.1X as long as scutellum and with some shallow polygonally reticulate sculpture. Relative measurements: FWL 106, FWW 44.5; HWL 78, HWW 23.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium reaching about half-way to apex; syntergum about as long as mid tibia and with apex acute; ovipositor slightly exserted, the exserted part about 0.3X as long as mid tibial spur or 0.1X as long as mid tibia. Relative measurements: OL 79, GL 23 [MT 50.5].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Zurqui de Moravia, 1600m, i-ii.1992 (P. Hanson). Holotype in NHMUK.

COMMENTS. *Cheiloneurus mardor* is similar to *mantua*. Apart from having a complete hyaline fore wing (see key), it can be separated from *mantua* by having linear sensilla on F4-F6, the clava about 3X as wide as F1, the subapical tuft of setae on the scutellum about one-third as long as the scutellum and at least about 40 setae on the side of the propodeum near the spiracle. In *mantua* linear sensilla are present only on F5-F6, the clava is about 2.5X as wide as F1, the subapical tuft of setae on the scutellum is about one-quarter as long the scutellum and there are at most only about 20 setae on the side of the propodeum near the spiracle.

See also comments under *mirabel* (p. 263).

***Cheiloneurus extillus* sp.nov.**
(Figs 676-678)

DIAGNOSIS. *Female* (length about 2.7mm): body generally dark brown to black with a weak to moderate metallic sheen; antenna (Fig. 678) with scape pale orange, dark brown basally; pedicel mostly pale orange, dorsally dark brown proximally; funicle pale orange; clava dark brown; mesoscutum with silvery setae in posterior four-fifths; coxae white, mid coxa brown proximally; legs mostly pale orange, mid and hind tibiae each with a dark brown subbasal spot; fore wing (Fig. 677) hyaline, slightly yellowish below marginal vein; head about 4.7X as wide as frontovertex, in facial view about as broad as long, subcircular, genae converging, weakly and evenly curved; frontovertex naked medially below anterior ocellus; area between eye and scrobe nearly 2X as wide as diameter of anterior ocellus, with shallow sculpture, scrobal margin rounded; interantennal prominence dorsally rounded with only a few long setae; mandible with two long, sharp lower teeth and a short, sharp, upper tooth; scape about 5.0X as long as broad; funicle with F1-F4 longer than broad, F5 quadrate and F6 transverse; head width about equal to F2-F6 and clava combined; linear sensilla on F4-F6; clava 3-segmented, nearly as long as F2-F6 combined, sensory area large and forming an oblique truncation, extending slightly more than 0.5X along ventral margin; mesoscutum with polygonally reticulate sculpture; scutellum without a distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 677) about 2.4X as long as broad; parastigma not curved downwards; costal cell dorsally with 4 or 5 setae at apex and ventrally with a single complete line of setae; area below proximal part of parastigma with a group of about 30 setae; apices of postmarginal and stigmal veins (Fig. 676) not connected by a naked hyaline area; apical bristle of postmarginal vein about 0.33X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with about 40 setae around each spiracle, side naked; syntergum about 1.2X as long as mid tibia; ovipositor about 3.0X gonostylus or 1.8X mid tibia; gonostylus about 1.5X as long as mid tibial spur; exserted part of ovipositor about 0.4X length of mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 2.66mm; excluding ovipositor, 2.53mm (CPD).

Head black with a very weak blue and purple sheen on frontovertex, slightly coppery between posterior ocelli and occipital margin; occiput with a very slight blue and purple sheen; scrobal area largely purple mixed blue laterally and on lower part of interantennal prominence; mouth margin mixed coppery and purple; temple metallic blue and purple mixed brassy; area immediately below eye metallic coppery purple; frontovertex with inconspicuous dark brown setae; antenna (Fig. 678) with radicle dark brown; scape pale orange with a narrow, dark brown, basal ring; pedicel mostly pale orange, basal half or so dark brown dorsally; funicle pale orange; clava dark brown; thorax dark brown to black; pronotum mainly dull purple-brown with a slight brassy sheen; mesoscutum with a slight purple sheen, bluish in some lights, posterior margin weakly coppery purple, setae pale brown in anterior one-fifth, posterior four-fifths with uniform, translucent, silvery setae; tegula dark brown; axilla duller than mesoscutum, with a slight purple and brassy sheen; scutellum virtually black, but with a very weak metallic green sheen with some purple reflections, clothed in dark brown setae, extreme apex and sides with a metallic green and brassy sheen; metanotum with a slight purple sheen; mesopleuron in posterior half with a purple and brassy sheen, medially blue and anteriorly mixed green, brassy and purple; fore coxa white; fore femur white, pale orange distally, fore tibia pale orange; mid coxa white, brown basally; mid femur white to very pale yellow, distally pale orange, tibia pale orange with an elongate, dark brown spot externally in proximal two-fifths; hind coxa white; hind femur very pale yellow, pale orange in distal half, tibia mostly pale orange with an elongate dark brown, subbasal spot externally; tarsi pale orange, hind tarsus palest, pretarsi slightly dusky; fore wing (Fig. 677) virtually hyaline, slightly yellowish below marginal vein; venation pale brown; propodeum dark purple-brown; sides metallic green with conspicuous silvery setae in spiracular area; gaster dark purple-brown, Gt1 mostly metallic blue-green, dorsum slightly coppery, mixed purple and brassy, sides and outer plate of ovipositor mixed metallic green, blue, coppery and brassy; gonostylus dark brown, extreme apex orange-brown.

Head about 4.7X as wide as frontovertex, anteriorly almost evenly rounded in profile, sublenticular; occipital margin acute, occiput with an incomplete median groove above foramen, not reaching occipital margin; ocelli forming an angle of about 60°; frontovertex slightly shiny, with conspicuous reticulate sculpture of mesh size generally very slightly smaller than diameter of eye facet; scrobal area and mouth margin with shallower sculpture; gena and temple with more elongate sculpture of larger mesh; scrobes shallow, meeting dorsally, dorsal and lateral margins weakly rounded; antenna as in Fig. 678; scape hardly broadened and flattened, about 5X as long as broad; F1 clearly longer than broad, F2-F4 slightly longer than broad, F5 quadrate, F6 transverse, segments broadest distad; linear sensilla present only on F4-F6; clava slightly broadened, about as long as F2-F6 combined, both sutures clearly oblique, sensory area enlarged, extending about 0.6X along clava ventrally, giving it a distinct, obliquely truncate appearance; eye reaching occipital margin, clothed with fairly conspicuous setae, each very slightly longer than diameter of facet; inner eye margins slightly converging anteriorly; malar sulcus absent; mandible with 2, relatively long, acute, lower teeth, and a short, upper tooth. Relative measurements: HW 99, HH 100, FV 21, OD 6.5, POL 14, OOL 0.5, OCL 6.5, AOL 16.5, EL 65, EW 51, MS 40, SL 58, SW 11.

Thorax with shallow, irregular, polygonally reticulate sculpture on pronotum, generally of mesh size subequal to diameter of facet; sculpture on mesoscutum generally of similar depth to that on pronotum, but more regular and of smaller mesh; sculpture on axilla similar to that on mesoscutum, but slightly deeper; scutellum with conspicuously deeper, polygonally reticulate sculpture, much more elongate on sides; extreme apex and sides completely smooth and shiny; visible part of mesoscutum about 1.7X as broad as long; scutellum about as long as broad, without a distinct subapical tuft, setae about one-third as long as scutellum; hind femur about 4.5X as long as broad; fore wing with venation and setation as in Figs 676, 677; costal cell with 5 setae dorsally at apex; no naked streak present between apices of postmarginal and stigmal veins (Figs 676); propodeum with moderately dense setae in spiracular area, side naked, medially about 0.1X as long as scutellum and with some shallow, irregular polygonally reticulate sculpture. Relative measurements: FWL 121, FWW 51; HWL 92, HWW 27.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium reaching about one-third towards apex; syntergum about 1.2X as long as tibia, with apex produced and very acute; ovipositor exserted, the exserted part very slightly more than one-third length of mid tibial spur. Relative measurements: OL 115, GL 38.5 [MT 64].

Variation. Known only from holotype.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/TN, iv.2002 (INBio-OET-ALAS). Holotype in NHMUK.

COMMENTS. *Cheiloneurus extillus* is similar to *onestas* and *hamadryas*, all three species having relatively short funicle segments, an obliquely truncate clava, hyaline fore wing and often no distinct subapical tuft of setae on the scutellum. It can be separated from both other species by having the hind femur entirely yellow to pale orange, the ovipositor about 3X as long as a gonostylus whereas in the other species the hind femur is dark brown in its apical half, the ovipositor is at least about 4X as long as a gonostylus. It can also be separated from *onestas* in the scape being about 5X as long as broad and having about 35-40 setae on the side of the propodeum near the spiracle, whilst in *onestas* the scape is about 4X as long as broad and there are only about 10 setae on the side of the propodeum.

***Cheiloneurus racidia* sp.nov.**
(Figs 679-681; Hab. ♀ 101)

DIAGNOSIS. *Female* (length about 1.3-1.4mm): body mostly orange, temple and gena with a broad, diagonal dark brown stripe, ocellar area dusky, pronotum partially brown, mesoscutum with a triangular brown area posteriorly, mesopleuron with a dark brown median band and gaster dark brown, darker areas with a weak to moderate metallic sheen; antenna (Fig. 680) with scape very pale orange, ventral margin dark brown; pedicel pale orange with a dark brown stripe; funicle pale yellow, proximal segments dusky, clava dark brown; mesoscutum with dense silvery setae on dark brown triangular area; all coxae white; legs almost completely white, mid and hind knees marked dark brown; fore wing (Fig. 680) mostly infuscate with basal cell almost completely hyaline, a small hyaline area at apex of venation and another on opposite wing margin, apex with a triangular hyaline area; head about 11X as wide as frontovertex, in facial view about as long as broad, with a distinct transfacial carina, gena bulging at transfacial carina; frontovertex with a setae medially above scrobes; eye separated from scrobe by about 3X diameter of anterior ocellus, area between eye and scrobe mostly completely smooth, scrobes deep and carinately margined laterally and dorsally; interantennal prominence with about 20 fairly conspicuous setae and dorsally acute; mandible tridentate; antenna (Fig. 681) with scape about 1.8X as long as broad; funicle with all segments transverse, proximal segments subquadrate; head width clearly more than length of flagellum; linear sensilla on F4-F6 or absent from F4; clava 3-segmented, as long as funicle; sensory area enlarged and forming an oblique truncation, extending about 0.6X along ventral margin; mesoscutum mostly with fine longitudinally elongate striate to striate-reticulate sculpture, triangular area near posterior margin medially with fairly shallow, imbricate polygonally reticulate sculpture; scutellum without a distinct apical tuft of setae; wings fully developed; fore wing (Fig. 680) about 2.4X as long as broad; parastigma clearly downcurved; costal cell naked; area below proximal part of parastigma with a line of two of three setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues someway into disc (Fig. 679); apical bristle of postmarginal vein about as long as marginal vein; mid tibial spur very slightly shorter than basitarsus; propodeum with about 3 setae adjacent to spiracle, side naked; syntergum about as long as mid tibia; ovipositor about 3.7X gonostylus or about 1.6X as long as mid tibia; gonostylus about 1.3X as long as mid tibial spur; exserted part of ovipositor about as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.44mm; excluding ovipositor, 1.34mm (CPD).

Head with frontovertex and area immediately below eye mainly, dusky orange, but with area between ocelli brown and a small median area immediately above scrobes pale orange; occiput pale orange with a dark brown, triangular mark above foramen; temple and gena with a broad, oblique, brown stripe extending from occipital margin nearly to torulus; other areas pale orange; area between ocelli with a conspicuous dark blue, purple and brassy sheen, frontovertex otherwise with a relatively dull purple and blue sheen; dusky area below eye with a metallic green, blue, brassy and purple sheen, orange part of temple with a distinct purple and blue sheen, anterior to this relatively dull metallic green and brassy; dark brown stripe on temple and gena with a dark blue, coppery, purple and brassy sheen; other areas with a weak purple and brassy sheen; frontovertex with moderately conspicuous, pale brown setae along inner eye margin, these continuing below eye to upper gena; interantennal prominence with relatively dense, conspicuous, silvery setae; maxillary palpus white; antenna (Fig. 681) with radicle pale orange, dorsally and laterally margined dark brown; scape pale orange proximally brown, and ventral margin dark brown from base to about 0.75X, apex white; pedicel white with a complete dark brown, dorso-lateral stripe; funicle very pale orange, proximal segments slightly dusky; clava dark brown; pronotum largely orange, neck dark brown; propleuron and prosternum pale orange; mesoscutum mostly orange with weak coppery reflections and clothed with relatively sparse, conspicuous, black setae, posterior margin with a broad triangular, dusky area with a conspicuous dark blue and purple sheen that medially projects nearly half way across mesoscutum and clothed with relatively dense, silvery setae, each lateral angle of mesoscutum with a conspicuous, compact tuft of silvery setae; tegula dusky orange, apex orange-brown; axilla and scutellum orange with weak brassy and coppery reflections, setae black; metanotum pale orange; mesopleuron largely pale orange with a

weak brassy sheen and a vertical, brown band with a coppery sheen at about two-thirds not quite reaching ventral margin; mesosternum pale orange; all coxae white; fore femur mostly white but dusky pale orange distally, tibia pale orange with an external, pale brown, subbasal spot, tarsus pale orange; mid femur mostly white but orange to dusky orange at apex, tibia mostly white, narrowly bordered dark brown at base, with a slender, interrupted oblique dark brown basal/subbasal band, apex, spur and tarsus pale orange; hind femur white with apex very pale orange margined pale brown, tibia mostly white with a small, brown subbasal spot dorsally, tarsus pale orange; fore wing (Fig. 680) mostly infuscate but hyaline towards base and at apex, venation pale orange; propodeum pale orange, slightly dusky laterally, side with 4 or 5 inconspicuous white setae near spiracle; gaster dark brown dorsally with a mixed purple, brassy and green sheen, side and venter with a more green, brassy and coppery sheen; gonostylus very pale orange.

Head about 11X as wide as frontovertex, in profile about 1.5X as high as deep, frontovertex evenly and weakly curved between occipital margin and transfacial carina; occipital margin sharp, not carinate; a very small, oval, shiny bottomed depression adjacent to eye near occipital margin; ocelli forming an angle of about 35°; frontovertex very shiny, mostly completely smooth, but with shallow, irregular, imbricate reticulate sculpture between occipital margin and anterior ocellus; submedian area between eye and transfacial carina with a wide, shallow, shiny bottomed, depression or fovea; temple and gena mostly completely smooth, but lower temple and upper gena with an area of distinct, rough, longitudinally elongate, striate sculpture extending from lateral parts of transfacial carina; scrobes quite smooth; narrowest point between eye and transfacial carina nearly 2.5X diameter of anterior ocellus; transfacial carina medially very strongly concave in dorsal view, laterally bulging anteriorly; scrobes deep, broadly ∩-shaped; interantennal prominence, with very shallow, polygonally reticulate sculpture and dorsally acute with an inconspicuous, shallow median carina that nearly extends to transfacial carina; antenna as in Fig. 681; scape broadened and flattened, about 1.8X as long as broad, dorsal margin slightly convex; funicle with F1-F4 smaller and subquadrate, F5-F6 larger and clearly transverse, segments larger and broader distad; clava moderately enlarged, about 1.5X as wide as F6, as long as funicle, sutures oblique, sensory area enlarged, extending about 0.6X along ventral margin, apex strongly obliquely truncate; eye reaching occipital margin, clothed in conspicuous setae, each slightly longer than diameter of facet; inner eye margins clearly converging either side of posterior ocelli; malar sulcus absent; clypeal margin weakly concave medially; mandible with 2 acute teeth and a short, almost rounded upper tooth. Relative measurements: HW 55.5, HH 57, FVL 50, FV 5, POL 2.5, OOL 0, OCL 5.5, AOL 8.5, EL 45, EW 28, MS 30, SL 34, SW 18.5.

Thorax with pronotum slightly exposed behind head, about 0.7X as long as mesoscutum; pronotum with polygonally reticulate to imbricate-reticulate sculpture that is clearly deeper and finer than any sculpture on frontovertex; mesoscutum mostly with fine longitudinally elongate striate to striate-reticulate sculpture with a small triangular area near posterior margin medially with fairly shallow, imbricate polygonally reticulate sculpture; axilla and scutellum with fine polygonally reticulate sculpture that is a little deeper than that on pronotum, becoming more longitudinally elongate, striate-reticulate laterally on scutellum, apex and side of scutellum completely smooth and shiny; visible part of mesoscutum about 2.2X as broad as long with setae in middle more conspicuous than those laterally; scutellum about 1.1X as long as broad, without a distinct subapical tuft, but with a subapical group of longer setae, subapical pair longest and about 0.4X as long as scutellum; mid tibia with a weakly swollen subbasally, basal carina extending about half way along its length; hind femur about 4.7X as long as broad; fore wing with venation and setation as in Figs 679, 680; costal cell naked; propodeum medially about 0.1X as long as scutellum and virtually smooth. Relative measurements: FWL 57, FWW 23.5; HWL 47, HWW 10.5.

Gaster with hypopygium reaching about 0.5X; syntergum about as long as mid tibia, with apex more or less rounded; ovipositor slightly exserted, the exserted part about as long as mid tibial spur or 0.3X mid tibia.

Paratype. Funicle with linear sensilla present only on F4-F5; gaster without “gland-like” structures on Gt1 or Gt5. Relative measurements: OL 88.5, GL 24 [MT 55].

Variation. Females vary in overall length from 1.29-1.44mm, the mouth margin may be pale brown medially, otherwise little variation noted in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Maritza (ACG), 700m, MT/YPT, 20.i-24.ii.1996 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Puntarenas**, San Vito, Las Cruces, Wilson Bot. Gdns, 1500m, 18-22.iii.1990 (J.S. Noyes); 1♀, Puntarenas, Pen. Osa, 8km S. R. Rincon, Coopermarti, x.1990 (A. Retama); 1♀, Puntarenas, Pen. Osa, 23km N Puerto Jimenez, La Palma, x-xi.1990 (P. Hanson). Holotype in MZUCR, paratypes in NHMUK.

Cheiloneurus miranda sp.nov.

(Figs 682-684; Hab. ♀ 102)

DIAGNOSIS. *Female* (length about 1.3-1.6mm): body mostly orange with mouth margin dark brown, temple and gena with a diagonal dark brown stripe, ocellar area dark brown, pronotum partially dark brown, mesoscutum partially brown, mesopleuron with a dark brown median band and gaster dark brown, darker areas with a weak to moderate metallic sheen; antenna (Fig. 684) with scape very pale orange, ventral margin dark brown; pedicel pale orange with a dark brown stripe; funicle and clava dark brown; mesoscutum with dense silvery setae on posterior half; fore and hind coxae white, mid coxa white with a dark brown spot; legs almost completely white to pale orange, mid femur and tibia and hind knee marked dark brown; fore wing (Fig. 683) mostly infuscate with basal cell almost completely hyaline, a small hyaline area at apex of venation and another on opposite wing margin, apex hyaline; head about 10-17X as wide as frontovertex, in facial view clearly longer than broad, suboval with genae moderately curved inwards, more strongly so near mouth margin; frontovertex without setae medially above scrobes; eye separated from scrobe by about diameter of anterior ocellus, area between eye and scrobe with shallow sculpture, scrobes moderately deep with sharp margins; interantennal prominence with only about five or six inconspicuous setae and dorsally rounded; mandible more or less tridentate; antenna (Fig. 684) with scape about 4.1X as long as broad; funicle with all segments longer than broad; head width clearly more than length of funicle but less than length of flagellum; linear sensilla on F4-F6; clava 3-segmented, slightly longer than F4-F6 combined; sensory area enlarged and forming an oblique truncation, extending slightly more than 0.5X along ventral margin; mesoscutum in anterior two-thirds with fine longitudinally elongate striate to striate-reticulate sculpture, posterior two-thirds with uniform, fairly shallow, polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 683) about 2.5-2.6X as long as broad; parastigma hardly downcurved; costal cell dorsally naked or with two or three apical setae, ventrally with a line of setae that is interrupted above parastigma; area below proximal part of parastigma with a line of four of five setae connected to a line of setae along cubital vein track towards wing base, one or two setae outside this line; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues someway into disc (Fig. 682); apical bristle of postmarginal vein nearly 0.8X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum with about four setae adjacent to spiracle, side naked; syntergum about 0.9X as long as mid tibia; ovipositor about 3.6X gonostylus or about 1.3X as long as mid tibia; gonostylus about as long as mid tibial spur; exserted part of ovipositor about 0.3X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.61mm; excluding ovipositor, 1.53mm (CPD).

Head mostly very pale orange, yellowish; occiput with a small, elongate brown spot above foramen; frontovertex pale orange-brown, area between ocelli metallic green, eye margins slightly coppery, anterior part of frontovertex with a weaker metallic green, blue and coppery sheen, a narrow, purplish line between eyes above immediately above scrobes, scrobal area otherwise with a weak brassy sheen; top of scrobes delimited by a brown line with a weak purple sheen,

area immediately below eye brown, with a metallic green, blue and purple sheen, area between toruli and mouth margin with a slender, curved, dark brown line, with purple and blue reflections, this connected to a much broader, oblique dark brown line from temple which has a distinct metallic green, brassy, coppery and purple sheen, temple otherwise with a weak brassy, green and purple sheen; frontovertex clothed with inconspicuous, translucent, pale brown setae, a line of fine, translucent setae between eye and scrobe; maxillary palpus white, terminal segment very pale brown; antenna (Fig. 684) with radicle pale orange with a narrow, apical, dark brown ring; scape very pale orange, ventral margin narrowly dark brown in proximal one-third, more widely so towards base internally; pedicel very pale orange with a dark brown streak internally along its length; funicle and clava dark brown; pronotum orange, neck and area immediately above coxa dark brown; prosternum orange, dark brown immediately outside coxa; mesoscutum orange, posterolaterally dark brown with a weak purple and blue lustre, anterior orange area clothed with relatively sparse, dark brown setae, dark area clothed with relatively dense, silvery setae, area between with relatively sparse translucent, white setae; tegula orange with apex orange-brown; axilla and scutellum orange clothed with golden brown to dark brown setae, subapical tuft black; metanotum slightly dusky, pale orange; mesopleuron white with a slight brassy lustre and a brown, median band that does not quite reach ventral margin; mesosternum white; fore coxa white; fore femur white with apex very pale orange, tibia very pale orange, tarsus pale orange; mid coxa white with a dorsal brown spot opposite median brown band on mesopleuron; mid femur with a subapical brown spot dorsally, tibia white at extreme base, dorsal margin brown for about half its length, an incomplete, brown, subbasal band otherwise very pale orange, spur and tarsus pale orange; hind coxa white; hind femur white, apex pale orange with an incomplete, subapical brown band, knee brown, tibia very pale orange, tarsus pale orange; fore wing (Fig. 683) mostly infuscate, hyaline towards base and at apex; submarginal vein very pale orange, parastigma distally dark brown, remainder of venation pale orange-brown; propodeum pale orange, a weak, orange-brown, longitudinal, stripe immediately inside spiracle, side with a weak, pale blue sheen, 3 or 4 translucent, silvery setae outside spiracle; gaster mostly dark brown with a mixed purple, coppery, brassy and green sheen, Gt1 with a distinct purple and green sheen, syntergum and apex otherwise, orange-brown; gonostylus very pale orange.

Head about 17X as wide as frontovertex in profile about 1.5X as high as deep, anteriorly quite straight between top of scrobes and mouth margin, interantennal prominence slightly protuberant just above torulus; occipital margin sharp, not carinate; ocelli forming an angle of about 35°; frontovertex moderately shiny, with distinct, fairly regular, polygonally reticulate sculpture of mesh size a little smaller than diameter of eye facet, deepest in ocellar area; narrowest area between eye and scrobe about as wide as diameter of anterior ocellus, area immediately below lowest part of eye with shallow, irregular sculpture, quite shiny; scrobes moderately deep, meeting, ∩-shaped, sharply margined between eye and scrobe; interantennal prominence with similar sculpture to frontovertex, clothed in sparse translucent setae, dorsally broadly rounded; temple with very shallow, irregular, elongate sculpture, gena with slightly deeper, irregular, reticulate sculpture; antenna as in Fig. 684; scape slightly broadened and flattened, about 4.1X as long as broad, widest below middle; funicle with all segments subequal in length and longer than broad, distal segments broadest, F1 about 2X as long as broad, F6 about 1.1X as long as broad; clava slightly broadened, a little longer than F4-F6 combined, sutures oblique, sensory area enlarged, extending ventrally slightly more than half-way along clava, giving it a strongly obliquely truncate appearance; eye slightly overreaching occipital margin, clothed in numerous, inconspicuous, very fine setae, each a little shorter than diameter of facet; inner eye margins strongly converging anteriorly; malar sulcus absent; clypeal margin weakly, but evenly concave; mandible more or less tridentate, with two sharp teeth and a truncation; apical segment of maxillary palpus not enlarged, about 1.5X as long as radicle. Relative measurements: HW 68, HH 74, FV 4, POL 3.5, OOL 0, OCL 6.5, AOL 10, EL 55, EW 39, MS 32, SL 41, SW 10.

Thorax with irregular, polygonally reticulate sculpture on pronotum that is about as deep as that in ocellar area of frontovertex; mesoscutum in anterior two-thirds with fine longitudinally elongate striate to striate-reticulate sculpture, posterior two-thirds with uniform, fairly shallow, polygonally reticulate sculpture; axilla and scutellum with similar sculpture to that on pronotum, but slightly deeper and coarser, especially on scutellum, more elongate laterally on scutellum;

visible part of mesoscutum about 2.1X as broad as long; scutellum about as long as broad, with a distinct subapical tuft, setae mostly about half as long as scutellum; mid tibia with a distinct, external carina for about 0.4X its length; hind femur about 5.4X as long as broad; fore wing with venation and setation as in Figs 682, 683; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 682); propodeum medially about 0.17X as long as scutellum, with some shallow, polygonally reticulate sculpture, side completely smooth. Relative measurements: FWL 75.5, FWW 28.5; HWL 61, HWW 14.

Gaster with hypopygium reaching about 0.4X to apex; syntergum nearly 0.9X as long as mid tibia, with apex very weakly angular; ovipositor hardly exserted, the exserted part about one-third length of mid tibial spur or about 0.13X mid tibia.

Paratype. Funicle with linear sensilla present only on F4-F6; gaster without "gland-like" structures on Gt1 or Gt5. Relative measurements: OL 40, GL 11 [MT 31].

Variation. Females vary in overall length from 1.32-1.61mm, the dark brown line above the mouth margin may not be connected to the oblique stripe from the temple, the gaster may be completely dark brown, the head may be only about 10X as wide as the frontovertex and there may be 1 or 2 setae dorsally at apex of costal cell.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, 11km SE La Virgen, 10°20'N 84°04'W, 450-550m, 05/N/TN, 22.ii-20.iv.2003 (INBio-OET-ALAS). Paratypes: **COSTA RICA**, 1♀, **Heredia**, OTS La Selva, 100m, 3km S Puerto Viejo, x.1992 (P. Hanson); 1♀, **Alajuela**, PN Volcán Arenal, Sendero Pilón, LN 458050 269200, #61216, 8.xi-7.xii.2000 (G. Carballo). Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. See comments under *fabius* (p. 283) and *finator* (p. 417).

***Cheiloneurus scolopax* sp.nov.**

(Figs 685-690; Hab. ♀ 103)

DIAGNOSIS. *Female* (length about 1.1-1.4mm): body mostly orange, generally with a weak metallic sheen; posterior part of mesoscutum (Fig. 690) dark brown with a metallic sheen, mesopleuron white with a partial, median, brown band, gaster brown mixed pale orange-brown, darker areas with a stronger metallic sheen; antenna (Fig. 687) with scape pale orange, ventral margin brown; pedicel white with a dark brown streak; funicle off-white, mixed brown on side; clava dark brown; mesoscutum in posterior half with dense, silvery setae; coxae white; legs mostly white to pale orange but with mid and hind tibia with some brown areas; fore wing (Fig. 685) mostly infuscate with basal cell almost completely hyaline, a small hyaline area at apex of venation narrowly connected to a small hyaline area on opposite margin via a narrow hyaline area along wing margin; head (Fig. 686) about 9.5X as wide as frontovertex, in facial view slightly broader than long, subrectangular, genae slightly curved but weakly converging, more strongly curved inwards near mouth; frontovertex with two setae medially immediately above scrobes; eye separated from scrobe by slightly less than 2X diameter of anterior ocellus, area between eye and scrobe with deep, distinct sculpture, scrobes quite deep with carinate margins; interantennal prominence with about 60 conspicuous pale setae and dorsally rounded; mandible with two teeth and a truncation, virtually tridentate; antenna (Fig. 687) with scape about 3.2X as long as broad; all funicle segments transverse; linear sensilla on F4-F6; clava 3-segmented, slightly longer than pedicel and funicle combined, apex with a strong oblique truncation, sensory area extending about 0.7X along ventral surface of clava; head width clearly greater than length of funicle; mesoscutum (Fig. 690) in anterior half or so with fine striate to striate reticulate sculpture, posterior part with uniform, polygonally reticulate sculpture; scutellum with a distinct, apical tuft

of setae; wings fully developed; fore wing (Fig. 685) about 2.6-2.7X as long as broad; parastigma clearly downcurved; costal cell dorsally with one or two apical setae, ventrally with a line of setae that is broadly interrupted above parastigma; area below proximal part of parastigma with a group of about 15 paler setae; apices of postmarginal and stigmal veins connected by a naked, hyaline line that extends a little way into disc; seta at apex of postmarginal vein about 0.6X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum (Fig. 690) with about 50 setae adjacent to spiracle that extend down side; syntergum about 0.8X as long as mid tibia; ovipositor (Fig. 689) about 3.6X gonostylus or about 1.2X as long as mid tibia; gonostylus about 0.9X as long as mid tibial spur; exserted part of ovipositor about 0.3X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.31mm; excluding ovipositor, 1.27mm (CPD).

Head with occiput pale orange, a dark brown, triangular mark above foramen; frontovertex orange, ocellar area dark brown with metallic blue and purple reflections, other parts of frontovertex with much weaker green, brassy and purple reflections; area between eye and scrobe with a fairly strong blue-green and purple reflections, temple similar but a little less shiny; gena with weaker pale blue, brassy, coppery and purple reflections; scrobal area with weak brassy, pale blue and purple reflections; frontovertex clothed with fairly conspicuous, translucent, pale brown setae along inner eye margins, a line of similar setae below eye; gena and interantennal prominence with similar, but shorter and more dense setae, especially on interantennal prominence; maxillary palpus white; antenna (Fig. 687) with radicle pale orange, extreme apex with a narrow brown ring; scape pale orange, apex white, externally with ventral margin narrowly brown proximally and a pale brown subapical band, internally with ventral margin broadly brown proximally almost to dorsal margin and narrowly margined brown subapically; pedicel more or less white with a dark brown streak internally along its length; funicle off-white, brown along sides; clava dark brown; pronotum orange with weak brassy and purple reflections, neck dark brown; prosternum pale orange; mesoscutum orange in anterior half clothed with relatively sparse, brown setae, posterior half dark metallic blue with some purple reflections and clothed with relatively dense, silvery setae, posterior margin purple-brown with a weak purple sheen; tegula orange with apex orange-brown; axilla and scutellum orange, clothed with brown setae, subapical tuft black; metanotum pale orange-brown; mesopleuron white with a weak brassy sheen and an incomplete, vertical median brown stripe; mesosternum very pale orange; fore coxa white; fore femur white, tibia and tarsus pale orange; mid coxa white; mid femur white, apex dusky, very pale orange, tibia pale orange with an incomplete, subbasal brown band, tibial spur and tarsus pale orange; hind coxa white; hind femur white, pale orange at apex, tibia pale orange, externally marked with pale brown in proximal half, tarsus pale orange; fore wing (Fig. 685) mostly infuscate, hyaline towards base, along anterior margin distad of venation and at apex; submarginal vein partially pale yellow, venation otherwise brown; propodeum pale orange with an extensive group of very dense, translucent, silvery setae surrounding spiracle and extending nearly to posterior margin; gaster largely pale orange with weak purple, green and brassy reflections, basal tergites and apex of syntergum brown with a stronger purple and coppery sheen, Gt1 largely metallic green laterally; gonostylus very pale orange.

Head (Fig. 686) about 9.5X as wide as frontovertex, in profile 1.6X as high as deep, anteriorly virtually straight from top of scrobes to mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, weakly carinate; ocelli forming an angle of about 40°; frontovertex slightly shiny, with distinct, fairly regular, polygonally reticulate sculpture of mesh size mostly slightly smaller than diameter of eye facet; sculpture immediately above scrobes distinctly transversely elongate; narrowest area between eye and scrobe a little less than 2X as wide as diameter of anterior ocellus and with distinct, transversely elongate, polygonally reticulate sculpture which, when viewed from above, appears similar to a fingerprint; temple and gena with irregular, elongate, reticulate sculpture, that on temple of larger mesh than that on frontovertex; scrobes quite deep, ∩-shaped, meeting and sharply margined dorsally and below eye; interantennal prominence dorsally rounded and with similar sculpture to frontovertex; antenna as in Fig. 687; scape broadened and flattened, about 3.2X as long as broad; all funicle segments transverse, F1 subquadrate, distal segments broadest; clava strongly broadened, slightly longer than pedicel and

funicle combined, sutures strongly oblique, sensory area enlarged, extending ventrally nearly three-quarters along clava, apex strongly obliquely truncate; eye reaching occipital margin, clothed in fairly conspicuous, short setae, each a little shorter than diameter of facet; inner eye margins converging anteriorly; malar sulcus absent; clypeal margin weakly concave medially; mandible with two acute teeth and a truncation, virtually tridentate; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 62, HH 59, FV 6.5, POL 4, OOL 0, OCL 4.5, AOL 9, EL 43, EW 31, MS 30, SL 32, SW 10.

Thorax (Fig. 690) with pronotum not strongly exposed behind head, about 0.7X as long as mesoscutum, pronotum with polygonally reticulate sculpture that is a little shallower than that in ocellar area; mesoscutum in anterior half with fine striate to striate-reticulate sculpture that is about as deep as sculpture in ocellar area, posterior half with slightly shallower polygonally reticulate sculpture; axilla and scutellum with similar sculpture to pronotum, but slightly coarser and deeper, slightly elongate on side of scutellum; visible part of mesoscutum about 1.7X as broad as long; scutellum nearly 1.2X as broad as long, with a distinct subapical tuft, setae mostly about 0.4X as long as scutellum; mid tibia without a distinct external carina; hind femur about 4X as long as broad; fore wing with venation and setation as in Figs 685, 688; costal cell with 1 or 2 setae dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 688); propodeum (Fig. 690) medially about 0.16X as long as scutellum, virtually smooth, but with some extremely shallow, reticulate sculpture; setae on side dense, long and conspicuous. Relative measurements: FWL 56, FWW 21; HWL 49, HWW 12.5.

Gaster with hypopygium reaching about half-way to apex; syntergum about 0.75X as long as mid tibia, with apex weakly angular; ovipositor hardly exserted, the exserted part about 0.3X as long as mid tibial spur or 0.1X mid tibia.

Paratype. Funicle with linear sensilla present only on F4-F6; gaster without "gland-like" structures on Gt1 or Gt5; ovipositor Fig. 689. Relative measurements: OL 45, GL 12.5 [MT 36.5].

Variation. Females vary in overall length from 1.06-1.42mm, otherwise very little in material available.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, PN Palo Verde, 400m E Puenta, La Espuela, LN 258980 396500, 10m, #60219, no date (I. Jiménez). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, NW Volcan Orosi, Cerro El Hacha, 300m, 1988; 1♀, Guanacaste, Santa Rosa NP, Hacienda 1-0, 13.iv-4.v.1986 (Janzen, Gauld). Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. The sculpture between the eye and scrobe in this species is very unusual in that it has the appearance of parts of a fingerprint.

Cheiloneurus genys **sp.nov.**

(Figs 691-696; Hab. ♀ 104)

DIAGNOSIS. *Female* (length about 1.3mm): body mostly orange with ocellar area dark brown, mesoscutum partially pale brown and gaster dark brown, darker areas with a weak to moderate metallic sheen; antenna (Fig. 693) with scape pale orange, ventral margin dark brown; pedicel very pale yellow; funicle white, clava dark brown; mesoscutum with dense silvery setae on posterior two-thirds; fore and hind coxae white, mid coxa pale orange; legs almost completely white to pale orange, mid and hind leg with some small areas of brown; fore wing (Fig. 692) mostly infuscate with basal cell almost completely hyaline, a small hyaline area at apex of venation and a similar area opposite wing margin, the two connected by continuous apical hyaline area; head (Fig. 695) about 12.5X as wide as frontovertex, in facial view clearly longer than broad,

suboval with genae weakly curved inwards, more strongly so near mouth margin; frontovertex with about 3 inconspicuous setae medially above scrobes; eye separated from scrobe by about 1.2X diameter of anterior ocellus, area between eye and scrobe completely smooth and shiny, scrobes shallow with margin rounded; interantennal prominence with about 20 inconspicuous setae and dorsally rounded; mandible tridentate; antenna (Fg. 693) with scape about 3.5X as long as broad; funicle with F1 subquadrate, remaining segments clearly transverse; head width a little less than length of flagellum; linear sensilla on F5-F6; clava 3-segmented, slightly longer than funicle; sensory area enlarged and forming an oblique truncation, extending nearly 0.7X along ventral margin; mesoscutum (Fig. 691) in anterior one-third and laterally with longitudinally elongate striate-reticulate sculpture, posterior two-thirds and most of middle with uniform, fairly shallow, polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 692) about 2.6-2.7X as long as broad; parastigma clearly downcurved; costal cell dorsally with a single apical seta or naked, ventrally with a complete line of setae; area below proximal part of parastigma with a group of about 13 setae, this connected to a line of setae along cubital vein track towards wing base; apices of postmarginal and stigmal veins connected by a naked hyaline area that hardly continues into disc (Fig. 694); apical bristle of postmarginal vein about 0.4X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum (Fig. 691) with about 30 setae adjacent to spiracle, side naked; syntergum about 0.7X as long as mid tibia; ovipositor (Fig. 696) about 3.9X gonostylus or about as long as mid tibia; gonostylus about 0.8X as long as mid tibial spur; exserted part of ovipositor about 0.5X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.27mm; excluding ovipositor, 1.24mm (CPD).

Head orange; occiput with a brown spot above foramen; area between ocelli metallic green and blue with some coppery reflections, anterior part of frontovertex with a weaker metallic green and blue sheen; orange areas above scrobes with a slight purple sheen; scrobal area with a brassy sheen; temple and upper gena with a weak metallic green and purple sheen; lower gena with a weak, brassy sheen; a small brown spot on mouth margin below torulus; frontovertex clothed with inconspicuous, translucent, pale brown setae, a line of fine, translucent setae between eye and scrobe; maxillary palpus pale orange; antenna (Fig. 693) with radicle pale orange with a narrow, apical, dark brown ring; scape pale orange, ventral margin narrowly dark brown, more widely so towards base internally; pedicel white to very pale yellow; funicle white; clava dark brown, almost black; pronotum orange, neck dark brown; prosternum orange; mesoscutum with anterior one-third or less orange, posterior two-thirds or so dark orange-brown with metallic blue and purple reflections, posterior margin orange, laterally purple-brown, orange areas clothed with relatively sparse, dark brown setae, metallic area clothed with relatively dense, silvery setae; tegula orange with apex orange-brown; axilla and scutellum orange clothed with golden brown to dark brown setae, subapical tuft black; metanotum orange-brown; mesopleuron pale orange with a very weak brassy sheen, posteriorly with a weak purple sheen; mesosternum orange; fore coxa white; fore femur white at extreme base, leg otherwise pale orange; mid coxa very pale orange; mid femur white, apex pale orange with a brown mark dorsally, tibia mostly pale orange but white at base, dorsal margin dusky for about two-thirds its length with the remnants of a brown, subbasal ring, spur and tarsus very pale orange; hind coxa white; hind femur white in proximal half, apex pale orange, knee brown, tibia and tarsus pale orange; fore wing (Fig. 692) mostly infuscate, hyaline towards base, at apex and along anterior margin distad of venation; submarginal vein pale orange, remainder of venation brown; propodeum pale orange, side with a weak purple and green sheen, about 8-10 translucent, silvery setae outside spiracle; gaster dark brown, dorsally with a distinct purple, green and brassy sheen, side with a green sheen with purple reflections, venter but mostly with a mixed green, brassy, coppery and purple sheen; gonostylus very pale orange, a little dusky proximally.

Head (Fig. 695) about 12.5X as wide as frontovertex, in profile about 1.7X as high as deep, anteriorly quite straight between top of scrobes and mouth margin, interantennal prominence slightly protuberant just above torulus; occipital margin sharp; ocelli forming an angle of about 40°; frontovertex moderately shiny, with distinct, fairly regular, polygonally reticulate sculpture of mesh size a little smaller than diameter of eye facet, deepest in ocellar area; narrowest area

between eye and scrobe about 2X as wide as diameter of anterior ocellus, area immediately below lowest part of eye completely smooth and shiny; scrobes shallow, hardly meeting, Λ-shaped, margins rounded; interantennal prominence with similar sculpture to frontovertex, clothed in sparse translucent setae, dorsally very acute; temple almost smooth with very shallow, irregular, elongate sculpture, gena with slightly deeper, irregular, reticulate sculpture; antenna as in Fig. 693; scape slightly broadened and flattened, about 3.5X as long as broad, widest slightly below middle; funicle with all segments transverse, F1 subquadrate; longer than broad, F4 quadrate, F5-F6 transverse, distal segments broadest and largest; clava slightly broadened, a little longer than funicle, sutures oblique, sensory area enlarged, extending ventrally about 0.7X along clava, giving it a strongly obliquely truncate appearance; eye reaching occipital margin, clothed in numerous, conspicuous setae, each at least as long as diameter of facet; inner eye margins converging strongly anteriorly; malar sulcus absent; clypeal margin weakly concave medially; mandible tridentate; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 56.5, HH 64, FV 4.5, POL 4.5, OOL 0, OCL 7, AOL 9, EL 43, EW 32, MS 30, SL 35 SW 10.

Thorax (Fig. 691) with irregular, polygonally reticulate sculpture on pronotum that is about as deep as that in ocellar area of frontovertex; mesoscutum with similar sculpture to pronotum, but more regular; axilla and scutellum with similar sculpture to that on mesoscutum, but slightly deeper and coarser, especially on scutellum, more elongate laterally on scutellum; visible part of mesoscutum about 1.6X as broad as long; scutellum about as long as broad, with a distinct subapical tuft, setae mostly about one-third as long as scutellum; mid tibia without a distinct, external carina; hind femur about 4.4X as long as broad; fore wing with venation and setation as in Figs 692, 694; costal cell with a single seta dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 694); propodeum (Fig. 691) medially about 0.15X as long as scutellum, with some shallow, irregular sculpture, side completely smooth in part, with shallow irregular sculpture dorsally. Relative measurements: FWL 60, FWW 23.5; HWL 48, HWW 12.

Gaster with hypopygium reaching about half-way to apex; syntergum about 0.75X as long as mid tibia, with apex rounded; ovipositor hardly exserted, the exserted part about half length of mid tibial spur or about 0.1X mid tibia.

Paratype. Funicle with linear sensilla present only on F5-F6; gaster without "gland-like" structures on Gt1 or Gt5; ovipositor Fig. 696. Relative measurements: OL 35, GL 9 [MT 35].

Variation. Females vary in overall length from 1.27-1.31mm, the brown spot on the mouth margin below the torulus may be absent; the costal cell of the fore wing may be completely naked dorsally at its apex, otherwise very little variation in material available.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown, but possibly a parasitoid of Dryinidae (see comments below).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, Est. Biol. La Selva, 10°24'N 84°01'W, 50-150m, canopy fog *Eugenia* sp., FOT/76/1-40, 5.i.2000 (INBio/OET). Paratypes: **COSTA RICA**, 1♀, **Puntarenas**, Pen. Osa, Bosque Esquinas, LN 302450 545100, 200m, vi.1994 (J.F. Quesada, M. Segura). Holotype in MZUCR, paratype in NHMUK.

COMMENTS. Of the New World species of *Cheiloneurus* this species is perhaps most similar to *albicornis* Howard from North America, both species being largely orange and having a white funicle contrasting with a dark brown clava. *Cheiloneurus genys* differs from *albicornis* in having the frontovertex less than 0.1X head width, the mesoscutum partially orange and hardly metallic, the propodeum orange and the infuscation of the fore wing extending about 0.9X to the apex. In *albicornis* the frontovertex is at least 0.2X head width, the mesoscutum is entirely metallic blue or green, the propodeum is dark brown and the infuscation of the forewing only extends

about 0.7X to the apex. bout as wide as the head. Otherwise *genys* is probably most similar to *Cheiloneurus chlorodryini* Perkins which also has the funicle entirely white and is a parasitoid of Dryinidae parasitising leaf hoppers and known only from Australia. *Cheiloneurus genys* differs from *chlorodryini* in having only about 15-20 pale setae in the basal cell below the parastigma and along the cubital vein, the mesoscutum posteriorly pale brown with a weak metallic sheen, the scape about 3.5X as long as broad, the mid tibia largely dark brown and the sensory part of the clava extending about 0.7X the length of the clava. In *chlorodryini* the fore wing has very dense, evenly distributed, pale setae across almost the whole of the basal cell, the mesoscutum is entirely orange, the scape is about 2.5X as long as broad, the mid tibia is completely pale yellow and the sensory part of the clava extends about half the length of the clava.

***Cheiloneurus fabius* sp.nov.**
(Figs 697-700; Hab. ♀ 105)

DIAGNOSIS. *Female* (length about 1.6-1.8mm): body mostly orange with mouth margin dark brown below torulus, mesopleuron posteriorly and propodeum laterally pale brown, gaster sometimes pale brown anteriorly, darker areas with a weak to moderate metallic sheen; antenna (Fig. 699) with scape pale orange; pedicel pale orange with a dark brown stripe; funicle and clava dark brown; mesoscutum with dense silvery setae posteriorly; fore and hind coxae white, mid coxa white with pale orange and brown; legs almost completely white to pale orange; fore wing (Fig. 700) mostly infuscate with basal cell almost completely hyaline, the small hyaline area at apex of venation is narrowly connected to apical hyaline area at apex and then narrowly nearly to opposite wing margin; head about 12X as wide as frontovertex, in facial view about as long as broad, subcircular with genae moderately curved inwards, more strongly so near mouth margin; frontovertex with three setae medially above scrobes; eye separated from scrobe by about 1.5X diameter of anterior ocellus, area between eye and scrobe completely smooth and shiny, scrobes moderately deep with sharp margins; interantennal prominence with about 12 inconspicuous setae and dorsally rounded; mandible more or less tridentate; antenna (Fig. 699) with scape about 3.7X as long as broad; funicle with all segments subequal in length and longer than broad; head width about equal to length of funicle; linear sensilla on F3-F6; clava 3-segmented, slightly longer than F4-F6 combined; sensory area enlarged and forming an oblique truncation, extending slightly more than 0.3X along ventral margin; mesoscutum (Fig. 698) anteriorly and laterally with coarse, longitudinally elongate striate-reticulate sculpture, posteriorly with uniform, fairly shallow, polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 700) about 2.6X as long as broad; parastigma hardly downcurved; costal cell dorsally naked or with a single apical setae, ventrally with a complete line of setae; area below proximal part of parastigma with a line of three to six setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 697); apical bristle of postmarginal vein about 0.5X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with about five setae adjacent to spiracle, side naked; syntergum about 0.9X as long as mid tibia; ovipositor about 3.5X gonostylus or about 1.4X as long as mid tibia; gonostylus about 1.1X as long as mid tibial spur; exserted part of ovipositor about 0.7X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.76mm; excluding ovipositor, 1.67mm (CPD).

Head pale orange, mouth margin weakly infuscate below torulus; frontovertex with a weak blue and purple sheen, less blue immediately above scrobes; area between eye and scrobe with a weak purple and green sheen; temple along eye margin mostly with a weak green sheen, otherwise purple; gena with an even weaker metallic green and purple sheen; scrobal area with a weak green and purple sheen; frontovertex clothed with inconspicuous, translucent, pale brown setae, a line of fine, translucent setae between eye and scrobe; maxillary palpus white, apical segment very pale orange; antenna (Fig. 699) with radicle and scape pale orange; pedicel pale orange with a dark brown streak internally along its length; funicle and clava dark brown; pronotum orange, neck slightly dusky; prosternum orange; mesoscutum orange, posterolaterally with a very slight purple sheen, anteriorly clothed with relatively sparse, dark brown setae, posteriorly with

translucent silvery setae that are slightly more dense laterally; tegula orange with apex orange-brown; axilla and scutellum orange clothed with golden brown to dark brown setae, subapical tuft black; metanotum slightly dusky, orange; mesopleuron orange with posterior half orange-brown; mesosternum orange; fore coxa white; fore femur white at extreme base, otherwise leg pale orange; mid coxa white mixed pale orange, brown towards base externally; mid femur white with apex pale orange, leg otherwise mostly pale orange, but tibia slightly dusky proximally; hind coxa white; leg otherwise mostly pale orange but area around knee slightly dusky; fore wing (Fig. 700) mostly infuscate, hyaline towards base, along anterior margin distad of venation and at apex; submarginal vein pale orange, venation otherwise brown; propodeum pale orange, pale brown with a slight blue sheen around spiracle, side with a weak purple sheen, 3 or 4 translucent, silvery setae outside spiracle; gaster pale orange to orange, with a weak, mixed, purple, brassy and green sheen, Gt1 laterally brownish with a stronger green, blue and purple sheen, apex of syntergum and outer plate of ovipositor brownish; gonostylus very pale orange, almost white.

Head about 11.5X as wide as frontovertex, in profile about 1.6X as high as deep, anteriorly quite straight between top of scrobes and mouth margin, interantennal prominence hardly protuberant above torulus; occipital margin sharp, not carinate; ocelli forming an angle of about 40°; frontovertex slightly shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh size a little smaller than diameter of eye facet, deepest in ocellar area; narrowest area between eye and scrobe about 1.5X as wide as diameter of anterior ocellus, area immediately below lowest part of eye almost completely smooth, very shiny; scrobes moderately deep, meeting, ∩-shaped, sharply margined between eye and scrobe; interantennal prominence with similar sculpture to frontovertex, clothed in sparse translucent setae, dorsally rounded; temple with very shallow, irregular, elongate sculpture, gena with slightly deeper, irregular, reticulate sculpture; antenna as in Fig. 699; scape slightly broadened and flattened, about 3.7X as long as broad, widest below middle; funicle with all segments subequal in length and longer than broad, distal segments broadest, F1 about 2X as long as broad, F6 about 1.1X as long as broad; clava hardly broadened, a little longer than F4-F6 combined, sutures oblique, sensory area enlarged, extending ventrally about one-third along clava, giving it an obliquely truncate appearance; eye slightly overreaching occipital margin, clothed in numerous, inconspicuous, very fine setae, each a little shorter than diameter of facet; inner eye margins strongly converging anteriorly; malar sulcus absent; clypeal margin weakly concave medially; mandible virtually tridentate, with two sharp teeth and a truncation; apical segment of maxillary palpus not enlarged, about 1.5X as long as radicle. Relative measurements: HW 69, HH 69, FV 6, POL 4.5, OOL 0, OCL 6.5, AOL 8.5, EL 48, EW 40, MS 30, SL 36.5, SW 10.

Thorax (Fig. 698) with irregular, polygonally reticulate sculpture on pronotum that is about as deep as that in ocellar area of frontovertex; mesoscutum in anterior one-third and on side with coarse, longitudinally elongate striate-reticulate sculpture, middle and posterior two-thirds with uniform, fairly shallow, polygonally reticulate sculpture; axilla and scutellum with similar sculpture to pronotum, but more regular and deeper, more elongate laterally on scutellum; visible part of mesoscutum about 1.8X as broad as long; scutellum hardly longer than broad, with a distinct subapical tuft, setae mostly about 0.4X as long as scutellum; mid tibia without a distinct, external carina; hind femur about 5X as long as broad; fore wing with venation and setation as in Figs 697, 700; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 697); propodeum (Fig. 698) medially about 0.13X as long as scutellum, with some very shallow, polygonally reticulate sculpture, side completely smooth. Relative measurements: FWL 77.5, FWW 29.5; HWL 63, HWW 16.

Gaster with hypopygium reaching about 0.4X to apex; syntergum about 0.9X as long as mid tibia, with apex weakly angular; ovipositor slightly exserted, the exserted part about two-thirds length of mid tibial spur or about one-quarter mid tibia.

Paratype. Funicle with linear sensilla present only on F3-F6; gaster without "gland-like" structures on Gt1 or Gt5. Relative measurements: OL 63.5, GL 18 [MT 45.5].

Variation. Females vary in overall length from 1.55-1.81mm, otherwise very little in material available, although the mid tibia may have a very inconspicuous external carina proximally.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Las Cruces, MT/YPT, 18-22.iii.1990 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Heredia**, 9km NE Vara Blanca, 10°14'N 84°06'W, 1450-1550m, 15/M/NOTN, ii-.iv.2005 (INBio/OET-ALAS); 2♀, **San José**, Zurqui de Moravia, 1600m, ix-x.1993 and iv.1995 (P. Hanson); 1♀, **Puntarenas**, Buenos Aires, Est. Altamira, LS 331700 572100, 1320m, #3349, x.1994 (M. Segura, Z. Fuentes); 1♀, Puntarenas, Buenos Aires, Est. Altamira, LS 572100 331700, 1450m, #4519, i-ii.1995 (J.F. Quezada, M. Segura); 1♀, Puntarenas, Est. Altamira, Send. los Gigantes, LS 331800 572100, 1460m, 10.i-10.ii.2002 (D. Rubí); 1♀, Puntarenas, San Vito, Las Alturas, 8°57'N 82°50'W, 1500m, 20.ii.2015 (J.S. Noyes); 1♀, same data as holotype. Holotype in MZUCR, paratypes in NHMUK and MZUCR.

COMMENTS. *Cheiloneurus fabius* is superficially fairly similar to *miranda* in that both species have largely pale orange bodies and the antennal flagellum is dark with relatively elongate segments. However, the two can be distinguished fairly easily because *fabius* lacks a brown genal stripe, the mesopleuron is mostly orange marked brown posteriorly, the apical margin of the infuscate area of the fore wing is curved and subparallel to the apical margin of the wing and the gaster is mostly orange. In *miranda*, the temple and gena have a broad, distinct oblique brown stripe, the mesopleuron is white with a vertical dark brown stripe in the middle, the apex of the fore wing has a subtriangular hyaline area and the gaster is dark brown with a strong metallic sheen.

Cheiloneurus nintra **sp.nov.**

(Figs 701-707; Hab. ♀ 106,107)

DIAGNOSIS. *Female* (length about 1.0-1.4mm): body generally orange, mesoscutum posteriorly usually with a pale brown band, gaster mostly dark brown, paler areas with a weak metallic sheen, darker areas with a moderate to strong metallic sheen; antenna (Fig. 703) with scape pale orange; pedicel brown; funicle with F1-F4 brown to orange-brown, F5-F6 pale orange-brown to orange; clava brown, sometimes proximal segments of clava pale orange; posterior half of mesoscutum with dense silvery setae; fore and hind coxae white, mid coxa pale orange; legs mostly white to pale orange with some brown on mid and hind legs; fore wing (Fig. 705) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation which continues more broadly around wing apex and then more narrowly to opposite margin; head (Fig. 707) about 6.7X as wide as frontovertex, in facial view hardly broader than long, subcircular, genae evenly slightly curved, more strongly curved near mouth margin; frontovertex with about 2 setae medially above scrobes; eye separated from scrobe by about 2X diameter of anterior ocellus, area between eye and scrobe virtually completely smooth, scrobes shallow and weakly margined; interantennal prominence with about 12 inconspicuous setae and dorsally acute; mandible tridentate; antenna (Fig. 703) with scape about 5.8X as long as broad; F1 slightly longer than broad, remaining segments subquadrate or transverse; linear sensilla on F4-F6; clava 3-segmented, very nearly as long as funicle, sensory area enlarged, extending about 0.6X along ventral surface of clava giving it a strong, obliquely truncate appearance; head width slightly greater than length of flagellum; mesoscutum (Fig. 702) anteriorly with coarse longitudinally elongate, striate-reticulate sculpture, posteriorly with polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 705) about 2.6X as long as broad; parastigma clearly downcurved; costal cell dorsally naked, ventrally with a complete line of setae; area below proximal part of parastigma with a line of about 6-12 paler setae that curves towards fore wing base, sometimes a setae outside this; apices of postmarginal and stigmal veins connected by a naked, hyaline area that hardly extends into disc (Fig. 701); seta at apex of postmarginal vein about 0.6X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum (Fig. 702) with about 24 setae adjacent to spiracle, these not extending down side; syntergum about 0.8X as long as mid

tibia; ovipositor (Fig. 706) about 4X gonostylus or about as long as mid tibia; gonostylus about 0.8X as long as mid tibial spur; ovipositor not exserted. *Male*: unknown.

Female (holotype): length 1.35mm (CPD).

Head generally pale orange; occiput with a small, dark brown triangular area immediately above foramen; temple and gena pale brown; mouth margin (Fig. 707) dark brown; ocellar area with purple and blue reflections, frontovertex anteriorly to ocelli with a weak metallic green sheen, purple about half-way between anterior ocellus and top of scrobes then brassy to top of scrobes; temple with a metallic green sheen, coppery along posterior; gena with a metallic green sheen with some blue, brassy and coppery areas anteriorly; area between eye and scrobe with a weak purple and brassy sheen; interantennal prominence with a weak purple and brassy sheen; frontovertex with inconspicuous pale brown setae along inner eye margins; a line of similar setae below eye; interantennal prominence clothed with sparse, brown setae; maxillary palpus very pale orange; antenna (Fig. 703) with radicle pale orange, apex dark brown; scape pale orange; pedicel brown; F1 brown, F2-F4 slightly paler orange-brown, F5 pale orange mixed pale orange-brown ventrally, F6 pale orange, clava brown; pronotum orange, side pale orange; prosternum brown; mesoscutum orange with a transverse, median pale brown band with a very weak metallic blue sheen and purple reflections, orange areas with relatively sparse, brown setae, brownish area with relatively dense, silvery setae; tegula orange with apex orange-brown; axilla and scutellum pale orange, clothed with golden brown and dark brown setae, subapical tuft on scutellum black; metanotum orange; mesopleuron pale orange with a weak brassy and purple sheen, posterior two-fifths brown with a weak green, purple and brassy sheen; mesosternum pale orange; fore coxa white, leg otherwise pale orange; mid coxa pale orange, leg otherwise mostly pale orange, but mid tibia dark brown at base and with an external brown stripe for about three fifths its length; hind coxa white; hind femur mostly pale orange but dorsal margin narrowly brown in apical half and apex brown, hind tibia pale orange-brown with apices pale orange, tarsus pale orange; fore wing (Fig. 705) mostly infuscate, hyaline towards base, along anterior margin distad of venation and at apex; submarginal vein mostly yellow, venation otherwise brown; propodeum pale orange medially and on side, brown laterally with a weak metallic blue and purple sheen, about 15 recumbent, silvery setae in a group inside spiracle and a single erect seta laterally outside it; gaster brown with purple, blue, green and brassy reflections, Gt1 with a green, blue and coppery sheen, syntergum mostly pale orange, apex brown, side and venter pale dusky orange, side with a weak metallic green and coppery sheen, apex of outer plates brown; gonostylus pale orange.

Head (Fig. 707) about 6.7X as wide as frontovertex, in profile 1.5X as high as deep, anteriorly quite straight from top of scrobes to mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, not carinate; ocelli forming an angle of about 40°; frontovertex quite shiny, with shallow, polygonally reticulate sculpture of mesh size a little smaller than diameter of facet; narrowest point between eye and scrobe slightly more than 2X diameter of anterior ocellus and virtually completely smooth; temple quite smooth, but with very shallow, irregular, elongate, sculpture; gena with slightly deeper more regular, polygonally reticulate sculpture; scrobes shallow, Λ-shaped, meeting, weakly margined; interantennal prominence dorsally acute and with shallow, polygonally reticulate sculpture; antenna as in Fig. 703; scape hardly broadened and flattened, about 5.8X as long as broad; F1 very slightly longer than broad, F2 quadrate, F3-F6 transverse, segments larger and broader distad; clava slightly broadened, very nearly as long as funicle, sutures oblique, sensory area enlarged, extending ventrally about 0.6X length of clava, apex strongly obliquely truncate; eye reaching occipital margin, virtually naked, but clothed in sparse, inconspicuous, fine, short setae, each much shorter than diameter of facet; inner eye margins converging slightly anteriorly; malar sulcus absent; clypeal margin virtually straight medially; mandible with three acute teeth; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 67, HH 66, FV 10, POL 7, OOL 0, OCL 5.5, AOL 12.5, EL 48.5, EW 39, MS 29, SL 37.5, SW 6.5.

Thorax (Fig. 702) with pronotum short and hardly exposed behind head, about as long as mesoscutum, pronotum with polygonally reticulate sculpture that is deeper than that on frontovertex; mesoscutum in anterior half with longitudinally elongate striate-reticulate sculpture, posterior half with polygonally reticulate sculpture of similar depth; axilla and scutellum with polygonally

reticulate sculpture of similar depth to that on pronotum, but slightly coarser, especially so on scutellum where it is laterally longitudinally elongate on sides; visible part of mesoscutum about 2.7X as broad as long; scutellum about as long as broad with a distinct subapical tuft, setae mostly about half as long as scutellum; mid tibia without a distinct external carina; hind femur about 5.0X as long as broad; fore wing with venation and setation as in Figs 701, 705; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 701); propodeum medially about 0.17X as long as scutellum and virtually smooth, lateral setae conspicuous. Relative measurements: FWL 61, FWW 23; HWL 54.5, HWW 14.5.

Gaster with hypopygium reaching about half-way to apex; syntergum about 0.9X as long as mid tibia, with apex very weakly angular; ovipositor not exserted.

Paratype. Funicle with linear sensilla present only on F4-F6; gaster without "gland-like" structures on Gt1 or Gt5; hypopygium Fig. 704; ovipisitor Fig. 706. Relative measurements: OL 32, GL 8 [MT 34].

Variation. Females vary in overall length from 0.97-1.42mm, the antenna may be relatively paler than in the holotype so that the proximal segment, and sometimes even the middle segment, of the clava is pale orange with the remainder very pale brown, the temple may be pale orange, the pale brown band on the mesoscutum may be absent or it may be broader, extending over almost the whole of the posterior half of the mesoscutum (the band of silvery setae is always present) and the gaster may have the side and venter pale orange;

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown, but very likely to be a parasitoid of Dryinidae (Hymenoptera) parasitizing leaf hoppers (Hemiptera).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Zurqui de Moravia, 1600m, v.1995 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Maritza (ACG), 700m, MT/YPT, 20.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, BN Diriá, Ret. Alr. Torre Control de Incendio, LN238550 358650, 600-700m, #66659, xii.2001-i.2002 (I. Jiménez); 2♀, **Heredia**, Santo Domingo, INBio Parque, 9°59'N 84°06'W, 14.ii.2015 (J.S. Noyes); 1♀, **San José**, San Antonio de Escazu, 2000m, ix-x.1996 (C. Flores, P. Hanson); 7♀, San José, Zurqui de Moravia, 1600m, v.1994, vi-vii.1994, v.1995 and vi.1995 (P. Hanson); 2♀, San José, 26km N San Isidro, 9´30'N 83°43'W, 2100m, ii-v.1991 and ii-v.1992 (P. Hanson); 1♀, **Cartago**, PN Tapanti-Macizo de la Muerte, Torre ICE #28, 1700m, #61063, vii-viii.2000 (D. Rubí); 1♀, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 23-24.ii.2013 (J.S. Noyes); 1♀, Puntarenas, Buenos Aires, Pila Savanas, LS 336200 573560, 1900m, #52793, MT, #52793, v-vi.1999 (R. Villalobos); 1♀, Puntarenas, Est. Altamira, Send a Casa Coca, LS 331750 574400, 1700m, ii.2002 (C. Hansson, D. Rubí, J. Azofeifa). Holotype in MZUCR, paratypes in NHMUK and MZUCR.

COMMENTS. *Cheiloneurus nintra* is very close to *angulatus* De Santis from Argentina and *olmii* Guerrieri & Viggiani (see Guerrieri & Viggiani, 2005) from the Galapagos Islands, all three species having a very similar body colouration, general habitus and pattern of infuscation on the fore wing. It can be separated from both species by having a line of dark setae below the parastigma that connects to a line of similar setae along the cubital vein, whereas in *angulatus* and *olmii* there is a distinct group of about 12-15 pale setae below the parastigma which may continue as a single line along the cubital vein. Further to this, the frontovertex in *nintra* it is at most about 0.16X head width whereas in *angulatus* and *olmii* it is about 0.20X head width. In *nintra* the mesoscutum is orange with a brown band that extends into the anterior half of the mesoscutum, whereas in *angulatus* the brown band is limited to the posterior one third and in *olmii* the whole of the posterior half of the mesoscutum is completely dark brown with a distinct metallic sheen. *Cheiloneurus nintra* further differs from *olmii* in having the mesopleuron anteriorly pale orange with the posterior two-fifths brown, whereas in *olmii* the mesopleuron is uniform dark orange-brown. *Cheiloneurus nintra* is also quite similar to *gonatopodis* Perkins

from the Old World tropics and subtropics and known as a parasitoid of Dryinidae attacking plant hoppers. It differs from *gonatopodis* in having the mouth margin dark brown and slightly metallic, whereas in gonatopodis it is completely orange. In addition, the fore wing of *gonatopodis* has two or three lines of pale setae below the parastigma that do not extend towards the wing base along the cubital vein

***Cheiloneurus santaros* sp.nov.**
(Figs 708-713; Hab. ♀ 108)

DIAGNOSIS. *Female* (length about 1.4mm): body dark brown with a weak to moderate metallic sheen; antenna (Fig. 709) with scape pale orange with dorsal margin partly brown; pedicel dark brown with some pale orange; flagellum dark brown; mesoscutum with sparse, translucent setae that may appear silvery; fore coxa pale orange, mid and hind coxae dark brown; legs largely pale orange with femora and hind tibia and tarsus dark brown; fore wing (Fig. 711) mostly infuscate, basal cell mostly hyaline, a hyaline area at apex of venation and another opposite which are connected via a narrow apical hyaline area; head (Fig. 708) about 3.7X as wide as frontovertex, in facial view clearly broader than long, subcircular, genae evenly curved, converging, more strongly curved inwards near mouth; frontovertex with four setae medially between anterior ocellus and scrobes; eye separated from scrobe by about 1.5X diameter of anterior ocellus, area between eye and scrobe with conspicuous sculpture; scrobes moderately deep, not sharply margined, interantennal prominence with about 25 inconspicuous setae, dorsally rounded, without a median ridge; mandible tridentate; antenna (Fig. 709) with scape about 4.3X as long as broad; funicle with F1 slightly longer than broad, F2-F6 transverse; clava 3-segmented, slightly longer than F3-F6 combined; sensory area enlarged, extending ventrally about 0.5X length of clava, apex obliquely truncate; head width slightly less than flagellum length; mesoscutum (Fig. 710) with shallow, fairly regular, polygonally reticulate sculpture; scutellum with an indistinct, relatively sparse, subapical tuft of setae; wings fully developed, fore wing (Fig. 711) about 2.5X as long as broad; parastigma not downcurved; costal cell dorsally with one apical setae, ventrally with a line of setae that is interrupted above parastigma; area below proximal part of parastigma with a group of about 25 uniform, fine setae; apices of postmarginal and stigmal veins (Fig. 712) more or less connected by a naked hyaline area; apical bristle of postmarginal vein about 0.3X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum (Fig. 710) with about 20 inconspicuous setae adjacent to spiracle, side naked; syntergum about 0.7X as long as mid tibia with apex acute, produced as a narrow, short, ribbon-like process; ovipositor (Fig. 713) about 2.6X gonostylus or about 1.8X as long as mid tibia; gonostylus about 1.7X as long as long mid tibial spur; exserted part of ovipositor about as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.43mm; excluding ovipositor, 1.27mm (CPD).

Head dark brown to black with a metallic sheen; occiput with a moderate dark, metallic, blue-green sheen with some and coppery violet reflections; frontovertex generally with a moderate metallic dark blue-green sheen, with some copper in ocellar area and some violet reflections above scrobes; temple with some metallic dark green adjacent to eye, elsewhere and gena with quite a strong metallic dark blue-green sheen; some violet along malar sulcus and between eye and scrobe; scrobal area metallic dark green, interantennal prominence dorsally violet; antenna (Fig. 709) with radicle pale orange; scape dusky pale orange with dorsal margin dark brown in proximal 0.4X and ventral margin narrowly dark brown in distal half except at extreme apex, inner surface similar but upper margin not dark brown proximally; pedicel dark brown, extreme apex dusky pale orange, venter narrowly dusky pale orange; flagellum dark brown; palpi very pale orange; thorax dark brown to black with a metallic sheen; pronotum with a moderate metallic dark blue-green sheen with some violet, posterior margin narrowly coppery purple; mesoscutum mostly with a strong metallic dark blue-green and dark green sheen with some violet laterally and posterior margin narrowly coppery purple; mesoscutum clothed with fairly sparse, translucent setae that appear silvery in most lights; tegula dark brown with a slight coppery sheen; axilla with a contrasting coppery sheen; scutellum mostly with a moderate metallic dark blue-green sheen, ridges of reticulate sculpture dark coppery purple, extreme side and apex with a strong metallic

dark blue-green and slight coppery sheen, setae dark brown; metanotum with a slight coppery purple sheen; mesopleuron in anterior 0.6X with a strong brassy and metallic dark blue-green sheen, posterior 0.4X coppery, between these an irregular narrow diagonal violet and dark blue area; fore coxa pale orange, mid and hind coxa dark brown with a slight metallic dark blue-green sheen; fore femur brown with apex pale orange, tibia pale orange at extreme base otherwise brown with extreme apex mixed pale orange, tarsus orange-brown, apical tarsomere dark brown; mid femur very slightly dusky pale orange, tibia dark brown, spur dusky orange, tarsus dark brown; hind femur, tibia and tarsus dark brown; fore wing (Fig. 711) with a small infuscate area at extreme base, hyaline to level with apex of submarginal vein, infuscate from apex of submarginal vein nearly to apex, apical 0.14X hyaline and with inner margin curved, subparallel to apical margin of wing, postmarginal and stigmal veins connected by a conspicuous narrow hyaline line (Fig. 712), anterior wing margin narrowly hyaline from apex of venation; stigmal vein and most of submarginal vein pale orange otherwise venation brown; hind wing hyaline; propodeum dark brown with a dark purple sheen, laterally and side metallic dark green, dark blue and violet, area around spiracle with conspicuous silvery setae; gaster dark brown, dorsally with a coppery sheen, side and venter with a mixed fairly strong metallic green, blue-green, coppery and coppery red sheen; gonostylus dark brown.

Head (Fig. 708) in facial view about 3.7X as wide as frontovertex with gena convex and converging, in profile anteriorly fairly rounded in profile and about 1.7X as high as deep, frontovertex fairly evenly curved from occipital margin to top of scrobes, angled at top of scrobes and fairly straight to mouth margin, with interantennal prominence weakly protuberant; ocelli forming an angle of about 60°; frontovertex with only a line of setae along eye margin, otherwise naked; some conspicuous scattered setae on lower gena and interantennal prominence; occipital margin sharp, not carinate; a short, oval groove present on eye margin behind posterior ocellus; frontovertex with moderately deep, polygonally reticulate sculpture of mesh size slightly smaller than eye facet, area between eye and scrobe with similar sculpture; temple and gena very shiny with shallow, longitudinally elongate, striate-reticulate sculpture, area immediately below eye almost smooth, anterior part of lower gena with moderately deep, elongate, polygonally reticulate sculpture; scrobes with moderately deep, polygonally reticulate sculpture; interantennal prominence with fairly shallow, polygonally reticulate sculpture; narrowest part between eye and scrobal margin equal to 1.5X diameter of anterior ocellus, scrobes moderately deep, meeting dorsally, well-defined but not sharply margined, broadly ∩-shaped, interantennal prominence dorsally rounded, without a median ridge; antenna as in Fig. 709; scape slightly broadened, broadest slightly above middle, about 4.3X as long as broad; funicle with F1 narrowest, very slightly longer than broad, F2-F6 all transverse, very slightly increasing in length and width distad, linear sensilla present on F4-F6; clava about 1.15X as broad as F6, very slightly longer than F3-F6 combined, outer suture oblique, sensory area slightly enlarged, extending about 0.5X along ventral margin, giving apex a distinct, obliquely truncate appearance; eye reaching occipital margin, appearing naked but with sparse, extremely short setae; inner eye margins subparallel, but slightly converging anteriorly, narrowest part of frontovertex about midway between anterior ocellus and scrobes; malar sulcus absent; clypeal margin medially conspicuously emarginate; mandible with 3 sharp teeth, lowermost tooth longest; apical segment of maxillary palpus hardly enlarged, about 1.5X as long as radicle. Relative measurements: HW 105, HH 95, FV 29, POL 16.5, AOL 17, OOL 0.5, OCL 6, EL 66, EW 55.5, MS 35, SL 49, SW 11.5.

Thorax (Fig. 710) with pronotum slightly exposed behind head, with moderately deep, fine, imbricate-reticulate to polygonally reticulate sculpture that is about as deep as sculpture on frontovertex; mesoscutum mainly with fairly regular, fine polygonally reticulate sculpture that is very slightly shallower than that on pronotum, a little coarser laterally; axilla with polygonally reticulate sculpture that is about as deep as sculpture in ocellar area; scutellum convex, with coarse deep, slightly to very elongate polygonally reticulate sculpture that is clearly much deeper than that on mesoscutum and more or less arranged in whorls, apex and extreme side mirror smooth and shiny; visible part of mesoscutum about 2.4X as broad as long; scutellum about as long as broad, with an indistinct, sparse subapical tuft, the longest setae of which are at least 0.2X as long as scutellum; hind femur about 4.0X as long as broad; fore wing with venation and setation as in Figs 711, 712; costal cell with at most 1 seta dorsally at apex; apices of postmarginal and stigmal

veins connected by a naked, hyaline streak (Fig. 712); mid tibia without a carina; propodeum medially about 0.12X as long as scutellum and more or less smooth; spiracle surrounded by about 15 conspicuous setae. Relative measurements: FWL 85, FWW 34; HWL 74, HWW 19.5.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium reaching about 0.6X to apex; syntergum about 0.7X as long as mid tibia, with apex acute and apparently produced as a narrow, short, ribbon-like process; ovipositor as in Fig. 713, exserted, the exserted part about as long as mid tibial spur or 0.35X as long as mid tibia. Relative measurements: OL 62.5, GL 23.5 [MT 35].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, PN Santa Rosa, Bosque Humedo, 10°51'N 85°37'W, 300m, 20.ii.2007 (J.S. Noyes). Holotype in NHMUK.

Cheiloneurus simus sp.nov.

(Figs 714-719; Hab. ♀ 109)

DIAGNOSIS. *Female* (length about 1.4-2.0mm): body generally orange, mesoscutum posteriorly with a dark band (Fig. 719), gaster mostly dark brown, paler areas with a weak metallic sheen, darker areas with a moderate to strong metallic sheen; antenna (Fig. 718) with scape mostly pale orange, ventrally margined brown; pedicel very pale orange with a dark brown streak; funicle with orange-brown to brown segments; clava dark brown; posterior half of mesoscutum with dense silvery setae; fore and hind coxae white, mid coxa very pale orange; legs mostly white to pale orange; fore wing (Fig. 715) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation which continues more broadly around wing apex to opposite margin; head (Fig. 716) about 4.7-5.3X as wide as frontovertex, in facial view slightly broader than long, subquadrate, genae quite strongly and evenly curved, but hardly converging; frontovertex with about 3 setae medially between anterior ocellus and scrobes; eye separated from scrobe by about 1.7X diameter of anterior ocellus, area between eye and scrobe completely smooth, scrobes deep and sharply margined; interantennal prominence with about 10 inconspicuous setae and dorsally rounded; mandible virtually tridentate; scape (Fig. 718) about 2.2X as long as broad; funicle segments subquadrate or transverse; linear sensilla on F4-F6; clava 3-segmented, about as long as F2-F6 combined, sensory area enlarged, extending nearly 0.4X along ventral surface of clava giving it a strongly obliquely truncate appearance; head width slightly less than length of pedicel and flagellum combined; mesoscutum (Fig. 719) anteriorly with fine, longitudinally elongate, striate-reticulate sculpture, posteriorly with slightly shallower polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 715) about 2.5-2.6X as long as broad; parastigma clearly downcurved; costal cell dorsally naked but for two or three apical setae, ventrally with a virtually complete line of setae; area below proximal part of parastigma with a line of about ten paler setae that curves towards fore wing base, one or two setae outside this; apices of postmarginal and stigmal veins connected by a naked, hyaline area that extends a little way into disc (Fig. 714); seta at apex of postmarginal vein about 0.5X as long as marginal vein; mid tibial spur hardly shorter than basitarsus; propodeum (Fig. 719) with only about four setae adjacent to spiracle; syntergum about 0.8X as long as mid tibia; ovipositor (Fig. 717) about 4.1X gonostylus or about 1.4X as long as mid tibia; gonostylus about as long as mid tibial spur; exserted part of ovipositor about 0.2X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.50mm; excluding ovipositor, 1.48mm (CPD).

Head generally orange; occiput pale orange; an oblique, brown stripe across temple towards

torulus, mouth margin brown (Fig. 716); frontovertex with a weak metallic blue sheen, some distinct purple reflections on ocellar area, purple and brassy immediately above scrobes; temple with a weak silvery and purple sheen; shining purple between eye and scrobe; gena relatively dull green, purple and brassy; top of scrobes delimited by a slender, slightly curved, brown band; interantennal prominence with a weak purple and brassy sheen; frontovertex with inconspicuous pale brown setae along inner eye margins; a line of slightly more conspicuous, translucent, white setae below eye; interantennal prominence clothed with inconspicuous, sparse, translucent, white setae; maxillary palpus pale orange; antenna (Fig. 718) with radicle pale orange with a narrow brown apical ring; scape pale orange, white at extreme apex, ventral margin dark brown; pedicel very pale orange with a dark brown streak along inner surface; F1-F3 brown, F4-F6 slightly paler orange-brown, clava dark brown; pronotum orange with weak brassy and coppery reflections, neck marked brown; prosternum pale orange, brown anterior to coxa; mesoscutum orange in anterior half with some very weak coppery and brassy reflections, clothed in relatively sparse golden brown and dark brown setae, posterior half and side brown with a moderately strong, dark blue sheen and distinct purple reflections, clothed in conspicuous, relatively dense silvery setae, posterior margin purple-brown with a purple sheen; tegula orange with apex orange-brown; axilla and scutellum orange, clothed with golden brown and dark brown setae, subapical tuft on scutellum black; metanotum orange; mesopleuron orange with a weak brassy sheen, posterior half pale brown with a weak green, purple and brassy sheen; mesosternum pale orange; fore coxa and proximal half of fore femur white, fore tibia with dorsal margin brown proximally, fore leg otherwise pale orange; mid coxa slightly dusky, very pale orange; mid femur white in proximal half, apex pale orange, tibia pale orange, slightly dusky subbasally, spur and tarsus pale orange; hind coxa white; hind femur pale orange, slightly dusky along margins towards apex and with a subapical brown streak on inner surface, tibia pale orange with diffuse brown subbasal and subapical rings and extreme base white, tarsus pale orange; fore wing (Fig. 715) mostly infuscate, hyaline towards base, along anterior margin distad of venation and at apex; submarginal vein pale orange, venation otherwise brown; propodeum orange medially, brown laterally and on side with a dark metallic blue and purple sheen, about 3 or 4 long, translucent, white setae in a line outside spiracle; gaster dark brown with a coppery sheen, Gt1 largely with a metallic blue and green sheen, side and venter paler orange to orange-brown and largely with coppery, brassy and purple reflections, syntergum pale orange-brown; gonostylus pale orange.

Head (Fig. 716) about 5.3X as wide as frontovertex, in profile 1.6X as high as deep, anteriorly quite straight from top of scrobes to mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 70°; frontovertex quite shiny, with shallow, polygonally reticulate sculpture of mesh size generally a little smaller than diameter of facet; narrowest point between eye and scrobe about 1.7X diameter of anterior ocellus and completely smooth; temple quite smooth, but with shallow, irregular, elongate, reticulate sculpture; gena with slightly deeper more regular, polygonally reticulate sculpture; scrobes deep, ∩-shaped, meeting, sharply margined; interantennal prominence dorsally rounded, with an indistinct median ridge and with shallow, polygonally reticulate sculpture; antenna as in Fig. 718; scape strongly broadened and flattened, about 2.2X as long as broad, broadest in middle; F1 subquadrate, F2-F6 transverse, segments larger and broader distad; clava clearly broadened, about as long as F2-F6 combined, sutures slightly oblique, sensory area enlarged, extending ventrally slightly less than 0.4X length of clava, apex appearing obliquely truncate; eye reaching occipital margin, clothed in sparse, inconspicuous, fine, short setae, each much shorter than diameter of facet; inner eye margins subparallel, converging slightly anteriorly; malar sulcus absent; clypeal margin very slightly concave medially; mandible with two sharp teeth and a truncation, virtually tridentate; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 72, HH 67, FV 13.5, POL 7.5, OOL 0, OCL 5.5, AOL 8, EL 44, EW 37, MS 33, SL 34, SW 15.5.

Thorax (Fig. 719) with pronotum short and hardly exposed behind head, about 0.6X as long as mesoscutum, pronotum with polygonally reticulate sculpture that is about as deep as that on frontovertex; mesoscutum anteriorly with fine, longitudinally elongate, striate-reticulate sculpture, posteriorly with slightly shallower polygonally reticulate sculpture; axilla with similar sculpture to pronotum, scutellum with similar but slightly coarser sculpture which is longitudinally elongate

laterally; visible part of mesoscutum about 1.7X as broad as long; scutellum about as long as broad with a distinct subapical tuft, setae mostly about half as long as scutellum; mid tibia with a distinct external carina for about half its length; hind femur about 4.3X as long as broad; fore wing with venation and setation as in Figs 714, 715; costal cell with 2 setae dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 714); propodeum (Fig. 719) medially about 0.10X as long as scutellum and virtually smooth, setae on side conspicuous. Relative measurements: FWL 71.5, FWW 27.5; HWL 62, HWW 17.

Gaster with hypopygium reaching about 0.4X to apex; syntergum about 0.9X as long as mid tibia, with apex fairly acute; ovipositor slightly exserted, the exserted part about 0.16X as long as mid tibial spur or less than 0.1X as long as mid tibia.

Paratype. Funicle with linear sensilla present only on F4-F6; gaster without "gland-like" structures on Gt1 or Gt5; ovipositor Fig. 717. Relative measurements: OL 51, GL 12.5 [MT 37].

Variation. Females vary in overall length from 1.35-2.00mm, the colour of the flagellum varies a little, F3 may be orange-brown and slightly paler than F1-F2, or F5 and F6 may be concolourous with F1, the faint brown rings on the hind tibia may not be apparent, the purple reflections on the posterior part of the mesoscutum may be virtually absent and the head varies from 4.7-5.3X as wide as the frontovertex.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Some of the paratypes were reared from an unknown coccid (Hemiptera: Coccidae) on *Psittacanthus* sp. (Santalales: Loranthaceae).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Alajuela**, Volcan Poas, Lagunillas, 2400m, ex scale on *Psitacanthus* [sic], 8.vi.2003 (M. Gates). Paratypes: **COSTA RICA**, 2♀, **Alajuela**, same data as holotype; 1♀, **Heredia**, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/NOTN, iii.2002, INBio-OET/ALAS); 1♀, Heredia, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/TN, iv.2002, INBio-OET/ALAS); 2♀, **San José**, 19km S 3km W Empalme, 9°39'N 83°52'W, x-xi.1993 and xii.1993 (P. Hanson); 1♀, San José, 19km S Empalme, Mirador Quetzal, 9°39'N 83°52'N, 2600m, iii.2000 (P. Hanson); 1♀, **Cartago**, Madreselva, Finca Los Lagos, LN 184450 550050, 2600m, 23.x-8.xi.1994 (M.M. Chavarria); 1♀, **Puntarenas**, Buenos Aires, Est. Altamira, Cerro Frantzius, LS 574450 334150, 2134m, #61083, xii.2000 (D. Rubí). Holotype in MZUCR, paratypes in NHMUK, MZUCR and USNM.

COMMENTS. As the key suggests, *Cheiloneurus simus* is very similar to *marcius*, both being of similar habitus, general colouration and having a similar pattern of infuscation of the fore wing. Both species also appear to have a small part of the apex of the fore wing straight or even very slightly convex. Apart from the characters given in the key *simus* differs from *marcius* in having the clava only about as long as F2-F6 combined, the sensory part of the clava extending only about one-third along the clava, the scape about 2.2X as long as broad, the occipital margin carinate, the mandible with two short teeth and a truncation and the ovipositor about 4X as long as the gonostylus. In *marcius* the clava is about as long as the funicle, the sensory part of the clava extends nearly 0.5X along clava, the scape is about 1.8X as long a broad, the occipital margin is not carinate, the mandible has three distinct teeth and the ovipositor is less than 3.5X as long as the gonostylus.

Cheiloneurus marcius **sp.nov.**

(Figs 720-725)

DIAGNOSIS. *Female* (length about 1.4mm): body generally orange, gaster mostly dark brown, paler areas with a weak metallic sheen, darker areas with a stronger metallic sheen; antenna (Fig. 722) with scape mostly pale orange, ventrally margined brown; pedicel very pale orange with a dark brown streak; funicle with proximally brown, distally orange; clava dark brown; posterior

half of mesoscutum with dense silvery setae; fore and hind coxae white, mid coxa very pale orange; legs mostly white to pale orange; fore wing (Fg. 725) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation which continues more broadly around wing apex to opposite margin; head (Fig. 720) about 5.3X as wide as frontovertex, in facial view slightly broader than long, subrectangular, genae weakly curved, hardly converging, but more strongly curved inwards near mouth; frontovertex with about 4 setae medially between anterior ocellus and scrobes; eye separated from scrobe by about 1.5X diameter of anterior ocellus, area between eye and scrobe completely smooth, scrobes deep and sharply margined; interantennal prominence with more than 100 conspicuous setae and dorsally rounded; mandible tridentate; antenna (Fig. 722) with scape about 1.8X as long as broad; funicle segments subquadrate; linear sensilla on F4-F6; clava 3-segmented, about as long as funicle, sensory area enlarged, extending about 0.5X along ventral surface of clava giving it a strongly obliquely truncate appearance; head width about equal to length of pedicel and flagellum combined; mesoscutum (Fig. 721) anteriorly with coarse lineolate sculpture, posteriorly with polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 725) about 2.6X as long as broad; parastigma slightly downcurved; costal cell dorsally naked or with a single apical seta, ventrally more or less with a complete line of setae; area below proximal part of parastigma with a line of about 8-10, paler setae that curves towards fore wing base; apices of postmarginal and stigmal veins connected by a naked, hyaline area that extends a little way into disc (Fig. 724); seta at apex of postmarginal vein about 0.8X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum (Fig. 721) with only about five setae adjacent to spiracle; syntergum hardly longer than mid tibia; ovipositor (Fig. 723) about 3.2X gonostylus or about 1.7X as long as mid tibia; gonostylus about 1.4X as long as mid tibial spur; exserted part of ovipositor about 0.5X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.37mm; excluding ovipositor, 1.29mm (CPD).

Head generally orange; occiput pale orange, slightly dusky near foramen; an oblique, brown stripe across temple towards torulus; frontovertex with a weak metallic blue sheen, stronger metallic green between posterior ocelli, purple immediately above scrobes; temple with a slight metallic blue and purple sheen; shining metallic green and purple between eye and scrobe; gena relatively dull green and brassy with some coppery and purple reflections; top of scrobes delimited by a slightly curved, metallic green band; frontovertex with inconspicuous pale brown setae along inner eye margins; a line of slightly more conspicuous, translucent, white setae below eye; interantennal prominence clothed with dense, conspicuous, silvery setae; maxillary palpus yellow; antenna (Fig. 722) with radicle orange-brown with a narrow brown apical ring; scape pale orange, apical one-third white, extreme apex brown, ventral margin dark brown, more broadly so proximally, upper margin pale brown proximally, a transverse brown band between apical white area and proximal pale orange area; pedicel very pale orange with a dark brown streak along inner surface; F1 brown, F2-F5 brown dorsally mixed yellow, distal segments more yellow, F6 yellow, clava dark brown; pronotum orange with weak brassy and coppery reflections, neck and area above coxa brown; prosternum pale orange, brown anterior to coxa; mesoscutum orange in anterior half with some very weak coppery and brassy reflections, clothed in relatively sparse golden brown and dark brown setae, posterior half and side brown with a moderately strong, dark blue sheen with some purple reflections, clothed in conspicuous, relatively dense silvery setae, posterior margin purple-brown with a purple sheen; tegula orange with apex orange-brown; axilla and scutellum orange, clothed with golden brown and brown setae, subapical tuft on scutellum black; metanotum orange-brown; mesopleuron orange with a weak brassy sheen, slightly dusky posteriorly with a weak purple and brassy sheen; mesosternum orange; fore coxa and proximal half of fore femur white, fore leg otherwise pale orange; mid coxa slightly dusky, very pale orange; mid femur white in proximal half, apex pale orange, tibia mostly pale orange, white at base and an incomplete, brown subbasal ring, spur and tarsus pale orange; hind coxa white; hind femur pale orange, slightly dusky along margins towards apex, tibia and tarsus pale orange; fore wing (Fig. 725) mostly infuscate, hyaline towards base, along anterior margin distad

of venation and at apex; submarginal vein pale orange, venation otherwise brown; propodeum orange medially, brown laterally with a dark metallic blue and purple sheen, side metallic blue, about 3 or 4 long, translucent, white setae in a line outside spiracle; gaster dark brown with a coppery sheen, Gt1 largely with a metallic blue and green sheen, side and venter largely with green and blue reflections, syntergum pale orange-brown; gonostylus pale orange.

Head (Fig. 720) about 5.3X as wide as frontovertex, in profile 1.5X as high as deep, anteriorly quite straight from top of scrobes to mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, not carinate; ocelli forming an angle of about 50°; frontovertex quite shiny, with shallow, polygonally reticulate sculpture of mesh size much smaller than diameter of facet; narrowest point between eye and scrobe about 1.5X diameter of anterior ocellus and completely smooth; temple quite smooth, but with shallow, irregular, elongate, reticulate sculpture; gena with slightly deeper more regular, polygonally reticulate sculpture; scrobes deep, ∩-shaped, meeting, sharply margined; interantennal prominence dorsally rounded and with shallow, polygonally reticulate sculpture; antenna as in Fig. 722; scape strongly broadened and flattened, about 1.8X as long as broad, broadest in middle; funicle segments subquadrate, larger and broader distad; linear sensilla present only on F4-F6; clava clearly broadened, about as long as funicle, sutures slightly oblique, sensory area enlarged, extending ventrally nearly half length of clava, apex appearing strongly obliquely truncate; eye reaching occipital margin, appearing naked, but clothed in sparse, inconspicuous, fine, very short setae, each much shorter than diameter of facet; inner eye margins subparallel, converging slightly anteriorly; malar sulcus absent; clypeal margin very slightly convex medially; mandible with three acute; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 63, HH 60, FV 12, POL 5.5, OOL 0, OCL 5, AOL 7, EL 41, EW 32, MS 30, SL 31.5, SW 18.

Thorax (Fig. 721) with pronotum short and hardly exposed behind head, about 0.6X as long as mesoscutum, pronotum with polygonally reticulate sculpture that is a little deeper than that on frontovertex; mesoscutum (Fig. 721) in anterior half with coarse lineolate sculpture, posterior half with polygonally reticulate sculpture of similar depth; axilla and scutellum with polygonally reticulate sculpture similar to that on pronotum, but perhaps slightly coarser, especially on scutellum where it is longitudinally elongate laterally; visible part of mesoscutum about 2.4X as broad as long; scutellum about as long as broad with a distinct subapical tuft, setae mostly about 0.4X as long as scutellum; mid tibia with a distinct external carina for about half its length; hind femur about 4.2X as long as broad; fore wing with venation and setation as in Figs 724, 725; costal cell with 2 or 3 setae dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 724); propodeum medially (Fig. 721) about 0.12X as long as scutellum and virtually smooth, setae on side conspicuous. Relative measurements: FWL 66, FWW 25; HWL 50, HWW 13.5.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium reaching about 0.4X to apex; syntergum about 0.9X as long as mid tibia, with apex acute; ovipositor (Fig. 723) slightly exserted, the exserted part about half as long as mid tibial spur or nearly 0.2X as long as mid tibia. Relative measurements: OL 55, GL 17 [MT 32.5].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Est. Altamira, Send. Los Gigantes, LS 321800 572100, 1460m, #62126, iii-iv.2001 (D. Rubí). Holotype in NHMUK.

COMMENTS. See comments under *simus* (p. 290).

***Cheiloneurus castalia* sp.nov.**
(Figs 726-730; Hab. ♀ 110)

DIAGNOSIS. *Female* (length about 1.3-1.7mm): body mostly orange with mesoscutum and gaster dark brown with a weak to moderate metallic sheen; antenna (Fig. 727) with scape white margined dark brown; pedicel and flagellum dark brown; mesoscutum with pale brown setae that may appear silvery; fore coxa white, mid and hind coxa white with some brown; legs mainly white to pale orange, tibiae brown proximally; fore wing (Fig. 730) mostly infuscate with a vaguely V-shaped hyaline area in basal cell, a small hyaline area at apex of venation and opposite on posterior wing margin, apex a little paler; head (Fig. 729) about 4X as wide as frontovertex, in facial view very slightly longer than broad, subcircular, genae converging, evenly curved towards mouth margin; frontovertex naked medially; eye separated from scrobe by about 1.3X diameter of anterior ocellus, area between eye and scrobe with deep, polygonally reticulate sculpture, scrobal margin sharp; interantennal prominence dorsally rounded with about 40 inconspicuous setae; mandible with one, lower acute tooth and a broad concave truncation; antenna (Fig. 727) with scape about 2.8X as long as broad; funicle with F1-F3 slightly longer than broad, remaining segments transverse; head width about 0.9X length of flagellum; linear sensilla on all funicle segments; clava 3-segmented, about as long as F4-F6 combined; sensory area large and forming an oblique truncation, extending about 0.3X along ventral margin; mesoscutum mostly with coarse, polygonally reticulate sculpture, that is more longitudinally elongate in anterior one-third and on side; scutellum with a distinct apical tuft of setae; wings fully developed; fore wing (Fig. 730) about 2.6-2.8X as long as broad; parastigma clearly curved downwards; costal cell dorsally with one or two setae at apex and a complete line of setae ventrally; area below proximal part of parastigma with a group of about 20 dark setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that extends a little way into disc (Fig. 726); apical bristle of postmarginal vein slightly more than 1.1X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with about 11 setae around each spiracle, side naked; syntergum about 0.8X as long as mid tibia; ovipositor (Fig. 728) about 4.7X gonostylus or 1.1X as long as mid tibia; gonostylus about 0.8X as long as mid tibial spur; ovipositor not exserted. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.66mm; excluding ovipositor, 1.64mm (CPD).

Head mostly orange, frontovertex with a weak brassy and purple sheen; temple and gena brown with a weak metallic blue-green and purple lustre; area between eye and torulus slightly dusky; interantennal prominence dorsally brown with a slight purple and blue sheen; frontovertex clothed with inconspicuous, pale brown setae; antenna (Fig. 727) with radicle pale orange; scape mostly white, ventral margin dark brown in proximal two-thirds, dorsal margin internally dark brown in its distal half; pedicel and flagellum dark brown; maxillary palpus dark brown; thorax mostly orange; neck of pronotum dark brown, posterior margin and sides orange; mesoscutum dark orange-brown with a purple sheen anteriorly and a mixed blue and purple sheen posteriorly, clothed with evenly distributed, translucent pale brown setae that appear slightly silvery in some lights, setae in anterior one-third more golden brown and less translucent; tegula with base orange and apex dark orange-brown with a slight purple sheen; axilla orange, with golden brown to brown setae; scutellum orange, anteriorly with pale brown setae, posterior setae and subapical tuft conspicuous and black; metanotum dark orange-brown with a very slight purple sheen; mesopleuron orange with a very weak brassy sheen; fore coxa white; fore femur virtually white, but pale orange ventrally and towards apex, ventral margin distally dark brown, fore tibia pale orange, externally dark brown, fore tarsus pale orange-brown; mid coxa ventrally brown, otherwise white to pale orange; mid femur white with a pale brown mark on dorsal margin subapically, tibia pale orange with a subbasal white ring and a dark brown streak dorsally in basal half, tarsus pale orange; hind coxa largely white but externally with proximal two-thirds dark brown; hind femur brown, hind tibia pale orange with a diffuse brown mark along dorsal margin proximally, hind tarsus pale orange; fore wing (Fig. 730) mostly infuscate, hyaline towards base; submarginal vein mostly pale yellow-brown, rest of venation pale brown; propodeum orange-brown with a weak purple lustre, slightly blue and green laterally, side with a weak metallic green, coppery and purple sheen; side of propodeum with a few inconspicuous translucent setae surrounding spiracle; gaster

orange-brown, dorsally mixed coppery, purple, green and brassy, Gt3-Gt6 medially dark brown, sides with a stronger green, blue, coppery and purple sheen; gonostylus very pale orange.

Head (Fig. 729) about 4X as wide as narrowest point of frontovertex, in profile about 1.9X as high as deep with interantennal prominence slightly protuberant below toruli, otherwise anteriorly fairly straight from top of scrobes to clypeus; occipital margin sharp, not carinate; occiput without a median groove above foramen; ocelli forming an angle of about 80°; frontovertex slightly shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh size clearly less than diameter of eye facet; interantennal prominence and mouth margin with similar sculpture to frontovertex; temple and posterior part of gena with moderately coarse, irregular sculpture that is slightly deeper than that on frontovertex; anterior part of gena below eye with conspicuous sculpture that is coarser and deeper than that on frontovertex; area between eye and scrobe with distinct, but irregular sculpture; scrobes deep, meeting dorsally, ∩-shaped, but relatively short, dorsally not longer than torulus, sharply margined laterally, but not dorsally; antenna as in Fig. 727; scape slightly broadened and flattened, broadest above middle, about 2.8X as long as broad; funicle with F1-F3 slightly longer than broad, remaining segments transverse, segments broadest distad; clava slightly broadened, about as long as F4-F6 combined, sutures oblique, sensory area enlarged, extending ventrally about one-third along clava, giving it a distinct, obliquely truncate appearance; eye very nearly reaching occipital margin, separated by much less than diameter of facet, appearing naked, but clothed with inconspicuous setae, each much shorter than diameter of facet; inner eye margins slightly diverging anteriorly; malar sulcus more or less present, but very inconspicuous; clypeal margin medially very slightly convexly rounded; mandible with 1 tooth and a broad, slightly concave truncation; apical segment of maxillary palpus slightly enlarged, about 2X as long as radicle. Relative measurements: HW 83.5, HH 87, FV 21.5, OD 6, POL 13.5, OOL 0, OCL 6.5, AOL 11.5, EL 54, EW 42, MS 39, SL 37, SW 13.

Thorax with irregular, polygonally reticulate sculpture on pronotum, about as deep as that on frontovertex in ocellar area but of slightly smaller mesh size; most of mesoscutum with slightly shallower, but similar polygonally reticulate sculpture to that on pronotum; axilla and scutellum with similar sculpture to that in ocellar area but a little deeper and coarser; visible part of mesoscutum about 1.9X as broad as long; scutellum about 1.25X as broad as long with a distinct subapical tuft, setae mostly about half as long as scutellum; hind femur about 4.2X as long as broad; fore wing with venation and setation as in Figs 726, 730; costal cell with 2 or 3 setae dorsally at its apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 726); propodeum with 10 to 12 setae surrounding spiracle, side with some distinct, shallow, polygonally reticulate sculpture, medially about 0.25X as long as scutellum and with some shallow, irregular, polygonally reticulate sculpture. Relative measurements: FWL 74.5, FWW 27; HWL 66, HWW 17.

Gaster with hypopygium reaching about one-third to apex; syntergum about 0.8X as long as mid tibia, with apex broadly rounded; ovipositor not exserted, or hardly so.

Paratype. Antenna with linear sensilla present only on F1-F6; gaster without "gland-like" structures on Gt1 or Gt5; ovipositor Fig. 728. Relative measurements: OL 42.5, GL 9 [MT 37].

Variation. Females vary in overall length from 1.29-1.66mm, otherwise very little in material available, although the mesoscutum may be slightly more strongly metallic than in the holotype and the exserted part of the ovipositor may be about one-third as long as mid tibial spur.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, S(an)ta Rosa NP, Hacienda 1-0, 18.i-8.ii.1986 (Janzen, Gauld). Paratypes: **COSTA RICA**, 16♀, **Guanacaste**, Santa Rosa NP, various localities and dates 17.vi.1985-25.iv.1987 (D. Janzen, I. Gauld); 3♀, Guanacaste, NW Volcan Orosi, Cerro El Hacha, 1986; 1♀,

Guanacaste, 12km SE La Cruz, Cerro El Hacha, LN 329200 238000, Malaise #7499 (GNP Biodiv. Inv.); 1♀, Guanacaste, Maritza (ACG) 700m, 20.i-24.ii.1996 (J.S. Noyes); 2♀, Guanacaste, PN Palo Verde, Sector Palo Verde, Campo Aterrizaje, LN 388400 259050, 10m, 10.i-9.ii.2001 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sector Catalina, Fila Catalina, LN 257400 400000, #62105, 13.iii-19.iv.2001 (I. Jiménez); 1♀, Guanacaste, BN Diría, Ret. Alr. Torre Control de Incendio, 600-700m, LN 238550 358650, #66659, xii.2001-i.2002 (I. Jiménez). Holotype in MZUCR, paratypes in NHMUK, MZUCR and USNM.

COMMENTS. *Cheiloneurus castalia* is relatively easy to recognise because of the combination of the continuous area of polygonally reticulate sculpture between the eye and scrobal margin and the large, strongly setose, triangular, infuscate area below the proximal part of the parastigma.

Cheiloneurus dipsas **sp.nov.**

(Figs 731-734; Hab. ♀ 111)

DIAGNOSIS. *Female* (length about 1.4-2.4mm): body generally dark brown with a weak to moderately metallic sheen, pronotum and scutellum with orange areas; antenna (Fig. 731) with scape white margined dark brown; pedicel and flagellum dark brown; posterior two-thirds or so of mesoscutum clothed with silvery setae; coxae dark brown; legs mostly dark brown, but with some orange or orange-brown areas; fore wing (Fig. 734) mostly infuscate with a V-shaped hyaline area proximal to linea calva, a small hyaline area at apex of venation and opposite on posterior wing margin, apex slightly paler; head about 3-4.2X as wide as frontovertex, in facial view slightly longer than broad, suboval, genae converging and evenly curved towards mouth margin; frontovertex naked medially below anterior ocellus but with 1 or 2 setae above scrobal area; eye separated from scrobe by about 0.7X diameter of ocellus, area between eye and scrobe completely smooth, scrobal margin carinate; interantennal prominence dorsally rounded with about 50 short inconspicuous setae; mandible with two short teeth and a truncation; antenna (Fig. 731) with scape about 3.4X as long as broad; funicle with F1-F4 longer than broad, F5-F6 subquadrate or transverse; head width slightly less than length of flagellum; linear sensilla on F3-F6; clava 3-segmented, nearly as long as F4-F6 combined; sensory area large and forming an oblique truncation, extending nearly 0.4X along ventral margin; mesoscutum with polygonally reticulate sculpture, a little coarser anteriorly and on sides where it is also conspicuously longitudinally elongate; scutellum with a distinct apical tuft of setae; wings fully developed; fore wing (Fig. 734) about 2.6-2.8X as long as broad; parastigma very distinctly curved downwards; costal cell dorsally with one or two setae at apex and ventrally with a single line of setae that is broadly interrupted above parastigma; area below proximal part of parastigma with only one or two setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that extends inconspicuously a little way into disc (Fig. 733); apical bristle of postmarginal vein about 0.6X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum with about 8 setae around each spiracle, side naked; syntergum about 0.8X as long as mid tibia; ovipositor (Fig. 732) about 4.0X gonostylus or 1.8X as long as mid tibia; gonostylus about 1.3X as long as mid tibial spur; exserted part of ovipositor about 0.5X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 2.00mm; excluding ovipositor, 1.89mm (CPD).

Head dark brown, mixed orange around toruli; frontovertex relatively dull, but with a slight purple and brassy sheen; interantennal prominence generally with a purple sheen, metallic green dorsally; antennal toruli connected ventrally by a very slender, metallic blue line, below this mouth margin coppery, laterally metallic green and brassy; temple metallic blue-green with some purple reflections; gena metallic green with some brassy and coppery reflections; area between eye and scrobe with a distinct, deep purple sheen; frontovertex with inconspicuous dark brown setae; antenna (Fig. 731) with radicle pale orange-brown, distally dark brown; scape white, with proximal two thirds of ventral margin dark brown, upper margin internally with distal half dark brown, proximally paler brown or orange-brown; pedicel and flagellum dark brown, virtually black; apical segment of maxillary palpus dark brown and conspicuous; thorax mostly dark brown; pronotum orange-brown, pale orange laterally, neck dark brown; mesoscutum virtually black with slight purple and blue reflections, clothed in posterior two-thirds, or so, with silvery

setae, these forming relatively dense concave lines laterally delimiting the posterior part of the mesoscutum, anterior and antero-lateral parts of mesoscutum clothed with golden brown setae; tegula dark brown, basally dark orange-brown; axilla dark brown, mixed orange-brown with some purple reflections; scutellum dusky orange in anterior half, remainder dark brown, extreme sides and apex orange, mixed dark brown, darker areas with a distinct purple and blue sheen, scutellum largely clothed in golden brown to black setae, subapical tuft conspicuous and black; metanotum dark brown with a slight purple sheen; mesopleuron brown, anteriorly with a slight brassy, green and purple sheen, posterior half with a distinct purple and brassy sheen; all coxae dark brown with a slight purple, brassy and green sheen; fore femur, tibia and tarsus dark brown, femur a little paler along dorsal margin; mid femur dark brown in proximal half, gradually becoming pale orange in distal half, dorsal margin dark brown, mid tibia narrowly dark brown basally with a narrow, white subbasal ring, remainder dark brown, gradually becoming orange-brown distally, spur dark brown, tarsus pale orange-brown; hind femur and tibia dark brown, femur with an external, subapical orange area, tarsus dark orange-brown; fore wing (Fig. 734) infuscate with a hyaline pattern, especially proximally; venation brown, submarginal vein mostly pale orange-brown; propodeum dark purple-brown with a slight brassy lustre, side near spiracle with a slight blue-green sheen, outside this shining metallic green; side of propodeum with only 4 or 5 inconspicuous silvery setae near spiracle; gaster dark purple-brown, mixed coppery, purple and brassy, sides and outer plate of ovipositor additionally with some metallic blue and green; gonostylus dark brown, extreme apex orange.

Head about 3.5X as wide as frontovertex, in profile anteriorly virtually straight below top of scrobes, about 2X as high as deep; occipital margin carinate, occiput without a median groove above foramen; ocelli forming an angle of about 85°; frontovertex slightly shiny, with fairly coarse, irregular, polygonally reticulate sculpture of mesh size generally a little less than diameter of eye facet, more transversely elongate above scrobes; scrobal area and mouth margin and gena with similar, coarse sculpture, interantennal prominence generally with shallower sculpture, dorsally quite smooth and shiny; temple with distinct, but shallow, longitudinally elongate sculpture; scrobes deep, meeting dorsally, dorsal margin clearly defined, but rounded and not carinate, lateral margins sharp and carinate, lateral carina reaching about level with top of torulus; antenna as in Fig. 731; scape hardly broadened and flattened, about 3.4X as long as broad; funicle with F1-F4 longer than broad, F5 subquadrate, F6 transverse, segments broadest distad; clava clearly broadened, very nearly as long as F4-F6 combined, sutures oblique, sensory area enlarged, extending ventrally about one-third along clava, giving it a distinct, obliquely truncate appearance; eye not reaching occipital margin, separated by about 1.5X than diameter of facet, appearing naked, clothed with extremely short, inconspicuous setae; inner eye margins slightly converging anteriorly; malar sulcus absent; mandible with 1 acute tooth and a broad truncation; apical segment of maxillary palpus relatively large and conspicuous, about 2X as long as radicle. Relative measurements: HW 90.5, HH 98.5, FV 26, OD 6, POL 17, OOL 2.5, OCL 9.5, AOL 13.5, EL 59, EW 44, MS 38, SL 39, SW 11.5.

Thorax with shallow, irregular, polygonally reticulate sculpture on pronotum, generally of mesh size less than diameter facet; sculpture on most of mesoscutum similar to that on frontovertex, but more regular and finer, sculpture shallower posteriorly; axillae with similar sculpture to anterior part of mesoscutum, that on scutellum similar but a little deeper, extreme apex and sides completely smooth and shiny; visible part of mesoscutum about 2X as broad as long; scutellum very slightly broader than long, with a very distinct subapical tuft, setae mostly about 0.8-0.9X as long as scutellum; hind femur about 3.9X as long as broad; fore wing with venation and setation as in Figs 733, 734; costal cell with 1 or 2 setae dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 734); propodeum with only a few setae anterior and lateral to spiracle, area posterior to spiracle and side naked, side of propodeum almost completely smooth and shiny, but anteriorly some shallow, distinct polygonally reticulate sculpture, medially about one quarter as long as scutellum and virtually completely smooth. Relative measurements: FWL 83, FWW 30; HWL 71, HWW 19.

Gaster with hypopygium reaching about one-third towards apex; syntergum a little more than three-quarters as long as mid tibia, with apex acute; ovipositor slightly exserted, the exserted part

a little less than half as long as mid tibial spur or about 0.15X as long as mid tibia.

Paratype. Antenna with linear sensilla present only on F3-F6; gaster without "gland-like" structures on Gt1 or Gt5; ovipositor Fig. 732. Relative measurements: OL 68.5, GL 17 [MT 39].

Variation. Females vary in overall length from 1.41-2.39mm, the mesopleuron may be pale orange-brown, the legs may be slightly more extensively marked with orange than in the holotype, the head may be only about 3X as wide as the frontovertex and the fore wing varies from about 2.6-2.8X as long as broad.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Some paratypes were reared from *Saissetia coffeae* (Walker) (Hemiptera: Coccidae) on coffee.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, Santo Domingo, INBio Parque, LN 217400 526250, #62082, 1100m, i-iii.2001 (R. Zuñiga). Paratypes**: COSTA RICA**, 1♀, **Heredia**, Estacion Biológica La Selva, 10°26'N 84°01'W, 75m, 1-2.iii.2007 (J.S. Noyes); 2♀, Heredia, Santo Domingo, ex *Saissetia coffeae*, viii.1993 (J. Perrer); 6♀, Heredia, Santo Domingo, ex *Saissetia hemisphaerica*, 22.viii.1993 (P. Hanson); 1♀, Heredia, Santo Domingo, 1100m, cafetal, 9.ix.1994 (M. Cerda, P. Hanson); 1♀, Heredia, Santo Domingo, INBio Parque, LN 217400 526250, 1100m, #62271. v.2001 (R. Zuñiga); 1♀, Heredia, Santo Domingo, INBio Parque, LN 526250 217400, 1100m, iii.2002 (J.A. Azofeifa, J.S. Noyes); 1♀, Heredia, San José, ex *Saissetia hemisphaerica*, 22.viii.1993 (M. Hivo). Holotype in MZUCR, paratypes in NHMUK, MZUCR.

COMMENTS. *Cheiloneurus dipsas* is superficially similar to *amadeus*, both species having a fairly similar arrangement of setae on the mesoscutum. In *dipsas* the top of the scrobes, area above and the mesoscutum are much less coarsely sculptured than in *amadeus*. In *dispas* the funicle segments are relatively longer with only F6 being slightly transverse whereas in *amadeus* F4 is slightly transverse and F5-F6 strongly transverse. Otherwise, the ovipositor of *dipsas* is about 1.8X as long as the mid tibia and 4X as long as the gonostylus, whereas in *amadeus* the ovipositor is about 1.1X as long as the mid tibia and nearly 6X as long as the gonostylus.

Cheiloneurus medusa sp.nov.

(Figs 735-741; Hab. ♀ 112)

DIAGNOSIS. *Female* (length about 1.3-1.5mm): body more or less completely dark brown with a weak to moderate metallic sheen; antenna ((Fig. 739) with scape mostly white with dorsal and ventral margins largely brown; pedicel and flagellum dark brown; mesoscutum generally with moderately dense silvery setae; coxae dark brown; legs otherwise mostly dark brown; fore wing (Fig. 737) mostly infuscate with a V-shaped hyaline area in basal cell, a small hyaline area at apex of venation which virtually continues across wing to opposite margin, two or three paler longitudinal streaks from apical margin connect with this paler transverse line; head (Fig. 735) about 3.6-4.0X as wide as frontovertex, in facial view clearly longer than broad, suboval, genae converging, slightly curved, but more strongly curved inwards near mouth; frontovertex naked medially between anterior ocellus and scrobes; eye separated from scrobe by about 1.3X diameter of anterior ocellus and with shallow, polygonally reticulate to longitudinally elongate imbricate-reticulate sculpture; scrobes deep, sharply margined, carinate below eye; interantennal prominence with about 35 inconspicuous setae and dorsally rounded and without a median ridge; mandible with one tooth and a broad truncation; antenna (Fig. 739) with scape about 4.2X as long as broad; F1-F3 slightly longer than broad, F4-F6 quadrate or transverse; linear sensilla on F3-F6; clava 3-segmented, slightly shorter than F4-F6 combined; sensory area enlarged, extending ventrally nearly 0.4X length of clava, apex obliquely truncate; head width about equal to flagellum length;

mesoscutum (Fig. 741) with fine, fairly uniform, polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 737) about 2.7-2.8X as long as broad; parastigma downcurved; costal cell dorsally naked, ventrally with a complete line of setae in proximal 0.7X, apex naked; area below proximal part of parastigma with a group of about 5-7 setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 738); apical bristle of postmarginal vein at least about 0.8X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with about 4 or 5 inconspicuous setae adjacent to spiracle, side naked; syntergum about 0.8X as long as mid tibia with apex broadly truncate; hypopygium Fig. 736; ovipositor (Fig. 740) about 5.6X gonostylus or about 1.2X as long as mid tibia; gonostylus about 0.6X as long mid tibial spur; ovipositor not exserted. *Male*: unknown.

Female (holotype): length 1.47mm (CPD).

Head dark brown; frontovertex and area between eye and scrobe with a weak brassy sheen and very weak coppery, purple and green reflections; temple with a relatively strong metallic green and blue-green sheen with some purple reflections, this metallic colouration continued behind eye almost to vertex; posterior part of gena similar to temple but less metallic and slightly brassy and coppery, anterior part relatively dull with coppery, purple, blue and green reflections; area outside torulus orange; scrobes shining metallic green, coppery dorsally; interantennal prominence dorsally purple, lower area mixed dark green and blue-green; a slender metallic purple, violet, blue and green line connecting lowest margins of toruli, below this mainly coppery with some blue and green reflections, especially near torulus; frontovertex clothed with inconspicuous, pale brown setae, these continued as a line below eye; gena and interantennal prominence with moderately dense, short, translucent setae; antenna (Fig. 739) with radicle brown to dark brown; scape mostly white to very pale, slightly dusky orange, ventral margin dark brown from base to widest part, dorsal margin dark brown, apex dark brown; pedicel and flagellum dark brown, almost black; maxillary palpus dark brown, proximal segments slightly paler brown; thorax dark brown, dorsally virtually black; pronotum, mesoscutum and axilla slightly shiny with a weak brassy sheen with some very weak blue and green reflections; mesoscutum clothed with evenly distributed, moderately dense setae, those in anterior one-third brown and inconspicuous, those in posterior two-thirds translucent, silvery and conspicuous; tegula dark brown with a slight brassy and purple sheen; axilla with dark brown setae; scutellum more or less completely matt, anteriorly clothed with golden brown setae, posterior setae and scutellar tuft black; mesopleuron with a weak, mixed brassy, blue, coppery and purple sheen; legs almost completely dark brown, mid tarsi pale orange-brown; fore wing (Fig. 737) mostly infuscate, largely hyaline towards base; submarginal vein slightly dusky pale orange, otherwise venation brown; propodeum dark brown, virtually black, medially with a weak purple and brassy sheen, area around spiracle metallic blue-green with some purple reflections, 7 or 8 dark brown setae outside spiracle; gaster dark brown, mostly with purple, brassy, coppery and green reflections, Gt1 medially metallic blue-green; visible part of gonostylus slightly dusky orange.

Head (Fig. 735) about 4X as wide as frontovertex, in profile about 1.8X as high as deep, frontovertex weakly and evenly curved to top of scrobes then angled towards mouth margin, virtually straight from top of scrobes to mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, weakly carinate; ocelli forming an angle of about 75°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture in ocellar area, anteriorly more imbricate-reticulate and slightly transversely elongate, mesh size much smaller than diameter of eye facet, sculpture slightly coarser and more transversely elongate immediately above scrobes; interantennal prominence with shallow, more regular polygonally reticulate sculpture; temple fairly smooth, with very shallow, irregular, longitudinally elongate sculpture, gena with slightly deeper, irregular, reticulate sculpture; area between eye and scrobe about 1.25X as wide as diameter of anterior ocellus and with shallow, polygonally reticulate to longitudinally elongate imbricate-reticulate sculpture; scrobes deep, meeting dorsally, sharply margined, carinate below eye, very broadly ∩-shaped, interantennal prominence dorsally broadly rounded, without a median ridge; antenna as in Fig. 739; scape broadened and flattened, broadest above middle, about 4.2X as long

as broad; F1-F3 very slightly longer than broad, F4-F6 quadrate or transverse, segments wider and larger distally so that F6 is largest and widest; clava slightly broadened, a little shorter than F4-F6 combined, sensory area slightly enlarged, extending nearly 0.4X along ventral surface, giving it an obliquely truncate appearance; eye not reaching occipital margin, separated by about diameter of facet, clothed with inconspicuous, short setae that are much shorter than diameter of facet; inner eye margins subparallel, narrowest point of frontovertex about midway between anterior ocellus and scrobes; malar sulcus absent; clypeal margin medially weakly concave; mandible with one acute tooth and a very broad, more or less straight, truncation; apical segment of maxillary palpus not enlarged, about 1.6X as long as radicle. Relative measurements: HW 104, HH 110, FV 26, POL 18.5, OOL 0.5, OCL 11, AOL 18, EL 74, EW 55, MS 45, SL 46, SW 11.

Thorax (Fig. 741) with pronotum hardly exposed behind head and about 0.6X as long as mesoscutum; pronotum and mesoscutum with similar, fairly regular, polygonally reticulate sculpture that is about as deep as that between posterior ocelli, but of slightly smaller mesh, mesoscutum uniformly shiny and with setae uniformly distributed; axilla with slightly deeper, coarser, polygonally reticulate sculpture than that on mesoscutum; scutellum with conspicuously deeper sculpture than that on mesoscutum, but of similar mesh size; visible part of mesoscutum about 2.2X as broad as long; scutellum about 1.2X as broad as long with a distinct subapical tuft, setae mostly about half as long as scutellum; hind femur about 3.7X as long as broad; fore wing with venation and setation as in Figs 737, 738; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 738); mid tibia without an external carina; propodeum medially about 0.23X as long as scutellum and smooth. Relative measurements: FWL 88, FWW 32; HWL 78, HWW 20.

Gaster with hypopygium reaching about 0.3X to apex; syntergum about 0.7X as long as mid tibia, with apex very weakly rounded, more or less broadly truncate; ovipositor not exserted.

Paratype. Funicle with linear sensilla present only on F3-F6; gaster without "gland-like" structures on Gt1 or Gt5; hypopygium Fig. 736; ovipositor Fig. 740. Relative measurements: OL 40.5, GL 7.25 [MT 33].

Variation. Females vary in overall length from 1.28-1.47mm, the head may be about 3.6X as wide as frontovertex, the fore wing varies from about 2.7-2.8X as long as broad, otherwise little in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, PN Corcovado, Est. Sirena, LS 507400 270400, 10m, #58053, 4.viii-10.ix.2000 (K. Caballero). Paratypes: **COSTA RICA**, 1♀, **Puntarenas**, Pen. Osa, Puerto Jimenez, 8°32'N 83°19'W, 10m, xi.1991 (P. Hanson); 1♀, Puntarenas, Pen. Osa, Puerto Jimenez, 8°32'N 83°21'W, 10m, x-xi.1991 (P. Hanson). Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. *Cheiloneurus medusa* is very similar to *amadeus* in general appearance, and especially in the colour pattern and setation of the fore wing. Other than the characters given in the key *medusa* differs from *amadeus* in having shallower, fairly uniform polygonally reticulate to imbricate-reticulate sculpture throughout whereas in *amadeus* the sculpture in the anterior half or so of the mesoscutum is relatively coarse lineolate-reticulate contrasting with the shallower, more regular polygonally reticulate to imbricate-reticulate sculpture in the posterior half. In *medusa* the scrobes are relatively less sharply margined than in *amadeus* and the sculpture above the scrobes is finer and shallower. The shape of the hypopygium also differs in that the posterior margin in *medusa* has a strong median invagination whereas in *amadeus* the posterior margin is quite uniformly convexly rounded.

See also comments under *grimus* (p. 304), *seius* (p. 309), *poeana* (p. 314) and *oshtan* (p. 316).

***Cheiloneurus amadeus* sp.nov.**
(Figs 742-747)

DIAGNOSIS. *Female* (length about 1.4mm): body more or less completely dark brown with a weak to moderate metallic sheen; antenna (Fig. 744) with scape mostly white with dorsal and ventral margins largely brown; pedicel and flagellum dark brown; mesoscutum with a narrow, transverse line of dense silvery setae subparallel to posterior margin of pronotum; coxae dark brown; legs otherwise mostly dark brown; fore wing (Fig. 746) mostly infuscate with a well-defined, V-shaped hyaline area in basal cell, a small hyaline area at apex of venation which virtually connects with a larger hyaline area opposite, two or three paler, virtually hyaline, longitudinal streaks from apical margin connect with this paler transverse line; head (Fig. 747) about 4.0X as wide as frontovertex, in facial view clearly longer than broad, suboval, genae converging, slightly curved, but more strongly curved inwards near mouth; frontovertex with a single seta medially between anterior ocellus and scrobes; eye separated from scrobe by slightly more than diameter of anterior ocellus, area between eye and scrobe with shallow, irregular, polygonally reticulate sculpture; scrobes deep, sharply margined, carinate below eye; interantennal prominence with about 35 inconspicuous setae and dorsally rounded and without a median ridge; mandible with one tooth and a broad truncation; antenna (Fig. 744) with scape about 4.3X as long as broad; F1-F3 slightly longer than broad, F4-F6 quadrate or transverse; linear sensilla on F3-F6; clava 3-segmented, slightly longer than F4-F6 combined; sensory area enlarged, extending ventrally nearly 0.5X length of clava, apex obliquely truncate; head width about equal to flagellum length; mesoscutum in anterior half with longitudinally elongate striate-reticulate sculpture which is delimited by a line of silvery setae, posterior half with fine, fairly uniform, polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 746) about 2.6X as long as broad; parastigma downcurved; costal cell dorsally naked, ventrally with a complete line of setae in proximal 0.7X, apex naked; area below proximal part of parastigma with a group of about 14-17 setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 743); apical bristle of postmarginal vein at least about 0.6X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with about seven inconspicuous setae adjacent to spiracle, side naked; syntergum about 0.8X as long as mid tibia with apex broadly truncate; ovipositor (Fig. 745) about 5.7X gonostylus or about 1.1X as long as mid tibia; gonostylus about 0.6X as long mid tibial spur; exserted part of ovipositor about 0.3X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.43mm; excluding ovipositor, 1.39mm (CPD).

Head dark brown; area between occipital margin and posterior ocellus with a moderately strong metallic purple, green and blue sheen; area between ocelli and frontovertex relatively dull with a weak brassy sheen with weak purple and green reflections, more purplish immediately above scrobes; temple with a relatively strong blue-green and purple sheen, the purple continued behind eye to vertex; anterior part of gena similar to temple without conspicuous purple areas, posterior part similar but conspicuously duller; area above base of mandible coppery; area between eye and scrobe metallic purple, coppery and green; scrobes shining metallic green and coppery; interantennal prominence margined by a very narrow coppery line dorsally, below this metallic green, a wide purple and brassy area between toruli, this delimited below by a narrow metallic purple, blue and brassy line connecting lower margins of toruli, below this purple, mouth margin coppery; frontovertex clothed with inconspicuous, pale brown setae, these continued as a line below eye; gena and interantennal prominence with moderately dense, short, translucent setae; antenna (Fig. 744) with radicle orange, dark brown on sides; scape mostly white to very pale, slightly dusky orange, ventral margin dark brown from base to widest part, dorsal margin dark brown, apex dark brown; pedicel and flagellum dark brown, almost black; maxillary palpus dark brown, proximal segments slightly paler brown; thorax dark brown, dorsally virtually black; pronotum and anterior half or so of mesoscutum more or less matt, but with a very slight silky sheen, posterior part of mesoscutum with a weak brassy lustre and distinct metallic, dark blue and purple reflections, anterior, part of mesoscutum with relatively sparse dark brown setae, this area delimited posteriorly by a narrow line of relatively dense silvery setae that runs subparallel

to posterior margin of pronotum, posterior part of mesoscutum with only a single, submedian pair of dark brown setae; tegula dark brown with a slight brassy and purple sheen; axilla with dark brown setae; scutellum more or less completely matt with dark brown setae, subapical tuft black; mesopleuron anteriorly with a weak, mixed brassy, blue and green sheen, posteriorly with a distinct coppery sheen; legs almost completely brown to dark brown, mid tarsi orange-brown; fore wing (Fig. 746) mostly infuscate, largely hyaline towards base; venation brown; propodeum dark brown, virtually black, medially with a weak purple and brassy sheen, area around spiracle with a metallic blue, green, brassy, coppery and purple sheen, 7 or 8 dark brown setae outside spiracle; gaster dark brown, mostly with purple, brassy, coppery and green reflections; visible part of gonostylus slightly dusky orange.

Head (Fig. 747) about 4X as wide as frontovertex, in profile about 2.0X as high as deep, frontovertex weakly and evenly curved to top of scrobes then slightly angled towards mouth margin and virtually straight from top of scrobes to mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, weakly carinate; ocelli forming an angle of about 75°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture in ocellar area, anteriorly almost imbricate-reticulate and a little transversely elongate, mesh size much smaller than diameter of eye facet, sculpture slightly coarser and more transversely elongate immediately above scrobes; interantennal prominence with moderately deep, quite coarse, regular polygonally reticulate sculpture; temple with very shallow, irregular, longitudinally elongate polygonally reticulate sculpture, posterior part of gena with similar sculpture, anterior part of gena with relatively deep, regular coarse, polygonally reticulate sculpture; area between eye and scrobe hardly wider than diameter of anterior ocellus and with shallow, irregular, polygonally reticulate sculpture; scrobes deep, meeting dorsally, sharply margined, carinate below eye, very broadly ∩-shaped, interantennal prominence dorsally broadly rounded, without a median ridge; antenna as in Fig. 744; scape broadened and flattened, broadest above middle, about 4.3X as long as broad; F1-F3 very slightly longer than broad, F4-F6 quadrate or transverse, segments wider and larger distally so that F6 is largest and widest, linear sensilla present only on F3-F4; clava slightly broadened, a little longer than F4-F6 combined, sensory area slightly enlarged, extending nearly 0.5X along ventral surface, giving it an obliquely truncate appearance; eye not reaching occipital margin, separated by about diameter of facet, clothed with inconspicuous, short setae that are much shorter than diameter of facet; inner eye margins subparallel, narrowest point of frontovertex about midway between anterior ocellus and scrobes; malar sulcus absent; clypeal margin medially weakly protuberant, but protuberant part slightly concave; mandible with one acute tooth and a very broad, hardly concave truncation; apical segment of maxillary palpus not enlarged, about 1.6X as long as radicle. Relative measurements: HW 97, HH 104, FV 25, POL 17.5, OOL 0.5, OCL 11.5, AOL 14.5, EL 61, EW 49, MS 43, SL 43, SW 10.

Thorax with pronotum hardly exposed behind head and about 0.6X as long as mesoscutum; pronotum matt with similar, fairly deep, coarse, regular, polygonally reticulate sculpture that is deeper and of smaller mesh than that between posterior ocelli; slightly more than anterior half of mesoscutum matt, clothed with numerous setae and with longitudinally elongate striate-reticulate sculpture which is delimited by a line of silvery setae, posterior part shiny, with only two setae and fine, relatively shallow, fairly uniform, polygonally reticulate to imbricate-reticulate sculpture; axilla and scutellum with polygonally reticulate sculpture that is conspicuously deeper and coarser than that on anterior part of mesoscutum; visible part of mesoscutum about 2.3X as broad as long; scutellum about 1.3X as broad as long with a distinct subapical tuft, setae mostly about half as long as scutellum; hind femur about 3.9X as long as broad; fore wing with venation and setation as in Figs 743, 746; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 743); mid tibia with a weak, external carina in proximal half; propodeum medially about 0.23X as long as scutellum and smooth. Relative measurements: FWL 81, FWW 31; HWL 76, HWW 19.

Gaster without “gland-like” structures on Gt1 or Gt5; hypopygium (Fig. 742) reaching about 0.3X to apex; syntergum about 0.8X as long as mid tibia, with apex very weakly rounded, more or less broadly; ovipositor (Fig. 745) hardly exserted, the exserted part about 0.3X as long as md tibial spur or 0.1X as long as mid tibia. Relative measurements: OL 109, GL 19 [MT 97].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, Puntarenas, Pen. Osa, Puerto Jimenez, 8°32'N 83°19'W, 10m, xi.1991 (P. Hanson). Holotype in NHMUK.

COMMENTS. See comments under *dipsas* (p. 297), *medusa* (p. 299), *grimus* (p. 304), *seius* (p. 309), *poeana* (p. 314) and *oshtan* (p. 316).

Cheiloneurus grimus sp.nov.

(Figs 748-754)

DIAGNOSIS. *Female* (length about 1.6mm): body almost completely dark brown with a weak to moderate metallic sheen; antenna (Fig. 749) with scape mostly white with dorsal and ventral margins largely brown; pedicel and flagellum dark brown; mesoscutum mostly with silvery setae; coxae dark brown; legs mostly dark brown; fore wing (Fig. 751) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation, a larger paler area opposite and at apex; head (Fig. 752) about 7.0X as wide as frontovertex, in facial view clearly longer than broad, subrectangular, genae slightly curved and converging, but more strongly curved inwards near mouth; frontovertex naked medially between anterior ocellus and scrobes; eye separated from scrobe by about diameter of anterior ocellus, area between eye and scrobe completely smooth and mirror shiny; scrobes deep, sharply margined, carinate below eye; interantennal prominence with about 45 inconspicuous setae and dorsally broadly rounded without a median ridge; mandible with one acute tooth and a broad truncation; antenna (Fig. 749) with scape about 4.5X as long as broad; F1-F3 longer than broad, F4-F6 quadrate or transverse; linear sensilla on F3-F6; clava 3-segmented, slightly shorter than F4-F6 combined; sensory area enlarged, extending ventrally nearly 0.35X length of clava, apex obliquely truncate; head width slightly more than flagellum length; mesoscutum (Fig. 754) mostly with regular, polygonally reticulate sculpture, anterolateral areas with slightly more longitudinally elongate polygonal sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 751) about 2.6X as long as broad; parastigma downcurved; costal cell dorsally with a single apical seta, ventrally with a line of setae in proximal 0.6X, apex naked; area below proximal part of parastigma with a group of about 13 setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 750); apical bristle of postmarginal vein about as long as marginal vein; mid tibial spur very slightly longer than basitarsus; propodeum (Fig. 754) with about four inconspicuous setae adjacent to spiracle, side naked; syntergum about 0.8X as long as mid tibia with apex narrowly rounded; ovipositor (Fig. 753) about 4.4X gonostylus or slightly more than 1.1X mid tibia; gonostylus about 0.7X as long mid tibial spur; exserted part of ovipositor about 0.1X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.57mm; excluding ovipositor, 1.53mm (CPD).

Head mainly dark brown, virtually black; a very small area outside torulus pale orange; frontovertex with occipital margin dark metallic blue, area between posterior ocelli and occipital margin weakly metallic green more or less bordered purple, a narrow metallic blue line between posterior ocelli, anterior to this relatively dull with weak brassy, blue and purple reflections, more strongly metallic immediately above scrobes; area between eye and scrobe strongly shining green, blue, brassy and coppery; temple with a relatively strong metallic green, blue-green and purple sheen, this continuing more weakly onto upper part of gena, lower part of gena brassy, green and coppery; scrobes and upper part of interantennal prominence metallic green and blue-green, lower part of interantennal prominence and mouth margin coppery mixed purple; no metallic line connecting toruli; frontovertex clothed with inconspicuous, pale brown setae, these continued

as a line below eye; gena and interantennal prominence with relatively dense, scattered, short, translucent setae; antenna (Fig. 749) with radicle mostly orange, apex dark brown; scape mostly white, ventral margin dark brown from base to about 0.75X along its length, dorsal margin and apex dark brown; pedicel and flagellum dark brown, almost black; maxillary palpus dark brown; thorax mostly dark brown; pronotum mixed orange-brown; mesoscutum black, mostly with distinct coppery and purple reflections and clothed with silvery setae, but a narrow anterior strip and wider anterolateral areas more or less matt, with weaker dark green and blue reflections and clothed with slightly less dense, dark brown setae; tegula dark orange-brown with a weak coppery sheen; axilla and scutellum dark orange mixed dark brown, with weak brassy and coppery reflections, axillae with dark brown setae, scutellum anteriorly with dark, golden brown setae, posterior setae and subapical tuft black; mesopleuron dark chestnut brown, anteriorly with a weak green, brassy, coppery and blue sheen, posteriorly with a coppery, purple and green sheen; legs more or less completely dark brown, mid tarsus orange, basitarsus orange-brown; fore wing (Fig. 751) mostly infuscate, largely hyaline towards base, submarginal vein orange-brown, otherwise venation brown; propodeum dark brown, medially with a metallic purple sheen, submedially and just medial to spiracle with a metallic blue, green and brassy sheen, side largely dark, metallic blue, 4 or 5 translucent, white setae outside spiracle; gaster dark brown, mostly with a coppery-purple and brassy sheen, Gt3-Gt5 laterally mixed metallic green; gonostylus pale orange.

Head (Fig. 752) about 7X as wide as frontovertex in profile about 1.9X as high as deep, frontovertex weakly and evenly curved to top of scrobes then slightly angled towards mouth margin and virtually straight from top of scrobes to mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 45°; frontovertex slightly shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh size smaller than diameter of eye facet, sculpture clearly coarser and of larger mesh immediately above scrobes, this area of coarser sculpture clearly defined laterally and with lower margin sharply angled and projecting slightly into scrobes; upper part of interantennal prominence narrowly smooth, but mostly with moderately deep, slightly coarse, regular polygonally reticulate to imbricate-reticulate sculpture; temple with shallow, irregular, longitudinally elongate polygonally reticulate sculpture, posterior part of gena with similar sculpture, anterior part of gena with regular, polygonally reticulate sculpture that is slightly deeper than that immediately below anterior ocellus; area between eye and scrobe slightly wider than diameter of anterior ocellus, completely smooth and mirror shiny; scrobes deep, meeting dorsally, sharply margined, carinate below eye, very broadly ∩-shaped, interantennal prominence dorsally broadly rounded, without a median ridge; antenna as in Fig. 749; scape broadened and flattened, broadest above middle, about 4.5X as long as broad; F1-F3 longer than broad, F4 quadrate, F5-F6 transverse, segments wider and larger distally so that F6 is largest and widest, linear sensilla present only on F3-F6; clava slightly broadened, a little shorter than F4-F6 combined, sensory area slightly enlarged, extending about 0.35X along ventral surface, giving it an obliquely truncate appearance; eye not quite reaching occipital margin, separated by about diameter of facet, appearing naked, but clothed with inconspicuous, very short setae that are much shorter than diameter of facet; inner eye margins subparallel, narrowest point of frontovertex about midway between anterior ocellus and top of scrobes; malar sulcus absent; clypeal margin medially virtually straight; mandible with one acute tooth and a broad, slightly concave truncation; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 98, HH 110, FV 14, POL 5, OOL 0, OCL 16, AOL 14, EL 72, EW 53, MS 50, SL 52, SW 11.5.

Thorax (Fig. 754) with pronotum hardly exposed behind head and about 0.6X as long as mesoscutum; pronotum slightly shiny with similar sculpture to that in ocellar area, but a little shallower; mesoscutum mostly with regular, polygonally reticulate sculpture that is similar to that in ocellar area, anterolateral areas with slightly more longitudinally elongate polygonal sculpture; axilla and scutellum with similar polygonally reticulate sculpture to that on most of mesoscutum; visible part of mesoscutum about 2.3X as broad as long; scutellum about 1.1X as broad as long, with a distinct subapical tuft, setae mostly about 0.7X as long as scutellum; hind femur about 4.6X as long as broad; fore wing with venation and setation as in Figs 750, 751; costal cell with a single seta dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 750); mid tibia with a distinct, external carina in proximal half; propodeum

(Fig. 754) medially about 0.19X as long as scutellum and smooth. Relative measurements: FWL 90, FWW 34; HWL 78, HWW 19.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium (Fig. 748) reaching about 0.4X to apex; syntergum about 0.8Xas long as mid tibia, with apex narrowly rounded; ovipositor (Fig. 753) hardly exserted, the exserted part about 0.13X as long as md tibial spur or much less than 0.1X as long as mid tibia. Relative measurements: OL 50.5, GL 11.5 [MT 44].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Est. Agujas, Sendero Trocho, LS 276750 526550, 310m, #65141, 17.ix-18.x.2001 (J. Azofeifa). Holotype in NHMUK.

COMMENTS. As the key suggests. *Cheiloneurus grimus* is generally quite similar to *medusa*, *amadeus*, *seius* and *herxius*. This species differs from the others in having the middle part of the carinate margin delimiting the top of the scrobes forming a strong, distinctly triangular area with the sculpture immediately above it on the frontovertex, whereas in the other species the carinate margin at the top of the scrobes is more or less straight and the sculpture above is not delimited as a triangular area. *Cheiloneurus grimus* also appears to lack a thin metallic line connecting the lower margins of the toruli as in the other species. Further to this *grimus* differs from *medusa* and *amadeus* in having the head about 7X as broad as the frontovertex and the ovipositor much less than 4.5X as long as the gonostylus whereas in *medusa* and *amadeus* the head as not more than about 4X as broad as the frontovertex and the ovipositor is at least 5X as long as the gonostylus. In *grimus* the scape is about 4.5X as long as broad and the syntergum 0.8X as long as the mid tibia whilst in *seius* the scape is not more than 4.1X as long as broad and the syntergum is about as long as the mid tibia. *Cheiloneurus grimus* lacks linear sensilla on F1 and F2 and the ovipositor is shorter than the mid tibia whereas *herxius* has linear sensilla on all funicle segments and the ovipositor is longer than the mid tibia.

See also comments under *poeana* (p. 314) and *oshtan* (p. 316).

***Cheiloneurus herxius* sp.nov.**

(Figs 755-759)

DIAGNOSIS. *Female* (length about 2mm): body almost completely dark brown with a weak to moderate metallic sheen; antenna (Fig. 757) with scape mostly white with dorsal and ventral margins largely brown; pedicel and flagellum dark brown; mesoscutum in posterior half with pale setae that may appear silvery; coxae dark brown; legs mostly dark brown, fore and mid legs partly pale orange; fore wing (Fig. 758) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation this connected by a paler line to a larger hyaline area opposite, apex with a subtriangular hyaline area; head (Fig. 756) about 6.0X as wide as frontovertex, in facial view clearly longer than broad, subrectangular, genae slightly curved and converging, but more strongly curved inwards near mouth; frontovertex naked medially between anterior ocellus and scrobes; eye separated from scrobe by about 1.5X diameter of anterior ocellus, area between eye and scrobe virtually completely smooth but with extremely shallow sculpture; scrobes deep, sharply margined, carinate below eye; interantennal prominence with about 50 inconspicuous setae and dorsally broadly rounded without a median ridge; mandible with one acute tooth and a broad truncation; antenna (Fig. 757) with scape about 4X as long as broad; F1-F5 longer than broad, F6 transverse; linear sensilla on F1-F6; clava 3-segmented, slightly shorter than F4-F6 combined; sensory area enlarged, extending ventrally about 0.4X length of clava, apex obliquely truncate; head width very slightly less than funicle length; mesoscutum (Fig. 755) mostly with regular,

polygonally reticulate sculpture, anterolateral areas with sculpture slightly more longitudinally elongate; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 759) about 2.9X as long as broad; parastigma slightly downcurved; costal cell dorsally with one or two apical setae, ventrally with a line of setae in proximal 0.7X, apex naked; area below proximal part of parastigma with a group of about four or five setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 759); apical bristle of postmarginal vein nearly 0.5X as long as marginal vein; mid tibial spur hardly longer than basitarsus; propodeum with about eight inconspicuous setae adjacent to spiracle, side naked; syntergum about 0.6X as long as mid tibia with apex broadly rounded, almost truncate; ovipositor about 4.1X gonostylus or slightly more than 0.9X mid tibia; gonostylus about 0.7X as long mid tibial spur; exserted part of ovipositor about 0.2X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 2.02mm; excluding ovipositor, 1.96mm (CPD).

Head mainly dark brown, virtually black; a very small area outside torulus, posterior part of gena and area above mandible pale orange; frontovertex with occipital margin faintly metallic blue laterally, area between posterior ocelli and occipital margin dull metallic green and purple; frontovertex below posterior ocelli dull purple and green with some blue-green, coppery and brassy reflections; slightly more strongly metallic coppery purple immediately above scrobes; area between eye and scrobe shining purple and green; temple with a relatively strong metallic green and blue-green sheen mixed with some purple, this continuing more weakly onto upper part of gena, lower part of gena relatively dull with a slight blue and coppery sheen; scrobes very shiny, metallic green mixed with some coppery; upper part of interantennal prominence with a strong green sheen, below this purple, green laterally towards toruli, a narrow dark blue line more or less connects lower margins of toruli, below this a mixed coppery, purple and green sheen to mouth margin; frontovertex clothed with inconspicuous, pale brown setae, these continued as a line below eye; gena and interantennal prominence with relatively dense, scattered, short, translucent setae; antenna (Fig. 757) with radicle mostly orange, sides dark brown; scape mostly white, ventral margin dark brown from base to about 0.75X along its length, inner surface more extensively dark brown, dorsal margin and apex dark brown; pedicel and flagellum dark brown, almost black; maxillary palpus dark brown, proximal segments slightly paler; thorax mostly dark brown; pronotum dark brown with sides orange; propleuron orange-brown; prosternum brown; mesoscutum black with very weak blue, green and coppery reflections, clothed anteriorly with brown setae, posterior half or so with paler, translucent setae that appear silvery in some lights; tegula dark brown with weak coppery and brassy reflections; axilla dark orange-brown, bordered dark brown, clothed with dark brown setae; scutellum matt black, anteriorly with golden brown setae, posterior setae and subapical tuft black; mesopleuron dark chestnut brown, anteriorly with a weak green, brassy, coppery and blue sheen, posteriorly with a coppery, purple and green sheen; fore coxa dark brown; fore femur dark brown, with an inconspicuous orange-brown streak externally, tibia dark brown, apically orange, tarsus brown; mid coxa dark brown; mid femur dark brown, extreme apex orange ventrally, tibia orange with a subbasal white band, extreme base dark brown and a dark brown, external streak for most of its length, spur orange with apex dark brown, tarsus orange; hind coxa mostly orange, ventrally dark brown; hind femur dark brown with a small, subapical, orange area, tibia dark brown, apex orange, tarsus brown; fore wing (Fig. 758) mostly infuscate, largely hyaline towards base, venation brown; propodeum dark brown, medially with a metallic purple sheen, area around spiracle metallic blue-green and green mixed with some purple, about 5 translucent, setae outside spiracle; gaster dark brown, mostly with a coppery-purple and brassy sheen, Gt3-Gt5 laterally with distinct coppery and green reflections; visible part of gonostylus very pale orange.

Head (Fig. 756) subrectangular in facial view, about 6X as wide as frontovertex, in profile about 1.9X as high as deep, frontovertex slightly angled level with posterior ocelli, then weakly and evenly curved to top of scrobes, slightly angled towards mouth margin and virtually straight from top of scrobes to mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 55°; frontovertex slightly shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh size smaller than diameter of eye facet, sculpture immediately above scrobes clearly coarser and transversely strigose, this area

bordered laterally by an almost completely smooth, area with extremely shallow, polygonally reticulate sculpture, and broadly below by dorsal margin of scrobes; scrobes virtually completely smooth, but dorsally with some very shallow, irregular ridges; upper part of interantennal prominence narrowly smooth, but mostly with moderately slightly coarse, regular polygonally reticulate to imbricate-reticulate sculpture; temple with shallow, irregular, longitudinally elongate polygonally reticulate sculpture, posterior part of gena with similar sculpture, anterior part of gena with regular, polygonally reticulate sculpture that is conspicuously deeper than that immediately below anterior ocellus; area between eye and scrobe about 1.5X as wide as diameter of anterior ocellus, almost completely smooth but with some extremely shallow polygonally reticulate sculpture; scrobes deep, meeting dorsally, sharply margined, carinate below eye, very broadly ∩-shaped, interantennal prominence dorsally broadly rounded, without a median ridge; antenna as in Fig.757; scape broadened and flattened, broadest above middle, about 4X as long as broad; F1-F5 longer than broad, F6 hardly transverse, segments wider and larger distally so that F6 is largest and widest, linear sensilla present only on F1-F6; clava slightly broadened, slightly shorter than F4-F6 combined, sensory area slightly enlarged, extending about 0.4X along ventral surface, giving it an obliquely truncate appearance; eye not quite reaching occipital margin, separated by about 1.5X diameter of facet, clothed with inconspicuous, very short setae that are much shorter than diameter of facet; inner eye margins subparallel, narrowest point of frontovertex about midway between anterior ocellus and top of scrobes; malar sulcus absent, but clearly indicated by a change in sculpture; clypeal margin medially very slightly convex; mandible with one acute tooth and a broad, slightly concave truncation; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 112, HH 130, FV 18.5, POL 10, OOL 0, OCL 12.5, AOL 13.5, EL 82, EW 63, MS 59, SL 64, SW 16.

Thorax (Fig. 755) with pronotum hardly exposed behind head and about 0.6X as long as mesoscutum; pronotum slightly shiny with similar sculpture to that in ocellar area; mesoscutum mostly with regular, polygonally reticulate sculpture that is similar to that in ocellar area, anterolateral areas with finer, slightly narrower but more longitudinally elongate polygonal sculpture; axilla and scutellum with polygonally reticulate sculpture that is deeper than that on mesoscutum; visible part of mesoscutum about 1.7X as broad as long; scutellum about 1.2X as broad as long, with a distinct subapical tuft, setae mostly about 0.6X as long as scutellum; hind femur about 4.9X as long as broad; fore wing with venation and setation as in Figs 758, 759; costal cell with 2 or 3 setae dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 759); mid tibia with an indistinct, external carina in proximal one-third; propodeum (Fig. 755) medially about 0.26X as long as scutellum and smooth. Relative measurements: FWL 113.5, FWW 39; HWL 102, HWW 23.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium reaching about 0.4X to apex; syntergum about 0.6X as long as mid tibia, with apex weakly rounded, virtually broadly truncate; ovipositor hardly exserted, the exserted part about 0.2X as long as mid tibial spur or a little less than 0.1X as long as mid tibia. Relative measurements: OL 60, GL 14.5 [MT 64]

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, RB La Selva, 10°26'N 84°01'W, xii.1999 (ALAS - INBio/OET). Holotype in NHMUK.

COMMENTS. *Cheiloneurus herxius* is probably closest to *moloch*, both species having the length of the pedicel and funicle combined greater than the head width and the apical part of the fore wing distad of venation less than 0.4X overall wing length. In *herxius* OCL is less than AOL and linear sensilla are on all funicle segments whereas on *moloch* OCL is greater than AOL and linear

sensilla are absent from F1. Apart from the characters given in the key, *herxius* differs from *oshtan* and *poeana* in having linea sensilla on all segments and the pedicel and funicle combined longer than head width whereas in *poeana* and *oshtan* lack linear sensilla on at least F1 and the length of the pedicel and funicle combined is shorter than the head width.

The head shape of *Cheiloneurus herxius* is very similar to that of some specimens of *lydia*. The two species are separated in the key by the colour of the hind coxa which is brown in *herxius* and yellow or pale orange in *lydia*. They can also be separated on much longer funicle segments and smaller clava in *herxius*. In *herxius* F1-F5 are clearly longer than broad and the clava is shorter than F4-F6 combined, whereas in lydia at most only F1-F3 are longer than broad (sometimes transverse) and the clava is at least about as long as F3-F6 combined.

See also comments under *grimus* (p. 304).

Cheiloneurus seius **sp.nov.**

(Figs 760-766; Hab. ♀ 113)

DIAGNOSIS. *Female* (length about 1.5-1.7mm): body almost completely dark brown with a weak to moderate metallic sheen; antenna (Fig,. 761) with scape mostly white with dorsal and ventral margins largely brown; pedicel and flagellum dark brown; posterior half of mesoscutum with silvery setae; coxae dark brown; legs mostly dark brown; fore wing (Fig. 766) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation, another similar-sized paler area opposite and pale area at apex; head (Fig. 760) about 5.2-5.5X as wide as frontovertex, in facial view clearly longer than broad, subrectangular, genae slightly curved and converging, but strongly curved inwards near mouth; frontovertex naked medially between anterior ocellus and scrobes; eye separated from scrobe by about diameter of anterior ocellus, area between eye and scrobe completely smooth; scrobes deep, sharply margined, carinate below eye; interantennal prominence with about 40 inconspicuous setae and dorsally rounded and without a median ridge; mandible with one acute tooth and a truncation; antenna (Fig. 761) with scape about 3.8-4.1X as long as broad; F1-F3 longer than broad, F4-F6 quadrate or transverse; linear sensilla on F3-F6, sometimes absent from F3; clava 3-segmented, slightly shorter than F4-F6 combined; sensory area enlarged, extending ventrally nearly 0.3X length of clava, apex obliquely truncate; head width slightly less than flagellum length; mesoscutum (Fig. 765) anteriorly with fine, longitudinally elongate, striate to striate-reticulate sculpture, posteriorly with shallower, polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 766) about 2.7X as long as broad; parastigma downcurved; costal cell dorsally with one or two apical setae, ventrally with a line of setae that is narrowly interrupted above parastigma; area below proximal part of parastigma with a group of about 13 setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that hardly continues into disc (Fig. 762); apical bristle of postmarginal vein about as long as marginal vein; mid tibial spur longer than basitarsus; propodeum (Fig. 765) with about five inconspicuous setae adjacent to spiracle, side naked; syntergum very nearly as long as mid tibia with apex virtually rounded; ovipositor (Fig. 763) about 5.2X gonostylus or about 1.4X mid tibia; gonostylus about 0.7X as long mid tibial spur; exserted part of ovipositor about 0.3X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.53mm; excluding ovipositor, 1.50mm (CPD).

Head mainly dark brown, virtually black; small area outside torulus and lower occiput pale orange; frontovertex with occipital margin partly dark metallic blue, purple to posterior ocelli, anterior to this with a slight blue-green, brassy and purple sheen, more strongly metallic immediately above scrobes; area between eye and scrobe coppery brassy, purple and green; temple with a relatively strong metallic green, blue-green and purple sheen, this continuing more weakly onto upper part of gena, lower part of gena brassy, green and coppery; upper part of scrobes metallic green, upper part of interantennal prominence metallic green and blue-green, below this coppery from about half-way down toruli to mouth margin but for a narrow, metallic, dark blue line connecting lower parts of toruli; frontovertex clothed with inconspicuous, pale brown setae, these continued as a line below eye; gena and interantennal prominence with relatively dense, scattered, short, translucent setae; antenna (Fig. 761) with radicle mostly dark brown, but pale

orange proximally; scape mostly white, ventral margin dark brown from base to about 0.75X along its length, dorsal margin and apex dark brown; pedicel and flagellum dark brown, almost black; maxillary palpus pale brown, apical segment dark brown; thorax mostly dark brown; sides of pronotum orange; mesoscutum black, anterior half virtually matt, posterior half with a weak brassy sheen with weak blue and coppery reflections, anterior part clothed with dark brown setae, posterior part clothed with silvery setae, these more dense towards sides and near posterior margin; tegula dark brown with a weak coppery sheen; axilla and scutellum dark orange-brown mixed dark brown, with weak brassy reflections, axillae with dark brown setae, scutellum anteriorly with dark, golden brown setae, posterior setae and subapical tuft black; mesopleuron dark chestnut brown, anteriorly with a weak brassy, coppery and blue sheen, posteriorly with a relatively strong coppery, purple and green sheen; legs more or less completely dark brown, mid tarsus orange; fore wing (Fig. 766) mostly infuscate, largely hyaline towards base, submarginal vein orange-brown, otherwise venation brown; propodeum dark brown, with a weak metallic purple sheen, mixed metallic blue-green outside spiracle, 6 or 7 translucent, white setae outside spiracle; gaster dark brown, mostly with a coppery-purple sheen, Gt3-Gt5 laterally mixed metallic green; gonostylus orange.

Head (Fig. 760) about 5.5X as wide as frontovertex, in profile about 1.9X as high as deep, frontovertex weakly and evenly curved to top of scrobes then slightly angled towards mouth margin and virtually straight from top of scrobes to mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 50°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh size smaller than diameter of eye facet, sculpture slightly coarser and more transversely elongate immediately above scrobes, this area of coarser sculpture clearly defined laterally and with a broadly truncate lower margin that is about as wide as narrowest part of frontovertex, and not projecting into scrobes; upper part of interantennal prominence narrowly smooth, but mostly with moderately deep, slightly coarse, regular polygonally reticulate to imbricate-reticulate sculpture; temple with shallow, irregular, longitudinally elongate polygonally reticulate sculpture, posterior part of gena with similar sculpture, anterior part of gena with regular, polygonally reticulate sculpture that is about as deep as that immediately above scrobes; area between eye and scrobe about as wide as diameter of anterior ocellus and smooth; scrobes deep, meeting dorsally, sharply margined, carinate below eye, very broadly ∩-shaped, interantennal prominence dorsally broadly rounded, without a median ridge; antenna as in Fig. 761; scape broadened and flattened, broadest above middle, about 3.8X (3.8) as long as broad; F1-F3 longer than broad, F4 quadrate, F5-F6 transverse, segments wider and larger distally so that F6 is largest and widest, linear sensilla present only on F4-F6; clava slightly broadened, a little shorter than F4-F6 combined, sensory area slightly enlarged, extending about 0.3X along ventral surface, giving it an obliquely truncate appearance; eye not quite reaching occipital margin, separated by a little less than diameter of facet, appearing naked, but clothed with inconspicuous setae that are much shorter than diameter of facet; inner eye margins subparallel, narrowest point of frontovertex a little in front of anterior ocellus; malar sulcus absent; clypeal margin medially weakly concave; mandible with one acute tooth and a broad, slightly concave truncation; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 116, HH 119, FV 21, POL 10, OOL 0, OCL 12, AOL 17, EL 80, EW 57, MS 46, SL 48, SW 12.5.

Thorax (Fig. 765) with pronotum hardly exposed behind head and about 0.6X as long as mesoscutum; pronotum slightly shiny with similar sculpture to that in ocellar area; mesoscutum in anterior half matt, with fine, longitudinally elongate, striate to striate-reticulate sculpture that is slightly finer than that in ocellar area, posterior half relatively shiny with shallower, polygonally reticulate sculpture; axilla and scutellum with deeper, coarser, polygonally reticulate sculpture, side of scutellum with slightly longitudinally elongate sculpture; visible part of mesoscutum about 2.1X as broad as long; scutellum about 1.2X as broad as long, with a distinct subapical tuft, setae mostly about 0.6X as long as scutellum; hind femur about 4.1X as long as broad; fore wing with venation and setation as in Figs 764, 766; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 762); mid tibia with a weak, external carina in proximal half; propodeum (Fig. 765) medially about 0.19X as long as scutellum and smooth. Relative measurements: FWL 83.5, FWW 30.5; HWL 76, HWW 19.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium (Fig. 764) reaching about 0.4X to apex; syntergum about as long as mid tibia, with apex weakly angular, virtually rounded; ovipositor (Fig. 763) slightly exserted, the exserted part about 0.25X as long as md tibial spur or a little less than 0.1X as long as mid tibia. Relative measurements: OL 52, GL 10 [MT 38].

Variation. Females vary in overall length from about 1.5-1.7mm, the head varies from about 5.2-5.5X as wide as frontovertex, the scape varies from about 3.8-4.1X as long as wide, F3 may be without linear sensilla, otherwise little variation noted on material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Pen Osa, 5km N Puerto Jimenez, 8°33'N 83°21'W, 10m, i-ii.1991 (P. Hanson, C. Godoy). Paratypes: **COSTA RICA**, 1♀, **Puntarenas**, PN Corcovado, Los Patos, 8°33'N 83°30'W, 200m, ii.2000 (J.S. Noyes, J.A. Azofeifa); 1♀, Puntarenas, Golfito, Puerto Jimenez, Bosque del Cabo, LS 259300 540900, #72911, 30.i.2003 (J. Azofeifa). Holotype in NHMUK, paratypes in MZUCR and NHMUK.

COMMENTS. *Cheiloneurus seius* is generally similar in habitus and colouration to both *amadeus* and *medusa*. It differs from these species in lacking the infuscate area below the proximal part of the parastigma, the head being at least 5X as wide as the frontovertex the ovipositor being less than 5.4X as long as the gonostylus and the mid tibia being less than 0.75X as long as the ovipositor. In *amadeus* and *medusa* there is a distinct triangular infuscate area below the parastigma, the head is less than 4.5X as wide as the frontovertex, the ovipositor is more than 5.5X as long as a gonostylus and the mid tibia is more than 0.8X as long as the ovipositor. It further differs from *amadeus* in having the posterior margin of the hypopygium strongly invaginate whilst in *amadeus* the posterior margin of the hypopygium is quite evenly rounded. Finally, it differs from *medusa* in having striate-reticulate sculpture on the anterior part and sides of the mesoscutum whereas in *medusa* the mesoscutum has fairly uniform imbricate-reticulate to polygonally reticulate sculpture.

See also comments under *grimus* (p. 304), *poeana* (p. 314) and *oshtan* (p. 316).

Cheiloneurus moloch **sp.nov.**

(Figs 767-771)

DIAGNOSIS. *Female* (length about 1.6mm): body more or less completely dark brown with a weak to moderate metallic sheen; antenna (Fig. 768) with scape mostly white with dorsal and ventral margins largely brown; pedicel and flagellum dark brown; mesoscutum without silvery setae; coxae dark brown; legs otherwise mostly dark brown; fore wing (Fig. 770) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation which virtually connects with a larger hyaline area opposite, two or three paler, virtually hyaline, longitudinal streaks from apical margin connect with this paler transverse line, apex with a narrow hyaline area; head about 5.5X as wide as frontovertex, in facial view clearly longer than broad, subrectangular, genae slightly converging, straight, but strongly curved inwards near mouth; frontovertex naked medially between anterior ocellus and scrobes; eye separated from scrobe by about diameter of anterior ocellus, area between eye and scrobe completely smooth and shiny; scrobes deep, sharply margined, carinate below eye; interantennal prominence with about 35 inconspicuous setae and dorsally rounded and without a median ridge; mandible with one tooth and a broad truncation; antenna (Fig. 768) with scape about 3.9X as long as broad; F1-F5 slightly longer than broad, F6 transverse; linear sensilla on F2-F6; clava 3-segmented, slightly shorter than F4-F6 combined; sensory area enlarged, extending ventrally nearly 0.4X length of clava, apex obliquely truncate; head width about equal to flagellum length; mesoscutum mostly with uniform, fine, polygonally reticulate sculpture, laterally becoming more longitudinally elongate; scutellum with

a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 770) about 2.9X as long as broad; parastigma downcurved; costal cell dorsally with one or two apical setae, ventrally with a complete line of setae in proximal 0.8X, apex naked; area below proximal part of parastigma with a group of about 6-8 setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 771); apical bristle of postmarginal vein a little less than 0.5X as long as marginal vein; mid tibial spur hardly longer than basitarsus; propodeum with about seven inconspicuous setae adjacent to spiracle, side naked; syntergum about 0.7X as long as mid tibia with apex broadly truncate; ovipositor about 4.3X gonostylus or hardly longer than mid tibia; gonostylus slightly longer than 0.6X as long mid tibial spur; exserted part of ovipositor about 0.1X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.62mm; excluding ovipositor, 1.60mm (CPD).

Head dark brown; frontovertex generally with a weak blue-green and purple sheen, more strongly metallic green between eye and occipital margin, area above scrobes more purplish; area between eye and scrobe purple and dark blue; temple and upper part of gena more strongly metallic green, blue-green and purple; lower gena orange-brown and relatively dull purple and blue-green; top of scrobes and dorsal part of interantennal prominence metallic green; lower part of interantennal prominence with a dull purple sheen, lower margins of toruli connected by a narrow metallic purple, blue and brassy line, below this purple, mouth margin coppery; area immediately outside torulus orange; frontovertex clothed with inconspicuous, pale brown setae, these continued as a line below eye; gena with a few short, translucent setae; and interantennal prominence with relatively dense, short, translucent setae; antenna (Fig. 768) with radicle orange, dark brown on sides; scape mostly white, ventral margin dark brown from base to widest part, dorsal margin dark brown, widest towards apex with apex dark brown; pedicel and flagellum dark brown, almost black; maxillary palpus dark brown, proximal segments slightly paler brown; thorax mainly dark brown, dorsally virtually black; pronotum with a weak brassy sheen and coppery reflections, side orange; mesoscutum with a weak blue sheen and slight coppery reflections, clothed with evenly distributed dark brown setae; tegula dark brown with a weak purple sheen; axilla pale orange-brown clothed with dark brown setae; scutellum more or less matt, but with weak metallic reflections, extreme apex smooth and shiny with a weak coppery and blue-green sheen; mesopleuron chestnut brown with a weak blue, purple and coppery sheen; legs almost completely brown to dark brown, apex of mid tibia and mid tarsi pale orange; fore wing (Fig. 770) mostly infuscate, largely hyaline towards base, submarginal vein pale orange-brown, venation otherwise brown; propodeum dark brown, virtually black, medially with a weak purple sheen, area around spiracle metallic green and blue-green, 6 or 7 dark brown setae outside spiracle; gaster dark brown, mostly with purple, brassy, coppery and green reflections; visible part of gonostylus pale orange.

Head about 5.5X as wide as frontovertex, in profile about 1.9X as high as deep, frontovertex weakly and evenly curved to top of scrobes then slightly angled towards mouth margin and virtually straight from top of scrobes to mouth margin, interantennal prominence bulging conspicuously; occipital margin sharp, weakly carinate; ocelli forming an angle of about 60°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh size much smaller than diameter of eye facet, sculpture slightly coarser and more transversely elongate immediately above scrobes; interantennal prominence with moderately deep, regular polygonally reticulate sculpture; temple with very shallow, irregular, longitudinally elongate polygonally reticulate sculpture, posterior part of gena with similar sculpture, anterior part of gena with regular, polygonally reticulate sculpture; area between eye and scrobe about as wide as diameter of anterior ocellus and completely smooth and shiny; scrobes deep, meeting dorsally, sharply margined, carinate below eye, very broadly ∩-shaped, interantennal prominence dorsally broadly rounded, without a median ridge; antenna as in Fig. 768; scape broadened and flattened, broadest above middle, about 3.9X as long as broad; F1-F5 longer than broad, F5 subquadrate, F6 transverse, segments wider and larger distally so that F6 is largest and widest, linear sensilla present only on F2-F6; clava slightly broadened, a little shorter than F4-F6 combined, sensory area slightly enlarged, extending about 0.4X along ventral surface, giving it an obliquely truncate appearance; eye not reaching occipital margin, separated by about 1.5X diameter of facet, clothed with inconspicuous,

short setae that are much shorter than diameter of facet; inner eye margins subparallel, narrowest point of frontovertex about midway between anterior ocellus and scrobes; malar sulcus present, but very weak; clypeal margin medially weakly protuberant, but protuberant part slightly concave; mandible with one acute tooth and a very broad, slightly concave truncation; apical segment of maxillary palpus not enlarged, about 1.6X as long as radicle. Relative measurements: HW 91, HH 106.5, FV 16.5, POL 9, OOL 0.5, OCL 15, AOL 12, EL 63, EW 49, MS 45, SL 49, SW 12.5.

Thorax with pronotum hardly exposed behind head and about 0.4X as long as mesoscutum; pronotum slightly shiny with similar sculpture to that between ocelli, but slightly shallower and of slightly smaller mesh; mesoscutum similar to pronotum, mostly with fairly regular, polygonally reticulate sculpture, but this a little longitudinally elongate laterally; axilla and scutellum with polygonally reticulate sculpture that is conspicuously deeper and coarser than sculpture on mesoscutum, sculpture on scutellum laterally quite strongly longitudinally elongate; visible part of mesoscutum about 1.6X as broad as long; scutellum about 1.2X as broad as long with a distinct subapical tuft, setae mostly about 0.75X as long as scutellum; hind femur about 4.9X as long as broad; fore wing with venation and setation as in Figs 770, 771; costal cell dorsally with 3 setae at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 771); mid tibia with a weak, external carina in proximal half; propodeum medially about 0.23X as long as scutellum and smooth. Relative measurements: FWL 97.2, FWW 34; HWL 84, HWW 20.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium (Fig. 769) reaching about 0.4X to apex; syntergum about 0.8X as long as mid tibia, with apex weakly angular, more or less broadly truncate; ovipositor (Fig. 767) hardly exserted, the exserted part about 0.1X as long as md tibial spur or less than 0.1X as long as mid tibia. Relative measurements: OL 50, GL 11.5 [MT 48.5].

Variation. Only holotype examined,

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, RF Golfo Dulce, 3km SW Rincon, 10m, x-xii.1990 (P. Hanson). Holotype in NHMUK.

COMMENTS. See comments under *herxius* (p. 306).

Cheiloneurus poeana sp.nov.

(Figs 772-777; Hab. ♀ 114)

DIAGNOSIS. *Female* (length about 1.4-1.8mm): body almost completely dark brown with a weak to moderate metallic sheen; antenna (Fig. 772) with scape mostly white with dorsal and ventral margins largely brown; pedicel and flagellum dark brown; mesoscutum mostly with silvery setae; fore coxa white, mid and hind coxae dark brown; legs dark orange-brown to dark brown, fore and mid legs paler; fore wing (Fig. 775) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation this connected by a paler line to a larger hyaline area opposite, apex with a narrow subtriangular hyaline area; head (Fig. 774) about 4.5-5.3X as wide as frontovertex, in facial view clearly longer than broad, suboval, genae slightly curved and converging, slightly more curved inwards near mouth; frontovertex naked medially between anterior ocellus and scrobes; eye separated from scrobe by about diameter of anterior ocellus, area between eye and scrobe completely smooth and shiny, occasionally with very shallow sculpture; scrobes deep, sharply margined, carinate below eye; interantennal prominence with about 50 fairly conspicuous setae and dorsally broadly rounded without a median ridge; mandible with one acute tooth and a broad truncation; antenna (Fig. 772) with scape about 3.5-3.7X as long as broad; F1-F4 longer than broad, F5-F6 quadrate or transverse; linear sensilla on F3-F6, occasionally also on F2; clava

3-segmented, slightly shorter than F4-F6 combined; sensory area enlarged, extending ventrally about 0.4X length of clava, apex obliquely truncate; head width slightly less than flagellum length; mesoscutum mostly with regular, polygonally reticulate sculpture, anterolateral areas with distinctly more longitudinally elongate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 775) about 2.7X as long as broad; parastigma downcurved; costal cell dorsally naked or with a single apical seta, ventrally with a line of setae in proximal 0.8X, apex naked; area below proximal part of parastigma with a group of about 6-17 setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 776); apical bristle of postmarginal vein about 0.6X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with about five inconspicuous setae adjacent to spiracle, side naked; syntergum about 0.7X as long as mid tibia with apex broadly rounded; ovipositor (Fig. 777) about 4.6X gonostylus or about as long as mid tibia; gonostylus about 0.6X as long mid tibial spur; ovipositor not exserted. *Male*: unknown.

Female (holotype): length, 1.75mm (CPD).

Head mainly dark brown, virtually black; a very small area outside torulus, posterior part of gena and area above mandible pale orange; occipital margin faintly metallic blue, frontovertex generally with a dull purple sheen; area between eye and scrobe more strongly shining purple and green; temple with a relatively strong metallic green and blue-green sheen mixed with some purple, this continuing more weakly to upper part of gena, area immediately below eye weakly shining coppery, violet and purple, lower part of gena dull with a weak blue-green and coppery sheen; scrobes very shiny, metallic green; upper part of interantennal prominence with a narrow green sheen, below this purple, a narrow coppery, purple, brassy and bright blue line more or less connects lower margins of toruli, below this metallic green with mouth margin mixed coppery and purple; frontovertex clothed with inconspicuous, pale brown setae, these continued as a line below eye; gena and interantennal prominence with relatively dense, scattered, short, translucent setae; antenna (Fig. 772) with radicle mostly orange, apex dark brown; scape mostly white, ventral margin dark brown from base to about 0.75X along its length, dorsal margin and apex dark brown; pedicel and flagellum dark brown, almost black; maxillary palpus dark brown; thorax mostly dark brown; pronotum dark brown with sides pale orange; propleuron pale orange; prosternum pale orange; mesoscutum black generally with a purple sheen and some blue, green and coppery reflections, clothed in anterior one-quarter with brown setae, posterior three-quarters or so with paler, translucent, silvery setae; tegula dark brown with weak coppery and brassy reflections; axilla orange-brown, bordered dark brown, clothed with dark brown setae; scutellum matt black mixed with some dark orange-brown, anteriorly with golden brown setae, posterior setae and subapical tuft black; mesopleuron dark chestnut brown, anteriorly with a weak green, brassy, coppery and blue sheen, posteriorly with a coppery, purple and green sheen; fore coxa white; fore femur pale orange, bordered brown, tibia brown, tarsus brown; mid coxa dark brown; mid femur largely off-white, dorsally dark brown, tibia pale orange with a subbasal white band, extreme base dark brown and a dark brown, external streak subbasally, spur orange mixed dark brown, with apex dusky, tarsus orange; hind coxa dark brown, mixed pale orange posteriorly; hind femur dark brown with a small, subapical, orange-brown area, tibia pale orange, bordered brown, tarsus pale orange, apex dark brown; fore wing (Fig. 775) mostly infuscate, largely hyaline towards base, venation brown; propodeum dark brown, medially with a metallic purple sheen, area around spiracle metallic dark blue, blue-green and purple, about 7 or 8 translucent, setae outside spiracle; gaster dark brown, mostly with a coppery-purple and brassy sheen, Gt3-Gt5 laterally with distinct coppery and green reflections; visible part of gonostylus very pale orange.

Head (Fig. 774) about 5.2X as wide as frontovertex, with gena rounded in facial view, in profile about 1.8X as high as deep, frontovertex slightly angled level with posterior ocelli, then weakly and evenly curved to top of scrobes, slightly angled towards mouth margin and virtually straight from top of scrobes to mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 55°; frontovertex slightly shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh size smaller than diameter of eye facet, sculpture immediately above scrobes clearly coarser and transversely elongate, this area bordered laterally by a completely smooth area and broadly below by dorsal margin of scrobes;

scrobes completely smooth; upper part of interantennal prominence narrowly smooth, but mostly with moderately slightly coarse, regular polygonally reticulate to imbricate-reticulate sculpture; temple with shallow, irregular, longitudinally elongate polygonally reticulate sculpture, posterior part of gena with similar sculpture, anterior part of gena with elongate, polygonally reticulate sculpture that is conspicuously deeper than that immediately below anterior ocellus; narrowest part between eye and scrobe hardly wider than diameter of anterior ocellus, completely smooth; scrobes deep, meeting dorsally, sharply margined, carinate below eye, very broadly ∩-shaped, interantennal prominence dorsally broadly rounded, without a median ridge; antenna as in Fig. 772; scape broadened and flattened, broadest above middle, about 3.7X as long as broad; F1-F4 longer than broad, F5 quadrate, F6 transverse, segments wider and larger distally so that F6 is largest and widest; clava slightly broadened, slightly shorter than F4-F6 combined, sensory area slightly enlarged, extending about 0.4X along ventral surface, giving it an obliquely truncate appearance; eye not quite reaching occipital margin, separated by slightly less than diameter of facet, clothed with inconspicuous, very short setae that are much shorter than diameter of facet; inner eye margins subparallel, narrowest point of frontovertex about midway between anterior ocellus and top of scrobes; malar sulcus absent; clypeal margin medially very slightly convex; mandible with one acute tooth and a broad, slightly concave truncation; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 83, HH 93, FV 16, POL 9.5, OOL 0.5, OCL 10.5, AOL 11, EL 60, EW 45, MS 41, SL 39, SW 10.5.

Thorax with pronotum hardly exposed behind head and about 0.6X as long as mesoscutum; pronotum slightly shiny with similar sculpture to that in ocellar area; mesoscutum mostly with regular, polygonally reticulate sculpture that is similar to that in ocellar area, anterolateral areas with finer, slightly narrower but more longitudinally elongate polygonal sculpture; axilla and scutellum with polygonally reticulate sculpture that is slightly deeper than that on mesoscutum; visible part of mesoscutum about 2X as broad as long; scutellum about as broad as long, with a distinct subapical tuft, setae mostly about 0.6X as long as scutellum; hind femur about 4.4X as long as broad; fore wing with venation and setation as in Figs 775, 776; costal cell with 1 seta dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 776); mid tibia without a distinct, external carina; propodeum medially about 0.1X as long as scutellum and smooth. Relative measurements: FWL 79, FWW 29.5; HWL 70, HWW 17.

Gaster with hypopygium reaching about 0.4X to apex; syntergum about 0.7X as long as mid tibia, with apex broadly rounded, virtually truncate; ovipositor hidden.

Paratype. Funicle with linear sensilla present only on F2-F6 or F3-F6; gaster without "gland-like" structures on Gt1 or Gt5; hypopygium Fig, 773; ovipositor Fig. 777. Relative measurements: OL 60, GL 13 [MT 60].

Variation. Females vary in overall length from 1.43-1.84mm; the area below the torulus may be distinctly brassy, the dorsal part of the interantennal prominence may be purple, the mesoscutum may have only a weak purple sheen, the narrowest point between the eye and scrobe may have extremely shallow, polygonally reticulate sculpture and the head vary from 4.5-5.3X as wide as the frontovertex.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Santa Rosa NP, Hacienda 2-C, 17.vi-27.iv.1985 (Janzen & Gauld). Paratypes: **COSTA RICA**, 9♀, **Guanacaste**, Santa Rosa NP, various localities and dates, 27.vi.1985-25.iv.1987 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, Guanacaste NP (error for Santa Rosa NP), near HQ, MT/YPT, 2-10.iii.1990 (J.S. Noyes); 1♀, Guanacaste, Est. Maritza (ACG), LN 326900 373000, 600m, iii.1996 (M. Pereira); 1♀, Guanacaste, BN Diriá, Vista del Mar, LN 233900 358750, 890m, #64075, vii-viii.2001 (I. Jiménez); 2♀, **San José**, Ciudad Colon, iii-iv.1990 (L. Fournier); 3♀, San José, Ciudad Colon, iv-v.1990 (P. Hanson). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

COMMENTS. Excluding the characters given in the key, within this group of similar species (*poeana*, *amadeus, medusa*, *seius, grimus* and *oshtan*), *poeana* differs from *oshtan* in having the scape about 3.5-3.7X as long as broad, whereas in *oshtan* the scape is about 3.2X as long as broad. *Cheiloneurus amadeus*, *medusa* and *grimus* all have a narrower scape which is greater than 4.2X as long as broad. In *poeana* the fore coxa is white, whereas in all of the above species it is dark brown, or mostly so. *Cheiloneurus poeana* has a relatively narrow frontovertex which is about 0.16-0.2X head width whilst in *amadeus* and *medusa* the frontovertex is greater than 0.25X head width. Finally, poeana differs from seius in having the ovipositor about as long as the mid tibia and about 4.7X as long as a gonostylus whilst in seius the ovipositor is about 1.4X as long as the md tibia and about 5.2X as long as a gonostylus.

See also comments under *herxius* (p. 306) and *oshtan* (p. 316).

Cheiloneurus oshtan **sp.nov.**

(Figs 778-784; Hab. ♀ 115)

DIAGNOSIS. *Female* (length about 1.4-1.8mm): body almost completely dark brown with a weak to moderate metallic sheen; antenna (Fig. 781) with scape mostly white with dorsal and ventral margins largely brown; pedicel and flagellum dark brown; mesoscutum generally with silvery setae; fore coxa orange-brown to dark brown, mid and hind coxae dark brown; legs dark orange-brown to dark brown; fore wing (Fig. 779) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation this connected by a paler line to a larger hyaline area opposite, apex with a narrow subtriangular hyaline area; head (Fig. 783) about 4.3-4.6X as wide as frontovertex, in facial view clearly longer than broad, subcircular, genae slightly curved and converging, hardly more curved inwards near mouth; frontovertex naked medially between anterior ocellus and scrobes; eye separated from scrobe by about diameter of anterior ocellus, area between eye and scrobe completely smooth and shiny; scrobes deep, sharply margined, carinate below eye; interantennal prominence with about 50 fairly conspicuous setae and dorsally broadly rounded without a median ridge; mandible with one acute tooth and a broad truncation; antenna (Fig. 781) with scape about 3.2X as long as broad; F1-F4 longer than broad, F5-F6 transverse; linear sensilla on F3-F6; clava 3-segmented, slightly shorter than F4-F6 combined; sensory area enlarged, extending ventrally about 0.3X length of clava, apex obliquely truncate; head width about equal to flagellum length; mesoscutum (Fig. 784) mostly with regular, polygonally reticulate sculpture, anterolateral areas with distinctly more longitudinally elongate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 779) about 2.8X as long as broad; parastigma slightly downcurved; costal cell dorsally with one or two apical setae, ventrally with a line of setae in proximal 0.8X, apex naked; area below proximal part of parastigma with a group of about 5-11 setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 778); apical bristle of postmarginal vein about 0.5X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum (Fig, 784) with about eight inconspicuous setae adjacent to spiracle, side naked; syntergum about 0.7X as long as mid tibia with apex broadly rounded, almost truncate; ovipositor (Fig. 782) about 4.6X gonostylus or about as long as mid tibia; gonostylus about 0.6X as long mid tibial spur; ovipositor not exserted. *Male*: unknown.

Female (holotype): length, 1.65 (CPD).

Head mainly dark brown, virtually black; a very small area outside torulus, posterior part of gena and area above mandible pale orange; occipital margin faintly metallic blue, frontovertex generally with a dull dark green and purple sheen; area between eye and scrobe more strongly shining purple and green; temple with a relatively strong metallic green and blue-green sheen mixed with some purple, this continuing more weakly onto upper part of gena, area immediately below eye weakly shining coppery, violet and purple, lower part of gena dull with a weak blue-green and coppery sheen; scrobes very shiny, metallic; upper part of interantennal prominence with a purple sheen, below this green, a narrow coppery, purple, brassy and bright blue line more or less connects lower margins of toruli, below this metallic green with mouth margin mixed coppery and purple; frontovertex clothed with inconspicuous, pale brown setae, these continued

as a line below eye; gena and interantennal prominence with relatively dense, scattered, short, translucent setae; antenna (Fig. 781) with radicle mostly orange, apex dark brown; scape mostly white, ventral margin dark brown from base to about 0.75X along its length, dorsal margin and apex dark brown; pedicel and flagellum dark brown, almost black; maxillary palpus dark brown; thorax mostly dark brown; pronotum dark brown with sides mixed orange; propleuron orange-brown; prosternum brown; mesoscutum black generally with a weak brassy sheen and very weak blue, green, purple and coppery reflections, clothed in anterior one-quarter with brown setae, posterior three-quarters or so with paler, translucent, silvery setae; tegula dark brown with weak coppery and brassy reflections; axilla orange-brown, bordered dark brown, clothed with dark brown setae; scutellum matt black, anteriorly with golden brown setae, posterior setae and subapical tuft black; mesopleuron dark chestnut brown, anteriorly with a weak green, brassy, coppery and blue sheen, posteriorly with a coppery, purple and green sheen; fore coxa orange-brown; fore femur orange-brown bordered dark brown, tibia brown, tarsus brown; mid coxa dark brown; mid femur dark orange-brown, tibia orange with a subbasal white band, extreme base dark brown and a dark brown, external streak for most of its length, spur orange with apex dusky, tarsus orange; hind coxa dark brown, mixed orange-brown; hind femur dark brown with a small, subapical, orange-brown area, tibia dusky orange, bordered brown, tarsus brown; fore wing (Fig. 779) mostly infuscate, largely hyaline towards base, venation brown; propodeum dark brown, medially with a metallic purple sheen, area around spiracle metallic dark blue and blue-green mixed with some purple, about 7 or 8 translucent, setae outside spiracle; gaster dark brown, mostly with a coppery-purple and brassy sheen, Gt3-Gt5 laterally with distinct coppery and green reflections; visible part of gonostylus very pale orange.

Head (Fig. 783) in facial view about 4.4X as wide as frontovertex with gena rounded, in profile about 1.8X as high as deep, frontovertex slightly angled level with posterior ocelli, then weakly and evenly curved to top of scrobes, slightly angled towards mouth margin and virtually straight from top of scrobes to mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 65°; frontovertex slightly shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh size smaller than diameter of eye facet, sculpture immediately above scrobes clearly coarser and transversely elongate, this area bordered laterally by a completely smooth area and broadly below by dorsal margin of scrobes; scrobes completely smooth; upper part of interantennal prominence narrowly smooth, but mostly with moderately slightly coarse, regular polygonally reticulate to imbricate-reticulate sculpture; temple with shallow, irregular, longitudinally elongate polygonally reticulate sculpture, posterior part of gena with similar sculpture, anterior part of gena with elongate, polygonally reticulate sculpture that is conspicuously deeper than that immediately below anterior ocellus; narrowest part between eye and scrobe hardly wider than diameter of anterior ocellus, completely smooth; scrobes deep, meeting dorsally, sharply margined, carinate below eye, very broadly ∩-shaped, interantennal prominence dorsally broadly rounded, without a median ridge; antenna as in Fig. 781; scape broadened and flattened, broadest above middle, about 3.2X as long as broad; F1-F4 longer than broad, F5-F6 transverse, segments wider and larger distally so that F6 is largest and widest; clava slightly broadened, slightly shorter than F4-F6 combined, sensory area slightly enlarged, extending about 0.3X along ventral surface, giving it an obliquely truncate appearance; eye not quite reaching occipital margin, separated by slightly more than diameter of facet, clothed with inconspicuous, very short setae that are much shorter than diameter of facet; inner eye margins subparallel, narrowest point of frontovertex about midway between anterior ocellus and top of scrobes; malar sulcus absent; clypeal margin medially very slightly convex; mandible with one acute tooth and a broad, slightly concave truncation; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 100, HH 108, FV 22.5, POL 14, OOL 0.5, OCL 12.5, AOL 13.5, EL 69, EW 50.5, MS 43, SL 43.5, SW 13.5.

Thorax (Fig. 784) with pronotum hardly exposed behind head and about 0.6X as long as mesoscutum; pronotum slightly shiny with similar sculpture to that in ocellar area; mesoscutum mostly with regular, polygonally reticulate sculpture that is similar to that in ocellar area, anterolateral areas with finer, slightly narrower but more longitudinally elongate polygonal sculpture; axilla and scutellum with polygonally reticulate sculpture that is deeper than that on mesoscutum; visible part of mesoscutum about 2.1X as broad as long; scutellum about 1.2X as

broad as long, with a distinct subapical tuft, setae mostly about 0.7X as long as scutellum; hind femur about 4.1X as long as broad; fore wing with venation and setation as in Figs 778, 779; costal cell with 2 or 3 setae dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 778); mid tibia without a distinct, external carina; propodeum (Fig. 784) medially about 0.21X as long as scutellum and smooth. Relative measurements: FWL 96.5, FWW 35; HWL 85, HWW 22.

Gaster with hypopygium reaching about 0.4X to apex; syntergum about 0.7X as long as mid tibia, with apex broadly rounded, almost truncate; ovipositor hidden.

Paratype. Funicle with linear sensilla present only on F3-F6; gaster without "gland-like" structures on Gt1 or Gt5; hypopygium Fig. 780; ovipositor Fig. 782. Relative measurements: OL 43, GL 9.5 [MT 42].

Variation. Females vary in overall length from 1.42-1.76mm; the area below the torulus may be distinctly brassy and the head varies from 4.3-4.6X as wide as the frontovertex.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Santa Rosa NP, Hacienda 3-0, 26.x-16.xi.1985 (Janzen, Gauld). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Santa Rosa NP, H10, 6-27.ix.1986 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, Santa Rosa NP, SE6C, 25.iv.1987 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, Guanacaste NP, Est. Mengo Vn Cacao, v.1986 (Gauld, Janzen); 2♀, Guanacaste, Est. Maritza (ACG), LN 326900 373000, 600m, iii.1996 (M. Pereira); 2♀, Guanacaste, PN Palo Verde, Sect. Palo Verde, LN 260952 385020, 50m, #55154, 7.ii-6.iii.2000 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Campo Aterrizaje, LN 259050 388400, 10m, 9.ii-12.iii.2001 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Campo Aterrizaje, LN 259050 386499, 10m, #59290, ix-x.2000 (I. Jiménez); 1♀, **Heredia**, Santo Domingo, INBio Parque, LN 217300 526200, 1100m, #62082, i-iii.2001 (R. Zuñiga). Holotype in MZUCR, paratypes in NHMUK and MZUCR.

COMMENTS. Other than the characters given in the key, *Cheiloneurus oshtan* can be separated from other similar species (*seius, amadeus, medusa, grimus poeana*) by having a relatively broad scape that is about 3.2X as long as broad. Of the species listed, *poeana* has the broadest scape, about 3.5-3.7X as long as broad, but has the fore coxa white (see key).

Cheiloneurus nigrescens Howard (1897), from Grenada (W.I.), is very close to *oshtan* and would run here in the above key to species (holotype examined, NHMUK). It differs in having the mesoscutum quite strongly metallic blue-green (*oshtan* - weakly brassy with very weak blue, green, purple and coppery reflections); the head about as high as wide as broad (*oshtan* – clearly higher than wide); the scape 5X as long as broad with the lower margin evenly curved and subparallel to upper margin (*oshtan* – about 3.2X as long as broad with lower margin abruptly bulging in apical two-thirds) and the sculpture on FV above the scrobes deeper and forming more distinct cells than in *oshtan*.

Cheiloneurus loretanus De Santis, from Argentina, is also very close and could run here in the key (images of holotype examined, MLP). The two species are very close with a very similar pattern of paler and darker areas on the fore wing. *Cheiloneurus loretanus* has the fore wing about 2.6X as long as broad (more than 2.7X in *oshtan*), the area below the proximal part of the parastigma with only two or three setae (11 in *oshtan*); the parastigma more strongly curved downwards than in *oshtan*; the dark setae on the proximal side of the linea calva less dense than in *oshtan*, the ventral margin of the scape more or less evenly curved (abruptly bulging in apical two-thirds in *oshtan*), F5 and F6 almost quadrate (strongly transverse in *oshtan*); the funicle segments gradually darkening towards the clava (unicolorous in *oshtan*);the face yellow (black with a metallic sheen in *oshtan*) and the tegula, axilla and scutellum yellow (dark brown to black in *oshtan*).

See also comments under *herxius* (p. 306) and *poeana* (p. 314).

***Cheiloneurus munda* sp.nov.**
(Figs 785-791; Hab. ♀ 116)

DIAGNOSIS. *Female* (length about 1.4-1.5mm): body generally dark orange-brown to dark brown, axilla and scutellum orange, darker areas with a weak to moderate metallic sheen; antenna (Fig. 790) with scape mostly white with dorsal and ventral margins largely brown; pedicel mostly dark brown; flagellum dark brown; mesoscutum with silvery setae in posterior half; fore and hind coxae white, mid coxa dark brown; legs mostly orange-brown to dark brown, fore and mid femora partially white; fore wing (Fig. 788) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation, apex slightly paler; head (Fig. 785) about 4.6X as wide as frontovertex, in facial view slightly longer than broad, suboval, genae evenly curved and converging, slightly more curved inwards near mouth; frontovertex naked medially between anterior ocellus and scrobes; eye separated from scrobe by about 2X diameter of anterior ocellus, area between eye and scrobe with shallow sculpture; scrobes deep, margins rounded, interantennal prominence with about 25-30 inconspicuous setae and dorsally broadly rounded without a median ridge; mandible with one acute tooth and a broad, slightly concave truncation; antenna (Fig, 790) with scape about 3.3X as long as broad; F1 subquadrate, remaining segments clearly transverse; linear sensilla on F5-F6; clava unsegmented, slightly longer than F4-F6 combined; sensory area enlarged, extending ventrally about 0.4X length of clava, apex obliquely truncate; head width greater than flagellum length but less than flagellum and pedicel combined; mesoscutum (Fig. 786) mostly with fairly regular polygonally reticulate sculpture, but anterior one-quarter with fine, transversely elongate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 788) about 2.4X long as broad; parastigma slightly downcurved; costal cell dorsally naked, ventrally with a line of setae in proximal 0.6X; area below proximal part of parastigma without any setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 789); apical bristle of postmarginal vein about 0.6X as long as marginal vein; mid tibial spur very slightly longer than basitarsus; propodeum (Fig. 786) with about eight inconspicuous setae adjacent to spiracle, side naked; syntergum about 0.8X as long as mid tibia with apex rounded; ovipositor (Fig. 791) about 4.9X gonostylus or about 1.1X as long as mid tibia; gonostylus about 0.8X as long mid tibial spur; ovipositor not exserted. *Male*: unknown.

Female (holotype): length, 1.53mm (CPD).

Head mainly brown; scrobal area orange, area above base of mandible mixed orange; area between eye and occipital margin metallic blue and green; occipital margin dull, dark, metallic blue; area between occipital margin and posterior ocelli metallic green and purple; a weak metallic blue and purple sheen between posterior ocelli; frontovertex otherwise with a mixed pale blue, purple and brassy sheen; area between eye and scrobe brassy, this delimited laterally by a metallic purple line; temple and upper gena with a distinct green, blue, brassy and purple sheen, lower gena similar, but relatively dull; mouth margin with a purple sheen and coppery and brassy reflections; a very narrow metallic blue line virtually connects lower margins of toruli; interantennal prominence dorsally with a weak purple and green sheen otherwise with a weak brassy and green sheen; frontovertex clothed with inconspicuous, pale brown setae, these continued as a line below eye; gena and interantennal prominence with relatively dense, scattered, short, pale brown setae; antenna (Fig. 790) with radicle mostly pale orange, apex narrowly dark brown; scape mostly white, ventral margin dark brown from base to about 0.75X along its length, inner surface more extensively dark brown, dorsal margin dusky orange internally; pedicel dusky orange, dark brown dorsally; flagellum dark brown; maxillary palpus virtually white, terminal segment brown; pronotum mostly orange, neck dark brown; propleuron and prosternum orange; mesoscutum dark brown, in anterior half with a weak brassy sheen and weak green reflections and clothed in pale brown setae, posterior half with a dark blue, purple and green metallic sheen and clothed in silvery setae, posterior margin dark purple-brown with a slight brassy sheen; tegula brown with a weak purple and brassy sheen; axilla orange-brown with a weak purple and brassy and sheen; scutellum in anterior half orange with very weak brassy reflections and clothed in translucent golden brown setae, posterior half orange-brown with dark brown to black setae,

subapical tuft black; metanotum dark brown; mesopleuron orange-brown, anteriorly with a weak green, brassy, coppery and blue sheen, posteriorly with a coppery, purple, green and brassy sheen; fore coxa white; fore femur white proximally, apical half dusky white, bordered dark brown, tibia mostly dark brown, tarsus dark orange-brown; mid coxa mostly dark brown, external surface mixed dusky white; mid femur dark brown at base, with a broad, submedian white band, apex dusky orange with dorsal margin dark brown, tibia with proximal half dark brown and apical half pale orange, spur and tarsus pale orange; hind coxa white; hind femur dark brown with a ventral, subapical pale orange patch, tibia and tarsus dark brown; fore wing (Fig. 788) mostly infuscate, largely hyaline towards base, a small hyaline area at apex and an elongate hyaline streak posteriorly, venation pale brown; propodeum dark brown with a slight brassy and purple sheen, laterally with a weak blue, green and purple sheen behind spiracle, side metallic blue and green, a group of about 5 or 6 silvery setae anterolateral to spiracle and a line of 11 or 12 silvery setae behind these; gaster dark brown, mostly with a coppery-purple and brassy sheen, Gt3-Gt5 laterally with distinct coppery and green reflections; gonostylus pale yellow.

Head (Fig. 785) in facial view about 4.6X as wide as frontovertex with gena rounded and converging, in profile about 1.7X as high as deep, frontovertex slightly angled level with posterior ocelli, then weakly and evenly curved to top of scrobes, slightly angled towards mouth margin and virtually straight from top of scrobes to mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 55°; frontovertex virtually smooth behind posterior ocelli but with very shallow, polygonally reticulate sculpture, without a groove adjacent to eye margin behind posterior ocellus; frontovertex otherwise relatively shiny with very shallow, irregular polygonally reticulate sculpture of much smaller mesh size than diameter of eye facet; area above scrobes that extends laterally almost level with outer margin of scrobes with relatively coarse transversely elongate imbricate-reticulate to strigose sculpture; area immediately below lowest eye margin completely smooth and shiny; temple and upper gena smooth and shiny, posterior part of temple with very shallow, longitudinally elongate sculpture, lower gena with shallow, longitudinally elongate, polygonally reticulate sculpture; scrobes laterally with shallow sculpture, upper part of interantennal prominence smooth, otherwise mostly with moderate, regular polygonally reticulate to imbricate-reticulate sculpture; narrowest part between eye and scrobal margin about 2X as wide as diameter of anterior ocellus, scrobes moderately deep, meeting dorsally, margins rounded, very broadly ∩-shaped, interantennal prominence dorsally broadly rounded, without a median ridge; antenna as in Fig. 790; scape broadened and flattened, broadest above middle, about 3.3X as long as broad, dorsal and ventral margins slightly curled inwards forming a shallow, but distinct groove; flagellum clavate, F1 subquadrate, remaining segments clearly transverse, wider and larger distally so that F6 is widest; clava unsegmented, hardly broader than F6, slightly longer than F4-F6 combined, sensory area slightly enlarged, extending about 0.4X along ventral surface, giving it an obliquely truncate appearance; eye nearly reaching occipital margin, separated by not more than 0.5X diameter of facet, naked; inner eye margins clearly diverging in front of anterior ocellus, narrowest point of frontovertex slightly in front of anterior ocellus; malar sulcus absent; clypeal margin medially weakly emarginate; mandible with one tooth and a broad, slightly concave truncation; apical segment of maxillary palpus not enlarged, although nearly 2X as long as radicle. Relative measurements: HW 97, HH 102, FV 21, POL 11.5, OOL 0, OCL 10, AOL 14.5, EL 61, EW 45, MS 49, SL 51, SW 15.5.

Thorax (Fig. 786) with pronotum hardly exposed behind head and about 0.6X as long as mesoscutum; pronotum slightly shiny with similar sculpture to that in ocellar area, but a little deeper; mesoscutum with similar sculpture to pronotum, but with conspicuous piliferous punctures that are generally separated by less than their own diameters, anterior one-quarter with transversely elongate sculpture; axilla and scutellum with much coarser, deeper, polygonally reticulate sculpture; visible part of mesoscutum about 1.9X as broad as long; scutellum about 1.2X as broad as long, with a distinct subapical tuft, setae mostly about 0.6X as long as scutellum; hind femur about 4.1X as long as broad; fore wing with venation and setation as in Figs 788, 789; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 789); mid tibia without an external carina; propodeum (Fig. 786) medially about 0.22X as long as scutellum and smooth. Relative measurements: FWL 85.5, FWW 35; HWL 74, HWW 20.

Gaster with hypopygium reaching about 0.5X to apex; syntergum about 0.95X as long as mid tibia, with apex rounded; ovipositor not exserted.

Paratype. Funicle with linear sensilla present only on F5-F6; gaster without "gland-like" structures on Gt1 or Gt5; hypopygium Fig, 787; ovipositor Fig. 791. Relative measurements: OL 41.5, GL 8.5 [MT 37].

Variation. Females vary in overall length from 1.38-1.53mm, the scrobal area may be largely brown with orange areas outside toruli, otherwise little variation noted in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, PN Corcovado, Los Patos, 200m, 8°33'N 83°30'W, 1-9.iii.2000 (J.S. Noyes, J.A. Azofeifa). Paratypes: **COSTA RICA**, 1♀, **Puntarenas**, RF Golfo Dulce, 3km SW Rincon, 10m, x-xii.1990 (P. Hanson); 1♀, same data as holotype but ii.2000. Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. *Cheiloneurus munda* may be unique in the genus because it has an entire clava and transversely elongate sculpture on the anterior part of the mesoscutum. It is the only species known that is similar to *nigrescens* or that occurs within Costa Rica that exhibits this combination of character states. It can also be distinguished from other similar species (*amadeus*, *medusa*, *seius*, *grimus*, *oshtan*, *poeana*, *longisetaceus*, etc.) by the scrobes not being sharply margined and the relatively wide, virtually naked costal cell, the other similar species have the scrobes at least partly sharply margined and the costal cell relatively narrow with numerous conspicuous setae.

***Cheiloneurus varus* sp.nov.**

(Figs 792-798)

DIAGNOSIS. *Female* (length about 1.5mm): body generally dark brown, anterior part of scutellum and mesopleuron orange-brown, darker areas with a weak to moderate metallic sheen; antenna (Fig. 792) with scape mostly white with dorsal and ventral margins largely brown; pedicel and flagellum dark brown; mesoscutum with silvery setae in posterior half or so; fore and hind coxae white, mid coxa dark brown; legs mostly orange-brown to dark brown, fore and mid femora partially white; fore wing mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation; head (Fig. 796) about 3.7X as wide as frontovertex, in facial view very slightly broader than long, subcircular, genae evenly curved and converging, more curved inwards near mouth; frontovertex with about 25 setae medially between anterior ocellus and scrobes; eye separated from scrobe by about 1.5X diameter of anterior ocellus, area between eye and scrobe smooth; scrobes deep, sharply margined, carinate below eye, interantennal prominence with about 20 inconspicuous setae, dorsally broadly rounded, without a median ridge; mandible with three acute teeth; antenna (Fig. 792) with scape about 4.7X as long as broad; F1-F3 slightly longer than broad or quadrate; F4-F6 transverse; linear sensilla on F3-F6; clava 3-segmented, nearly as long as F4-F6 combined; sensory area enlarged, extending ventrally about 0.4X length of clava, apex obliquely truncate; head width greater than flagellum length; mesoscutum (Fig. 797) mostly with longitudinally elongate sculpture, but medially sculpture of more rounded cells; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 798) about 2.3X long as broad; parastigma hardly downcurved; costal cell dorsally naked but for five or six apical setae, ventrally with a complete line of setae; area below proximal part of parastigma with a group of about two to five setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 795); apical bristle of postmarginal vein about 0.6X as long as marginal vein; mid tibial spur very slightly longer than basitarsus; propodeum (Fig. 797) with about seven inconspicuous setae adjacent to spiracle, side naked; syntergum about 0.8X as long as

mid tibia with apex broadly truncate; ovipositor (Fig. 794) about 4.7X gonostylus or about 0.8X as long as mid tibia; gonostylus about 0.6X as long mid tibial spur; ovipositor not exserted. *Male*: unknown.

Female (holotype): length, 1.50mm (CPD).

Head mainly dark brown, scrobes orange-brown; carinate part of occipital margin dark metallic blue; area between occipital margin and posterior ocelli purple, a dark blue line between posterior ocelli; anterior part of frontovertex with a watery, pale blue and dark blue metallic sheen mixed brassy with inner eye margins purple; area above scrobes with a duller sheen; area between eye and scrobe with a brassy, pale green and purple sheen, this area delimited laterally by a metallic purple and blue line; temple and upper gena with a distinct green and brassy sheen, posteriorly coppery, lower gena similar but duller and more coppery; scrobes with a weak brassy sheen; interantennal prominence dorsally with a weak, metallic green sheen, below this purplish; frontovertex clothed with conspicuous, pale brown setae, these continued as a line below eye; gena and interantennal prominence with relatively short, pale brown setae; antenna (Fig. 792) with radicle mostly pale orange, apex narrowly dark brown; scape mostly white, ventral margin dark brown from base to about 0.6X along its length, inner surface more extensively dark brown, dorsal margin brown to dark brown in apical half; pedicel and flagellum dark brown; maxillary palpus with two proximal segments virtually white, penultimate segment orange, terminal segment dark brown; pronotum mostly dark brown, with weak, metallic green and purple reflections; propleuron dark brown; prosternum orange, dark brown anteriorly; mesoscutum dark brown, virtually matt, but medially and near posterior margin with a few purple and blue reflections, posterolaterally mixed with a hint of orange, anterior half to three-fifths clothed in dark brown setae, posterior part clothed with silvery setae of similar density; tegula brown with a weak purple and brassy sheen; axilla dark brown, mixed with a hint of orange, with a few weak, metallic blue reflections; scutellum orange-brown in anterior half with a few very weak metallic blue and purple reflections, posterior half dark brown with a hint of orange, clothed with black setae, subapical tuft black; metanotum dark brown; mesopleuron orange-brown, anteriorly with a weak green, brassy and coppery sheen, posteriorly with a coppery, purple, green and brassy sheen; fore coxa white; fore femur white proximally, apical two-thirds brown to dark brown, tibia dark brown, tarsus brown; mid coxa dark brown; mid femur white in proximal half and ventrally nearly to apex, dorsal margin dark brown in apical half or so, apex dark brown, tibia dark brown with apex pale orange, tibial spur pale orange, tarsus very pale yellow, virtually white; hind coxa white; hind femur dark brown with a subapical orange patch ventrally, tibia dark brown, tarsus white, pretarsus dark brown; fore wing (Fig. 798) mostly infuscate, largely hyaline towards base, venation pale brown; propodeum dark brown, metallic coppery purple laterally, blue-green on side, a line of about 6 translucent, white setae outside spiracle; gaster dark brown, mostly with a brassy and purple with green reflections, Gt1-Gt2 slightly coppery and darker, Gt3-Gt5 laterally with distinct coppery and green reflections; gonostylus pale orange.

Head (Fig. 796) in facial view about 3.7X as wide as frontovertex with gena rounded and converging, in profile about 1.6X as high as deep, frontovertex slightly angled level with posterior ocelli, then weakly and evenly curved to top of scrobes, slightly angled towards mouth margin and virtually straight from top of scrobes to mouth margin, interantennal prominence clearly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 75°; frontovertex (Fig. 796) unusually setose with at least 7 pairs of long, conspicuous setae in front of anterior ocellus in addition to those along eye margins, area behind posterior ocelli virtually smooth but with very shallow, irregular, reticulate sculpture, without a short, narrow, groove adjacent to eye margin slightly behind posterior ocellus; frontovertex otherwise relatively shiny, virtually smooth; area above scrobes with fairly coarse transversely elongate, imbricate-reticulate sculpture; area between eye and scrobe completely smooth and shiny; temple and upper gena smooth and shiny, posterior part of temple with very shallow, longitudinally elongate sculpture, lower gena with shallow, longitudinally elongate, polygonally reticulate sculpture; scrobes smooth; upper part of interantennal prominence smooth, otherwise mostly with very shallow, fairly regular, polygonally reticulate to imbricate-reticulate sculpture; narrowest part between eye and scrobal margin about 1.5X as wide as diameter of anterior ocellus, smooth; scrobes deep, meeting dorsally, sharply

margined, carinate below eye, very broadly ∩-shaped, interantennal prominence dorsally broadly rounded, without a median ridge; antenna as in Fig. 792; scape broadened and flattened, broadest slightly below middle, about 4.7X as long as broad; flagellum strongly clavate, F1-F2 slightly longer than broad, F3 subquadrate, F4-F6 transverse, segments clearly wider distally; linear sensilla present only on F3-F6; clava hardly broader than F6, nearly as long as F4-F6 combined, sensory area slightly enlarged, extending about 0.4X along ventral surface, giving it a slightly obliquely truncate appearance; eye not reaching occipital margin, separated by about diameter of facet, conspicuously setose with setae clearly longer than diameter of facet; inner eye margins converging slightly in front of anterior ocellus, narrowest point just above scrobes; malar sulcus absent; clypeal margin medially weakly convex; mandible with three acute teeth, upper tooth very short; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 99, HH 97.5, FV 27, POL 12.5, OOL 1.5, OCL 8, AOL 11.5, EL 59, EW 47.5, MS 48, SL 47, SW 10.

Thorax (Fig. 797) with pronotum hardly exposed behind head and about 0.6X as long as mesoscutum; pronotum with shallow, fairly regular, fine imbricate-reticulate to polygonally reticulate sculpture; mesoscutum with very fine, polygonally reticulate sculpture that is slightly deeper than that on pronotum, sculpture mostly distinctly longitudinally elongate, but medially mostly regular, polygonally reticulate; axilla and scutellum with polygonally reticulate sculpture that is conspicuously deeper and coarser than that on mesoscutum and more elongate on sides of scutellum; visible part of mesoscutum about 2.3X as broad as long; scutellum about 1.1X as broad as long, with a distinct subapical tuft, setae mostly about 0.7X as long as scutellum; hind femur about 4.7X as long as broad; fore wing with venation and setation as in Figs 795, 798; costal cell with 5 or 6 setae dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak; mid tibia with an external carina in proximal half or so; propodeum medially about 0.25X as long as scutellum and virtually smooth, but with some irregular polygonally reticulate sculpture along anterior margin laterally. Relative measurements: FWL 88, FWW 37.5; HWL 79, HWW.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium (Fig. 793) reaching about 0.5X to apex; syntergum about 0.75X as long as mid tibia, with apex broadly truncate; ovipositor (Fig. 794) not exserted. Relative measurements: OL 30.5, GL 6.5 [MT 40.5].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, PN Corcovado, Est. Los Patos, Send. a Sirena, LS 514200 276500, 100m, #58151, viii.2001(J.A. Azofeifa). Holotype in NHMUK.

COMMENTS. *Cheiloneurus varus* can be distinguished from all other similar species (*nigrescens*, *amadeus*, *medusa*, *seius*, *grimus*, *oshtan*, etc.) by the relatively hairy frontovertex. In *varus* there are at least about 24 setae medially (excluding those along eye margins) between the anterior ocellus and the top of the scrobes. In all other similar species, there are not more than 4 or 5 setae. In addition, there are also about 6 setae dorsally at the apex of the costal cell, whereas in other similar species there are generally 3 or fewer.

Of the extralimital species, *Cheiloneurus loretanus* De Santis (1972:60) may run here. It is likely that the species differ in the number and density of the setae on the frontovertex as outlined above, but this cannot be verified from the remains of the holotype (digital image examined; MLP). On the other hand, *Cheiloneurus loretanus* also differs from *varus* in having the tegula, axilla and scutellum orange and F5 and F6 virtually quadrate whereas in *varus* the tegula, axilla and scutellum are generally dark brown and F5 and F6 are clearly transverse (see also comments under *oshtan*). The fore wing of *loretanus* is also relatively narrower (about 2.6X as long as broad,

whereas in *varus* it is less than 2.4X as long as broad) and the pattern of light and dark areas in *loretanus* is much more pronounced than in *varus* (fore wing almost uniformly infuscate in its apical two-thirds).

***Cheiloneurus iphigenes* sp.nov.**

(Figs 799-804; Hab. ♀ 117)

DIAGNOSIS. *Female* (length about 1.5-2.3mm): head mostly pale orange-brown, thorax dorsally largely orange, remainder of body dark to black with a weak to moderate metallic sheen; antenna (Fig. 799) with scape white margined dark brown; pedicel and flagellum dark brown; darker area of mesoscutum clothed with pale brown setae that may appear silvery; fore and hind coxae white, middle coxa white mixed brown; legs white to pale orange with femora and tibiae largely brown, hind tibia dark brown; fore wing (Fig. 801) mostly infuscate with basal cell hyaline except base, a small hyaline area at apex of venation and opposite on posterior wing margin, apex with a small triangular hyaline area; head (Fig. 803) about 4.2X as wide as frontovertex, in facial view slightly longer than broad, subrectangular, genae weakly converging and abruptly curved inwards near mouth margin; frontovertex naked medially below anterior ocellus but with 4 or 5 setae immediately above scrobal area; eye separated from scrobe by about 1.5X diameter of ocellus, area between eye and scrobe completely smooth, scrobal margin carinate; interantennal prominence dorsally rounded with about 35 conspicuous setae; mandible with two short teeth and a truncation; antenna (Fig. 799) with scape about 3.7X as long as broad; funicle with F1 about 1.5X as long as broad, F2-F3 longer than broad, F4-F6 transverse; head width slightly less than length of flagellum; linear sensilla on F3-F6; clava 3-segmented, a little longer than F4-F6 combined; sensory area large and forming an oblique truncation, extending about 0.5X along ventral margin; mesoscutum with polygonally reticulate sculpture, a little coarser anteriorly and on sides where it is also slightly longitudinally elongate; scutellum with a distinct apical tuft of setae; wings fully developed; fore wing (Fig. 801) about 2.6X as long as broad; parastigma very distinctly curved downwards; costal cell dorsally naked at apex and ventrally with a single complete line of setae that is broadly interrupted above parastigma; area below proximal part of parastigma with only one or two setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that extends inconspicuously a little way into disc (Fig. 802); apical bristle of postmarginal vein about 0.7X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum with about 10 setae around each spiracle, side naked; syntergum slightly shorter than mid tibia; ovipositor (Fig. 804) about 4.5X gonostylus or 1.4X as long as mid tibia; gonostylus about 0.9X as long as mid tibial spur; exserted part of ovipositor about 0.2X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.69mm; excluding ovipositor, 1.62mm (CPD).

Head orange-brown, paler in scrobal area, temple and gena metallic, occiput orange; a very week blue and purple sheen on frontovertex, interantennal prominence with a weak purple sheen dorsally; temple and much of gena metallic green, remainder of gena slightly brassy or purplish; malar sulcus partially indicated by a narrow coppery line; area between eye and scrobe with a distinct purple and green sheen; mouth margin orange; frontovertex with inconspicuous dark brown setae; antenna (Fig. 799) with radicle pale orange, distally dark brown; scape white, with proximal two thirds of ventral margin broadly dark brown, upper margin internally with distal half dark brown; pedicel and flagellum dark brown, virtually black; thorax dorsally largely orange with some darker areas; neck of pronotum orange-brown; posterior two-thirds or so of mesoscutum dark brown with a weak purple and blue sheen, anterior margin of dark brown area more or less straight, darker area clothed with sparse, translucent, pale brown setae that may appear slightly silvery in some lights, remaining setae dark brown; tegula orange-brown basally, apex dark brown; scutellum largely clothed in pale brown to black setae, subapical tuft conspicuous and black; metanotum dark brown with a slight purple sheen; mesopleuron brown, anteriorly with a slight brassy, green and purple sheen, posterior half with a very weak purple and brassy sheen; fore coxa white; fore femur white, margined dark brown in distal half, tibia dark brown, distal apex orange-brown; mid coxa ventrally dark brown, otherwise dirty white to pale brown; mid

femur white, apex orange-brown, tibia dark brown proximally, distally gradually becoming amber to pale orange, spur amber; hind coxa white; hind femur and tibia dark brown; fore tarsus brown, mid tarsus pale orange, hind tarsus dusky white, distally brown; fore wing (Fig. 801) infuscate with a hyaline pattern, especially proximally; venation brown; propodeum dark purple-brown, side with a weak metallic blue-green sheen; side with not more than 8 or 9 inconspicuous silvery setae near spiracle; gaster dark purple-brown, mixed coppery, purple and brassy, sides and outer plate of ovipositor additionally with some metallic blue and green; gonostylus very pale yellow.

Head (Fig. 803) about 4.2X as wide as frontovertex, in profile anteriorly almost evenly rounded, shallow, a little less than 2X as high as deep; occipital margin carinate, occiput without a median groove above foramen; ocelli forming an angle of about 55°; frontovertex slightly shiny, with shallow, polygonally reticulate sculpture of mesh size generally a little less than diameter of eye facet; scrobal area and mouth margin with shallower sculpture, interantennal prominence dorsally smooth and shiny; temple with distinct, but shallow, longitudinally elongate sculpture, gena with similar sculpture to temple but slightly deeper and of smaller cells; scrobes deep, meeting dorsally, dorsal and lateral margins sharp, carinate, lateral carina reaching level with top of torulus; antenna as in Fig. 799; scape hardly broadened and flattened, about 3.7X as long as broad; funicle with F1-F3 slightly longer than broad, F4-F6 transverse, segments broadest distad; clava clearly broadened, a little longer than F4-F6 combined, sutures oblique, sensory area enlarged, extending ventrally about half-way along clava, giving it a distinct, obliquely truncate appearance; eye nearly reaching occipital margin, separated by less than diameter of facet, appearing naked, clothed with extremely short, inconspicuous setae; inner eye margins slightly diverging anteriorly; malar sulcus absent; mandible with 2 short, acute teeth and a truncation. Relative measurements: HW 82, HH 90, FV 19.5, OD 6, POL 10.5, OOL 0, OCL 9.5, AOL 12, EL 58, EW 40, MS 35, SL 43, SW 11.5.

Thorax with shallow, irregular, polygonally reticulate sculpture on pronotum, generally of mesh size less than diameter facet; sculpture on mesoscutum similar to that on pronotum but a little more elongate anteriorly and on sides; axilla with sculpture similar to that on mesoscutum but slightly coarser; scutellum with slightly coarser sculpture than axilla, extreme apex and sides of scutellum completely smooth and shiny; visible part of mesoscutum about 1.7X as broad as long; scutellum very slightly broader than long, with a very distinct subapical tuft, setae about half as long as scutellum; hind femur about 4.9X as long as broad; fore wing with venation and setation as in Figs 801, 802; costal cell without setae dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 802); propodeum naked but for a few setae anterior to and outside spiracle; side of propodeum, outside spiracle, with some shallow, distinct polygonally reticulate sculpture, medially about 0.22X as long as scutellum and completely smooth. Relative measurements: FWL 81, FWW 31; HWL 68, HWW 17.5.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium reaching about half-way to apex; syntergum very slightly shorter than mid tibia, with apex acute; ovipositor hardly exserted, the exserted part about 0.2X as long as mid tibial spur or less than 0.1X as long as mid tibia.

Paratype. Antenna with linear sensilla present only on F3-F6; hypopygium Fig. 800; ovipositor Fig. 804.. Relative measurements: OL 70, GL 15.5 [MT 50].

Variation. Females vary in overall length from 1.48-2.25mm and the mesopleuron may be pale orange-brown or may have a relatively strong purplish lustre, otherwise very little in the material available.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, Santo Domingo, INBio Parque, 1100m, LN 526250 217400, #60665, 6.xi-6.xii.2000 (R. Zuñiga). Paratypes: **COSTA RICA**, 1♀, **Heredia**, Santa Rosa de Heredia, INBio, LN 526250 217400, 1100m, #58654, 5.ix-5.x.2000 (R. Zuñiga); 8♀, same data as holo-

type, but various dates 6.xi.2000-18.iii.iv.2002; 1♀, **Cartago**, Dulce Nombre, Vivero Linda Vista, 1300m, , viii-x.1993 (P. Hanson). Holotype in MZUCR, paratypes in NHMUK and MZUCR.

COMMENTS. *Cheiloneurus iphigenes* is probably the most similar Costa Rica species to *lineascapus* Gahan (1910). It differs in having the ovipositor hardly exserted (0.25X length of gaster in *lineascapus*), at most only 2 or 3 setae below proximal part of parastigma (6 in *lineascapus*) and the fore and hind coxa and mid femur white (coxae at least pale orange and slightly dusky in *lineascapus* with mid femur dusky orange).

In terms of general colouration, *Cheiloneurus iphigenes* is possibly the most similar Costa Rica species to *Cheiloneurus loretanus* De Santis, both species having the face and much of the dorsum of the thorax orange and the remainder of the body dark brown. In *loretanus* the fore coxa is brown whereas in *iphigenes* it is white. Furthermore, *loretanus* has F5-F6 virtually quadrate, whereas in *iphigenes* these funicle segments are clearly transverse. Also, in *loretanus* there are only 2 or 3 lines of setae making up the delta of dark setae along the proximal margin of the linea calva (in *iphigenes* up to 4 or 5 lines) and the pattern of light and dark areas in the distal two-thirds of the fore wing is much more pronounced in *loretanus* (very similar to *oshtan*, Fig. 779, with a narrow subhyaline apical strip) than in *iphigenes* (small triangular subhyaline apical area, etc.).

Cheiloneurus solon **sp.nov.**

(Figs 805-811; Hab. ♀ 118)

DIAGNOSIS. *Female* (length about 1.6-2.4mm): body generally dark brown, head, pronotum, axilla and scutellum at least partially orange, darker areas with a weak to moderate metallic sheen; antenna (Fig. 805) with scape mostly white or very pale orange with dorsal and ventral margins largely brown; pedicel dark brown with some dusky orange; mesoscutum with silvery setae in posterior half or so; fore and hind coxae white, mid coxa dark brown; legs mostly pale orange to dark brown; fore wing (Fig. 810) mostly infuscate with a V-shaped hyaline area in basal cell and a very small hyaline area at apex of venation; head (Fig. 807) about 3.3-4.4X as wide as frontovertex, in facial view very slightly broader than long, subcircular to subrectangular, genae evenly and weakly curved, converging, more curved inwards near mouth; frontovertex naked medially between anterior ocellus and scrobes; eye separated from scrobe by about diameter of anterior ocellus, area between eye and scrobe smooth and shiny; scrobes deep, sharply margined, carinate below eye, interantennal prominence with about 16 inconspicuous setae, dorsally broadly rounded, without a median ridge; mandible tridentate; scape about 4.0X as long as broad; F1-F4 longer than broad, F5-F6 quadrate or transverse; linear sensilla on F3-F6, sometimes absent from F3; clava 3-segmented, slightly longer than F4-F6 combined; sensory area enlarged, extending ventrally about 0.4X length of clava, apex obliquely truncate; head width about equal to flagellum length; mesoscutum (Fig. 811) almost entirely with longitudinally elongate sculpture, but medially near posterior margin sculpture of more rounded cells; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 810) about 3.1-3.2X as long as broad; parastigma downcurved; costal cell dorsally naked or with a single seta, ventrally with an almost complete line of setae which is interrupted above parastigma; area below proximal part of parastigma with a group of about 35-45 setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that does not continue into disc (Fig. 809); apical bristle of postmarginal vein a little more than 0.5X as long as marginal vein; mid tibial spur very slightly longer than basitarsus; propodeum (Fig. 811) with about five inconspicuous setae adjacent to spiracle, side naked; syntergum about 1.2X as long as mid tibia with apex acute; ovipositor (Fig. 808) about 4.1X gonostylus or about 2.0X as long as mid tibia; gonostylus about 1.5X as long mid tibial spur; exserted part of ovipositor about 0.8X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.73mm; excluding ovipositor, 1.61mm (CPD).

Head with occiput pale orange, frontovertex brown, scrobal area pale orange, mouth margin medially dark brown, temple and upper gena brown, lower gena pale orange; carinate part of occipital margin dark metallic blue, narrowly purple in front of this; area between occipital margin and posterior ocelli with a weak brassy sheen; posterior ocelli ringed dark metallic blue, ocellar

area with a purple sheen, anterior ocellus ringed with a weak metallic green sheen; frontovertex in front of ocelli with a weak brassy, purple and green sheen, inner eye margins with a weak purple and metallic green sheen; area immediately bordering top of scrobes with weak metallic blue reflections; area between eye and scrobe with a brassy, pale green and purple sheen, this delimited laterally by a metallic purple and blue-green line; temple and upper gena with a metallic green sheen, posteriorly brassy and coppery, lower gena similar but duller; scrobes with a weak brassy sheen; interantennal prominence with a weak purple and brassy sheen, mouth margin with blue and purple reflections; frontovertex clothed with inconspicuous, translucent pale brown setae, these continued as a line below eye and scattered on gena and interantennal prominence; antenna (Fig. 805) with radicle mostly pale orange, apex narrowly dark brown; scape mostly very pale orange, white towards apex, ventral margin dark brown from base to about 0.75X along its length, dorsal margin orange, dark brown towards apex; pedicel dusky orange, dark brown dorsally; F1-F5 brown, F6 and clava dark brown; maxillary palpus white, terminal segment brown; pronotum mostly orange, neck brown; propleuron orange-brown, dark brown anteriorly to coxa; prosternum dark brown; mesoscutum virtually matt blue-black in anterior two-thirds with a relatively weak metallic blue sheen, posterior one-third similar but with a much stronger blue sheen, anterior one third with pale, golden brown setae, posterior two-thirds with similarly dense silvery setae, these a little more dense laterally; tegula dark orange-brown with a weak purple and brassy sheen; axilla orange, slightly dusky along margins, with a few weak purple and brassy reflections and with a few black setae; scutellum orange with weak purple and brassy reflections, anteriorly with translucent white setae, subapical tuft black; metanotum dark brown; mesopleuron dark brown, anteriorly with a weak green, blue, brassy, purple and coppery sheen, posteriorly with a coppery, purple, blue and brassy sheen; fore coxa white; fore femur white proximally, apical two-thirds orange to dark brown, tibia dark brown, apices dusky pale orange, tarsus dusky pale orange; mid coxa dark brown; mid femur white in proximal half and dusky orange apically, tibia dark brown at extreme base, an incomplete subbasal white ring, otherwise with apex pale orange, spur and tarsus pale orange; hind coxa white; hind femur and tibia dark brown, tibia with a white basal band, tarsus slightly dusky pale orange; fore wing (Fig. 810) mostly infuscate, largely hyaline towards base, submarginal vein pale orange otherwise venation pale brown; propodeum dark brown, medially with a purple and green sheen, metallic blue-green around spiracle, side dark metallic blue, brassy and coppery, a single translucent white seta anterolateral to spiracle and a line of about 4 setae outside spiracle; gaster dark purple-brown, mostly with brassy, purple and green reflections, Gt1-Gt2 slightly coppery and darker, Gt3-Gt6 laterally with distinct coppery and green reflections; gonostylus virtually white.

Head (Fig. 807) in facial view about 3.6X as wide as frontovertex with gena rounded and converging, in profile about 1.5X as high as deep, frontovertex slightly angled level with posterior ocelli, then weakly and evenly curved to top of scrobes, slightly angled towards mouth margin and virtually straight from top of scrobes to mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 75°; frontovertex virtually smooth behind posterior ocelli but with very shallow, irregular, reticulate sculpture, with a very slender, shallow groove adjacent to eye margin that connects with occipital carina; frontovertex otherwise relatively shiny, with shallow mostly transversely elongate, imbricate-reticulate to polygonally reticulate sculpture, cells generally much smaller than eye facet, sculpture slightly deeper above scrobes; area between eye and scrobe completely smooth and shiny; temple and upper gena very shiny with shallow, longitudinally elongate imbricate-reticulate to strigose sculpture, lower gena with slightly coarser sculpture; scrobes smooth; upper part of interantennal prominence smooth, otherwise mostly with very shallow, fairly regular, polygonally reticulate sculpture; narrowest part between eye and scrobal margin about as wide as diameter of anterior ocellus, smooth and shiny; scrobes deep, meeting dorsally, sharply margined, carinate below eye, very broadly ∩-shaped, interantennal prominence dorsally broadly rounded, without a median ridge; antenna as in Fig. 805; scape broadened and flattened, broadest slightly above middle, about 4.0X as long as broad; flagellum with F1-F4 longer than broad, F5 quadrate, F6 transverse, segments clearly wider distally; clava slightly broader than F6, a little longer than F4-F6 combined, sensory area slightly enlarged, extending about 0.4X along ventral surface, giving it a slightly obliquely truncate appearance; eye not quite reaching occipital margin, separated by a little less

than diameter of facet, with inconspicuous setae, each clearly shorter than diameter of facet; inner eye margins subparallel; malar sulcus absent; clypeal margin medially very weakly convex; mandible with 2 acute teeth and a slightly rounded upper tooth; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 90, HH 86, FV 25, POL 14, OOL 0, OCL 14, AOL 13, EL 65.5, EW 50, MS 30, SL 40, SW 10.

Thorax (Fig. 811) with pronotum hardly exposed behind head and about 0.6X as long as mesoscutum; pronotum with shallow, imbricate-reticulate to polygonally reticulate sculpture that is about as deep as that in ocellar area; mesoscutum with fairly regular, fine, longitudinally elongate, vermiculate-reticulate sculpture that is conspicuously deeper than that on pronotum, near posterior margin medially of more polygonally reticulate cells; axilla and scutellum with polygonally reticulate sculpture that is slightly deeper and coarser than that on mesoscutum, longitudinally elongate laterally on scutellum; visible part of mesoscutum about 1.8X as broad as long; scutellum about as broad as long, with a distinct subapical tuft, setae mostly about 0.7X as long as scutellum; hind femur about 4.4X as long as broad; fore wing with venation and setation as in Figs 809, 810; costal cell with at most a single seta dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 809); mid tibia without an external carina proximally; propodeum (Fig. 811) medially about 0.19X as long as scutellum and smooth. Relative measurements: FWL 84, FWW 27; HWL 77, HWW 18.

Gaster with hypopygium reaching about 0.4X to apex; syntergum about 1.2X as long as mid tibia, with apex acute; ovipositor exserted, the exserted part about 0.75X as long as mid tibial spur or 0.25X as long as mid tibia.

Paratype. Funicle with linear sensilla present only on F4-F6; gaster without "gland-like" structures on Gt1 or Gt5; hypopygium Fig. 806; ovipositor Fig. 808. Relative measurements: OL 73, GL 18 [MT 36].

Variation. Females vary in overall length from 1.55-2.35mm, the head may be completely pale orange, but a with metallic sheen as described for holotype, F1-F4 may be partially dusky yellow or off white, F5-F6 may be slightly paler brown than proximal segments, the occipital carina may be hardly metallic, the mesoscutum may be completely matt with only a few, very inconspicuous, metallic, pale blue reflections posteriorly, the femora and tibiae may be mostly orange, the mid femur may be almost completely dark brown, the base of the gaster may be pale orange ventrally, the head is about 3.3-4.4X frontovertex width with smaller specimens having a relatively wider frontovertex, F5 may be a little longer than broad in larger specimens, F3 may have linear sensilla, the fore wing may be 3.1-3.2X as long as broad and the costal cell may be completely naked. Specimens from higher altitude and from Puntarenas tend to be relatively dark.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Sta Rosa NP, Hacienda 1-0, 29.xi-20.xii.1986 (Janzen, Gauld). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, same data as holotype; 1♀, Guanacaste, NW Volcan Orosí, Cerro El Hacha, 1988; 1♀, Guanacaste, Nandayure, Finca Agua Fria, LN 222550 399500, canopy fog, i.2002 (W. Porras); 1♀, **Heredia**, 11km SE La Virgen, 10°11'N 84°07'W, 450-550m, 05/M/TN, 23.ii-20.iv.2003 (INBio-OET-ALAS); 1♀, **Puntarenas**, Pen. Osa, Puerto Jimenez, 8°32'N 83°19'W, viii.1991 (P. Hanson); 2♀, Puntarenas, Pen. Osa, Puerto Jimenez, 10m, ix.1991 and ii.1992 (P. Hanson). Holotype in MZUCR, paratypes in NHMUK and MZUCR.

COMMENTS. *Cheiloneurus solon* can be distinguished from most similar species by the having the fore wing more than 3X as long as broad, with the apex rounded and uniformly infuscate distad of the apex of the venation. In other similar species (*nigrescens*, *amadeus*, *medusa*, *seius*, *grimus*, *oshtan*, etc.) the fore wing is less than 3X as long as broad and usually has a pattern of paler and darker areas distally and the apex frequently truncate.

***Cheiloneurus pometia* sp.nov.**
(Figs 812-817)

DIAGNOSIS. *Female* (length about 1.6mm): body mostly dark brown with a weak to moderate metallic sheen, scutellum orange; antenna (Fig. 812) with scape mostly white margined dark brown; pedicel and flagellum dark brown; mesoscutum with evenly distributed translucent setae that may appear silvery; fore coxa orange-brown, mid coxa dark brown, hind coxa white; legs mainly orange-brown with fore and hind tibiae mostly dark brown; fore wing (Fig. 814) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation and opposite on posterior wing margin, a small hyaline area at apex; head (Fig. 815) about 14X as wide as frontovertex, in facial view about 1.2X as long as broad, subrectangular, genae weakly converging, more strongly curved near mouth margin; frontovertex naked medially; eye separated from scrobe by about 0.6X diameter of anterior ocellus, area between eye and scrobe completely smooth, scrobal margin carinate; interantennal prominence dorsally rounded with about 40 fairly conspicuous setae; mandible tridentate, upper tooth short and broad; antenna (Fig. 812) with scape about 4.2X as long as broad; funicle with F1-F5 longer than broad, F6 transverse; head width about 0.7X length of funicle; linear sensilla on F3-F6; clava 3-segmented, hardly longer than F5-F6 combined; sensory area large and forming an oblique truncation, extending about 0.3X along ventral margin; mesoscutum (Fig. 817) mostly with very fine polygonally reticulate sculpture but slightly coarser and more elongate anteriorly and laterally; scutellum with a distinct apical tuft of setae; wings fully developed; fore wing (Fig. 814) about 2.6X as long as broad; parastigma clearly curved downwards; costal cell dorsally naked at apex, with a complete line of setae ventrally but naked above parastigma; area below proximal part of parastigma with a group of about 30 pale setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that extends a little way into disc (Fig. 813); apical bristle of postmarginal vein very slightly longer than marginal vein; mid tibial spur about 1.1X as long as basitarsus; propodeum with about 4 setae around each spiracle, side naked; syntergum slightly shorter than mid tibia; ovipositor (Fig. 816) about 3.5X gonostylus or 1.2X as long as mid tibia; gonostylus about as long as mid tibial spur; exserted part of ovipositor about 0.6X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.63mm; excluding ovipositor, 1.47mm (CPD).

Head mostly dark brown, area outside torulus pale orange; occiput pale orange behind gena but mostly dark brown with a blue or blue-green sheen; narrow area between eye and occipital margin with strong golden, green and coppery reflections; frontovertex with a coppery purple sheen, with green reflections, metallic green between posterior ocelli, purple and blue between ocelli and occipital margin, narrowly metallic blue along occipital margin; above scrobes more strongly metallic green with some coppery reflections; between eye and scrobe metallic purple and green; interantennal prominence mostly metallic green, but with a broad purple band between toruli dorsally; a narrow coppery and blue band between toruli ventrally; mouth margin metallic green and coppery; strongly coppery between mouth margin and torulus; temple and most of gena metallic green mixed purple, blue and brassy, small posterior area of gena pale orange; frontovertex clothed with inconspicuous, brown setae; antenna (Fig. 812) with radicle pale orange, apex brown; scape externally white with extreme base and apex dark brown, inner surface white with ventral margin dark brown in proximal two-thirds, dorsal margin with an elongate brown spot half-way and apex dark brown; pedicel and flagellum dark brown; maxillary palpus brown; thorax mostly dark brown; pronotum orange with posterior margin transparent and clear, and neck dark brown; mesoscutum with dark blue sheen with purple reflections, clothed with more or less evenly distributed translucent setae that appear silvery in most lights, posterior margin narrowly mixed purple; tegula dark brown, orange proximally; axilla and scutellum orange, clothed in golden brown setae, subapical tuft on scutellum black; metanotum dark purple-brown with a slight sheen; mesopleuron orange-brown with weak brassy, purple, blue and green reflections; fore coxa orange-brown, fore leg otherwise mostly dark brown with some orange-brown areas; mid coxa dark brown; mid femur white with dorsal margin dark brown and an oblique, subapical, dark brown band, tibia orange-brown, paler distally, with a subbasal white band and a narrow, incomplete subbasal brown band, spur dark orange-brown, tarsus pale orange to orange; hind coxa

white; hind femur pale orange-brown, tibia and tarsus dark brown; fore wing (Fig. 814) mostly infuscate, hyaline towards base and with a small apical hyaline spot; submarginal vein mostly pale brown, rest of venation dark brown; propodeum purple-brown, side shining purple and blue; side of propodeum with some translucent setae outside spiracle; gaster brown, dorsally with a distinct purple sheen with some coppery, green and brassy reflections, sides similar but with a more distinct green sheen, outer plates of ovipositor with a slight blue sheen; gonostylus very pale orange, almost white.

Head (Fig. 815) nearly 14X as wide as narrowest point of frontovertex, in profile with interantennal prominence very distinct below top of scrobes, head about 1.8X as high as deep; occipital margin sharp and carinate; occiput without a median groove above foramen; ocelli forming an angle of about 30°; frontovertex quite shiny, with moderately deep, fairly regular, polygonally reticulate sculpture of mesh size clearly less than diameter of eye facet; lower interantennal prominence with similar sculpture to frontovertex, upper interantennal prominence and scrobes completely smooth; area immediately above scrobes with much deeper, coarser and transversely elongate sculpture; temple and posterior gena with distinctly shallower, more irregular and longitudinally elongate sculpture than on upper part of frontovertex, anterior gena and mouth margin with coarse, irregular, reticulate sculpture; area between eye and scrobe completely smooth; scrobes deep, meeting dorsally, sharply margined above, but roundly margined outside torulus, very weakly ∩-shaped with dorsal part of interantennal prominence hardly convex; antenna as in Fig. 812; scape broadened and flattened above middle, about 4.2X as long as broad; funicle with F1-F5 longer than broad, F6 transverse, segments shortest and broadest distad; linear sensilla present only on F3-F6; clava hardly broadened, only a little longer than F5-F6 combined, sutures oblique, sensory area enlarged, extending ventrally along about one-third of clava, giving it an obliquely truncate appearance; eye not reaching occipital margin, separated by about diameter of facet, appearing naked, but clothed with sparse, very short, inconspicuous setae, each much shorter than diameter of facet; inner eye margins clearly converging for a little way below anterior ocellus; malar sulcus absent; clypeal margin virtually straight; mandible with 3 teeth; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 67.5, HH 82, FV 5, OD 4.5, POL 3, OOL 0, OCL 13, AOL 13.5, EL 55, EW 38, MS 37, SL 48, SW 11.5.

Thorax (Fig. 817) with irregular, polygonally reticulate sculpture on pronotum and most of mesoscutum that is very similar to that on frontovertex; axilla and scutellum with slightly coarser sculpture than disc of mesoscutum; visible part of mesoscutum about 2.1X as broad as long; scutellum about 1.2X as broad as long with a distinct subapical tuft, setae mostly about 0.75X as long as scutellum; hind femur about 5.7X as long as broad; fore wing with venation and setation as in Figs 813, 814; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 813); propodeum (Fig. 817) with 4 or 5 long setae in a line outside spiracle, side almost completely smooth, medially about 0.25X as long as scutellum and smooth. Relative measurements: FWL 64, FWW 25; HWL 56.9, HWW 14.1.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium reaching about two-fifths to apex; syntergum about 0.75X as long as mid tibia, with apex narrowly rounded; ovipositor (Fig. 816) exserted, the exserted part about 0.6X as long as mid tibial spur or about a quarter as long as mid tibia. Relative measurements: OL 57, GL 16.5 [MT 48].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, OTS La Selva, 100m, canopy fog *Virola*, FVK/09, 5.vii.1993 (INBio/OET). Holotype in NHMUK.

COMMENTS. *Cheiloneurus pometia* is similar to *herxius*, *seius*, *poeana* and *oshtan* in that all five species have the head dark brown with a small orange area outside each torulus. Apart from having a much narrower frontovertex (less than 0.1X head width, other species at least 0.15X head width), it differs in having the ovipositor about 3.5X as long as a gonostylus (at least about 4X as long in other species). In addition, in facial view, the dorsal margin of the scrobes is more or less straight and transverse whereas in other similar species the scrobes are distinctly downcurved laterally.

***Cheiloneurus genua* sp.nov.**
(Figs 818-823; Hab. ♀ 119)

DIAGNOSIS. *Female* (length about 3.1-3.6mm): body mostly dark brown with a weak to moderate metallic sheen, some orange areas on head, pronotum, scutellum and mesopleuron; antenna (Fig. 819) with scape white margined dark brown; pedicel and flagellum dark brown, distal segments of funicle orange or mixed pale orange; darker areas of mesoscutum with silvery setae; fore and hind coxae white, mid coxae dark brown; legs largely dark brown with pale orange areas; fore wing (Fig. 820) mostly infuscate with basal cell hyaline except proximally, a small hyaline area at apex of venation and opposite on posterior wing margin, apex slightly paler; head (Fig. 822) about 6X as wide as frontovertex, in facial view about 1.2X as long as broad, oval, genae converging, evenly weakly curved inwards towards mouth margin; frontovertex naked medially; eye separated from scrobe by about 1.7X diameter of ocellus, area between eye and scrobe completely smooth, scrobal margin carinate; interantennal prominence dorsally rounded with about 40 fairly conspicuous setae; mandible with two long, acute teeth and a slightly shorter, rounded, upper tooth; antenna (Fig. 819) with scape about 5X as long as broad; all funicle segments clearly longer than broad; head width about 0.9X length of flagellum; linear sensilla on F4-F6; clava 3-segmented, about as long as F3-F6 combined; sensory area large and forming an oblique truncation, extending nearly 0.8X along ventral margin; mesoscutum (Fig. 823) mostly with coarse, fine, polygonally reticulate sculpture, anteriorly and on sides sculpture fine longitudinally striate to striate-reticulate sculpture; scutellum with a distinct apical tuft of setae; wings fully developed; fore wing (Fig. 820) about 2.7-2.8X as long as broad; parastigma very distinctly curved downwards; costal cell dorsally naked at apex and ventrally with a line of setae that is complete or interrupted above parastigma; area below proximal part of parastigma with a group of about 9-30 pale setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that extends a little way into disc (Fig. 818); apical bristle of postmarginal vein about 0.5X as long as marginal vein; mid tibial spur slightly shorter than basitarsus; propodeum (Fig. 823) with about 4 setae around each spiracle, side naked; syntergum about 0.7X as long as mid tibia; ovipositor (Fig. 821) about 1.8X gonostylus or 2.9X as long as mid tibia; gonostylus about 5X as long as mid tibial spur; exserted part of ovipositor about 4.5X as long as mid tibial spur or longer than gaster. *Male*: unknown.

Female (holotype): length, including ovipositor, 3.58mm; excluding ovipositor, 2.26mm (CPD).

Head mostly brown, mixed orange around top of scrobes and around toruli; occiput orange-brown, dark brown medially; frontovertex mostly shiny with a weak purple, blue and brassy sheen, ocellar area with a dark blue and purple sheen, area towards occipital margin with a stronger purple, coppery and brassy sheen; interantennal prominence with a metallic green and purple sheen, green stronger dorsally; middle part of clypeus dark metallic green, dark coppery on protuberant part; temple metallic blue-green and green; gena similar to temple but mixed distinctly brassy; area between eye and scrobe shining purple; antenna (Fig. 819) with radicle pale orange-brown, distally dark brown; scape white, with proximal two thirds of ventral margin dark brown, upper margin internally dark brown, proximally paler brown; pedicel and flagellum dark brown, virtually black, F4 and F5 partially mixed pale orange; apical two segments of maxillary palpus dark brown, contrasting with off-white proximal segments; thorax mostly orange; posterior margin of pronotum translucent, neck dark brown; mesoscutum dark brown with a very slight brassy and purple lustre, antero-lateral parts less metallic and mixed orange, darker parts clothed with fairly evenly distributed silvery setae, these slightly more dense laterally along anterior edge of darker area, antero-lateral parts with slightly less dense, golden brown setae; tegula dark brown;

axilla with golden brown setae; scutellum anteriorly with pale brown setae, posterior setae golden brown, subapical tuft conspicuous and black, a few anterior setae of subapical tuft off-white; metanotum dark orange-brown with a very slight purple sheen; mesopleuron orange weakly margined brown, anteriorly with a slight brassy, green and purple sheen, posteriorly with a very weak purple and brassy sheen; fore and hind coxae white, mid coxa dark brown; fore femur dark brown, largely pale brown internally and externally with a white, median stripe, tibia dark brown, tarsus dark brown; mid femur white, distal half with dorsal margin dark brown merging into an oblique subapical dark brown ring, distal apex white, mid tibia narrowly dark brown basally with a narrow, white subbasal ring, remainder dark brown, gradually becoming pale orange distally, spur mostly pale orange but dorsal margin brown; hind femur and tibia dark brown, femur with a weak, external, subapical orange area, hind tarsus orange-brown; fore wing (Fig. 820) mostly infuscate, hyaline towards base; submarginal vein yellow-brown, rest of venation dark brown; propodeum dark purple-brown, side shining metallic blue and green; side of propodeum with 5 or 6 inconspicuous silvery setae in a line outside spiracle; gaster dark purple-brown, mixed coppery, purple and brassy, sides quite strongly metallic blue and green; visible part of gonostylus pale orange.

Head (Fig. 822) about 6X as wide as frontovertex, in profile anteriorly virtually straight from top of scrobes to top of clypeus, about 2X as high as deep; occipital margin sharp, weakly carinate; occiput without a median groove above foramen; ocelli forming an angle of about 35°; frontovertex shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh size slightly less than diameter of eye facet, a little coarser, of larger mesh and more transversely elongate above scrobes; scrobal area and mouth margin and gena with more irregular, shallower sculpture, interantennal prominence dorsally smooth and shiny; temple virtually entirely smooth, but posteriorly with shallow, longitudinally elongate sculpture; area between eye and scrobe smooth and shiny; scrobes deep, meeting dorsally, very broadly ∩-shaped, dorsal and lateral margins clearly defined, sharp, lateral margins clearly carinate, carina extending a little below top of torulus; antenna as in Fig. 819; scape hardly broadened and flattened, about 5X as long as broad; funicle with all segments clearly longer than broad, segments shortest and broadest distad; clava slightly broadened, about as long as F3-F6 combined, sutures very oblique, sensory area enlarged, extending ventrally about 0.75X along clava, giving it a distinct, strongly, obliquely truncate appearance; eye very nearly reaching occipital margin, separated by much less than diameter of facet, clothed with very short, inconspicuous setae, each much shorter than diameter of facet; inner eye margins slightly diverging anteriorly; malar sulcus present, but very inconspicuous; clypeus distinctly produced medially, rounded; mandible with two long, acute teeth and a slightly shorter, rounded, upper tooth; apical segment of maxillary palpus not conspicuously enlarged, about 1.5X as long as radicle. Relative measurements: HW 92, HH 113, FV 15.5, OD 7.5, POL 5.5, OOL 0, OCL 12.5, AOL 13.5, EL 71.5, EW 50, MS 45, SL 52, SW 10.

Thorax (Fig. 823) with shallow, irregular, transversely elongate, polygonally reticulate sculpture on pronotum, a little deeper than that on frontovertex and generally of mesh size much less than diameter facet; sculpture on most of mesoscutum similar to that on pronotum, but a little more regular and slightly deeper, shallower towards posterior margin; axillae with similar sculpture to anterior part of mesoscutum, but slightly deeper, that on scutellum similar but a little deeper and more longitudinally elongate, extreme apex and sides completely smooth and shiny; visible part of mesoscutum about 2.1X as broad as long; scutellum about as broad as long, with a very distinct subapical tuft, setae mostly about half as long as scutellum; hind femur about 5.3X as long as broad; fore wing with venation and setation as in Figs 818, 820; costal cell more or less naked dorsally at apex, at most with only a single seta; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 818); propodeum (Fig. 823) with not more than five setae in a line outside spiracle, side completely smooth and shiny and demarked by a strong anterior carina outside spiracle, medially about 0.2X as long as scutellum, smooth and shiny. Relative measurements: FWL 93, FWW 34; HWL 81, HWW 20.5.

Gaster with hypopygium reaching about half-way to apex; syntergum about 0.7X as long as mid tibia, with apex weakly angular; ovipositor strongly exserted, the exserted part longer than rest of gaster or about 1.6X as long as mid tibia.

Paratype. Antenna with linear sensilla present only on F4-F6; gaster without “gland-like”

structures on Gt1 or Gt5; ovipositor Fig. 821. Relative measurements: OL 157.5, GL 87.5 [MT 54].

Variation. Females vary in overall length from 3.10-3.58mm, F5 and F6 may be almost completely pale orange; the coppery area on the clypeus may extend laterally to below the torulus, the mesopleuron may be dark orange-brown, the head may be about 5X as wide as the frontovertex, the fore wing varies from 2.7-2.8X as long as broad, there may be a group of about 9-30 pale setae below the parastigma and the line of setae on the ventral surface of the costal cell may be complete or broadly interrupted above the parastigma.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, La Selva BS, 10°26'N 84°01'W, 50-150m, fog *Virola*, FVK/01, i.1993 (INBio-OET). Paratypes: **COSTA RICA**, 1♀, **Heredia**, same data as holotype; 1♀, **Puntarenas**, PN Piedras Blancas, Est. El Bonito, 8°43'N 83°13'W, 100m, 13-14.ii.2012 (J.S. Noyes). Holotype in MZUCR, paratypes in NHMUK.

Cheiloneurus goldus **sp.nov.**

(Figs 824-827; Hab. ♀ 120)

DIAGNOSIS. *Female* (length about 1.5-2.3mm): body mostly from orange-brown to dark brown with orange scutellum, darker areas with a weak to moderate sheen; antenna (Fig. 827) with scape mostly white with dorsal and ventral margins largely brown; pedicel dark brown; funicle dark brown with F2-F4 partially or completely white; clava dark brown; mesoscutum with silvery setae in posterior half; fore and hind coxae white, mid coxa dark brown; legs otherwise white to pale orange, with extensive dark brown areas, hind femur and tibia dark brown; fore wing (Fig. 825) mostly infuscate with an extensive V-shaped hyaline area in basal cell, a small hyaline area at apex of venation and another opposite; head (Fig. 826) about 5.9-7.0X as wide as frontovertex, in facial view slightly longer than broad, suboval, genae converging, virtually straight but strongly curved inwards near mouth; frontovertex naked medially between anterior ocellus and scrobes; eye separated from scrobe by about diameter of anterior ocellus, area between eye and scrobe completely smooth and shiny; scrobes deep, sharply margined; interantennal prominence with about 25 moderately conspicuous setae and dorsally rounded; mandible virtually tridentate; antenna (Fig. 827) with scape about 5.8X as long as broad; F1-F5 longer than broad, F6 transverse; linear sensilla on F1-F6; clava 3-segmented, about as long as F4-F6 combined; sensory area enlarged, extending ventrally about 0.5X length of clava, apex obliquely truncate; head width hardly longer than funicle; mesoscutum with fine polygonally reticulate sculpture, slightly elongate laterally; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 825) about 2.8-2.9X as long as broad; parastigma downcurved; costal cell dorsally naked save for one or two apical setae, ventrally with a line of setae that is broadly interrupted above parastigma; area below proximal part of parastigma with a group of about 35 setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that hardly continues into disc (Fig. 824); apical bristle of postmarginal vein about 0.6X as long as marginal vein; mid tibial spur slightly shorter than basitarsus; propodeum with about eight silvery setae adjacent to spiracle, side naked; syntergum about 1.3X as long as mid tibia with apex angular; ovipositor about 3.8X gonostylus or about 1.3X as long as mid tibia; gonostylus about 1.2X as long mid tibial spur; exserted part of ovipositor about 0.5X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.84mm; excluding ovipositor, 1.76mm (CPD).

Head generally orange; occiput pale orange-brown, darker towards foramen; temple and gena with a broad pale brown streak from occipital margin towards base of mandible; ocellar area

orange-brown; occipital margin to dorsal part of temple narrowly dark, metallic blue; area between occipital margin and posterior ocelli margined purple, within this brassy; area between ocelli metallic blue and purple; frontovertex in front of ocelli mainly weakly brassy; area between eye and scrobe with a weak, mixed brassy and purple sheen, distinctly coppery and purple laterally; temple metallic blue, more coppery anteriorly and on brown areas; gena weakly coppery and brassy; top of scrobes pale orange, narrowly bordered dark brown laterally; interantennal prominence dorsally orange-brown with a weak green, blue and purple sheen, ventrally pale orange with a weak brassy sheen; frontovertex with inconspicuous pale brown setae along inner eye margins, these continued as a single line of slightly more conspicuous translucent, pale brown, setae below eye; gena and interantennal prominence with numerous, scattered, pale brown setae; maxillary palpus orange-brown, terminal segment dark brown; antenna (Fig. 827) with radicle orange proximally, apex narrowly dark brown; scape largely white to very pale orange with proximal 0.7X of ventral margin dark brown, dorsal dark brown at extreme apex and base, otherwise orange; pedicel and F1 dark brown, F2 white dorsally, dark brown ventrally, F3-F4 white, F5-F6 and clava dark brown; pronotum orange with weak purple, blue and brassy reflections, posterior margin translucent, neck widely dark brown; propleuron orange, brown in front of coxa; prosternum mainly white, pale orange anteriorly; mesoscutum black with weak brassy reflections, posterior margin dark purple-brown with slight brassy reflections, anterior half with golden brown to dark brown setae, posterior half with similarly spaced, but more conspicuous, translucent, silvery setae; tegula dark brown, apex slightly paler, translucent orange-brown; axilla orange with weak coppery and brassy reflections, with dark brown setae; scutellum orange-brown between axillae and in apical one-third, otherwise orange with weak coppery reflections, anteriorly with translucent pale brown setae, posteriorly with black setae, subapical tuft black; metanotum dark brown; mesopleuron orange-brown, generally with a weak brassy lustre, additionally with weak purple, blue and gold reflections anteriorly and a purple and coppery lustre posteriorly; fore coxa white; proximal half of fore femur more or less white, margined dark brown, more widely so in middle, apex orange, fore tibia and tarsus brown; mid coxa dark brown; mid femur white in proximal half, apex orange mixed dark brown dorsally, tibia with a narrow, subbasal, dusky white band, otherwise dark brown proximally with apical half orange to pale orange, spur and tarsus pale orange; hind coxa white; hind femur dark brown with a pale orange area ventrally towards apex, tibia and basitarsus dark brown, tarsus otherwise pale orange; fore wing (Fig. 825) mostly infuscate but hyaline towards base, submarginal vein pale orange, otherwise venation brown; propodeum dark brown with a purple sheen medially, green laterally, dark blue and purple on side, a group of about 6 or 7 conspicuous silvery setae anterolateral to spiracle; gaster dark brown, Gt1 dorsally with a coppery sheen, remaining tergites mostly with a weaker coppery, purple and slight brassy sheen, sides of tergites mainly metallic blue-green and green mixed with some copper and purple, remainder of gaster with a brassy, coppery and purple sheen; gonostylus pale orange, proximally brown.

Head (Fig. 826) about 6.7X as wide as frontovertex, in profile 1.7X as high as deep, anteriorly evenly rounded from occipital margin to top of scrobes then fairly straight towards mouth margin with interantennal prominence slightly protuberant; occipital margin sharp, distinctly carinate; ocelli forming an angle of about 45°; frontovertex quite shiny, completely smooth between occipital margin and posterior ocelli, otherwise with conspicuous, fine, polygonally reticulate sculpture of mesh size a little smaller than diameter of facet, area immediately above scrobes with coarser, more irregular, transversely elongate sculpture; narrowest point between eye and scrobe about equal to diameter of anterior ocellus and completely smooth and mirror-like; temple with relatively shallow, irregular, elongate, sculpture; gena with slightly deeper more regular, polygonally reticulate sculpture; scrobes deep, very broadly ∩-shaped, meeting, dorsally very smooth, sharply margined dorsally and laterally, carinate laterally; interantennal prominence without median ridge, dorsally completely smooth and broadly rounded, lower parts with relatively shallow, polygonally reticulate sculpture; antenna as in Fig. 827; scape hardly broadened and flattened, about 5.8X as long as broad; F1-F4 clearly longer than broad, F5 slightly longer than broad, F6 transverse, segments larger and broader distad; clava hardly broadened, about as long as F4-F6 combined, sutures oblique, sensory area enlarged, extending ventrally about 0.5X length of clava, apex strongly obliquely truncate; eye reaching occipital margin, clothed in sparse, inconspicuous, setae, each clearly shorter than diameter of facet; inner eye

margins clearly diverging in front of anterior ocellus; malar sulcus present, but indistinct; clypeal margin virtually straight medially; mandible with one acute tooth and a broad, slightly concave truncation, virtually tridentate; apical segment of maxillary palpus not enlarged, about 1.6X as long as radicle. Relative measurements: HW 77, HH 81, FV 11.5, POL 5, OOL 0, OCL 11.5, AOL 9, EL 60, EW 44, MS 31.5, SL 46, SW 8.

Thorax with pronotum short, hardly exposed behind head, about 0.6X as long as mesoscutum; pronotum, mesoscutum, axilla and scutellum with polygonally reticulate sculpture that is deeper and coarser than that on frontovertex, sculpture on pronotum perhaps a little shallower than elsewhere on thoracic dorsum and slightly more elongate on sides of mesoscutum; visible part of mesoscutum about 1.9X as broad as long; scutellum about as long as broad, with a distinct subapical tuft, setae about 0.6X as long as scutellum; mid tibia with a weak external carina for about half its length; hind femur about 5.1X as long as broad; fore wing with venation and setation as in Figs 824, 825; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak (Fig. 824); propodeum medially about 0.21X as long as scutellum and virtually smooth. Relative measurements: FWL 72, FWW 24.5; HWL 63, HWW 14.5.

Gaster with hypopygium reaching about 0.4X to apex; syntergum about as long as mid tibia, with apex angular; ovipositor slightly exserted, the exserted part about 0.5X length of mid tibial spur or about 0.13X mid tibia.

Paratype. Funicle with linear sensilla present only on F1-F6; gaster without "gland-like" structures on Gt1 or Gt5. Relative measurements: OL 59, GL 15.5 [MT 47].

Variation. Females vary in overall length from 1.48-2.26mm, some specimens may be significantly darker than the holotype with the head largely orange-brown to brown, the axilla and apical one-third of the scutellum orange-brown and the head may vary from about 5.9-7.0X as wide as the frontovertex.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Sta Rosa NP, Hacienda 4-C, 5-26.x.1985 (Janzen, Gauld). Paratypes: **COSTA RICA**, 19♀, **Guanacaste**, NP, various localities and dates, 28.xii.1985-23.i.1988 (Janzen, Gauld); 4♀, Guanacaste, NW Volcan Orosi, Cerro El Hacha, 300m, 1988; 1♀, Guanacaste, Murcielago (ACG), MT, 24.i-4.ii.1996 (J. Ugalde); 2♀, Guanacaste, Guanacaste NP, Est. Pitilla, 700m, YPT, iii.1990 (J.S. Noyes); 4♀, Guanacaste, Pitilla (ACG), MT/YPT, 24.i-27.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Est. Maritza (ACG), LN 326900 373000, 600m, iii.1996 (M. Pereira); 1♀, Guanacaste, Est. Pitilla (ACG), Sector Rio Mena, 11°00'N 85°27'W, 700m, 4-7.i.2001(C. Moraga, P.N. Thomas); 1♀, Guanacaste, Murcielago, 3km NNW Cerro Guachipelin, LN 323000 336500, 40m, 28.ii.1996 (M. Araya); 1♀, Guanacaste, Las Pallas (ACG), 10°46'N 85°21'W, 600m, 28.i-2.ii.2001 (C. Moraga, P.N. Thomas); 1♀, Guanacaste, 10km NW Cañas, Mojica, rice, 12-26.ix.2011 (P. Hanson); 1♀, Guanacaste, Cañas, Rio Chiquito, LN 292000 4417000, 410m, #74625, 25.vii.2003 (J. Azofeifa); 2♀, Guanacaste, ZP Nozara, Fila Maravilla, LN 221350 381700, 800m, #66663, 24.xi-21.xii.2001 (I. Jiménez); 1♀, Guanacaste, PN Bosque Diría, 10°10'N 85°34'W, 200m, 14-15.ii.2011 (J.S. Noyes); 1♀, Guanacaste, PN Palo Verde, Sector Palo Verde, LN 260952 385020, 50m, #54954, 5-18.i.2000 (I. Jiménez); 3♀, Guanacaste, PN Palo Verde, Sector Catalina, Fila Catalina, 250m, LN 257400 400000, 8.i-8.ii.2000 and ix.1999 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sector Catalina, Ojo de Agua, LN 388500 257300, 20m, #62106, 13.iii-9.iv.2001 (I. Jiménez); 4♀, Guanacaste, PN Palo Verde, Camino de Alto Viejo, LN 386300 260770, 40m, #61363, 11.i-10.ii.2001 (I. Jiménez); 1♀, **Alajuela**, RF Arenal, PN Volcan Arenal, Sector Colada, LN 269900 456750, 600m, #54371, 1-26.x.1999 (G. Carballo); 1♀, Alajuela, PN Arenal, Sendero Pilón, LN 458050 269200, 650m, T. Malaise, #59234, 5.ix-7.x.2000 (G. Carballo); 1♀, Alajuela, Chiles de Agua Zarcas, 300m, café, xii.1989 (C. Céspedes); 2♀, Alajuela, Agua Zarcas, La Chiles, café, xi.1989 and i.1990 (P. Hanson); 1♀, Alajuela, San Cristobal, LN 318056 383200, 600-820m, #51902, 23.ii-25.iii.1996 (F.A. Quezada, D. Briceño); 1♀, **Heredia**, Est. Biol. La Selva, 10°26'N

84°01'W, x.1995 (OET/INBio); 1♀, **San José**, San Pedro, Tigre Cacao, ii-iv.1990 (P. Hanson); 1♀, **Cartago**, Turrialba, CATIE, 700m, MT/YPT, 14-15.iii.1990 (J.S. Noyes); 2♀, Cartago, Turrialba, CATIE, v.1994 and viii,1994 (P. Hanson); 7♀, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 14-15.ii.2005, 19-20.ii.2019, 17-18.ii.2011 and 23-24.ii.2013 (J.S. Noyes); 1♀, Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 11-21.ii.2005 (C. Hansson); 1♀, Puntarenas, Reserva Absoluta Cabo Blanco, 9°35'N 85°06'W, 30m, 16-17.ii.2009 (J.S. Noyes); 1♀, Puntarenas, Manuel Antonio, 26.vii.1986 (L. Masner); 1♀, Puntarenas, NP Manuel Antonio, 8-14.xii.1987 (Grenierre & Bertrand); 1♀, Puntarenas, Coto Brus, Melizas Sabalito, LS 315500 598500, 1400-1500m, #55162, 28.xii.1995 (P. Navarro); 2♀, Puntarenas, RF Golfo Dulce, 5km W Piedras Blancas,8°46'N 83°17'W, vi-vii.1992 and x.1992 (P. Hanson); 1♀, **Limón**, RB Hitoy Cerere, Est. Hitoy Cerere, Sendero Bobócara, LN 184250 640500, 640m, MT, #52905, 18.v-18.vi.1999 (F. Umaña); 1♀, Limón, RB Hitoy Cerere, Est. Hitoy Cerere, Rompe Pechos, LS 400250 571500, 600m, #53324, 6.ix.1999 (F. Umaña); 1♀, Limón, RB Hitoy Cerere, Send. Tepezcuintle, LN 199225 395300, 0-100m, #72363, 6-10.ii.2002 (P. Thomas); 1♀, Limón, RB Hitoy Cerere, Calle del Silencio, LS 570120 400702, 560m, #58066, 17.vi-17.vii.2000 (F. Umaña). Holotype in MZUCR, paratypes in NHMUK, MZUCR, USNM and CNC.

Cheiloneurus aliphera sp.nov.

(Figs 828-832; Hab. ♀ 121)

DIAGNOSIS. *Female* (length about 2.1-3.1mm): body mostly dark brown with a weak to moderate metallic sheen, head orange-brown, scutellum mostly at least partially orange; antenna with (Fig. 830) scape mostly white margined dark brown; pedicel and flagellum mostly dark brown, F2-F5 variously mixed yellow or pale orange; mesoscutum with evenly distributed translucent setae that may appear silvery; fore and hind coxae white, mid coxa dark brown; legs mainly dark brown with some paler areas; fore wing (Fig. 828) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation and opposite on posterior wing margin, apex a little paler; head about 4.8X as wide as frontovertex, in facial view very slightly broader than long, subquadrate, genae weakly converging, more strongly curved towards mouth margin; frontovertex naked medially; eye separated from scrobe by about 0.6X diameter of anterior ocellus, area between eye and scrobe completely smooth, scrobal margin sharp below eye, rounded medially; interantennal prominence dorsally rounded with about 20 fairly conspicuous setae; mandible tridentate; antenna (Fig. 830) with scape about 5X as long as broad; all funicle segments longer than broad; head width about equal to length of funicle; linear sensilla on F3-F6 or absent from F3; clava 3-segmented, nearly as long as F4-F6 combined; sensory area large and forming an oblique truncation, extending about 0.2X along ventral margin; mesoscutum (Fig. 831) medially in posterior two two-thirds with polygonally reticulate sculpture, anteriorly and on sides with coarse striate sculpture; scutellum with a distinct apical tuft of setae; wings fully developed; fore wing (Fig. 828) about 3.1X as long as broad; parastigma clearly curved downwards; costal cell dorsally with two or three setae at apex and a complete line of setae ventrally; area below proximal part of parastigma with a group of about 16-20 pale setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that extends a little way into disc (Fig. 829); apical bristle of postmarginal vein slightly more than 0.4X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with about 8 setae around each spiracle, side naked; syntergum very slightly longer than mid tibia; ovipositor (Fig. 832) about 2.6X gonostylus or 2X as long as mid tibia; gonostylus about 2.3X as long as mid tibial spur; exserted part of ovipositor about 1.7X as long as mid tibial spur. *Male* (length about 1.3-1.4mm): similar to female but scape yellow; flagellar segments at least 4X as long as broad clothed in long setae; wings hyaline; digitus with a single apical hook; aedeagus slender, about 14X as long as broad.

Female (holotype): length, including ovipositor, 3.08mm; excluding ovipositor, 2.56mm (CPD).

Head mostly orange-brown, pale orange between toruli; frontovertex with a weak purple sheen, bluish along eye margins, distinctly brassy in ocellar area; temple with a metallic green and blue-green sheen, brassy near eye; gena posteriorly with a dull green sheen, anteriorly with a purple, coppery and brassy sheen; area between eye and scrobe purple with a slight brassy lustre; interantennal prominence dorsally with a moderate purple sheen; mouth margin dark brown between mandibular bases; frontovertex clothed with inconspicuous, pale brown setae;

antenna (Fig. 830) with radicle brown; scape mostly dusky white to very pale orange, ventral margin dark brown in proximal two-thirds or so, dorsal margin dark brown; pedicel and flagellum largely dark brown, F4 very pale yellow, F3 distally and F5 proximally mixed pale orange; apical segment of maxillary palpus brown contrasting with white proximal segments; thorax mostly dark brown; pronotum with a slight dark purple sheen; mesoscutum with a dark green sheen with metallic blue reflections, clothed with more or less evenly distributed translucent setae that appear silvery in some lights, posterior margin narrowly mixed purple; tegula dark brown; axilla similar to mesoscutum but appearing slightly darker; scutellum anteriorly similar to axilla, mixed orange posteriorly and medially completely orange, clothed in golden brown setae, subapical tuft black, extreme sides and apex shining metallic green and brassy, mixed orange; metanotum dark purple-brown with a slight sheen; mesopleuron chestnut brown, anteriorly with a brassy, purple, blue and green sheen, posteriorly with a purple sheen; fore coxa white; remainder of fore leg almost entirely dark brown, proximal part of femur and distal part of tibia mixed orange; mid coxa dark brown, proximal half of femur white mixed pale brown, distal half dark brown, tibia dark brown with a dusky white, subbasal ring and orange apex, spur orange-brown, tarsus pale orange-brown; hind coxa white, femur and tibia dark brown, tarsus orange-brown; fore wing (Fig. 828) mostly infuscate, hyaline towards base; submarginal vein mostly pale yellow-brown, rest of venation dark brown; propodeum purple-brown medially with a slight brassy lustre, laterally with a green and coppery sheen, side shining blue-green, brassy and coppery; side of propodeum with translucent setae outside spiracle; gaster brown, dorsally with a distinct purple sheen with some coppery, green and brassy reflections, sides similar but with a more distinct green sheen, outer plates of ovipositor with a slight blue sheen; gonostylus very pale orange.

Head about 4.8X as wide as narrowest point of frontovertex, in profile virtually straight below top of scrobes, head about 1.6X as high as deep; occipital margin rounded; occiput without a median groove above foramen; vertex with a distinct groove adjacent to eye margin behind posterior ocellus; ocelli forming an angle of about 50°; frontovertex slightly shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh size clearly less than diameter of eye facet; lower interantennal prominence and mouth margin with similar sculpture to frontovertex, upper interantennal prominence completely smooth; temple and posterior gena with shallow, irregular longitudinally elongate sculpture, anterior gena with similar, but coarser sculpture; area between eye and scrobe completely smooth; scrobes moderately deep, meeting dorsally, ∩-shaped, but relatively short, dorsally hardly longer than torulus, sharply margined near eye, but roundly margined dorsally and below level with top of torulus; antenna as in Fig. 830; scape hardly broadened and flattened, about 5X as long as broad; all funicle segments longer than broad, segments shortest and broadest distad; clava slightly broadened, a little shorter than F4-F6 combined, sutures oblique, sensory area enlarged, extending ventrally along about one-fifth of clava, giving it a slightly obliquely truncate appearance; eye not reaching occipital margin, separated by about 2X diameter of facet, appearing naked, but clothed with sparse, very inconspicuous setae, each much shorter than diameter of facet; inner eye margins slightly diverging below anterior ocellus; malar sulcus present, but very inconspicuous; clypeal margin medially very slightly convexly rounded; mandible with 3 teeth, upper tooth slightly rounded; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 96, HH 94, FV 20, OD 6.5, POL 9, OOL 0, OCL 15, AOL 11, EL 65, EW 50, MS 40, SL 48, SW 9.5.

Thorax (Fig. 831) with irregular, polygonally reticulate to imbricate-reticulate sculpture on pronotum, very slightly deeper than that in ocellar area but of similar mesh size; most of mesoscutum with polygonally reticulate sculpture that is slightly coarser than that on pronotum and slightly, but distinctly, longitudinally elongate anteriorly and on sides; axilla with slightly coarser sculpture than disc of mesoscutum; scutellum with slightly coarser sculpture than that on axilla and of larger mesh; visible part of mesoscutum about 1.7X as broad as long; scutellum about as long as broad with a distinct subapical tuft, setae mostly about half as long as scutellum; hind femur about 5X as long as broad; fore wing with venation and setation as in Figs 829, 828; costal cell naked dorsally at its apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 829); propodeum (Fig. 831) with 5 or 6 setae in a line outside spiracle, side completely smooth, medially about 0.17X as long as scutellum and with some shallow, irregular, sculpture. Relative measurements: FWL 114, FWW 37; HWL 97, HWW 21.5.

Gaster with hypopygium reaching about two-fifths to apex; syntergum about as long as mid

tibia, with apex narrowly rounded; ovipositor strongly exserted, the exserted part about 1.7X as long as mid tibial spur or a little more than half as long as mid tibia.

Paratype. Antenna with linear sensilla present only on F3-6 or F4-6; gaster without "gland-like" structures on Gt1 or Gt5; ovipositor Fig. 832. Relative measurements: OL 108.5, GL 41.5 [MT 54].

Variation. Females vary in overall length from 2.06-3.08mm, the scrobal area may be almost entirely pale orange; F3 may be almost completely pale yellow with F2 partially yellow, the scutellum may vary from more or less completely orange to completely dark brown, the mid coxa may be largely white, only dark brown on the ventral surface, and in smaller specimens F6 may be hardly longer than broad and the sensory area on the clava relatively shorter so that apex may appear to be more or less transversely truncate.

Male: length 1.25-1.36mm. Quite similar to female but for structure of antenna and genitalia. Antenna with scape yellow and flagellum pale brown; scutellum dark brown, medially with a strong coppery purple sheen, laterally narrowly with a metallic dark blue-green sheen; wings hyaline; antenna with scape about 4.4X as long as broad; funicle with all segments at least about 4X as long as broad and clothed with setae about 2.5-3X as long as diameter of segments; clava about 6X as long as broad and about 1.7X as long as F6; digitus with a single apical hook; aedeagus slender, about 14X as long as broad. Relative measurements: HT 45, FV 19, SL 21, MT 60, AL 39.

DISTRIBUTION. Costa Rica, Trinidad & Tobago, Colombia, Venezuela, Peru.

HOSTS. Recorded below from cricket (Orthoptera) eggs in Colombia.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Alajuela**, San Carlos, RF Arenal, Send. Pilón, LN 269100 457900, 600m, #56656, 9.iii-7.iv.2000 (G. Carballo). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, PN Palo Verde, Cerro Guayacan, LN 259350 389600, 212m, #55148, 10.i-9.ii.2000 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sector Catalina, Puente Espuela, LN 385020 260952, 0m, #58295, 9.viii-8.ix.2002 (I. Jiménez); 2♀, Guanacaste, 5km NW Cañas, sweeping trees, grasses, shrubs, edge of forest, 80/102B, 9.xi.1980 (J.B. Woolley); 1♀, **Heredia**, Chilamate, 75m, 25.iii.1989 (Hanson, Godoy); 1♀, Heredia, F(inca) La Selva, 3km S P(uer)to Viejo, 10´26'N 84°01'W, 6.iv.1983 (H.A. Hespenheide); 1♀, Heredia, OTS La Selva, 10´26'N 84°01'W, x.1992 (P. Hanson);); 11♀, Heredia, Estacion Biológica La Selva, 10°26'N 84°01'W, 75m, 1-2. iii.2007 (J.S. Noyes); 1♀, **San José**, Braulio Carrillo NP, 1000m, 18.ii.2001 (J.S. Noyes); 1♀, **Cartago**, Turrialba, CATIE, YPT, ix.1994 (P. Hanson); 2♀, **Puntarenas**, Pen. Osa, Puerto Jimenez, 8°32'N 83°19'W, 10m, viii.1991 and ii.1992 (P. Hanson); 1♀, Puntarenas, RF Golfo Dulce, Est. Agujas, LS 276750 526550, 300m, MT, #54023, 1-11.xi.1999 (J.A. Azofeifa); 2♀, Limón, PN Braulio Carrillo, Est. Queb. Gonzalez, 10°09'N 83°57'W, 450m, 15.ii.2003 (J.S. Noyes); 1♀, **Limón**, RB Hitoy-Cerere, 100m, 14-19.i.1991 (J.S. Noyes); 1♀, Limón, PN Cahuita, 10m, 9°43'N 82°49'W, 24.ii.2010 (J.S. Noyes). **TRINIDAD & TOBAGO**, 1♀, **Trinidad**, St George, Caura, edge of rainforest and grassland, 26.vi.1976 (J.S. Noyes); 1♀, Trinidad, St George, Tumpuna Reserve, Caribbean pine plantation, 7.viii.1976 (J.S. Noyes); 1♀, 1♂, Trinidad, St George, Lopinot, cocoa plantation and rainforest, 10.viii.1976 (J.S. Noyes); 1♀, Trinidad, Caroni, pepper, cacao and coffee plantation, 2.vii.1976 (J.S. Noyes); 1♀, Trinidad, St Andrew, Oropuche, cocoa and banana plantations, 28.vi.1976 (J.S. Noyes); 1♀, 1♂, Trinidad, Maracas Valley, x.1977 (F.D. Bennett). **COLOMBIA**, 25♀, 2♂, Armenia, cricket eggs, 8.viii.1974 (R. Cárdenas). **VENEZUELA**, 1♀, Merida, 2km NW La Azulita, iv.1988 (A.T. Finnamore, C.E. Baxfield). **PERU**, 1♀, Junin, Satipo, 18-19.i.1984 (L. Huggert); 1♀, Loreto, Explorama Inn, 40km N. Iquitos Amazon R., vii.1990 (A. Menke, A. Vertschenko). Holotype in MZUCR, paratypes in NHMUK, CNC, TAMU and MZUCR.

Cheiloneurus mago sp.nov.
(Figs 833-839)

DIAGNOSIS. *Female* (length about 1.5mm): head orange to orange-brown, axilla and scutellum orange, rest of body dark brown with a weak to moderate metallic sheen; antenna (Fig. 836) with scape mostly white with dorsal and ventral margins largely brown; pedicel and flagellum dark brown; mesoscutum mostly with translucent, silvery setae; coxae white; fore femur and mid legs

mostly white to pale orange, remainder of legs mostly dark brown; fore wing (Fig. 834) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation, another similar-sized area opposite and apex with a subtriangular hyaline area; head (Fig. 833) about 5.2X as wide as frontovertex, in facial view slightly broader than long, subquadrate, genae slightly converging, straight, but strongly curved inwards near mouth; frontovertex naked medially between anterior ocellus and scrobes; eye separated from scrobe by slightly less than diameter of anterior ocellus, area between eye and scrobe completely smooth; scrobes deep, sharply margined, carinate below eye; interantennal prominence with about 30 inconspicuous setae and dorsally rounded and without a median ridge; mandible tridentate; antenna (Fig. 836) with scape about 4.4X as long as broad; F1-F5 longer than broad, F6 transverse; linear sensilla on F1-F6; clava 3-segmented, slightly shorter than F4-F6 combined; sensory area enlarged, extending ventrally nearly 0.3X length of clava, apex obliquely truncate; head width hardly less than flagellum length; mesoscutum mostly with coarse, polygonally reticulate sculpture, slightly more elongate antero-laterally; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 834) about 2.7X as long as broad; parastigma slightly downcurved; costal cell dorsally with a single apical seta, ventrally with a line of setae in proximal 0.7X, apex naked; area below proximal part of parastigma with a group of about 14 setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that hardly continues into disc (Fig. 837); apical bristle of postmarginal vein about 0.6X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with about seven inconspicuous setae adjacent to spiracle, side naked; syntergum about 0.8X as long as mid tibia with apex acute; ovipositor (Fig. 835) about 3.6X gonostylus or about 1.5X mid tibia; gonostylus about 1.2X as long mid tibial spur; exserted part of ovipositor about 0.7X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.51mm; excluding ovipositor, 1.38mm (CPD).

Head mainly orange-brown; occiput pale orange with a dark brown triangular mark above foramen; scrobes, lower interantennal prominence and mouth margin pale orange; frontovertex with area between occipital margin and posterior ocelli metallic purple, violet and dark blue, dark blue between ocelli, a slight brassy sheen and weak blue and purple reflections in front of ocelli, purple immediately above scrobes; area between eye and scrobe with a slight purple and blue-green sheen; temple with a relatively strong metallic green and blue-green sheen with some brassy areas, eye margin narrowly coppery; gena relatively dull with green, coppery and brassy reflections; dorsal part of interantennal prominence with a distinct purple sheen, scrobal area otherwise with only a weak brassy and purple sheen; frontovertex clothed with inconspicuous, pale brown setae, these continued as a line below eye; gena and interantennal prominence with a few short, translucent setae; antenna (Fig. 836) with radicle orange, dark brown at apex; scape mostly white, ventral margin dark brown from base to about 0.75X along its length, wider on inner surface, dorsal margin orange for most of its length, apex dark brown; pedicel and flagellum dark brown, almost black, external surface of pedicel weakly mixed orange; maxillary palpus white; pronotum orange, neck and side dark brown; propleuron orange, dark brown near coxa; prosternum white, brown anteriorly; mesoscutum black with weak blue and purple reflections, anteriorly clothed with translucent golden brown setae, but mostly with translucent silvery setae; tegula dark orange-brown, paler orange-brown towards apex; axilla and scutellum orange with scattered, weak, coppery reflections, axilla clothed in translucent brown setae, scutellum anteriorly with translucent, paled orange setae, posterior part and subapical tuft black; metanotum dark brown; mesopleuron dark brown, anteriorly with a weak brassy, coppery and blue sheen, posteriorly with a relatively strong purple sheen; mesosternum dark brown; fore coxa white; fore femur white, apex pale orange, tibia dark brown, extreme base and apex orange, tarsus brown; mid coxa white; mid femur white with an incomplete dark brown, subapical band, tibia pale orange, dark brown at extreme base otherwise white at base, with a faint, incomplete subbasal, brown band and an external dark brown streak for most of its length, spur and tarsus pale orange; hind coxa white; hind femur broadly brown medially, base white, a subapical orange area, apex dark brown, tibia dark brown, white at base, tarsus pale orange, basitarsus partially brown, apex brown; fore wing (Fig. 834) mostly infuscate, largely hyaline towards base, submarginal and stigmal veins orange, otherwise venation brown; propodeum dark brown, with a weak purple

sheen, mixed metallic green laterally, side brassy and metallic blue, 6 or 7 translucent, white setae outside spiracle; gaster dark brown, mostly with weak purple and brassy sheen, Gt1 with a metallic green sheen, side of Gt1 with a metallic blue sheen, sides of Gt2-Gt5 with a metallic green sheen mixed with coppery and blue-green; gonostylus pale orange.

Head (Fig. 833) about 5.2X as wide as frontovertex, in profile about 1.7X as high as deep, frontovertex weakly and evenly curved to top of scrobes then slightly angled towards mouth margin and virtually straight from top of scrobes to mouth margin, interantennal prominence hardly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 50°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh size smaller than, or subequal to, diameter of eye facet, sculpture slightly coarser and more transversely elongate immediately above scrobes; upper part of interantennal prominence smooth, but below with moderately deep, regular polygonally reticulate sculpture; temple virtually smooth but very shallow, irregular, longitudinally elongate polygonally reticulate sculpture, posterior part of gena with similar sculpture, anterior part of gena with regular, polygonally reticulate sculpture; area between eye and scrobe slightly narrower than diameter of anterior ocellus and completely smooth; scrobes deep, meeting dorsally, sharply margined, carinate below eye, very broadly ∩-shaped, interantennal prominence dorsally broadly rounded, without a median ridge; antenna as in Fig. 836; scape broadened and flattened, broadest about middle, about 4.4X as long as broad; F1-F5 longer than broad, F5 subquadrate, F6 transverse but subquadrate, segments wider and larger distally so that F6 is largest and widest, linear sensilla present only on F1-F6; clava slightly broadened, a little shorter than F4-F6 combined, sensory area slightly enlarged, extending about 0.3X along ventral surface, giving it an obliquely truncate appearance; eye reaching occipital margin, appearing naked, but clothed with inconspicuous, very short setae that are much shorter than diameter of facet; inner eye margins subparallel, narrowest point of frontovertex a little in front of anterior ocellus; malar sulcus absent; clypeal margin medially weakly concave; mandible with three acute teeth; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 85, HH 83, FV 16.5, POL 6, OOL 0, OCL 9.5, AOL 10, EL 58, EW 46, MS 36, SL 48.5, SW 11.

Thorax (Fig. 839) with pronotum hardly exposed behind head and about 0.6X as long as mesoscutum with similar, regular sculpture to that between ocelli, but slightly deeper and finer; mesoscutum fairly shiny with slightly deeper, coarse, fairly regular, polygonally reticulate sculpture which is slightly more elongate antero-laterally; axilla and scutellum with similar sculpture to pronotum; visible part of mesoscutum about 1.8X as broad as long; scutellum about as long as broad with a distinct subapical tuft, setae mostly about 0.8X as long as scutellum; hind femur about 5.5X as long as broad; fore wing with venation and setation as in Figs 834, 837; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 837); mid tibia with a weak, external carina in proximal half; propodeum (Fig. 839) medially about 0.2X as long as scutellum and smooth. Relative measurements: FWL 86, FWW 32; HWL 73.5, HWW 17.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium(Fig. 838) reaching about 0.4X to apex; syntergum about 0.8X as long as mid tibia, with apex acute; ovipositor (Fig. 835) clearly exserted, the exserted part about 0.7X as long as mid tibial spur or less than 0.25X as long as mid tibia. Relative measurements: OL 61, GL 17 [MT 42].

Variation. Only holotype examined,

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Alajuela**, RF Arenal, Sector Colada, LN 269900 456750, 600m, #54371, 1-26.x.1999 (G. Carballo). Holotype in NHMUK.

***Cheiloneurus mckenziei* sp.nov.**
(Figs 840-853; Hab. ♀ 122-125)

DIAGNOSIS. *Female* (length about 1.3-2.5mm): body varies from largely orange with dark brown areas on the head, mesoscutum, propodeum and gaster to almost completely dark brown with only parts of face orange, paler areas with a weak metallic sheen, darker areas with a weak to moderate sheen; antenna (Figs 840, 841, 844) with scape mostly white with dorsal and ventral margins largely brown; pedicel and flagellum dark brown, sometimes funicle segments mixed orange; mesoscutum generally with moderately dense silvery setae; fore and hind coxae white, mid coxa dark brown; legs otherwise white to pale orange, with extensive dark brown areas; fore wing (Figs 850, 853) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation and a much larger, subtriangular area at apex; head (Figs 846-849) about 4.4-7.4X as wide as frontovertex, in facial view slightly longer than broad, subcircular, genae converging, virtually straight but strongly curved inwards near mouth; frontovertex with up to three or four inconspicuous setae medially between anterior ocellus and scrobes; eye separated from scrobe by about diameter of anterior ocellus, area between eye and scrobe completely smooth and shiny; scrobes deep, sharply margined; interantennal prominence with about 20-45 moderately conspicuous setae and dorsally rounded; mandible virtually tridentate; antenna (Figs 840, 841, 844) with scape about 3.3-4.2X as long as broad; F1-F4 longer than broad, F5-F6 transverse, F5 sometimes longer than broad; linear sensilla on F2-F6, sometimes absent from F2; clava 3-segmented, slightly longer than F4-F6 combined; sensory area enlarged, extending ventrally about 0.4-0.5X length of clava, apex obliquely truncate; head width clearly longer than funicle but shorter than flagellum; mesoscutum (Fig. 852) with fine polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Figs 850, 853) about 2.4-2.8X as long as broad; parastigma downcurved; costal cell dorsally naked save for one or two apical setae, ventrally with a complete line of setae which may be interrupted above parastigma; area below proximal part of parastigma with a group of about 15-25 setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 850, 853); apical bristle of postmarginal vein about 0.6-0.8X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with up to about ten silvery setae adjacent to spiracle, side naked; syntergum about 0.8-0.9X as long as mid tibia with apex angular; ovipositor (Fig. 842) about 3.8X gonostylus or about 1.5X as long as mid tibia; gonostylus about as long as mid tibial spur or slightly longer; exserted part of ovipositor about 0.3-0.8X as long as mid tibial spur to nearly as long. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.51mm; excluding ovipositor, 1.43mm (CPD).

Head generally dark brown; occiput pale orange with a large dark brown area above foramen; temple and gena with a distinct metallic dark green sheen; scrobal area laterally orange medially dark brown with a metallic green sheen; mouth margin dark brown with a metallic dark green sheen; shiny bottomed grooves between posterior ocellus and occipital margin orange-brown; ocellar area dusky with metallic blue reflections along occipital margin, a purple sheen behind posterior ocelli, area between posterior ocelli with a blue and purple sheen, this becoming gradually weaker and more purplish anteriorly, area in front of anterior ocellus mostly with weak brassy reflections, narrowly purple immediately above scrobes; area between eye and scrobe with a deep, purple sheen towards mid-line, this becoming gradually weaker and more brassy towards gena; interantennal prominence dorsally brown with a distinct purple and blue sheen, ventrally with a broad orange band between toruli with a weak brassy sheen; frontovertex with inconspicuous pale brown setae along inner eye margins, these continued as a single line of slightly more conspicuous translucent, pale brown, setae below eye; gena and interantennal prominence with numerous, scattered, pale brown setae; maxillary palpus white, terminal segment pale brown; antenna (Fig. 841) with radicle pale orange proximally, dark brown distally; scape largely very pale orange to white with proximal 0.7X of ventral margin dark brown, inner surface more widely margined ventrally and also with dorsal margin orange proximally and distal 0.6X dark brown; pedicel and flagellum dark brown, dorsal setae of F1-F4 translucent and white contrasting with ventral, dark brown setae; pronotum orange with weak purple and brassy reflections, posterior margin translucent, neck dark

brown; prosternum orange, brown in front of coxa; mesoscutum black with weak brassy, purple and some bluish reflections, posterior margin dark purple-brown with slight brassy reflections, the whole with moderately dense, conspicuous, translucent, silvery setae; tegula orange, apex orange-brown; axilla dark brown, mixed orange with weak coppery and brassy reflections, with dark brown setae; scutellum dark brown with metallic dark green and coppery reflections, anteriorly with translucent pale brown setae, posteriorly with black setae, subapical tuft black; metanotum dark brown; mesopleuron brown, generally with a weak brassy lustre, additionally with weak purple, blue and gold reflections anteriorly and a purple and coppery lustre posteriorly; fore coxa white; proximal half of fore femur more or less white, margined dark brown, more widely so in middle, apex orange, fore tibia brown, apex and tarsus orange-brown; mid coxa dark brown; mid femur white with a dorsal, subapical, brown, V-shaped mark, tibia with a subbasal, white band, otherwise dark brown proximally with apical two-thirds orange to pale orange, spur and tarsus orange; hind coxa white; hind femur dark brown with an orange area ventrally towards apex, tibia and tarsus dark brown; fore wing (Fig. 850) mostly infuscate but hyaline towards base and at apex, submarginal vein pale orange, otherwise venation brown; propodeum dark brown with a green sheen medially, purple laterally, blue-green and purple around spiracle, blue-green and coppery on side, a tight group of about 12-15 conspicuous silvery setae anterolateral to spiracle and a line of 4 or 5 longer setae posterior to this; gaster dark brown, Gt1 with a strong metallic purple and blue sheen, remaining tergites mostly with a weaker coppery purple and slight brassy sheen, sides of TII-TV mainly metallic blue-green and brassy, remainder of gaster with a brassy, coppery and purple sheen; gonostylus pale orange.

Head (Fig. 848) about 5.4X as wide as frontovertex, in profile 1.8X as high as deep, anteriorly evenly rounded from occipital margin to top of scrobes then slightly angled towards mouth margin with interantennal prominence clearly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 55°; frontovertex slightly shiny, with conspicuous, fine, polygonally reticulate sculpture of mesh size a little smaller than diameter of facet, area immediately above scrobes with coarser, more irregular, transversely elongate sculpture; narrowest point between eye and scrobe about equal to diameter of anterior ocellus and completely smooth and mirror-like; temple with relatively shallow, irregular, elongate, sculpture; gena with slightly deeper more regular, polygonally reticulate sculpture; scrobes deep, very broadly ∩-shaped, meeting, dorsally very smooth, sharply margined dorsally and laterally, carinate laterally; interantennal prominence without median ridge, dorsally completely smooth and broadly rounded, lower parts with relatively shallow, polygonally reticulate sculpture; antenna as in Fig. 841; scape broadened and flattened, about 3.7X as long as broad; F1-F4 slightly longer than broad, F5-F6 transverse, segments larger and broader distad; clava clearly broadened, slightly longer than F4-F6 combined, sutures oblique, sensory area enlarged, extending ventrally about 0.5X length of clava, apex strongly obliquely truncate; eye reaching occipital margin, virtually naked, clothed in sparse, inconspicuous, setae, each clearly shorter than diameter of facet; inner eye margins subparallel, diverging slightly in front of anterior ocellus; vertex with a distinct, narrow, shiny bottomed groove contiguous with inner eye margin between posterior ocellus and occipital margin; malar sulcus absent; clypeal margin virtually straight medially; mandible with one acute tooth and a broad, slightly concave truncation, virtually tridentate; apical segment of maxillary palpus not enlarged, only slightly longer than radicle. Relative measurements: HW 98, HH 96, FV 18, POL 7, OOL 0, OCL 12, AOL 14, EL 70, EW 54, MS 39, SL 47, SW 11.

Thorax (Fig. 852) with pronotum short, hardly exposed behind head, about 0.6X as long as mesoscutum; pronotum, mesoscutum, axilla and scutellum with polygonally reticulate sculpture that is generally similar to that on frontovertex, sculpture on axillae and scutellum perhaps a little coarser; visible part of mesoscutum about 1.8X as broad as long; scutellum about 1.1X as broad as long, with a distinct subapical tuft, setae about 0.8X as long as scutellum; mid tibia with a weak external carina for about half its length; hind femur about 4.5X as long as broad; fore wing with venation and setation as in Figs 845, 850; costal cell with 1 or 2 setae dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak (Fig. 845); propodeum (Fig. 852) medially about 0.16X as long as scutellum and virtually smooth. Relative measurements: FWL 91, FWW 35.5; HWL 78, HWW 17.5.

Gaster with hypopygium reaching about 0.4X to apex; syntergum about 0.9X as long as mid

tibia, with apex angular; ovipositor slightly exserted, the exserted part about 0.6X length of mid tibial spur or about 0.2X mid tibia.

Paratype. Funicle with linear sensilla present only on F2-F6; gaster without "gland-like" structures on Gt1 or Gt5; hypopygium Fig. 851; ovipositor Fig. 842. Relative measurements: OL 72.5, GL 19 [MT 49.5].

Variation. A very variable species with larger specimens from higher altitudes often being darker and having relatively broader fore wings (see Fig. 853) than the holotype. Females vary in overall length from 1.29-2.5mm, the metallic colours on the head may be weaker or stronger than in the holotype, the mouth margin may be dusky pale orange, sometimes the funicle segments may be mixed with orange with F4-F6 or F4-F5 completely orange (see Figs 840, 844), the scutellum and axilla vary from orange to almost completely metallic green, the dorsal setae on the funicle may be concolourous with the ventral setae, the legs may be slightly darker than in the holotype with the fore femur mostly dark brown, the hind tibia and tarsus may be orange-brown, the head varies from about 4.4-7.4X as wide as the frontovertex with the ocellar angle varying from 40°-55°, the setae on the interantennal prominence vary between 20-45, the scape is 3.3-4.2X as long as broad, the funicle may have F5 transverse(Fig. 841) or longer than broad (Fig. 844), linear sensilla may be absent from F2, the fore wing varies from 2.4-2.8X (Fig. 850, 853) as long as broad and the gonostylus varies from as long as the mid tibial spur to 1.2X as long.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Ciudad Colón, ii.1990 (L. Fournier). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Guanacaste NP, Est. Cacao, 1200m, 13.ii.1995 (L. Masner); 2♀, Guanacaste, Est. Cacao (ACG), 10°55'N 83°30'W, 1100m, 19-20.ii.2005 (J.S. Noyes); 1♀, Guanacaste, Maritza (ACG), 700m, MT/YPT, 20.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Tierras Morenas, Tilaran, Rio San Lorenzo, LN 287800 427600, 1050m, #3368, xi.1994 (G. Rodriguez); 1♀, Guanacaste, BN Diriá, Cerro Retallano, LN 238550 358650, 600-700m, #66658, 15.xi-16.xii.2001 (I. Jiménez); 1♀, **Alajuela**, PN Arenal, Sendero Mena, LN 450170 271800, 600m, 17.iv-19.v.2001 (G. Carballo); 1♀, Alajuela, RB San Ramon, 800m, viii-ix.1997 (P. Hanson); 1♀, **Heredia**, OTS-La Selva, 10°26'N 84°01'W, i-iii.1993 (P. Hanson); 1♀, Heredia, OTS-La Selva, 10°26'N 84°01'W, iii-iv.1993 (ALAS); 1♀, Heredia, OTS-La Selva, 10°26'N 84°01'W, 75m, xii.1993 (ALAS); 1♀, Heredia, Santo Domingo, 1100m, cafetal, 9.ix.1994 (M. Cerda, P. Hanson); 1♀, Heredia, Danto Domingo, INBio cafetal, 6-7.iii.1996 (L. Masner); 1♀, Heredia, Santo Domingo, INBio, 1100m, YPT (compost), 6-7.iii.1996 (L. Masner); 2♀, Heredia, Santo Domingo, INBio Parque, 1200m (error for 1100m), ii.2001 (J.S. Noyes); 3♀, Heredia, Santo Domingo, INBio Parque, LN 217300 526200, 1100m, TM, 22.v-27.vi.2001 and vii.2001 (R. Zuñiga); 1♀, Heredia, Santo Domingo, INBio Parque, LN 217300 526200, 1100m, #65446, vii.2001 (R. Zuñiga); 18♀, Heredia, Santo Domingo, INBio Parque, LN 217300 526200, 1100m, iii.2002 (J.S. Noyes, J. Azofeifa); 1♀, Heredia, Santo Domingo, INBio Parque, LN 217300 526200, 1100m, 1-12.iv.2002 (J.S. Noyes, D. Rubí); 6♀, Heredia, Santo Domingo, INBio Parque, 9°59'N 84°06'W, 1100m, 16.ii.2008, 3.ii.2010, 12.ii.2011,16.ii.2013 and 14.ii.2015 (J.S. Noyes); 1♀, **San José**, San Pedro, 1200m, 19.ii.2001 (J.S. Noyes); 1♀, San José, Zurqui de Moravia, 1600m, viii.1995 (P. Hanson); 1♀, San José, Zurqui de Moravia, 1600m, x.1995 (P. Hanson); 1♀, San José, San Antonio de Escazu, 1300m, ix.1998 (W. Eberhardt);1♀, San José, Ciudad Colón, xii.1989-i.1990 (L. Fournier); 1♀, San José, Holland House, ex mango, 25.iv.1973 (D.J. Calvert, I. Solis); 1♀, **Cartago**, Dulce Nombre, Vivero Linda Vista, 1300m, viii-ix.1994 (P. Hanson); 1♀, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 14-15.ii.2005 (J.S. Noyes); 1♀, Puntarenas, Monteverde, St. Luis Valley, 1400m, 17.viii.1986 (L. Masner); 1♀, Puntarenas, Est. Altamira, Send a Casa Coca, LS 331750 574400, 1700m, 12.i-12.ii.2001 (D. Rubí); 1♀, Puntarenas, Est. Altamira, Cerro Frantzius, LS 334150 574450, 2134m, #62125, 12.iii-12.iv.2001 (D. Rubí). 1♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 1500m, 18-22.iii.1990 (J.S. Noyes); 1♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 8°46'N 82°57'W, 1300m, 30.ii.2015 (J.S. Noyes); 1♀, Puntarenas, 6km W. Piedras Blancas, 8°46'N 83°17'W, 100m, vi-vii.1993 (P. Hanson); 1♀, Puntarenas, PN

Corcovado, Los Patos, 200m, 8°33'N 83°30'W, ii.2000 (J.S. Noyes, J. Azofeifa); 1♀, **Limón**, PN Cahuita, 9°43'N 82°49'W, 10m, 24.ii.2010 (J.S. Noyes). Holotype in MZUCR, paratypes in NHMUK, MZUCR and USNM.

COMMENTS. In general habitus, *Cheiloneurus mckenziei* can be very similar to *lineascapus* Gahan, especially specimens of *mckenziei* that have an orange scutellum. However, in *mckenziei* the flagellar segments are not flattened and are clearly oval in cross-section whereas in *lineascapus* the flagellar segments are slightly, but conspicuously broadened and flattened. In addition, in *mckenziei* the mouth margin is dark brown, the fore coxa is white and there is a group of about 20 pale setae below the parastigma, whereas in lineascapus the mouth margin is orange, the fore coxa is orange-brown and there are only 4 or 5 dark setae below the parastigma.

See also comments under *lydia* (p. 361).

The species is named in honour of my late good friend Alan McKenzie who is much missed.

***Cheiloneurus origo* sp.nov.**

(Figs 854-858; Hab. ♀ 126)

DIAGNOSIS. *Female* (length about 2.5-2.9mm): head and thorax mostly orange to orange-brown with dark brown areas with a weak to moderate metallic sheen, rest of body dark brown to black with a weak to moderate metallic sheen; antenna (Fig. 855) with scape white margined brown to dark brown; pedicel and flagellum dark brown with some funicle segments mixed pale orange; mesoscutum with uniformly distributed silvery setae; fore and hind coxae white, mid coxae dark brown; legs largely orange with dark brown areas; fore wing (Fig. 857) mostly infuscate with basal cell hyaline except proximally, a small hyaline area at apex of venation and opposite on posterior wing margin, apex slightly paler with a hyaline, apical triangular area; head about 6X as wide as frontovertex, in facial view very slightly longer than broad, subrectangular, genae slightly converging and more strongly curved inwards towards mouth margin; frontovertex naked medially below anterior ocellus but with 1 or 2 setae above scrobal area; eye separated from scrobe by about 0.8X diameter of ocellus, area between eye and scrobe completely smooth, scrobal margin carinate; interantennal prominence dorsally rounded with about 50 inconspicuous setae; mandible with two short teeth and a short, broad, rounded, upper tooth; antenna (Fig. 855) with scape about 4.4X as long as broad; funicle with F1-F4 clearly longer than broad, F5 subquadrate or transverse, F6 transverse; head width a little more than 0.8X length of flagellum; linear sensilla on F2-F6; clava 3-segmented, slightly longer than F4-F6 combined; sensory area large and forming an oblique truncation, extending about 0.5X along ventral margin; mesoscutum (Fig. 858) with coarse, very fine, polygonally reticulate sculpture, a little elongate anteriorly and on sides; scutellum with a distinct apical tuft of setae; wings fully developed; fore wing (Fig. 857) about 2.6X as long as broad; parastigma very distinctly curved downwards; costal cell dorsally naked at apex and ventrally with a single line of setae that is broadly interrupted above parastigma; area below proximal part of parastigma with about 20 pale setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that clearly extends a little way into disc (Fig. 856); apical bristle of postmarginal vein about 0.7X as long as marginal vein; mid tibial spur clearly a little longer than basitarsus; propodeum with about 8 setae around each spiracle, side naked; syntergum about as long as mid tibia; ovipositor about 3.2X gonostylus or 1.9X as long as mid tibia; gonostylus about 1.5X as long as mid tibial spur; exserted part of ovipositor about 1.2X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 2.55mm; excluding ovipositor, 2.19mm (CPD).

Head mostly orange-brown, occiput pale orange, marked dark brown above and around foramen; top and sides of scrobes pale orange, dorsally with a very slight metallic lustre; area above mouth margin and posterior gena pale orange; dorsal part of interantennal prominence and temple dark brown with a strong metallic green sheen, temple also mixed coppery and brassy; gena dark brown with a metallic green, coppery and purple sheen; area between eye and scrobe shining purple and green; antenna (Fig. 855) with radicle pale orange-brown, distally dark brown; scape white, with proximal two thirds of ventral margin dark brown, upper margin internally dark

brown, proximally paler brown or orange-brown; pedicel and flagellum dark brown, virtually black, F4 and F5 partially mixed pale orange dorsally; apical segment of maxillary palpus dark brown, contrasting with white proximal segments; thorax mostly orange; posterior margin of pronotum translucent, neck dark brown; mesoscutum virtually black with slight to moderate purple, blue, blue-green and green reflections, clothed with evenly distributed silvery setae, these slightly golden to golden brown anteriorly; tegula basally orange, apically dark brown; scutellum anteriorly with golden brown setae, posterior setae and subapical tuft conspicuous and black, a few anterior setae of subapical tuft white; metanotum dark brown with a slight purple sheen; mesopleuron orange weakly margined brown, anteriorly with a slight brassy, green and purple sheen, posteriorly with a very weak purple and brassy sheen; fore and hind coxae white, mid coxa dark brown; fore femur dark brown, largely white to pale brown internally and externally white proximally with a distal pale orange-brown, median stripe, tibia dark brown, tarsus orange-brown; mid femur white, distal half of dorsal margin with an elongate chevron-shaped dark brown mark merging into an oblique subapical dark brown ring, distal apex pale orange, mid tibia narrowly dark brown basally with a narrow, white subbasal ring, remainder dark brown, gradually becoming orange distally, spur orange-brown, tarsus orange; hind femur, tibia and tarsus dark brown, femur with an external, subapical orange area; fore wing (Fig. 857) mostly infuscate, hyaline towards base and hyaline at apex; submarginal vein yellow-brown, rest of venation dark brown; propodeum dark brown, medially with a green, brassy and coppery lustre, side near spiracle metallic blue-green mixed purple, outside this shining metallic green mixed coppery; side of propodeum with only 5 or 6 inconspicuous silvery setae near spiracle; gaster dark purple-brown, mixed coppery, purple and brassy, sides and outer plate of ovipositor additionally with some metallic blue and green; visible part of gonostylus pale yellow.

Head about 6X as wide as frontovertex, in profile anteriorly virtually straight below top of scrobes, about 1.6X as high as deep; occipital margin sharp, occiput without a median groove above foramen; ocelli forming an angle of about 40°; frontovertex slightly shiny, with fine, fairly regular, polygonally reticulate sculpture of mesh size much less than diameter of eye facet, a little coarser, of larger mesh and more transversely elongate above scrobes; scrobal area and mouth margin and gena with similar, shallower sculpture, interantennal prominence dorsally smooth and shiny; temple with distinct, but shallow, longitudinally elongate sculpture; area between eye and scrobe smooth and shiny; scrobes deep, meeting dorsally, very broadly ∩-shaped, dorsal and lateral margins clearly defined, sharp, lateral margins clearly carinate, carina extending a little below top of torulus; antenna as in Fig. 855; scape slightly broadened and flattened, about 4.4X as long as broad; funicle with F1-F4 clearly longer than broad, F5 slightly longer than broad, F6 slightly transverse, segments broadest distad; clava clearly broadened, very slightly longer than F4-F6 combined, sutures oblique, sensory area enlarged, extending ventrally very slightly more than half-way along clava, giving it a distinct, obliquely truncate appearance; eye just reaching occipital margin, appearing naked but clothed with short, inconspicuous setae, each a little shorter than diameter of facet; inner eye margins diverging slightly anteriorly; malar sulcus absent; mandible with 3 teeth; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 98, HH 100, FV 16, OD 7, POL 6, OOL 0, OCL 12, AOL 13.5, EL 70, EW 53, MS 41, SL 53, SW 12.

Thorax (Fig. 858) with shallow, irregular, polygonally reticulate sculpture on pronotum, about as deep as that on frontovertex and generally of mesh size a little less than diameter facet; sculpture on most of mesoscutum similar to that on frontovertex, but perhaps very slightly deeper, shallower posteriorly; axillae with similar sculpture to anterior part of mesoscutum, that on scutellum similar but a little deeper, extreme sides completely smooth and shiny, extreme apex with shallow, reticulate sculpture; visible part of mesoscutum about 2X as broad as long; scutellum very slightly broader than long, with a very distinct subapical tuft, setae mostly about half as long as scutellum; hind femur about 4.4X as long as broad; fore wing with venation and setation as in Figs 856, 857; costal cell more or less naked dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 856); propodeum (Fig. 858) with only a few setae anterior and lateral to spiracle, area posterior to spiracle and side naked, side almost completely smooth and shiny, but anteriorly some shallow, distinct polygonally reticulate sculpture, medially about 0.14X as long as scutellum, smooth and with a very shallow median, longitudinal depression.

Relative measurements: FWL 96, FWW 36.5; HWL 83, HWW 22.

Gaster with hypopygium reaching about half-way to apex; syntergum very nearly as long as mid tibia, with apex acute; ovipositor clearly exserted, the exserted part about 1.2X as long as mid tibial spur or about 0.45X as long as mid tibia.

Paratype. Antenna with linear sensilla present only on F2-F6; gaster without "gland-like" structures on Gt1 or Gt5. Relative measurements: OL 121, GL 38 [MT 63.5].

Variation. Females vary in overall length from 2.52-2.90mm, F2-F5 may be largely mixed pale orange, otherwise very little in the material available.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, La Selva BS, 10°26'N 84°01'W, 50-150m, fog *Carapa guianensis*, FOT/02, 5.iii.1993 (INBio-OET). Paratypes: **COSTA RICA**, 3♀, **Heredia**, same data as holotype, but 15.iii.1993; 1♀, Heredia, 11km SE La Virgen, 10°20'N 84°04'W, 450-550m, 05/N/TN, 22.ii-20.iv.2003 (INBio-OET-ALAS). Holotype in MZUCR, paratypes in NHMUK and MZUCR.

Cheiloneurus argos sp.nov.

(Figs 859-865)

DIAGNOSIS. *Female* (length about 1.6mm): head and thorax mostly orange to orange-brown, most of mesoscutum, propodeum and gaster dark brown, darker areas with a weak to moderate metallic sheen; antenna (Fig. 859) with scape mostly white, margins largely brown; pedicel mostly dark brown; flagellum dark brown; mesoscutum with dense silvery setae in posterior three-quarters; fore and hind coxae white, mid coxa brown dorsally, pale orange ventrally; legs mostly white to pale orange with dark brown areas on tibiae and femora; fore wing (Fig. 862) mostly infuscate, basal cell mostly hyaline, a small hyaline area at apex of venation, a pale area opposite; head (Fig. 860) about 4.2X as wide as frontovertex, in facial view very clearly broader than long, subcircular, genae evenly and weakly curved, converging, slightly more curved inwards near mouth; frontovertex with four setae medially between anterior ocellus and scrobes; eye separated from scrobe by about diameter of anterior ocellus, area between eye and scrobe smooth and shiny; scrobes deep, sharply margined, weakly so medially, carinate below eye, interantennal prominence with about 35 conspicuous setae, dorsally rounded, without a median ridge; mandible tridentate; antenna with scape (Fig. 859) about 2.7X as long as broad; funicle with F1-F4 slightly longer than broad, F5-F6 quadrate or transverse; clava 3-segmented, about as long as F3-F6 combined; sensory area enlarged, extending ventrally about 0.2X length of clava, apex obliquely truncate; head width clearly less than flagellum length; mesoscutum (Fig. 861) anteriorly with fairly regular, fine, elongate, lineolate sculpture, posteriorly with more regular, polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 862) about 2.8X as long as broad; parastigma downcurved; costal cell dorsally naked or with a single seta at apex, ventrally with an almost complete line of setae which is narrowly interrupted above parastigma; area below proximal part of parastigma with a group of about 20 uniform, fine setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues someway into disc (Fig. 864); apical bristle of postmarginal vein about 0.6X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with about five inconspicuous setae adjacent to spiracle, side naked; syntergum about 1.1X as long as mid tibia with apex acute; ovipositor (Fig. 863) about 3.3X gonostylus or about 1.8X as long as mid tibia; gonostylus about 1.4X as long mid tibial spur; exserted part of ovipositor about 0.8X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.60mm; excluding ovipositor, 1.44mm (CPD).

Head generally orange-brown; occiput, scrobes, lower part of interantennal prominence and posterior part of gena pale orange; mouth margin pale orange; occiput with a dark brown triangular mark above foramen; area between occipital margin and anterior ocellus with a violet sheen, laterally metallic blue and blue-green; frontovertex in front of anterior ocellus with a moderate blue-green and slight purple sheen; area between eye and scrobe shining metallic green, blue-green and purple, bordered coppery laterally; temple and upper gena with a metallic green sheen, mixed coppery posteriorly and ventrally; lower gena with a weaker purple, coppery and brassy sheen; upper interantennal prominence with a coppery purple sheen, lower part of interantennal prominence with a weak brassy and purple sheen; frontovertex clothed with inconspicuous, pale brown setae, these continued as a line below eye and scattered on gena; interantennal prominence with relatively dense, conspicuous, translucent silvery setae; antenna (Fig. 859) with radicle pale orange proximally, but mostly dark brown; scape largely white but with ventral margin broadly dark brown to about 0.75X along its length, base completely dark brown, dorsal margin orange with apex dark brown; pedicel mainly dark brown, but paler orange-brown dorsally; flagellum dark brown; maxillary palpus white, terminal segment very pale orange; pronotum pale orange with weak coppery and brassy reflections, neck brown; propleuron pale orange, dark brown in front of coxa; prosternum dark brown, pale orange posteriorly; mesoscutum mostly black with a weak, but distinct dark, metallic blue and purple sheen, anterior part (normally covered by pronotum) orange with slight coppery reflections; mesoscutum mainly clothed in conspicuous, translucent silvery setae, anterior setae slightly less dense and golden brown to dark brown setae; tegula slightly dusky pale orange with apex dark orange-brown with a weak purple sheen; axilla orange with weak purple reflections and with a few black and golden brown setae; scutellum orange with weak purple reflections, with golden brown setae, subapical tuft black; metanotum dark brown; mesopleuron dark orange-brown, with a moderate coppery, blue, green, brassy and purple sheen; mesosternum dark brown; fore coxa white; fore femur mostly white, apex and margins dark brown, tibia white at extreme base, broadly dark brown medially, apex slightly dusky pale orange, tarsus slightly dusky pale orange; mid coxa brown dorsally, pale orange ventrally; mid femur white, apical two-fifths brown with an incomplete subapical dark brown ring on inner surface and dorsal margin, tibia dark brown at extreme base, white subbasally otherwise very pale orange with an incomplete, subbasal dark brown ring continued as a dark brown streak externally for most of length of tibia, spur and tarsus pale orange; hind coxa white, hind femur dark brown, tibia white at base, apex pale orange, otherwise dark brown, tarsus pale orange; fore wing (Fig. 862) mostly infuscate, largely hyaline towards base, submarginal vein pale orange otherwise venation brown; propodeum dark brown, medially with a coppery and brassy sheen, laterally with coppery purple and metallic green patches, side relatively dull blue-green, blue and purple, about 5 silvery setae in a line outside spiracle; gaster mainly dark brown with a slight brassy and purple sheen, Gt1 and Gt2 dorsally mixed relatively strongly coppery, green, purple and blue, sides of Gt3-Gt5 with a relatively strong green and blue-green sheen with coppery and purple reflections, sternites with coppery, blue, green, purple and brassy reflections; gonostylus very pale orange, apex slightly dusky.

Head (Fig. 860) in facial view about 4.2X as wide as frontovertex with gena rounded and converging, in profile about 1.4X as high as deep, frontovertex slightly angled level with posterior ocelli, then weakly and evenly curved to top of scrobes, strongly angled at top of scrobes towards mouth margin, with interantennal prominence slightly protuberant; occipital margin sharp, weakly carinate; a short, shallow, groove present on eye margin behind ocellus; ocelli forming an angle of about 65°; frontovertex with shallow, polygonally reticulate sculpture of mesh size generally subequal to, or smaller than, diameter of eye facet; area immediately above scrobes with relatively deep, coarse, transversely elongate, polygonally reticulate to imbricate-reticulate sculpture, area outside this between eye and scrobe completely smooth and shiny; temple and upper gena very shiny with shallow, longitudinally elongate imbricate-reticulate to strigose sculpture, lower gena with similar sculpture to that on temple but less shiny; scrobes smooth; interantennal prominence virtually smooth but with fine, shallow, polygonally reticulate sculpture; narrowest part between eye and scrobal margin about as wide as diameter of anterior ocellus, scrobes deep, meeting

dorsally, sharply margined, weakly so dorsally, but carinate below eye, very broadly ∩-shaped, interantennal prominence dorsally broadly rounded, without a median ridge; antenna as in Fig. 859; scape broadened and flattened, broadest about middle or slightly above, about 2.7X as long as broad; funicle with F1-F4 very slightly longer than broad, F5 quadrate, F6 transverse, segments clearly larger and wider distally, linear sensilla present only on F4-F6; clava hardly broadened, about as long as F3-F6 combined, sensory area slightly enlarged, extending about 0.2X along ventral surface, giving it a weakly oblique, truncate appearance; eye not quite reaching occipital margin, separated by about 1.5X diameter of facet, with extremely short, inconspicuous setae, each much shorter than diameter of facet; inner eye margins weakly converging in front of anterior ocellus, narrowest part of frontovertex a little nearer scrobes than anterior ocellus; malar sulcus absent; clypeal margin medially weakly emarginate; mandible with 3 acute teeth, upper tooth slightly shorter; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 80, HH 73, FV 19, POL 10, OOL 0.5, OCL 10.5, AOL 10.5, EL 55, EW 44, MS 32, SL 37, SW 13.5.

Thorax (Fig. 861) with pronotum hardly exposed behind head and about 0.5X as long as mesoscutum; pronotum with shallow, imbricate-reticulate to polygonally reticulate sculpture that is of similar depth to that in ocellar area; mesoscutum in anterior half with fairly regular, fine, obliquely, elongate, lineolate sculpture that is clearly a little deeper than that on pronotum, posterior half strongly contrasting with sculpture tending more towards vermiculate-reticulate and polygonally reticulate; axilla and scutellum with polygonally reticulate sculpture that is slightly coarser than that on mesoscutum but of similar depth, more longitudinally elongate laterally on scutellum; visible part of mesoscutum about 2X as broad as long; scutellum hardly longer than broad, with a distinct subapical tuft, setae mostly about 0.7X as long as scutellum; hind femur about 4.3X as long as broad; fore wing with venation and setation as in Figs 862, 864; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 864); mid tibia without an external carina; propodeum (Fig. 861) medially about 0.19X as long as scutellum and smooth. Relative measurements: FWL 105.5, FWW 37.5; HWL 94, HWW 21.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium (Fig. 865) reaching about 0.4X to apex; syntergum about as long as mid tibia, with apex acute; ovipositor (Fig. 863) exserted, the exserted part about 0.8X as long as mid tibial spur or 0.3X as long as mid tibia. Relative measurements: OL 68, GL 17.5 [MT 37.5].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Alajuela**, RF Arenal, Stor Colada, LN 269900 456750, 600m, #74102, v-vi.2000 (G. Carballo). Holotype in NHMUK.

COMMENTS. *Cheiloneurus argos* is very similar to *feritas* and, apart from the characters given in the key, *argos* can be separated from *feritas* by having F3 and F4 both very slightly longer than broad, the posterior ocellus midway between occipital margin and anterior ocellus and a group of about 20 uniform, fine setae below the parastigma. In feritas F3 is quadrate and F4 distinctly transverse, the posterior ocelli are slightly closer to the occipital margin than to the anterior ocellus and there is a group of about 40 non-uniform setae below the parastigma. In addition, argos has the mid femur proximally white with apical two-fifths brown and the hind femur dark brown, whereas in feritas the mid femur is white with an incomplete, subapical dark brown ring and the hind femur is white basally and distally dark brown.

See also comments under *feritas* (p. 349).

***Cheiloneurus feritas* sp.nov.**
(Figs 866-870; Hab. ♀ 127)

DIAGNOSIS. *Female* (length about 1.9mm): head and thorax mostly orange to pale orange-brown, mesoscutum, propodeum and gaster dark brown, darker areas with a weak to moderate metallic sheen; antenna (Fig. 866) with scape mostly white, margins largely brown; pedicel mostly dark brown; flagellum dark brown; mesoscutum with dense silvery setae in posterior three-quarters; coxae white, mid coxa brown dorsally; legs mostly white to pale orange with dark brown areas on tibiae and femora; fore wing (Fig. 867) mostly infuscate, basal cell mostly hyaline, a small hyaline area at apex of venation, a pale area opposite and apex paler; head (Fig. 869) about 4.5X as wide as frontovertex, in facial view very clearly broader than long, subcircular to subrectangular, genae evenly and weakly curved, converging, more curved inwards near mouth; frontovertex with four setae medially between anterior ocellus and scrobes; eye separated from scrobe by about diameter of anterior ocellus, area between eye and scrobe smooth and shiny; scrobes deep, sharply margined, weakly so medially, carinate below eye, interantennal prominence with about 40 inconspicuous setae, dorsally rounded, without a median ridge; mandible tridentate; antenna (Fig. 866) with scape about 3.0X as long as broad; funicle with F1-F3 slightly longer than broad, F4-F6 quadrate or transverse; clava 3-segmented, slightly longer than F4-F6 combined; sensory area enlarged, extending ventrally about 0.3X length of clava, apex obliquely truncate; head width nearly as much as flagellum length; mesoscutum (Fig. 868) with fairly regular, fine, coarse polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 867) about 2.9-3.1X as long as broad; parastigma slightly downcurved; costal cell dorsally with one or two setae at apex, ventrally with an almost complete line of setae which is partially interrupted above parastigma; area below proximal part of parastigma with a group of about 15 stronger setae and another distad of this of about 25 finer setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues someway into disc (Fig. 867); apical bristle of postmarginal vein about 0.6X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum with about ten inconspicuous setae adjacent to spiracle, side naked; syntergum about as long as mid tibia with apex angular; ovipositor (Fig. 870) about 3.6X gonostylus or about 2.0X as long as mid tibia; gonostylus about 1.7X as long mid tibial spur; exserted part of ovipositor about 1.1X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.93mm; excluding ovipositor, 1.70mm (CPD).

Head generally orange-brown; occiput, scrobes, lower part of interantennal prominence and posterior part of gena pale orange; mouth margin brown below torulus, this connected to a weaker brown arc across lower part of interantennal prominence; occiput with a dark brown triangular mark above foramen; area between occipital margin and anterior ocellus with a violet sheen, laterally metallic green; frontovertex in front of anterior ocellus with a weak brassy sheen; area between eye and scrobe shining metallic green, blue-green and purple; temple and upper gena with a metallic green sheen, mixed coppery posteriorly and ventrally; lower gena with a weaker purple, coppery and brassy sheen; upper interantennal prominence with a purple and green sheen, lower part of interantennal prominence with a weak brassy and purple sheen; area below torulus with a distinct green, brassy and coppery sheen, this continued as a less distinct arc across lower part of interantennal prominence; frontovertex clothed with inconspicuous, pale brown setae, these continued as a line below eye and scattered on gena; interantennal prominence with moderately dense, translucent pale brown setae; antenna (Fig. 866) with radicle pale orange proximally, but mostly dark brown; scape largely white but with ventral margin broadly dark brown to about 0.75X along its length, base completely dark brown, dorsal margin orange with apex dark brown; pedicel mainly dark brown, but paler orange-brown dorsally; flagellum dark brown; maxillary palpus white, terminal segment very pale orange; pronotum medially orange-brown with weak coppery and brassy reflections, laterally orange, side brown with a green and purple sheen; propleuron dark brown with a green and purple sheen, anteriorly pale orange; prosternum dark brown, pale orange posteriorly; mesoscutum dark brown with very weak brassy reflections, mainly clothed in conspicuous, dense silvery setae, anterior one-quarter with slightly less dense, dark brown setae; tegula slightly dusky pale orange with apex dark orange-brown with a weak purple sheen; axilla

orange with weak purple reflections and with a few black and golden brown setae; scutellum orange with weak purple reflections and golden brown setae, subapical tuft black; metanotum dark brown; mesopleuron orange-brown, with a moderate coppery, blue, green brassy and purple sheen; mesosternum dark brown; fore coxa white; fore femur mostly white, apex and margins dark brown, tibia white at extreme base, broadly dark brown medially, apex slightly dusky pale orange, tarsus slightly dusky pale orange; mid coxa brown dorsally, white ventrally; mid femur white with an incomplete subapical dark brown ring on inner surface and dorsal margin, tibia dark brown at extreme base, white subbasally otherwise very pale orange with an incomplete, subbasal dark brown ring continued as a dark brown streak externally for most of tibia length, spur and tarsus very pale orange; hind coxa white, hind femur white proximally, middle one-third and apex brown with an external, subapical orange area, tibia white at base, otherwise dark brown, tarsus very pale orange, almost white; fore wing (Fig. 867) mostly infuscate, largely hyaline towards base, submarginal vein pale orange otherwise venation brown; propodeum dark brown, medially with a coppery and brassy sheen, laterally with coppery purple and metallic green patches, side relatively dull blue-green, blue and purple, about 8 silvery setae in a line outside spiracle; gaster mainly dark brown with a slight brassy and purple sheen, syntergum slightly paler and orange-brown, Gt1 and Gt2 dorsally mixed relatively strongly coppery, green, purple and blue, sides of Gt3-Gt5 with a relatively strong green and blue-green sheen with coppery and purple reflections, sternites with coppery, blue, green, purple and brassy reflections; gonostylus very pale yellow, virtually white,
apex slightly dusky.

Head (Fig, 869) in facial view about 4.5X as wide as frontovertex with gena rounded and converging, in profile about 1.4X as high as deep, frontovertex slightly angled level with posterior ocelli, then weakly and evenly curved to top of scrobes, strongly angled at top of scrobes towards mouth margin, with interantennal prominence slightly protuberant; occipital margin sharp, weakly carinate; a short, shallow, groove present on eye margin behind ocellus; ocelli forming an angle of about 65°; frontovertex with shallow, polygonally reticulate sculpture of mesh size generally subequal to diameter of eye facet; area immediately above scrobes with relatively deep, coarse, transversely elongate, polygonally reticulate to imbricate-reticulate sculpture, area outside this between eye and scrobe completely smooth and shiny; temple and upper gena very shiny with shallow, longitudinally elongate imbricate-reticulate to strigose sculpture, lower gena with similar sculpture to that on temple but less shiny; scrobes smooth; interantennal prominence virtually smooth but with fine, shallow, polygonally reticulate sculpture; narrowest part between eye and scrobal margin about as wide as diameter of anterior ocellus, scrobes deep, meeting dorsally, sharply margined, weakly so dorsally, but carinate below eye, very broadly ∩-shaped, interantennal prominence dorsally broadly rounded, without a median ridge; antenna as in Fig. 866; scape broadened and flattened, broadest about middle or slightly above, about 3X as long as broad; funicle with F1-F3 very slightly longer than broad, F4 quadrate, F5-F6 transverse, segments clearly larger and wider distally; clava hardly broadened, a little longer than F4-F6 combined, sensory area slightly enlarged, extending about 0.25X along ventral surface, giving it a weakly oblique, truncate appearance; eye not quite reaching occipital margin, separated by about 1.5X diameter of facet, with extremely short, inconspicuous setae, each much shorter than diameter of facet; inner eye margins weakly diverging in front of anterior ocellus, narrowest part of frontovertex a little in front of anterior ocellus; malar sulcus absent; clypeal margin medially weakly emarginate; mandible with 3 acute teeth, upper tooth slightly shorter; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 93, HH 86, FV 20.5, POL 10.5, OOL 0.5, OCL 15, AOL 12, EL 66, EW 50.5, MS 35, SL 45, SW 15.

Thorax (Fig. 868) with pronotum hardly exposed behind head and about 0.5X as long as mesoscutum; pronotum with shallow, imbricate-reticulate to polygonally reticulate sculpture that is of similar depth to that in ocellar area; mesoscutum with fairly regular, fine, coarse, polygonally reticulate sculpture that is clearly a little deeper than that on pronotum; axilla and scutellum with polygonally reticulate sculpture that is slightly coarser than that on mesoscutum but of similar depth; visible part of mesoscutum about 1.6X as broad as long; scutellum about as broad as long, with a distinct subapical tuft, setae mostly about 0.8X as long as scutellum; hind femur about 4X as long as broad; fore wing with venation and setation as in Fig. 867; costal cell naked dorsally at

apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak; mid tibia without an external carina; propodeum (Fig. 868) medially about 0.23X as long as scutellum and smooth. Relative measurements: FWL 90, FWW 28; HWL 81, HWW 18.5.

Gaster with hypopygium reaching about 0.4X to apex; syntergum about as long as mid tibia, with apex angular; ovipositor exserted, the exserted part about 1.1X as long as mid tibial spur or 0.35X as long as mid tibia.

Paratype. Funicle with linear sensilla present only on F3-F6; gaster without "gland-like" structures on Gt1 or Gt5; ovipositor Fig. 870. Relative measurements: OL 81, GL 22.5 [MT 41].

Variation. Females vary in overall length from 1.87-1.93mm, the dark areas below toruli may be connected by a dark brown arc with a distinct metallic green sheen and the fore wing varies from about 2.9-3.1X as long as broad.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Maritza (ACG), LN 327000 373600, 700m, ii.1996 (Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Valle Miravalles, Est. Cabro Muco, LN 299769 411243, 1100m, #74012, 4.vii.2003 (J.D. Gutierrez, et al.). Holotype in MZUCR, paratype in NHMUK.

COMMENTS. *Cheiloneurus feritas* and *argos* are essentially of similar appearance to *leda* and the three species may be close because all have a relatively long, apically broad syntergum and similarly exserted ovipositor. However, both *argos* and *feritas* differ from *leda* in having the head relatively deeper, in profile about 1.4X as high as deep whereas in *leda* it is about 1.5X as high as deep. They also differ from *leda* in having the flagellum uniform dark brown, the scape not more than 3X as long as broad and the fore wing not more than 3.1X as long as broad, whereas in *leda* the funicle is mostly white or pale yellow, the scape is at least about 3.5X as long as broad and the fore wing is about 3.6X as long as broad.

See also comments under *argos* (p. 346) and *horocles* (p. 366).

Cheiloneurus paean **sp.nov.**

(Figs 871-877)

DIAGNOSIS. *Female* (length about 1.6mm): body almost completely dark brown with a weak to moderate metallic sheen; antenna (Fig. 871) with scape mostly white with dorsal and ventral margins largely brown; pedicel and flagellum dark brown; mesoscutum with silvery setae in posterior half; fore and hind coxae white, mid coxa dark brown; legs dark orange-brown to dark brown, fore and mid legs slightly paler; fore wing (Fig. 875) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation, apex with a small, slightly paler area; head (Fig. 877) about 5.3X as wide as frontovertex, in facial view clearly longer than broad, subrectangular, genae slightly curved but hardly converging, more strongly curved inwards near mouth; frontovertex naked medially between anterior ocellus and scrobes; eye separated from scrobe by about diameter of anterior ocellus, area between eye and scrobe completely smooth; scrobes deep, sharply margined, carinate below eye; interantennal prominence with about 30 inconspicuous setae and dorsally broadly rounded without a median ridge; mandible with three short teeth; antenna (Fig. 871) with scape about 4.0X as long as broad; F1-F4 longer than broad, F5-F6 quadrate or transverse; linear sensilla on F3-F6 or F4-F6; clava 3-segmented, nearly as long as F3-F6 combined; sensory area enlarged, extending ventrally about 0.5X length of clava, apex obliquely truncate; head width slightly less than flagellum length; mesoscutum (Fig. 873) in anterior two-thirds with longitudinally elongate striate to striate-reticulate sculpture, posterior one-third with regular, polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 875) about 2.6X as long as broad; parastigma slightly

downcurved; costal cell dorsally with two or three apical setae, ventrally with a line of setae in proximal 0.6X; area below proximal part of parastigma with a group of about 20 setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 876); apical bristle of postmarginal vein about 0.8X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with about three inconspicuous setae adjacent to spiracle, side naked; syntergum about 0.9X as long as mid tibia with apex broadly angular; ovipositor (Fig. 874) about 3.6X gonostylus or about 1.3X as long as mid tibia; gonostylus about as long mid tibial spur; exserted part of ovipositor about 0.5X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.61mm; excluding ovipositor, 1.52mm (CPD).

Head mainly dark brown, virtually black; a very small area outside torulus, scrobes partially and lower part of interantennal prominence orange; occipital margin faintly metallic dark blue, vertex between posterior ocelli and occipital margin shining purple, a little metallic green between posterior ocelli, blue and purple between ocelli, relatively dull purple and green from ocelli to top of scrobes; area between eye and scrobe more strongly shining purple; temple with a relatively strong metallic green and blue-green sheen mixed with some purple, this continuing more weakly to upper part of gena, area immediately below eye weakly shining purple and green, lower part of gena dull with a weak purple and green sheen; scrobes smooth, but with only a weak sheen; upper part of interantennal prominence with a purple sheen, below this with weak green reflections, below this mixed coppery and purple to mouth margin; frontovertex clothed with inconspicuous, pale brown setae, these continued as a line below eye; gena and interantennal prominence with relatively dense, scattered, short, translucent setae; antenna (Fig. 871) with radicle mostly orange, sides dark brown; scape mostly white, ventral margin dark brown from base to about 0.75X along its length, dorsal margin and apex dark brown; pedicel and flagellum dark brown, almost black; maxillary palpus dark brown, proximal segments mixed pale brown; thorax mostly dark brown; pronotum dark brown, side weakly mixed orange; propleuron and prosternum brown; mesoscutum black, anterior half completely matt with dark brown setae, posterior half with distinct blue-green and purple reflections and with silvery setae, these slightly more dense laterally, posterior margin purple-brown with a slight brassy sheen; tegula dark brown with weak coppery and brassy reflections; axilla orange-brown with weak green reflections, bordered dark brown, clothed with dark brown setae; scutellum orange-brown in anterior half, with golden brown setae and some very weak green reflections, posterior half dark orange-brown with dark brown setae, subapical tuft black; mesopleuron dark chestnut brown, anteriorly with a weak green, brassy, coppery and blue sheen, posteriorly with a coppery, purple and green sheen; fore coxa white; fore femur orange-brown bordered dark brown, tibia brown, tarsus brown; mid coxa dark brown; mid femur dark orange-brown, tibia orange with a subbasal white band, extreme base dark brown and a dark brown, external streak for most of its length, spur dark brown, tarsus white, apical tarsomere dark brown; hind coxa white, ventrally brown at base; hind femur dark brown with a small, subapical, orange-brown area, tibia dark brown, tarsus white, two apical tarsomeres dark brown; fore wing (Fig. 875) mostly infuscate, largely hyaline towards base, venation brown; propodeum dark brown, medially with a metallic purple sheen, area around spiracle metallic green mixed with purple and some coppery, about 5 or 6 translucent, setae outside spiracle; gaster dark brown, mostly with a coppery-purple and brassy sheen, Gt3-Gt5 laterally with distinct coppery and green reflections; visible part of gonostylus dark brown with apex pale orange.

Head (Fig. 877) in facial view about 5.3X as wide as frontovertex with gena rounded, in profile about 1.7X as high as deep, frontovertex slightly angled level with posterior ocelli, then weakly and evenly curved to top of scrobes, slightly angled towards mouth margin and virtually straight from top of scrobes to mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 50° frontovertex virtually smooth and quite shiny behind posterior ocelli, moderately shiny in ocellar area, but more anterior parts less shiny, frontovertex in front of posterior ocelli with distinct polygonally reticulate sculpture of mesh size subequal to eye facet, sculpture immediately above scrobes clearly much coarser and transversely elongate, this area bordered laterally by a completely smooth area and broadly below by dorsal margin of scrobes; scrobes completely smooth; upper part of interantennal prominence

narrowly smooth, but mostly with moderate, slightly coarse, regular polygonally reticulate to imbricate-reticulate sculpture; temple with shallow, irregular, longitudinally elongate polygonally reticulate sculpture, posterior part of gena with similar sculpture, anterior part of gena with coarse, polygonally reticulate sculpture similar to that immediately above scrobes; narrowest part between eye and scrobe hardly wider than diameter of anterior ocellus, completely smooth; scrobes deep, meeting dorsally, sharply margined, carinate below eye, very broadly ∩-shaped, interantennal prominence dorsally broadly rounded, without a median ridge; antenna as in Fig. 871; scape broadened and flattened, broadest above middle, about 4X as long as broad; F1-F4 longer than broad, F5 quadrate, F6 transverse, segments wider and larger distally so that F6 is largest and widest, linear sensilla present only on F3-F6 or F4-F6; clava slightly broadened, nearly as long as F3-F6 combined, sensory area slightly enlarged, extending about 0.45X along ventral surface, giving it an obliquely truncate appearance; eye not quite reaching occipital margin, separated by about diameter of facet, clothed with inconspicuous, very short setae that are much shorter than diameter of facet; inner eye margins subparallel, narrowest point of frontovertex slightly in front of anterior ocellus; malar sulcus absent; clypeal margin medially straight; mandible with three teeth, upper tooth slightly rounded; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 89.5, HH 96, FV 17, POL 8, OOL 0, OCL 14, AOL 11.5, EL 65, EW 46, MS 46, SL 42, SW 10.5.

Thorax (Fig. 873) with pronotum hardly exposed behind head and about 0.6X as long as mesoscutum; pronotum slightly shiny with similar sculpture to area in front of anterior ocellus; anterior two-thirds of mesoscutum with fairly regular, fine, longitudinally elongate, striate to striate-reticulate sculpture, more extensive laterally, of similar depth to that on pronotum, posterior half with slightly more rounded, polygonally reticulate sculpture that is perhaps a little shallower than that on anterior part; axilla and scutellum with coarser, polygonally reticulate sculpture that is deeper than that on mesoscutum, sculpture on side of scutellum more longitudinally elongate; visible part of mesoscutum about 2X as broad as long; scutellum about 1.1X as broad as long, with a distinct subapical tuft, setae mostly about 0.6X as long as scutellum; hind femur about 4.3X as long as broad; fore wing with venation and setation as in Figs 875, 876; costal cell with 1 seta dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 876); mid tibia with an indistinct, external carina in proximal half; propodeum (Fig. 873) medially about 0.26X as long as scutellum and smooth. Relative measurements: FWL 116, FWW 44; HWL 99, HWW 24.5.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium (Fig. 872) reaching about 0.4X to apex; syntergum about 0.9X as long as mid tibia, with apex broadly angular; ovipositor (Fig. 874) slightly exserted, the exserted part about half as long as mid tibial spur or about 0.2X mid tibia. Relative measurements: OL 54, GL 15 [MT 42].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Pen Osa, 5km NW Puerto Jimenez, 8°33'N 83°21'W, 10m, xi-xii.1992 (P. Hanson). Holotype in NHMUK.

COMMENTS. *Cheiloneurus paean* belongs to a group of species that are very similar in general habitus and colouration to *nigrescens*. It can be separated reliably from these species using the characters provided in the key. In addition, it can be distinguished from many of these (*amadeus*, *medusa*, *seius*, *grimus*, *oshtan*, etc.) by having both the fore coxa and hind coxa white and relatively longer gonostyli. In *paean* the gonostyli are more than one-quarter as long as the ovipositor whereas in many other similar species both the fore and hind coxae are brown and the gonostyli are less than one-quarter as long as the ovipositor.

***Cheiloneurus bion* sp.nov.**
(Figs 878-883; Hab. ♀ 128)

DIAGNOSIS. *Female* (length about 1.4-2.2mm): head mostly orange-brown, thorax mostly orange, remainder of body dark to black with a weak to moderate metallic sheen; antenna (Fig. 878) with scape white margined dark brown or orange; pedicel and flagellum dark brown; darker area of mesoscutum clothed with silvery setae; fore and hind coxae white, middle coxa white sometimes mixed brown; legs white to pale orange with brown areas on femora and tibiae; fore wing (Fig. 878) mostly infuscate with a V-shaped hyaline area proximal to linea calva, a small hyaline area at apex of venation and opposite on posterior wing margin, apex less strongly infuscate; head (Fig. 883) about 3.6X as wide as frontovertex, in facial view slightly longer than broad, suboval, genae converging and weakly curved; frontovertex naked medially below anterior ocellus; eye separated from scrobe by about 0.8X diameter of ocellus, area between eye and scrobe completely smooth, scrobal margin carinate; interantennal prominence dorsally rounded with about 40 conspicuous setae; mandible with two teeth and a truncation; antenna (Fig. 878) with scape about 4.6X as long as broad; funicle with F1 about 2X as long as broad, remaining segments longer than broad or sometimes F5 quadrate and F6 transverse; head width slightly less than length of flagellum; linear sensilla on F4-F6, sometimes also F4; clava 3-segmented, about as long as F4-F6 combined; sensory area large and forming an oblique truncation, extending nearly 0.4X along ventral margin; mesoscutum (Fig. 882) with coarse linear sculpture medially in anterior half and laterally, otherwise with polygonally reticulate sculpture; scutellum with a distinct apical tuft of setae; wings fully developed; fore wing (Fig. 880) about 3.0X as long as broad; parastigma very distinctly curved downwards; costal cell dorsally with 1 or 2 setae at apex and ventrally with a single complete line of setae that is broadly interrupted above parastigma; area below proximal part of parastigma with a group of about 20 setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that extends a little way into disc (Fig. 879); apical bristle of postmarginal vein about 0.7X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum with about 5 setae around each spiracle, side naked; syntergum about as long as mid tibia; ovipositor (Fig. 881) about 2.7X gonostylus or 2.2X as long as mid tibia; gonostylus about 2.3X as long as mid tibial spur; exserted part of ovipositor about 1.5X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 2.24mm; excluding ovipositor, 1.90mm (CPD).

Head pale orange-brown, darker on frontovertex, temple and gena; a moderate blue sheen on frontovertex, mixed purple anteriorly and behind ocelli; area between eye and scrobe brassy; top of interantennal prominence shining metallic blue, area between toruli green; mouth margin with a slight green lustre; temple largely metallic green or blue-green, mixed brassy; gena with a slight blue sheen, mixed purple; frontovertex with inconspicuous dark brown setae; antenna (Fig. 878) with radicle pale orange; scape white, with proximal two thirds of ventral margin narrowly dark brown, upper margin externally pale orange, internally with distal two-thirds dark brown; pedicel and flagellum dark brown; thorax orange with some darker areas; neck of pronotum laterally dark brown; mesoscutum posteriorly dark brown with a weak purple and indigo sheen, the anterior margin of the dark brown area convexly curved and extending a little more than half-way across mesoscutum, darker area clothed in silvery setae that are more dense anteriorly and laterally, setae in paler area pale brown; tegula orange-brown; axilla dusky posteriorly; scutellum largely clothed in pale brown setae, subapical tuft conspicuous and black; metanotum dark brown with a slight purple sheen; mesopleuron anterior slightly dusky and with a slight brassy, green and purple sheen, posterior half with a very weak purple and brassy sheen; fore coxa white; fore femur pale orange with a brown streak externally in distal half connected to an inconspicuous, brown, subapical ring, tibia mostly brown with apices white or pale orange; mid coxa ventrally brown, otherwise dirty white; mid femur white, apex pale orange with a small, external, subapical brown streak, tibia pale orange, dark brown, then white at extreme base and with a elongate, subbasal brown spot; hind coxa white; hind femur pale orange, pale brownish along ventral margin, hind tibia pale orange, but narrowly white basally with a small, faint, brown, subbasal spot externally; tarsi orange, pretarsi slightly dusky; fore wing (Fig. 880) infuscate with a hyaline pattern,

especially proximally; submarginal vein pale yellow, otherwise venation brown; propodeum dark purple-brown with a green lustre, medially slightly purplish and brassy; sides with not more than 5 inconspicuous silvery setae near spiracle; gaster dark purple-brown, mixed coppery, purple and brassy, sides and outer plate of ovipositor additionally with some metallic blue and green; gonostylus pale yellow.

Head (Fig. 883) in facial view about 3.6X as wide as frontovertex, in profile anteriorly almost evenly rounded, shallow, about 2X as high as deep; occipital margin carinate, occiput without a median groove above foramen; ocelli forming an angle of about 85°; frontovertex slightly shiny, with shallow, transversely elongate, reticulate sculpture of mesh size generally greater than diameter of eye facet; scrobal area and mouth margin with shallower sculpture, interantennal prominence dorsally smooth and shiny; temple virtually smooth, with extremely shallow, longitudinally elongate sculpture, gena with similar sculpture to temple but slightly deeper and of smaller cells; scrobes deep, meeting dorsally, dorsal and lateral margins sharp, carinate; antenna as in Fig. 878; scape hardly broadened and flattened, about 4.6X as long as broad; all funicle segments clearly longer than broad, F1 relatively longest, about 3X as long as broad, segments broadest distad so that F6 is only about 1.2X as long as broad; linear sensilla present only on F3-F4; clava hardly broadened, about as long as F4-F6 combined, sutures oblique, sensory area enlarged, extending about one-third along clava ventrally, giving it a distinct, obliquely truncate appearance; eye almost reaching occipital margin, separated by less than diameter of facet, appearing naked, clothed with extremely short, inconspicuous setae; inner eye margins slightly diverging anteriorly; malar sulcus absent; mandible with 2 short, acute teeth and a truncation. Relative measurements: HW 79, HH 86, FV 22, OD 6, POL 12, OOL 0.5, OCL 7, AOL 9, EL 58, EW 40, MS 30, SL 39, SW 8.5.

Thorax (Fig. 882) with shallow, irregular, polygonally reticulate sculpture on pronotum, generally of mesh size less than diameter facet; sculpture on mesoscutum, axilla and scutellum similar to that on pronotum, but more regular and significantly coarser; extreme apex and sides of scutellum completely smooth and shiny; visible part of mesoscutum about 2X as broad as long; scutellum very slightly broader than long, with a very distinct subapical tuft, setae at least about half as long as scutellum; hind femur about 4X as long as broad; fore wing with venation and setation as in Figs 878, 879; costal cell without setae dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 879); propodeum (Fig. 882) naked but for a few setae anterior and lateral to spiracle, medially about 0.18X as long as scutellum and completely smooth. Relative measurements: FWL 76, FWW 25.5; HWL 68, HWW 17.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium reaching about half-way to apex; syntergum about as long as mid tibia, with apex acute; ovipositor (Fig. 881) well exserted, the exserted part about 1.5X as long as mid tibial spur or about 0.6X as long as mid tibia. Relative measurements: OL 98, GL 36 [MT 44].

Variation. Females vary in overall length from 1.36-2.24mm, the mid coxa may be completely white or dirty white mixed brown, in smaller specimens F5 may be quadrate and F6 transverse, linear sensilla may be present on F3-F6 or F4-F6, otherwise little variation noted in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, 3km S. Puerto Viejo, OTS-La Selva, 100m, canopy fog *Carapa* sp., FOT/02, 15.iii.1993. Paratypes: **COSTA RICA**, 1♀, **Heredia**, Estacion Biologica La Selva, 10°26'N 84°01'W, 75m, 24-25.ii.2011 (J.S. Noyes); 3♀, **Heredia**, Santo Domingo, INBio Parque, 9°59'N 84°08'W, 14.ii.2015 (J.S. Noyes) . Holotype in NHMUK, paratypes in MZUCR and NHMUK.

***Cheiloneurus zephyrus* sp.nov.**
(Figs 884-890; Hab. ♀ 129)

DIAGNOSIS. *Female* (length about 1.2-1.4mm): body mostly orange with darker areas on head, mesoscutum, propodeum and gaster, darker areas with a weak to moderate metallic sheen; antenna (Fig. 886) with scape mostly white margined dark brown; pedicel dark brown, flagellum orange-brown to dark brown; posterior part of mesoscutum with dense silvery setae; fore and hind coxae white, mid coxa dark brown; legs mainly white, pale orange or orange-brown with areas of dark brown; fore wing (Fig. 890) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation and opposite on posterior wing margin, a very small hyaline area at apex; head (Fig. 885) about 4.6X as wide as frontovertex, in facial view about 1.1X as long as broad, subrectangular, genae weakly converging, more strongly curved near mouth margin; frontovertex naked medially; eye separated from scrobe by about 1.2X diameter of anterior ocellus, area between eye and scrobe completely smooth, scrobal margin carinate; interantennal prominence dorsally rounded with about 30 fairly conspicuous setae; mandible with two teeth and a broad truncation; antenna (Fig. 886) with scape about 4X as long as broad; funicle with F1-F4 longer than broad, F5-F6 quadrate or transverse; head about as wide as length of flagellum or very slightly less; linear sensilla on F2-F6; clava 3-segmented, hardly longer than F4-F6 combined; sensory area large and forming an oblique truncation, extending nearly 0.4X along ventral margin; mesoscutum (Fig. 884) medially with fairly coarse polygonally reticulate sculpture of relatively small mesh, slightly coarser and longitudinally striate-reticulate to striate anteriorly and laterally; scutellum with a distinct apical tuft of setae; wings fully developed; fore wing (Fig. 890) about 2.5-2.6X as long as broad; parastigma strongly downcurved; costal cell dorsally with a single seta apex and ventrally with a single line of setae that is broadly interrupted above parastigma; area below proximal part of parastigma with a group of about 30 pale setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that extends a little way into disc (Fig. 889); apical bristle of postmarginal vein about as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum with about 5 setae adjacent to spiracle, side naked; syntergum very slightly shorter than mid tibia; ovipositor (Fig. 887) about 4.8X gonostylus or 1.3X as long as mid tibia; gonostylus about 0.8X as long as mid tibial spur; exserted part of ovipositor about 0.3X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.44mm; excluding ovipositor, 1.40mm (CPD).

Head mostly orange, occiput pale orange; frontovertex with a weak blue and purple sheen, more strongly coppery and purple behind ocelli; area between eye and scrobe metallic green and brassy with coppery reflections; temple and anterior part of gena dark brown with a metallic green and brassy sheen with some purple, coppery and blue reflections; remainder of gena with weak purple, blue and brassy reflections; upper part of interantennal prominence dark brown with a metallic green sheen; frontovertex clothed with inconspicuous, pale brown setae; antenna (Fig. 886) with radicle pale orange, apex marked brown; scape mostly white, ventral margin narrowly brown in proximal two-thirds, distal half of dorsal margin internally brown, paler proximally; pedicel and F1-F5 orange-brown, proximal funicle segments darker, F6 and clava dark brown; maxillary palpus with proximal two segments off-white, apical segments brown; thorax mostly orange; pronotum orange, neck slightly dusky; mesoscutum orange with posterior one-third or so dark brown with an indigo and purple lustre, posterior margin purple, paler anterior part with evenly distributed, relatively sparse, golden brown setae, darker posterior part with slightly more dense, silvery setae; tegula apically dark brown, basally orange; axilla and scutellum orange, clothed in golden brown to dark brown setae, subapical tuft black; metanotum orange; mesopleuron pale orange-brown, slightly darker in posterior one-third; fore coxa white; fore femur and tibia pale orange, fore tarsus pale orange-brown; mid coxa dark brown, paler distally and dorsally; mid femur white, pale orange towards apex, tibia dark brown at extreme base, with a narrow, white subbasal ring, otherwise mostly pale orange, proximally marked brown dorsally, spur pale orange, tarsus pale orange; hind coxa white; hind femur pale orange, tibia narrowly white at base, remainder orange-brown, darker proximally, tarsus very pale orange, apically brown, pretarsus brown; fore wing (Fig. 890) mostly infuscate, hyaline towards base; venation mostly pale brown;

propodeum medially orange, laterally brown with a metallic green sheen and with only 1 or 2 translucent setae outside spiracle, side metallic green; gaster pale brown with brassy, purple and green reflections, syntergum pale orange-brown; gonostylus very pale orange.

Head (Fig. 885) in facial view about 4.5X as wide as narrowest point of frontovertex, in profile about 1.7X as high as deep, anteriorly quite straight below top of scrobes, bulging very slightly below eye at scrobal margin and interantennal prominence level with torulus; occipital margin sharp and carinate; ocelli forming an angle of about 75°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh size subequal to diameter of eye facet; area immediately above scrobes with slightly deeper, coarser and transversely elongate sculpture; lower interantennal prominence with similar sculpture to main part frontovertex, upper interantennal prominence and scrobes completely smooth; temple and posterior gena with more irregular and longitudinally elongate sculpture than on main part of frontovertex, anterior gena with coarse, irregular, reticulate sculpture; area between eye and scrobe completely smooth; scrobes deep, meeting dorsally, sharply margined above, carinate below eye, but roundly margined outside torulus, very broadly ∩-shaped; antenna as in Fig. 886; scape hardly broadened and flattened, about 4X as long as broad; funicle with F1-F4 slightly longer than broad, F5 subquadrate, F6 transverse, segments broadest distad; clava slightly broadened, hardly longer than F4-F6 combined, sutures oblique, sensory area enlarged, extending ventrally slightly more than one-third of clava, giving it an obliquely truncate appearance; eye reaching occipital margin, virtually naked, but clothed in sparse, short setae, each clearly shorter than diameter of facet; inner eye margins clearly diverging below anterior ocellus; malar sulcus absent; clypeal margin very slightly concave; mandible with 1 tooth and a broad, slightly concave, truncation; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 63, HH 67, FV 13.5, OD 5, POL 6.5, OOL 0, OCL 5, AOL 6.5, EL 46, EW 32, MS 28, SL 28, SW 7.

Thorax (Fig. 884) with irregular, polygonally reticulate sculpture on pronotum that is slightly deeper than that on frontovertex; mesoscutum with fairly regular, polygonally reticulate sculpture that is slightly deeper and finer than that on pronotum, sculpture on sides slightly longitudinally elongate; axilla and scutellum with similar sculpture to disc of mesoscutum, but perhaps a little coarser; visible part of mesoscutum about 1.9X as broad as long; scutellum very slightly broader than long with a distinct subapical tuft, setae mostly about half as long as scutellum; hind femur about 4.1X as long as broad; fore wing with venation and setation as in Figs 889, 890; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 889); propodeum (Fig. 884) with only 1 or 2 setae outside spiracle, side almost completely smooth, with some very shallow, reticulate sculpture anteriorly, medially about 0.16X as long as scutellum and smooth. Relative measurements: FWL 55, FWW 21; HWL 49, HWW 13.5.

Gaster with hypopygium reaching about half-way to apex; syntergum a little shorter than mid tibia, with apex broadly rounded; ovipositor hardly exserted, the exserted part about 0.25X as long as mid tibial spur.

Paratype. Antenna with linear sensilla present only on F2-F6; gaster without "gland-like" structures on Gt1 or Gt5; hypopygium Fig. 888; ovipositor Fig. 887. Relative measurements: OL 40.5, GL 8.5 [MT 31.5].

Variation. Females vary in overall length from 1.22-1.44mm, the fore wing varies from 2.5-2.6X as long as broad, otherwise little variation noted in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, PN Corcovado, Cerro Rincón, La Tigrilla, LS 274500 523600, 600m, #70847, 24.vi-31.vii.2002 J.A. Azofeifa). Paratypes: **COSTA RICA**, 1♀, **Puntarenas**, Golfito, Est. Agujas, LS 520100 275200, 782m, #66478, 6.xi-20.xii.2000 (J. Azofeifa); 1♀, Puntarenas,

Est. Agujas, Cerro Rincón, LS 521000 275500, 745m, #62419, 28.iv-26.v.2001 (J. Azofeifa). Holotype in MZUCR paratypes in NHMUK.

COMMENTS. See comments for *Cheiloneurus pherus* (p. 358).

***Cheiloneurus pherus* sp.nov.**
(Figs 891-897; Hab. ♀ 130)

DIAGNOSIS. *Female* (length about 1.5-1.6mm): body largely orange with darker areas on head, mesoscutum, mesopleuron and propodeum, gaster entirely dark brown, darker areas with a weak to moderate metallic sheen; antenna (Fig. 893) with scape mostly white margined dark brown; pedicel dark brown, flagellum dark brown; posterior part of mesoscutum with dense silvery setae; fore and hind coxae white, mid coxa dark brown; legs mainly white, pale orange or orange-brown with areas of dark brown; fore wing (Fig. 895) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation and opposite on posterior wing margin, a very small hyaline area at apex; head (Fig. 897) about 4.3-4.7X as wide as frontovertex, in facial view nearly 1.1X as long as broad, subrectangular, genae weakly converging, more strongly curved near mouth margin; frontovertex naked medially; eye separated from scrobe by about 1.2X diameter of anterior ocellus, area between eye and scrobe completely smooth, scrobal margin carinate; interantennal prominence dorsally rounded with about 30 fairly conspicuous setae; mandible with one tooth and a broad, concave truncation; antenna (Fig. 893) with scape about 4.3-4.7X as long as broad; funicle with F1-F3 longer than broad, F4 subquadrate, F5-F6 transverse; head width hardly more than flagellum length; linear sensilla on F2-F; clava 3-segmented, hardly longer than F4-F6 combined; sensory area large and forming an oblique truncation, extending nearly 0.4X along ventral margin; mesoscutum (Fig. 892) medially with fairly coarse polygonally reticulate sculpture of relatively small mesh, slightly coarser and longitudinally striate-reticulate to striate anteriorly and laterally; scutellum with a distinct apical tuft of setae; wings fully developed; fore wing (Fig. 895) about 2.7X as long as broad; parastigma strongly downcurved; costal cell dorsally with a single seta apex and ventrally with a single line of setae that is interrupted above parastigma; area below proximal part of parastigma with a group of about 20-30 pale setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that extends a little way into disc (Fig. 894); apical bristle of postmarginal vein about as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum with about 4 setae adjacent to spiracle, side naked; syntergum very slightly shorter than mid tibia; ovipositor (Fig. 896) about 5.2X gonostylus or 1.3X as long as mid tibia; gonostylus about 0.7X as long as mid tibial spur; exserted part of ovipositor about 0.2X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.48mm; excluding ovipositor, 1.44mm (CPD).

Head largely orange to orange-brown, occiput brown margined orange; frontovertex orange-brown, paler towards scrobes, mostly with a weak brassy and blue-green sheen, more strongly dark blue and violet purple behind ocelli and more purple towards scrobes; area between eye and scrobe metallic green and brassy with some coppery purple; temple and anterior part of gena dark brown in the form of a broad stripe, with a metallic green, coppery and brassy sheen; posterior and anterior parts of gena orange with some weak purple, blue and brassy reflections; upper part of interantennal prominence dark brown with a fairly strong metallic green sheen, coppery dorsally; rest of scrobal area orange; frontovertex clothed with inconspicuous, pale brown setae; antenna (Fig. 893) with radicle pale orange, apex marked brown; scape mostly white, ventral margin narrowly brown in proximal two-thirds, distal half of dorsal margin internally brown, paler proximally; pedicel and F1-F5 brown, F6 and clava slightly darker brown; maxillary palpus with proximal two segments off-white, apical segments brown; thorax largely orange; pronotum orange, neck slightly dusky; mesoscutum orange with posterior two-fifths or so dark purple-brown with dark blue reflections, posterior margin purple, paler anterior part with evenly distributed, relatively sparse, golden brown setae, darker posterior part with slightly more dense, silvery setae; tegula apically dark brown, basally orange; axilla and scutellum orange, clothed in golden brown to dark brown setae, subapical tuft black; metanotum orange-brown; mesopleuron

uniform orange-brown, anterior half mostly with a moderate green and blue-green sheen, posterior half largely with a slightly stronger dark blue and coppery sheen, becoming more brassy and pale blue towards posterior margin; fore coxa white; fore femur proximally white, remainder and tibia pale orange to orange-brown, fore tarsus pale orange-brown; mid coxa dark brown; mid femur white, dark brown towards apex, tibia dark brown proximally, with a narrow, white subbasal ring, otherwise mostly pale orange, proximally marked brown dorsally, spur pale orange, tarsus pale orange; hind coxa white; hind femur pale orange, dark brown at apices, tibia narrowly white at base, remainder dark brown, tarsus white, apically brown, pretarsus brown; fore wing (Fig. 895) mostly infuscate, hyaline towards base; venation mostly pale brown; propodeum uniformly dark brown with a slight purple sheen, laterally with a strong metallic green sheen mixed with some coppery purple and with only 3 or 4 translucent setae outside spiracle, side metallic green with some coppery purple; gaster entirely dark brown with brassy, coppery purple and green reflections; gonostylus pale orange.

Head (Fig. 897) about 4.6X as wide as narrowest point of frontovertex, in profile about 1.8X as high as deep, anteriorly quite straight below top of scrobes, bulging very slightly below eye at scrobal margin and interantennal prominence level with torulus; occipital margin sharp and carinate; ocelli forming an angle of about 57°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh size subequal to diameter of eye facet; area immediately above scrobes with slightly deeper, coarser and transversely elongate sculpture; lower interantennal prominence with similar sculpture to main part frontovertex, upper interantennal prominence and scrobes completely smooth; temple and posterior gena with more irregular and longitudinally elongate sculpture than on main part of frontovertex, anterior gena with coarse, irregular, reticulate sculpture; area between eye and scrobe completely smooth; scrobes deep, meeting dorsally, sharply margined above, carinate below eye, but roundly margined outside torulus, very broadly ∩-shaped; antenna as in Fig. 893; scape slightly broadened and flattened, about 3.5X as long as broad; funicle with F1-F3 slightly longer than broad, F4 subquadrate, F5-F6 transverse, segments broadest distad; clava slightly broadened, slightly longer than F4-F6 combined, sutures oblique, sensory area enlarged, extending ventrally slightly more than one-third of clava, giving it an obliquely truncate appearance; eye reaching occipital margin, virtually naked, but clothed in sparse, short setae, each clearly shorter than diameter of facet; inner eye margins clearly diverging below anterior ocellus; malar sulcus absent; clypeal margin very slightly concave; mandible with 1 tooth and a broad, slightly concave, truncation; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 99, HH 105, FV 21.5, OD 7.5, POL 11.5, OOL 0.5, OCL 7.5, AOL 13, EL 73, EW 51, MS 37, SL 38, SW 11.

Thorax (Fig. 892) with irregular, polygonally reticulate sculpture on pronotum that is slightly deeper than that on frontovertex; mesoscutum with fairly regular, polygonally reticulate sculpture that is slightly deeper and finer than that on pronotum, sculpture on sides slightly longitudinally elongate; axilla and scutellum with similar sculpture to disc of mesoscutum, but perhaps a little coarser; visible part of mesoscutum about 2.1X as broad as long; scutellum very slightly broader than long with a distinct subapical tuft, setae mostly about half as long as scutellum; hind femur about 4.0X as long as broad; fore wing with venation and setation as in Figs 894, 895; costal cell with a single seta dorsally at apex, ventral surface with line of setae interrupted above parastigma; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak; propodeum (Fig. 892) with only 4 setae outside spiracle, side almost completely smooth, with some very shallow, reticulate sculpture anteriorly, medially about 0.18X as long as scutellum and smooth. Relative measurements: FWL 200, FWW 75; HWL 180, HWW 46.5.

Gaster with hypopygium reaching about half-way to apex; syntergum about 0.8X as long as mid tibia, with apex broadly rounded; ovipositor hardly exserted, the exserted part about 0.2X as long as mid tibial spur.

Paratype. Antenna with linear sensilla present only on F2-F6; gaster without “gland-like” structures on Gt1 or Gt5; hypopygium Fig. 891; ovipositor Fig. 896. Relative measurements: OL 109, GL 21 [MT 86].

Variation. Females vary in overall length from 1.45-1.56mm, the hind femur may be almost completely brown, the head varies from 4.3-4.7X as wide as the frontovertex and about 1.06-

1.07X as high as broad in facial view, the scape varies from 3.5-3.8X as long as broad and the fore wing varies in length from about 2.6-2.7X as long as broad.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, La Selva BS, 10°26'N 84°01'W, 50-150m, fog *Pentaclethra macroloba*, FPM/03, 6.iii.1993 (INBio-OET). Paratypes: **COSTA RICA**, 1♀, **Alajuela**, Penas Blancas, 1° rainforest, iii.1987 (E. Cruz); 1♀, **Heredia**, Braulio Carrillo NP, 250-500m, 10.iv.1985 (L. Masner, H. Goulet); 1♀, **Cartago**, CATIE, 700m, MT/YPT, 14-15.iii.1990 (J.S. Noyes). Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. The left antenna of the holotype appears to be slightly deformed but otherwise the holotype is in good condition.

Of the Costa Rican species of *Cheiloneurus*, *pherus* and *zephyrus* (see p. 354) are the closest to *Cheiloneurus noxius* Compere (1925), known only from the USA (California and Hawaii). The generally dark brown body, colouration of the scape and pattern of fore wing infuscation and setation suggest that all three species are close to *nigrescens*, but differ from this and other, related species by having the mesoscutum partially orange instead of entirely dark brown. *Cheiloneurus zephyrus* can be distinguished from both *pherus* and *noxius* by having the gaster mostly orange-brown with the syntergum orange, whereas in the other two named species the gaster is entirely dark brown. Both *pherus* and *zephyrus* can be distinguished from *noxius* by having the anterior part of the mesoscutum orange, whereas in *noxius* the part that is normally covered by the pronotum is brown. Further to this, in *noxius* the posterior dark brown band is more than twice as wide as the anterior orange band and with hardly a metallic sheen whereas in both *pherus* and *zephyrus* the posterior dark brown band is less than 0.8X as wide as the orange area and is shiny with a distinct dark blue and purple sheen. Further to this, in *noxius*, the sculpture on the frontovertex is deeper and of larger mesh (slightly larger than diameter of an eye facet), the transversely elongate sculpture above the scrobes extends further towards the anterior ocellus (about 2X length of torulus above frontofacial carina) and the scape is less than 4X as long as broad and broadest in the middle. In both *pherus* and *zephyrus* the sculpture on the frontovertex is very shallow and of smaller mesh (equal to or smaller than diameter of eye facet), the transversely elongate sculpture above the scrobes extends only about 0.5X the length of a torulus above the transfacial carina and the scape is more than 4X as long as broad and broadest subapically. There are also significant differences in the colour of the legs and base of fore wing.

Cheiloneurus lydia **sp.nov.**

(Figs 898-914; Hab. ♀ 131)

DIAGNOSIS. *Female* (length about 1.3-1.8mm): body mostly dark brown to black with a weak to moderate metallic sheen, head and pronotum with orange areas, scutellum orange; antenna (Figs 908, 912, 913, 914) with scape mostly white margined dark brown; pedicel and flagellum dark brown; posterior two-thirds of mesoscutum with dense silvery setae; fore and hind coxae white, mid coxa mostly brown; legs mainly white or pale orange with areas of dark brown; fore wing (Figs 898, 902) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation and opposite on posterior wing margin, apex slightly paler; head (Figs 907, 909, 910, 911) about 6X as wide as frontovertex, in facial view about 1.1X as long as broad, variable but more or less horse-shoe shaped, genae converging but fairly straight and more strongly curved near mouth margin; frontovertex naked medially; eye separated from scrobe by about 1.3X diameter of anterior ocellus, area between eye and scrobe completely smooth, scrobal margin carinate; interantennal prominence dorsally rounded with about 35 inconspicuous, translucent

setae; mandible with one tooth teeth and a broad slightly concave truncation; antenna (Figs 908, 912, 913, 914) with scape about 3.8X as long as broad; funicle with F1-F3 longer than broad, F4-F6 subquadrate or transverse; head width slightly less than length of flagellum; linear sensilla on F3-F6, sometimes absent from F3; clava 3-segmented, at least as long as F3-F6 combined; sensory area large and forming an oblique truncation, extending about 0.4X along ventral margin; mesoscutum (Fig. 906) with fairly uniform coarse polygonally reticulate sculpture medially, anterior one-third or so and sides with sculpture a little more elongate and becoming striate-reticulate; scutellum with a distinct apical tuft of setae; wings fully developed; fore wing (Fig. 898, 902) about 2.6-2.7X as long as broad; parastigma clearly downcurved; costal cell dorsally more or less naked at apex, sometimes with one or two setae, and ventrally with a single line of setae that is broadly interrupted above parastigma; area below proximal part of parastigma with a group of about 8-20 pale setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that extends a little way into disc (Figs 899, 901); apical bristle of postmarginal vein about 0.6-1.0X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with from one to six setae adjacent to spiracle, side naked; syntergum about 0.7-0.8X as long as mid tibia; ovipositor (Fig. 903) about 4.0-4.5X gonostylus or 1.1-1.3X as long as mid tibia; gonostylus about 0.8-0.9X as long as mid tibial spur; exserted part of ovipositor less than 0.2X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.56mm; excluding ovipositor, 1.53mm (CPD).

Head with frontovertex mostly pale orange-brown, occiput medially brown with some blue reflections; occipital margin medially with a distinct blue sheen, area between this and posterior ocelli metallic green and brassy, narrowly bordered metallic purple; anterior ocellus to top of scrobes with weak purple and blue reflections; area between eye and scrobe brown with a distinct green, coppery and purple sheen, narrowly margined purple laterally; temple and posterior part of gena dark brown with a metallic green, blue-green and brassy sheen; anterior part of gena with a mixed blue, green, brassy and coppery sheen; upper part of interantennal prominence with a metallic green and blue-green sheen weakly mixed coppery and purple; frontovertex clothed with inconspicuous, pale brown setae; antenna (Fg. 908) with radicle pale orange, apex brown; scape mostly white, ventral margin narrowly brown in proximal two-thirds, distal two-thirds of dorsal margin internally brown, paler proximally; pedicel and F1-F5 dark brown, F6 and clava very dark brown, almost black; maxillary palpus with apical segments brown contrasting with off-white proximal segments; pronotum mostly pale orange, neck slightly dusky, posterior margin medially transparent; mesoscutum anteriorly dark orange-brown, remainder dark brown with weak purple reflections, clothed in posterior two-thirds or so with moderately dense, translucent, silvery setae, anterior one-third clothed with less dense, translucent, golden brown setae; tegula dark brown, orange-brown proximally; axilla and scutellum orange, clothed in golden brown to dark brown setae, subapical tuft black; metanotum dark purple-brown; mesopleuron orange-brown, anteriorly with a weak blue, green, brassy and purple sheen, posteriorly with a weak copper and purple sheen; fore coxa white; fore femur largely white, margins pale orange to orange-brown distally, tibia dark brown, tarsus pale orange-brown; mid coxa mostly brown, apex dirty white; mid femur white, narrowly brown towards apex, tibia dark brown at extreme base, with a narrow, white subbasal ring, otherwise mostly pale orange, but brown subbasally, spur and tarsus pale orange; hind coxa white; hind femur dark brown, pale orange-brown subapically, tibia narrowly orange at base, remainder orange-brown, darker proximally, tarsus pale orange; fore wing (Fig. 898) mostly infuscate, hyaline towards base and at apex; submarginal vein yellow, rest of venation dark brown; propodeum brown, medially with a weak blue and purple lustre, laterally with a weak metallic green sheen, side with a weak coppery and blue-green sheen, some translucent setae outside spiracle; gaster dark brown, dorsally with brassy, coppery, purple and green reflections, sides with a more conspicuous green, blue, brassy, coppery and purple sheen, especially proximally; outer plates of ovipositor with weak blue, brassy and purple reflections; gonostylus pale orange.

Head (Fig. 907) about 6X as wide as frontovertex, in profile about 1.8X as high as deep, anteriorly quite straight below top of scrobes, interantennal prominence protuberant very slightly level with torulus; occipital margin sharp and carinate; ocelli forming an angle of about 45°; frontovertex (Fig. 907) quite shiny, with conspicuous, fairly regular, polygonally reticulate

sculpture of mesh size slightly smaller than diameter of eye facet; area immediately above scrobes with conspicuously coarser and transversely elongate sculpture; lower interantennal prominence with similar sculpture to main part frontovertex, upper interantennal prominence and scrobes completely smooth; temple and posterior gena with shallower, more irregular and longitudinally elongate sculpture than on main part of frontovertex, anterior gena with coarse, irregular, reticulate sculpture; area between eye and scrobe completely smooth; scrobes deep, meeting dorsally, sharply margined above, carinate below eye, but roundly margined outside lower part of torulus, very broadly ∩-shaped; antenna as in Fig. 908; scape hardly broadened and flattened, about 3.8X as long as broad; funicle with F1-F3 slightly longer than broad, F4 subquadrate, F5-F6 transverse, segments broadest distad; clava broadened, hardly longer than F2-F6 combined, sutures oblique, sensory area enlarged, extending ventrally about 0.5X along clava, giving it an obliquely truncate appearance; eye very nearly reaching occipital margin, appearing naked, but clothed with extremely short setae that are very much shorter than diameter of facet; inner eye margins clearly diverging below anterior ocellus; malar sulcus present, but extremely weak; clypeal margin very slightly convexly rounded medially; mandible with 1 tooth and a broad, slightly concave, truncation; apical segment of maxillary palpus hardly enlarged, only slightly longer than radicle. Relative measurements: HW 73, HH 82, FV 12, OD 6.5, POL 4, OOL 0, OCL 10.5, AOL 9, EL 54, EW 40, MS 34, SL 37.5, SW 10.

Thorax (Fig. 906) with irregular, polygonally reticulate sculpture on pronotum that is similar to that on frontovertex; mesoscutum with fairly regular, polygonally reticulate sculpture that is slightly deeper and finer than that on pronotum, sculpture on sides slightly longitudinally elongate; axilla and scutellum with similar sculpture to disc of mesoscutum, but perhaps a little coarser, axilla posteriorly weakly sculptured; visible part of mesoscutum about 2.1X as broad as long; scutellum about as long as broad with a distinct subapical tuft, setae mostly about 0.6X as long as scutellum; hind femur about 4.7X as long as broad; fore wing with venation and setation as in Figs 898, 899; costal cell with a single seta dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 899); propodeum (Fig. 906) with only 4 or 5 setae outside spiracle, side almost completely smooth, with some very shallow, reticulate sculpture anteriorly, medially about 0.17X as long as scutellum and with a very weak median carina. Relative measurements: FWL 74.5, FWW 29; HWL 64, HWW 15.

Gaster with hypopygium reaching about half-way to apex; syntergum about three-quarters as long as mid tibia, with apex narrowly rounded; ovipositor hardly exserted, the exserted part less than one-fifth as long as mid tibial spur.

Paratype. Funicle with linear sensilla present only on F4-F6; gaster without "gland-like" structures on Gt1 or Gt5; hypopygium Fig. 900; ovipositor Fig. 903. Relative measurements: OL 51.5, GL 13 [MT 43.5].

Variation. Females vary in overall length from 1.29-1.81mm, the head (Figs 907, 909, 910, 911) is 1.08-1.15X as high as broad with the gena virtually straight or even slightly bulging to gradually convexly rounded, the head also varies from 5-7X wide as the frontovertex, linear sensilla may also be present on F3, the clava varies from about as long as F3-F6 combined (Fig. 912) to as long as the funicle (Fig. 914), the sensory part of the clava extends about one-third to one-half along its ventral surface and the fore wing is 2.55-2.76X as long as broad.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, RF Golfo Dulce, 24km W Piedras Blancas, 8°46'N 83°24'W, 200m, i-iii.1991 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **Alajuela**, RF Arenal, PN Volcan Arenal, Sector Colada, LN 269900 456750, 600m, #54371, 1-26.x.1999 (G. Carballo); 1♀, Alajuela, PN Arenal. 10°28'N 84°45'W, 617m, 21-28.ii.2005 (C. Hansson); 1♀, **Heredia**, OTS La Selva, 100m, 3km S Puerto Viejo, x.1992 (P. Hanson); 1♀, Heredia, 3km S. Puerto Viejo, OTS-La Selva, 100m, ii-iii.1993 (P. Han-

son); 1♀, Heredia, OTS-La Selva, 10°26'N 84°01'W, canopy fog *Pentaclethra macroloba*, vii.1993 (ALAS project); 1♀, Heredia, OTS-La Selva, 10°26'N 84°01'W, canopy fog *Virola koscheyi*, FVK/11, 4.ix.1993 (INBio-OET); 1♀, Heredia, OTS La Selva, FPM 23, 14.x.1994 (ALAS); 1♀, Heredia, OTS-La Selva, FPM 28, 22.x.1994 (ALAS); 1♀, Heredia, OTS La Selva, 10°26'N 84°01'W, xii.1995 (ALAS); 1♀, Heredia, RB La Selva, 10°26'N 84°01'W, xii.1999 (INBio-OET); 2♀, Heredia, La Selva BS, 10°26'N 84°01'W, 50-150m, canopy fog *Eugenia* sp., FOT/76/1-40, 5.i.2000 (ALAS, INBio/OET); 1♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, canopy fog *Meliosoma vernicosa,* FOT/44/01-40, 8.i.2000 (INBio-OET); 1♀, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 16-17.ii.2009 (J.S. Noyes); 2♀, Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 17-18.ii.2011 (J.S. Noyes); 5♀, Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 23-24.ii.2013 (J.S. Noyes); 1♀, Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 19-20.ii.2016 (J.S. Noyes); 14♀, same data as holotype but xii.1990-vii.1992; 1♀, Puntarenas, PN Corcovado, Est. Agujas, Cerro Quebraditas, LS 521400 274300, 782m, #58104, vii-viii.2000 (J. Azofeifa); 1♀, Puntarenas, Golfito, Est. Agujas, LS 276750 526550, 250-350m, #56674, 11-26.v.2000 (J. Azofeifa); 1♀, Puntarenas, Golfito, Est. Agujas, LS 520100 275200, 782m, #66478, 6.xi-20.xii.2000 (J. Azofeifa); 1♀, Puntarenas, PN Corcovado, Send. Los Patos/Sirena, LS 331800 572100, 100m, #57960, 15.vi-.15.vii.2000 (J. Azofeifa); 1♀, **Limón**, RB Hitoy-Cerere, Valle de Estrella, Send. Bobócara, LN 641800 184250, 300m, #54018, 11.x-11.xi.1999 (F. Umaña); 1♀, Limón, RB Hitoy-Cerere, Valle de Estrella, Send. Bobócara, LN 641800 184250, 300m, #58065, vi-vii.2000 (F. Umaña). Holotype in MZUCR, paratypes in NHMUK and MZUCR.

COMMENTS. As understood here, *Cheiloneurus lydia* is an unusually variable species. Perhaps the most striking variation is in the shape of the head, closely followed by the relative size of the clava (see above under variation). It is possible that the material listed above may represent a complex of species, but I prefer to treat it all one species pending further work on the group.

Females of *Cheiloneurus lydia* can be difficult to separate from *mckenziei* but can be distinguished on the relative size and shape of the hyaline area at the apex of the fore wing (see key). Apart from this, the two species can be characterised using the proportions of the antennal segments and relative length of the gonostylus. In *lydia* the proximal funicle segments are relatively shorter so that F4 and sometimes F3 are transverse, the clava is at least about as long as F3-F6 combined and the gonostylus is at least slightly shorter than the mid tibial spur. In mckenziei F1-F4 are long than broad, the clava is hardly longer than F4-F6 combined and the gonostylus is longer than the mid tibial spur.

See comments under *herxius* (p. 306).

Cheiloneurus parnisa **sp.nov.**

(Figs 915-920; Hab. ♀ 132)

DIAGNOSIS. *Female* (length about 1.1-1.4mm): body mostly dark brown to black with a weak to moderate metallic sheen, head and pronotum with orange areas, scutellum orange; antenna (Fig. 915) with scape mostly white margined dark brown; pedicel and flagellum dark brown; most of mesoscutum with dense silvery setae; fore and hind coxae white, mid coxa white, mixed brown ventrally; legs largely white or pale orange with areas of dark brown; fore wing (Fig. 920) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation and opposite on posterior wing margin, apex slightly paler; head (Fig. 917) about 4.4-4.8X as wide as frontovertex, in facial view about 1.1X as long as broad, genae converging but fairly straight more strongly curved near mouth margin; frontovertex naked medially; eye separated from scrobe by about 1.1X diameter of anterior ocellus, area between eye and scrobe completely smooth, scrobal margin carinate; interantennal prominence dorsally rounded with about 35 inconspicuous, translucent setae; mandible with one tooth teeth and a broad slightly concave truncation; antenna (Fig. 915) with scape about 3.7X as long as broad; funicle with F1-F3 longer than broad, F4-F6 subquadrate or transverse; head width slightly greater than length of flagellum; linear sensilla on F3-F6; clava 3-segmented, hardly longer than F4-F6 combined; sensory area large and forming an oblique truncation, extending about 0.4X along ventral margin; mesoscutum with fairly uniform coarse polygonally reticulate sculpture medially, anterior one-third or so and sides with sculpture a little more elongate and becoming striate-reticulate ; scutellum with a distinct apical tuft of

setae; wings fully developed; fore wing (Fig. 920) about 2.8X as long as broad; parastigma clearly downcurved; costal cell dorsally more or less naked at apex, sometimes with one or two setae, and ventrally with a single line of setae that is broadly interrupted above parastigma; area below proximal part of parastigma with a group of about 20 pale setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that extends a little way into disc (Fig. 919); apical bristle of postmarginal vein about 0.9X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with about five or six setae adjacent to spiracle, side naked; syntergum about as long as mid tibia; ovipositor (Fig. 916) about 5.6X gonostylus or 1.5X as long as mid tibia; gonostylus about 0.8X as long as mid tibial spur; exserted part of ovipositor less than 0.3X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.43mm; excluding ovipositor, 1.39mm (CPD).

Head with frontovertex mostly pale orange-brown, occiput medially brown with some blue reflections; occipital margin medially with a distinct blue sheen, area between this and posterior ocelli coppery purple and brassy, blue between ocelli; anterior ocellus to top of scrobes with weak purple and blue reflections; area between eye and scrobe orange-brown with a distinct green, coppery and purple sheen, narrowly margined purple laterally; temple and posterior part of gena dark brown with a metallic green, blue-green and brassy sheen; anterior part of gena with a mixed blue, green, brassy and coppery sheen; upper part of interantennal prominence with a metallic green and blue-green sheen weakly mixed coppery and purple; frontovertex clothed with inconspicuous, pale brown setae; antenna (Fig. 915) with radicle pale orange, apex brown; scape mostly white, ventral margin narrowly brown in proximal two-thirds, distal two-thirds of dorsal margin internally brown, paler proximally; pedicel and flagellum very dark brown, almost black; maxillary palpus with apical segments brown contrasting with off-white proximal segments; pronotum mostly pale orange, neck slightly dusky, posterior margin medially transparent; mesoscutum dark brown with weak blue-green and purple reflections, posterior margin with a distinct blue-green sheen, mesoscutum uniformly clothed with moderately dense, translucent, silvery setae; tegula dark brown, orange-brown proximally; axilla and scutellum orange, clothed in golden brown to dark brown setae, subapical tuft black; metanotum dark purple-brown; mesopleuron orange-brown, anteriorly with a weak blue, green, brassy and purple sheen, posteriorly with a weak copper and purple sheen; fore coxa white; fore femur largely white, dorsal margin dark brown distally, tibia dark brown, tarsus dark brown; mid coxa white, mixed brown ventrally; mid femur white, narrowly pale brown towards apex, tibia dark brown, with a narrow, white subbasal ring, extreme apex orange-brown, spur and tarsus pale orange; hind coxa white; hind femur brown, pale orange-brown subapically, tibia dark brown, tarsus white, apex dark brown; fore wing (Fig. 920) mostly infuscate, hyaline towards base and at apex; apex of submarginal vein yellow, rest of venation dark brown; propodeum brown, medially with a weak blue and purple lustre, laterally with a weak metallic green sheen, side with a weak coppery and blue-green sheen, some translucent setae outside spiracle; gaster dark brown, dorsally with brassy, coppery, purple and green reflections, sides with a more conspicuous green, blue, brassy, coppery and purple sheen, especially proximally; outer plates of ovipositor with weak blue, brassy and purple reflections; gonostylus pale orange.

Head (Fig. 917) about 4.8X as wide as frontovertex, in profile about 1.7X as high as deep, anteriorly quite straight below top of scrobes, interantennal prominence protuberant very slightly level with torulus; occipital margin sharp and carinate; ocelli forming an angle of about 50°; frontovertex quite shiny, with conspicuous, fairly regular, polygonally reticulate sculpture of mesh size slightly smaller than diameter of eye facet; area immediately above scrobes with conspicuously coarser and transversely elongate sculpture; lower interantennal prominence with similar sculpture to main part frontovertex, upper interantennal prominence and scrobes completely smooth; temple and posterior gena with shallower, more irregular and longitudinally elongate sculpture than on main part of frontovertex, anterior gena with coarse, irregular, reticulate sculpture; area between eye and scrobe completely smooth; scrobes deep, meeting dorsally, sharply margined above, carinate below eye, but roundly margined outside lower part of torulus, very broadly ∩-shaped; antenna as in Fig. 915; scape hardly broadened and flattened, about 3.7X as long as broad; funicle with F1-F2 slightly longer than broad, F3 subquadrate, F4-F6 transverse,

segments broadest distad; clava broadened, hardly longer than F4-F6 combined, sutures oblique, sensory area enlarged, extending ventrally about 0.4X along clava, giving it an obliquely truncate appearance; eye very nearly reaching occipital margin, naked; inner eye margins clearly diverging below anterior ocellus; malar sulcus present, but extremely weak; clypeal margin very slightly convexly rounded medially; mandible with 1 tooth and a broad, slightly concave, truncation; apical segment of maxillary palpus hardly enlarged, only slightly longer than radicle. Relative measurements: HW 92, HH 95, FV 19, OD 6.5, POL 9, OOL 0, OCL 10.5, AOL 12, EL 80, EW 51, MS 38, SL 42, SW 11.5.

Thorax with irregular, polygonally reticulate sculpture on pronotum that is similar to that on frontovertex; mesoscutum with fairly regular, polygonally reticulate sculpture that is slightly deeper and finer than that on pronotum, sculpture on sides slightly longitudinally elongate; axilla and scutellum with similar sculpture to disc of mesoscutum, but perhaps a little coarser, axilla posteriorly weakly sculptured; visible part of mesoscutum about 2.1X as broad as long; scutellum about as long as broad with a distinct subapical tuft, setae mostly about 0.6X as long as scutellum; hind femur about 4.0X as long as broad; fore wing with venation and setation as in Figs 919, 920; costal cell with two setae dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 919); propodeum with only 4 or 5 setae outside spiracle, side almost completely smooth, with some very shallow, reticulate sculpture anteriorly, medially about 0.17X as long as scutellum and without a median carina. Relative measurements: FWL 193, FWW 69; HWL 175, HWW 39.

Gaster with hypopygium reaching about half-way to apex; syntergum about as long as mid tibia, with apex narrowly rounded; ovipositor hardly exserted, the exserted part less than one-third as long as mid tibial spur.

Paratype. Funicle with linear sensilla present only on F3-F6; gaster without "gland-like" structures on Gt1 or Gt5; hypopygium Fig. 918; ovipositor Fig. 916. Relative measurements: OL 61.5, GL 11 [MT 41.5].

Variation. Females vary in overall length from 1.14-1.43mm, the posterior margin of the mesoscutum varies from distinctly metallic blue-green to dull purple, otherwise little in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, La Selva BS, 10°26'N 84°01'W, 50-150m, fog *Pentaclethra macroloba*, FPM/03, 6.iii.1993 (INBio-OET). Paratypes: **COSTA RICA**, 2♀, **Heredia**, La Selva BS, 10°26'N 84°01'W, 50-150m, fog *Pentaclethra macroloba*, FPM/04, 6.v.1993 (INBio-OET); 1♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, ii.1994 (INBio-OET); 1♀, **Puntarenas**, PN Corcovado, Est. Los Patos, Send. a Sirena, LS 514200 276500, 100m, #58151, viii.2001 (J. Azofeifa). Holotype in MZUCR, paratypes in NHMUK.

Cheiloneurus horocles **sp.nov.**

(Figs 921-927; Hab. ♀ 133)

DIAGNOSIS. *Female* (length about 1.2-1.9mm): head and thorax mostly orange to orange-brown, mesoscutum, propodeum and gaster dark brown, darker areas with a weak to moderate metallic sheen; antenna (Fig. 925) with scape mostly white, margins largely brown; pedicel mostly dark brown; flagellum mostly dark brown, F2-F4 at least partially pale orange; mesoscutum with dense silvery setae in posterior two-thirds; fore and hind coxae white, mid coxa brown dorsally, white ventrally; legs mostly white to pale orange with dark brown areas on tibiae and femora; fore wing (Fig. 921) mostly infuscate, basal cell mostly hyaline, a small hyaline area at apex of venation, apex with a small triangular hyaline area; head (Fig. 926) about 4.7-6.8X as wide

as frontovertex, in facial view slightly to very clearly broader than long, suboval, genae hardly curved, converging, distinctly curved inwards near mouth; frontovertex with two setae medially between anterior ocellus and scrobes; eye separated from scrobe by about diameter of anterior ocellus, area between eye and scrobe smooth and shiny; scrobes deep, sharply margined, carinate below eye, interantennal prominence with about 40-50 inconspicuous setae, dorsally rounded, without a median ridge; mandible tridentate; antenna (Fig. 925) with scape about 4.1-4.3X as long as broad; funicle with F1-F4 slightly longer than broad, F5-F6 quadrate or transverse, F4 may be quadrate; linear sensilla on F2-F6; clava 3-segmented, about as long as F3-F6 combined or F4-F6; sensory area enlarged, extending ventrally about 0.3-0.4X length of clava, apex obliquely truncate; head width greater than funicle length but less than flagellum length; mesoscutum (Fig. 927) with fairly regular, coarse, polygonally reticulate sculpture, very slightly more elongate and coarser anterolaterally; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 921) about 2.8-2.9X as long as broad; parastigma downcurved; costal cell dorsally naked or with a single seta at apex, ventrally with a line of setae that is interrupted above parastigma; area below proximal part of parastigma with a group of about 25 uniform, fine setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 922); apical bristle of postmarginal vein about 0.7-0.8X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum with about five inconspicuous setae adjacent to spiracle, side naked; syntergum about as long as mid tibia with apex narrow and angular; ovipositor (Fig. 924) about 4.2X gonostylus or about 1.5X as long as mid tibia; gonostylus very nearly as long as long mid tibial spur; exserted part of ovipositor about 0.5X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.93mm; excluding ovipositor, 1.84mm (CPD).

Head generally slightly dusky orange; occiput pale orange with a dark brown, triangular mark above foramen; lower scrobes, lower interantennal prominence, much of mouth margin and posterior part of gena pale orange; mouth margin below torulus dark brown; carinate part of occipital margin dark, dull metallic purple, area to posterior ocelli with a metallic sheen, coppery between posterior ocelli, area between ocelli with a weak purple, blue and green sheen, frontovertex in front of anterior ocellus with a weak brassy and slightly purple sheen; immediately above scrobes with a weak metallic blue sheen; area between eye and scrobe with a relatively strong metallic green and purple sheen, this bordered laterally by a purple and blue line; temple and upper gena with a metallic green sheen, mixed coppery posteriorly and ventrally; lower gena with a weaker purple, coppery and brassy sheen; top of scrobes metallic green; upper part of interantennal prominence with weak purple sheen, lower part of interantennal prominence with a weak brassy sheen with weak green and purple reflections; mouth margin below torulus with a metallic green and coppery sheen; frontovertex clothed with inconspicuous, pale brown setae, these continued as a line below eye and scattered on gena; interantennal prominence with relatively dense, translucent, slightly silvery setae; antenna (Fig. 925) with radicle pale orange proximally, but mostly dark brown; scape largely white but with ventral margin broadly dark brown to about 0.75X along its length, base completely dark brown, dorsal margin proximally orange with apical 0.4X and apex dark brown; pedicel mainly dark brown, but paler orange-brown dorsally; F1 dark brown, F2-F4 pale orange mixed dark brown, F3-F4 mostly pale orange, F5-F6 and clava dark brown; maxillary palpus white, terminal segment brown; pronotum mostly pale orange with weak purple and brassy reflections, neck brown; propleuron pale orange, dark brown in front of coxa; prosternum pale orange; mesoscutum black with weak brassy, coppery, purple, green and blue reflections, these most distinct posteriorly and virtually absent anteriorly, mesoscutum mainly clothed in conspicuous, translucent silvery setae, anterior one-third or so with slightly less dense and golden brown to dark brown setae; tegula dark orange-brown with a weak purple sheen; axilla slightly dusky orange, bordered brown, with weak purple reflections and with a few black and golden brown setae; scutellum orange, slightly dusky between axillae, with weak purple reflections, with golden brown setae, subapical tuft black; metanotum very dark purple-brown; mesopleuron orange-brown, with a moderate coppery, blue, green brassy and purple sheen; mesosternum dark brown mixed pale orange; fore coxa white; fore femur mostly white, apex and margins dark brown, tibia white at extreme base, broadly dark brown medially, apex slightly dusky pale orange, tarsus slightly dusky

orange; mid coxa mostly brown, white apically and on much of venter; mid femur white, with an incomplete subapical dark brown ring on inner surface and dorsal margin, tibia dark brown at extreme base, white subbasally otherwise very pale orange with an incomplete, subbasal dark brown ring continued as a dark brown streak externally for most of length of tibia, spur and tarsus pale orange; hind coxa white, hind femur white at extreme base, apex brown with a preapical orange area, tibia white at base, otherwise dark brown, tarsus pale orange; fore wing (Fig. 921) mostly infuscate, largely hyaline towards base, apex with a small hyaline area, submarginal vein pale orange otherwise venation brown; propodeum dark brown, medially with a coppery and metallic green sheen, laterally with coppery purple and metallic green patches, side relatively dull blue-green, blue and purple, about 5 silvery setae in a line outside spiracle; gaster mainly dark brown with a slight brassy and purple sheen, Gt1 and Gt2 dorsally mixed relatively strongly coppery, green, purple and blue, sides of Gt3-Gt5 with a relatively strong green and blue-green sheen with coppery and purple reflections, sternites with coppery, blue, green, purple and brassy reflections; gonostylus very pale orange.

Head (Fig. 926) in facial view about 5.9X as wide as frontovertex with upper part of gena straight and converging, in profile about 1.6X as high as deep, frontovertex slightly angled level with posterior ocelli, then weakly and evenly curved to top of scrobes, strongly angled at top of scrobes towards mouth margin, with interantennal prominence slightly protuberant; occipital margin sharp, carinate; a shallow groove present on eye margin behind ocellus which connects with occipital carina; ocelli forming an angle of about 38°; frontovertex with shallow, fine polygonally reticulate sculpture of mesh size generally slightly smaller than eye facet; area immediately above scrobes with relatively deep, coarse, transversely elongate, polygonally reticulate to imbricate-reticulate sculpture, area outside this between eye and scrobe completely smooth and shiny; temple and upper gena with distinct, shallow, longitudinally elongate imbricate-reticulate to strigose sculpture, lower gena with similar sculpture to that on temple but less shiny; scrobes smooth; interantennal prominence virtually smooth but with fine, shallow, polygonally reticulate sculpture; narrowest part between eye and scrobal margin about as wide as diameter of anterior ocellus, scrobes deep, meeting dorsally, sharply margined, carinate below eye, very broadly ∩-shaped, interantennal prominence dorsally broadly rounded, without a median ridge; antenna as in Fig. 925; scape broadened and flattened, broadest subapically, about 4.3X as long as broad; funicle with F1-F4 very slightly longer than broad, F5 quadrate, F6 transverse, segments clearly larger and wider distally; clava hardly broadened, slightly shorter than F4-F6 combined, sutures oblique, sensory area slightly enlarged, extending about 0.4X along ventral surface, giving it a distinct obliquely truncate appearance; eye virtually reaching occipital margin, separated by much less than diameter of facet, with extremely short, inconspicuous setae, each much shorter than diameter of facet; inner eye margins diverging in front of anterior ocellus, narrowest part of frontovertex slightly in front of anterior ocellus; malar sulcus absent; clypeal margin medially weakly convex; mandible with 2 acute teeth and a truncation, virtually tridentate; apical segment of maxillary palpus not enlarged, about 1.5X as long as radicle. Relative measurements: HW 122, HH 129, FV 21, POL 9.5, OOL 0, OCL 18, AOL 20, EL 94, EW 69, MS 42, SL 60, SW 14.

Thorax (Fig. 927) with pronotum hardly exposed behind head and about 0.5X as long as mesoscutum; pronotum with shallow, imbricate-reticulate to polygonally reticulate sculpture that is of similar depth to that in ocellar area; mesoscutum with fairly regular, coarse, polygonally reticulate sculpture, slightly deeper anteriorly and laterally, overall clearly a little deeper than that on pronotum; axilla and scutellum with polygonally reticulate sculpture, more elongate on side of scutellum, generally slightly coarser than that on mesoscutum but of similar depth; visible part of mesoscutum about 1.8X as broad as long; scutellum about as long as broad, with a distinct subapical tuft, setae mostly about 0.75X as long as scutellum; hind femur about 4.8X as long as broad; fore wing with venation and setation as in Figs 921, 922; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 922); mid tibia with a weak external carina proximally; propodeum (Fig. 927) medially about 0.21X as long as scutellum and smooth. Relative measurements: FWL 96.5, FWW 34.5; HWL 86.5, HWW 21.5.

Gaster with hypopygium reaching about 0.4X to apex; syntergum about as long as mid tibia, with apex narrow and angular; ovipositor exserted, the exserted part about 0.5X as long as mid

tibial spur or 0.2X as long as mid tibia.

Paratype. Funicle with linear sensilla present only on F2-F6; gaster without "gland-like" structures on Gt1 or Gt5; hypopygium Fig. 923; ovipositor Fig. 924. Relative measurements: OL 62, GL 15 [MT 42].

Variation. Females vary in overall length from 1.2-1.93mm, F2-F3 may be almost completely pale orange, the funicle may be virtually completely dark brown with F1-F3 only very slightly paler, the hind femur may be almost completely dusky, pale orange, the head varies from 4.7-6.8X as wide as the frontovertex in facial view slightly to clearly higher than broad, wider and shorter in smaller specimens, the interantennal prominence has about 40-50 setae, the scape varies from 4.1-4.3X as long as broad, and in smaller specimens F4 may be quadrate and F5 transverse, the clava may be about as long as F4-F6 combined with the sensory part extending ventrally about 0.3-0.4X length of clava, the fore wing may be about 2.8-2.9X as long as broad and the costal cell may be dorsally naked or with a single apical seta.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Santa Rosa NP, Hacienda 3-0, 26.x-16.xi.1985 (Janzen, Gauld). Paratype: **COSTA RICA**, 12♀, **Guanacaste**, Santa Rosa NP, various localities and dates 28.vii.1985-21.ii.1987 (D. Janzen, I. Gauld); 1♀, Guanacaste, PN Palo Verde, La Espuela, Q. Mula, LN 386300 260770, 10m, #61362, 10-20.i.2001 (I. Jiménez); 1♀, Guanacaste, Volcan Orosí, SW side, Est. Orosí, 1100m, 1988-1989; 1♀, **Alajuela**, San Pedro de la Tigra, cacao, i-ii.1990 (R. Cespedes); 1♀, **Puntarenas**, Pen Osa, Puerto Jimenez, 10m, ii-iii.1993 (P. Hanson). Holotype in MZUCR, paratypes in NHMUK and MZUCR.

COMMENTS. *Cheiloneurus horocles* is superficially very similar to *feritas* in general habitus and colouration and at a quick glance the two species could be easily confused. Other than the relative width of the scape given in the key to species (about 4X as long as broad in *horocles* and about 3X in *feritas*), *horocles* can be distinguished from *feritas* on the colour of the funicle segments, size of the sensory area of the clava, relative length of the head, mandibular teeth, the setae below the parastigma and the relative length of the gonostyli. In *horocles*, at least some funicle segments are marked yellow or pale orange, the sensory part of the clava extends about 0.4X along its ventral surface, the head is slightly higher than broad, the mandible has 2 teeth and a truncation, there is a group of about 20 pale uniform setae below the parastigma and the ovipositor is a little more than 4X as long as the gonostylus. In *feritas* the scape is about 3X as long as broad, the flagellum is uniformly dark brown, the sensory part of the clava does not extend more than about 0.25X along the ventral surface of the clava, the head is a little broader than high, the mandible is tridentate, there is a group of about 40 variable setae below the parastigma and the ovipositor is about 3.6X as long as the gonostylus.

Cheiloneurus longisetaceus **De Santis stat.rev.**

(Figs 928-936; Hab. ♀ 134)

Cheiloneurus longisetaceus De Santis 1939:334-336. Holotype ♀, Argentina, MLP, image examined.

DIAGNOSIS. *Female* (length about 1.4-2.3mm): body almost completely dark brown with a weak to moderate metallic sheen. often with orange areas on the lower face, pronotum, axilla and scutellum; antenna (Figs 930, 931) with scape mostly white with dorsal and ventral margins largely brown; pedicel and flagellum dark brown; posterior part of mesoscutum with evenly distributed translucent silvery setae; fore and hind coxae white, mid coxa orange-brown to dark brown; legs

dark orange-brown to dark brown, mid legs paler; fore wing (Fig. 933) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation, a diffuse paler area opposite and apex with a small, slightly paler or hyaline area; head (Fig. 928) about 6.1-6.9X as wide as frontovertex, in facial view from about as long as broad to clearly longer than broad, subquadrate, genae slightly curved but hardly converging, more strongly curved inwards near mouth; frontovertex naked medially between anterior ocellus and scrobes or sometimes with up to two setae; eye separated from scrobe by about diameter of anterior ocellus to nearly 1.5X diameter of anterior ocellus, area between eye and scrobe completely smooth; scrobes deep, sharply margined, carinate below eye; interantennal prominence with about 40-50 inconspicuous setae and dorsally broadly rounded without a median ridge; mandible virtually tridentate; antenna (Fig. 930, 931) with scape about 4.0-4.5X as long as broad; F1-F4 longer than broad, F5-F6 quadrate or transverse, sometimes F4 quadrate; linear sensilla on F2-F6 or absent from F2 or even F3; clava 3-segmented, about as long as F4-F6 combined; sensory area enlarged, extending ventrally about 0.3-0.4X length of clava, apex obliquely truncate; head width slightly greater than funicle length, clearly less than flagellum length; mesoscutum (Fig. 932) with fairly regular polygonally reticulate sculpture, very slightly more elongate and coarser anterolaterally; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 933) about 2.6-2.8X as long as broad; parastigma slightly downcurved; costal cell dorsally naked or with one or two apical setae, ventrally with a line of setae in proximal 0.6X; area below proximal part of parastigma with a group of about 10-18 setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 929); apical bristle of postmarginal vein about 0.7-0.8X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with up to four inconspicuous setae adjacent to spiracle, side naked; gaster without "gland-like" structures on Gt1 or Gt5; syntergum about 0.9X as long as mid tibia with apex broadly angular; hypopygium Fig. 936; ovipositor (Figs 934, 935) about 3.6-4.2X gonostylus or about 1.3-1.6X as long as mid tibia; gonostylus about 0.9-1.0X as long mid tibial spur; exserted part of ovipositor about 0.5-1.2X as long as mid tibial spur. *Male* (length about 1.5mm): inadequately described by De Santis (1939), the characters given would not help distinguish males of this species from others of the genus.

DISTRIBUTION. Costa Rica, Argentina.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material: Holotype ♀ (on slide): white label "D.A.G.I. Laboratorio de Entomologia ex Baradero capturado en Citrus ♀ leg D.S./I/1937", red label "D.A.G.I. "D.A.G.[I.] 1967 Laboratorio Entomologia Cheiloneurus longisetaceus Holotipo det. De Santis";

Non type material. **COSTA RICA**, 1♀, **Heredia**, La Selva BS, 10°26'N 84°01'W, 50-150m, fog *Carapa guianensis*, FOT/02, 5.iii.1993 (INBio/OET); 1♀, Heredia, OTS La Selva, 10°26'N 84°01'W, canopy fog *Virola koschayi*, FVK/11, 4.ix.1993 (INBio/OET); 2♀, Heredia, OTS La Selva, 75m, 10°26'N 84°01'W, xii.1993 (ALAS).1♀, Heredia, La Selva BS, 10°26'N 84°01'W, FVK 32, 3.xi.1994; 1♀, Heredia, OTS La Selva, FPM 23, 14.x.1994 (ALAS); 1♀, **Puntarenas**, Buenos Aires, 120m, viii-ix.1991 (P. Hanson); 1♀, Puntarenas, Golfito, 20.iii.1990 (J.S. Noyes); 2♀, Puntarenas, Golfito, RF Golfo Dulce, Est. Agujas, LS 526550 276750, 300m, 15.ii-15.iii.2001 and iii-iv.2001 (J. Azofeifa); 1♀, Puntarenas, RF Golfo Dulce, 24km W Piedras Blancas, 200m, 8°46'N 83°24'W, ii.1992 (P. Hanson); 1♀, Puntarenas, PN Corcovado, Los Patos, LS 517900 281600, 200m, 21.ii.2002 (J.A. Azofeifa). Material in MZUCR and NHMUK.

COMMENTS. *Cheiloneurus longisetaceus* was treated previously as a synonym of *nigrescens* Howard (1897) (Noyes, 1979), but in light of the present study I now consider this synonymy to be incorrect. *Cheiloneurus longisetaceus* differs from *nigrescens* in a number of important characters, not least the difference in the colour of the hind coxa (dark brown in *nigrescens*, pale yellow in *longisetaceus*) and mesoscutum (largely metallic dark blue in *nigrescens*, dark brown in *longisetaceus*). Comparison of the Costa Rica specimens with the digital image of the holotype (slide-mounted and in poor condition) shows little difference except that F3 in the holotype appears to be only about 1.4X as long as broad whereas in the Costa Rica material it is usually more than

1.5X as long as broad. The Costa Rica specimens are provisionally placed in *longisetaceus* pending direct comparison with freshly collected, topotypical material. As understood here, *longisetaceus* is separated from other species using the characters presented in the key.

***Cheiloneurus numida* sp.nov.**
(Figs 937-939; Hab. ♀ 135)

DIAGNOSIS. *Female* (length about 3.2-4.5mm): head and thorax orange, gaster dark brown, generally with a weak metallic sheen; darker areas with a stronger metallic sheen; antenna (Fig. 937) with scape pale orange, ventral margin brown; pedicel pale orange with a dark brown streak; funicle pale yellow to pale orange, F6 largely dark brown; clava dark brown; mesoscutum with conspicuous brown setae; fore and hind coxae white, mid coxa orange; legs generally pale orange; fore wing (Fig. 938) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation; head about 4.7-8.2X as wide as frontovertex, in facial view slightly broader than long, subcircular, genae converging, weakly curved, but more strongly curved inwards near mouth; frontovertex naked medially between anterior ocellus and scrobes; eye separated from scrobe by about 1.8X diameter of anterior ocellus, area between eye and scrobe completely smooth, scrobes moderately deep, sharply margined only below eye; interantennal prominence with about 20 inconspicuous setae and dorsally rounded; mandible tridentate; antenna (Fig. 937) with scape about 4.4X as long as broad; all funicle segments clearly longer than broad, linear sensilla on F3-F6; clava 3-segmented, slightly longer than F5-F6 combined, apex with an weak oblique truncation, sensory area extending slightly more than 0.1X along ventral surface; head width slightly less than funicle length; mesoscutum generally with uniform, fine sculpture that is very slightly elongate anteriorly and laterally; scutellum with a distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 938) about 3.0-3.1X as long as broad; parastigma slightly downcurved; costal cell dorsally with eight or nine apical setae, ventrally with a complete line of setae; area below proximal part of parastigma with a group of about 25-30, paler setae; apices of postmarginal and stigmal veins connected by a naked, hyaline line that extends a little way into disc (Fig. 939); seta at apex of postmarginal vein about 0.2X as long as marginal vein; mid tibial spur slightly shorter than basitarsus; propodeum with only about ten setae adjacent to spiracle, these not extending down side; syntergum about as long as mid tibia; ovipositor about 1.9X gonostylus or about 2.9X as long as mid tibia; gonostylus about 4.9X as long as mid tibial spur; exserted part of ovipositor about 4X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 4.41mm; excluding ovipositor, 3.03mm (CPD).

Head orange, generally with a weak brassy and purple sheen; occiput with a small, triangular brown spot above foramen; area between posterior ocelli stronger metallic blue-green, a weak metallic purple stripe behind this; gena with some additional, weak blue and green reflections; mouth margin weakly marked brown above mandibular base; frontovertex with inconspicuous pale brown setae along inner eye margins; a line of more conspicuous, translucent pale setae below eye; interantennal prominence with a few scattered, translucent setae; maxillary palpus pale orange, apex pale brown; antenna (Fig. 937) with radicle pale orange with a narrow brown apical ring; scape pale orange, externally with ventral margin narrowly dark brown for about 0.8X its length, internally with ventral margin more broadly bordered brown in its middle 0.4X and extreme apex brown; pedicel pale orange with a dark brown streak internally along its length; F1-F3 pale orange, internally dark brown, F4-F5 pale yellow, F6 dark brown, proximally orange, clava dark brown; pronotum orange with weak brassy sheen with some coppery purple reflections, neck with a small, pale brown spot; prosternum pale orange; mesoscutum orange with a weak brassy and purple sheen, clothed with conspicuous brown setae; tegula orange with apex orange-brown; axilla and scutellum orange, clothed with dark brown setae, subapical tuft on scutellum black; metanotum orange; mesopleuron orange with a weak brassy and purple sheen; mesosternum orange; fore coxa white, leg otherwise pale orange; mid leg generally pale orange, tibia white at base and with a very weak, dusky, subbasal ring; hind coxa white, leg otherwise pale orange; fore wing (Fig. 938) mostly infuscate, hyaline towards base; submarginal vein orange, venation otherwise brown; propodeum orange with a weak brassy and purple sheen, side with a

weak metallic green and brassy sheen; about 5 or 6 long, translucent, pale brown setae in a line outside spiracle; gaster dark brown with coppery, purple and brassy sheen mixed metallic green on Gt1 and on side, syntergum mixed orange proximally; gonostylus very pale orange.

Head about 8.2X as wide as frontovertex, in profile 1.5X as high as deep, anteriorly quite straight from top of scrobes to mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, not carinate; ocelli forming an angle of about 40°; frontovertex quite shiny, with fine, shallow, polygonally reticulate sculpture of mesh size conspicuously smaller than diameter of facet, area immediately above scrobe with slightly coarser, more transversely elongate sculpture; narrowest point between eye and scrobe about 1.8X diameter of anterior ocellus and completely smooth; temple and gena with shallow, irregular, elongate, reticulate sculpture; scrobes moderately deep, ∩-shaped, meeting, sharply margined only at point closest to eye; interantennal prominence dorsally rounded and with shallow, polygonally reticulate sculpture; antenna as in Fig. 937; scape slightly broadened and flattened, about 4.4X as long as broad, broadest in middle; all funicle segments clearly longer than broad; F1 about 3.5X as long as broad, F6 about 1.3X as long as broad, segments broader and shorter distad; clava hardly broadened, a little longer than F5-F6 combined, outer suture slightly oblique, sensory area enlarged but extending ventrally only about 0.13X along clava, apex hardly obliquely truncate; eye not quite reaching occipital margin, separated by about diameter of facet, virtually naked but clothed in sparse, inconspicuous, fine, very short setae, each much shorter than diameter of facet; inner eye margins clearly converging anteriorly; malar sulcus present, but fine and indistinct; clypeal margin virtually straight medially; mandible with three acute teeth; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 103, HH 100, FV 12.5, POL 6, OOL 0, OCL 11.5, AOL 12, EL 73, EW 60, MS 35, SL 51, SW 11.5.

Thorax with pronotum short and hardly exposed behind head, about 0.6X as long as mesoscutum, pronotum and mesoscutum with similar shallow, polygonally reticulate to imbricate-reticulate sculpture that is about as deep as that on frontovertex; axilla with very slightly deeper sculpture than mesoscutum; scutellum with deeper, polygonally reticulate sculpture, distinctly longitudinally elongate laterally; visible part of mesoscutum about 1.5X as broad as long; scutellum about 1.1X as broad as long with a distinct subapical tuft, setae mostly about 0.3X as long as scutellum; mid tibia without a distinct external carina; hind femur about 4.8X as long as broad; fore wing with venation and setation as in Figs 938, 939; costal cell dorsally with 7 or 8 setae at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 939); propodeum medially about 0.18X as long as scutellum and virtually smooth; setae on side moderately conspicuous. Relative measurements: FWL 132, FWW 43; HWL 106, HWW 26.

Gaster with hypopygium reaching about half-way to apex; syntergum about 1.1X as long as mid tibia, with apex very narrowly rounded; ovipositor strongly exserted, the exserted part nearly as long as gaster or about 4X as long as mid tibial spur or 1.3X mid tibia.

Paratype. Funicle with linear sensilla present only on F3-F6; gaster without "gland-like" structures on Gt1 or Gt5. Relative measurements: OL 95, GL 49 [MT 32.5].

Variation. Females vary in overall length from 3.22-4.45mm, the mouth margin may be completely orange, the outer plates of the ovipositor may be orange, in smaller specimens the inner eye margins may be hardly converging anteriorly and the head may be only about 4.7X as wide as the frontovertex with the ocelli forming an angle of about 70°

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, Est. Biol. La Selva, 10°25'N 84°01'W, iii.1994 (INBio-OET). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Pitilla (ACG), 700m, MT/YPT, 24.i-27.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Est. Maritza (ACG), 10°58'N 85°29'W, 700m, 23.ii.2003 (J.S. Noyes); 2♀,

Alajuela, PN Volcán Tenorio, Est. Pilón, 700m, 10°43'N 84°59'W, 13-17.ii.2004 (C. Hansson, J. Azofeifa); 1♀, **Heredia**, OTS-La Selva, 10°26'N 84°01'W, iii-iv.1993 (ALAS); 1♀, Heredia, Estacion Biológica La Selva, 10°26'N 84°01'W, 75m, 28-29.ii.2008 (J.S. Noyes); 1♀, **Puntarenas**, San Vito, Las Cruces, Wilson Bot. Gdns, 8°46'N 82°57'W, 7-19.ii.2007 (C. Hansson); 1♀, Puntarenas, PN Piedras Blancas, Est. El Bonito, 100m, 8°43'N 83°13'W, 100m, 13-14.ii.2012 (J.S. Noyes); 1♀, **Limón**, RB Hitoy Cerere, Sendero Espavel hacia el Cerco, LS 400702 570120, 560m, #52200, 19.v-19.vi.1998 (C. Rojas). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

Cheiloneurus aunes sp.nov.
(Figs 940-944)

DIAGNOSIS. *Female* (length about 1.4-1.5mm): body generally pale orange, with some dark brown to black areas with a weak to moderate metallic sheen on head, mesoscutum, and gaster; mouth margin orange, temple and gena with a diagonal, brown streak; antenna (Fig. 940) with scape mostly pale orange with ventral margin brown; pedicel pale orange with a longitudinal, dark brown streak; funicle generally orange to orange-brown, F6 dark brown; clava dark brown; mesoscutum with silvery setae in posterior one-third to one-half; coxae white; legs mostly pale orange to dark brown; fore wing mostly infuscate, basal cell mostly hyaline, a small hyaline area at apex of venation, another opposite and a small triangular area at apex; head (Fig. 942) about 5.5-6X as wide as frontovertex, in facial view very slightly longer than broad, subcircular to subrectangular, genae evenly and weakly curved, converging, more curved inwards near mouth; frontovertex with two to four setae medially between anterior ocellus and scrobes; eye separated from scrobe by about 2X diameter of anterior ocellus, area between eye and scrobe smooth and shiny; scrobes deep and sharply margined, weakly so medially, carinate below eye, interantennal prominence with about 20 inconspicuous setae, dorsally rounded, without a median ridge; mandible tridentate; antenna (Fig. 940) with scape about 2.5-2.6X as long as broad; all funicle segments transverse, F1 may be slightly longer than broad; linear sensilla on F4-F6; clava 3-segmented, slightly longer than funicle; sensory area enlarged, extending ventrally about 0.5X length of clava, apex obliquely truncate; head width nearly as much as flagellum length; mesoscutum (Fig. 941) in anterior two-thirds with fine longitudinally elongate sculpture, posterior part with polygonally reticulate sculpture of more rounded cells; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 944) about 2.5-2.6X as long as broad; parastigma strongly downcurved; costal cell dorsally with one or two setae at apex, ventrally with an almost complete line of setae which is interrupted above parastigma; area below proximal part of parastigma with a group of about ten stronger setae and below this another group of 15 finer setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that hardly continues into disc (Fig. 943); apical bristle of postmarginal vein about 0.6X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum with about 12 inconspicuous setae adjacent to spiracle, side naked; syntergum about as long as mid tibia with apex rounded; ovipositor about 3.5-4.0X gonostylus or about 1.7X as long as mid tibia; gonostylus about 1.3-1.7X as long mid tibial spur; exserted part of ovipositor about as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.41mm; excluding ovipositor, 1.27mm (CPD).

Head generally pale orange with a weak brassy sheen; temple and gena with a diagonal, pale brown line from occipital margin to scrobal margin below torulus; area between eye and torulus with a weak purple sheen; temple and upper gena with a slightly stronger purple and pale blue sheen, brown area with an additional pale green sheen, lower gena with a slightly weaker lustre than temple; frontovertex clothed with inconspicuous, translucent white setae, these continued as a line below eye and scattered on gena and interantennal prominence; antenna (Fig. 940) with radicle mostly pale orange, apex narrowly dark brown; scape mostly very pale orange, white towards apex, ventral margin dark brown from base to about 0.6X along its length, dorsal margin dark brown at extreme apex; pedicel pale orange with a dark brown streak along its length internally; F1-F5 mostly pale orange, but marked pale brown internally and ventrally, F6 dark brown, clava dark brown; maxillary palpus white; pronotum pale orange with weak brassy and coppery reflections, neck narrowly brown; propleuron and prosternum pale orange; mesoscutum

in pale orange in anterior three-fifths with weak brassy and coppery reflections and clothed with black setae, posterior two-fifths brown with a dark metallic blue and green sheen with some purple reflections and clothed in silvery setae that are a little more dense laterally, mixed with a few black setae medially, posterior margin pale orange with a slight brassy sheen; tegula pale orange with apex slightly dusky; axilla pale orange with a few weak coppery reflections, clothed with black setae; scutellum pale orange with weak coppery reflections, with a few, translucent golden brown setae mixed with black setae, subapical tuft black; metanotum pale orange; mesopleuron pale orange, a little dusky along posterior margin, with weak a brassy sheen, mixed purple along posterior margin; mesosternum pale orange; fore coxa white; fore femur mostly white, very pale orange towards apex, mid tibia and tarsus very pale orange; mid coxa white; mid femur mostly white, extreme apex very pale orange, slightly dusky dorsally, tibia very pale orange in proximal half, slightly dusky proximally, apical half of tibia, spur and tarsus very pale yellow, virtually white; hind coxa white; hind femur white at base, very pale orange towards apex, extreme apex dark brown, tibia very pale yellow, virtually white with a dark brown mark at extreme base, tarsus virtually white; fore wing (Fig. 944) mostly infuscate, largely hyaline towards base and at apex, submarginal vein pale orange otherwise venation pale brown; propodeum medially pale orange with a weak brassy sheen, laterally brown with a weak purple sheen, metallic green around spiracle, side metallic green, about 10 silvery setae in a line outside spiracle; gaster mainly pale orange with a weak brassy sheen and green and purple reflections, gonostylus virtually white.

Head (Fig. 942) in facial view about 6X as wide as frontovertex with gena rounded and converging, in profile about 1.6X as high as deep, frontovertex slightly angled level with posterior ocelli, then weakly and evenly curved to top of scrobes, strongly angled at top of scrobes towards mouth margin with scrobal margins convex and interantennal prominence slightly protuberant; occipital margin sharp, weakly carinate; ocelli forming an angle of about 40°; frontovertex fairly smooth with shallow, polygonally reticulate sculpture of mesh size less than diameter of eye facet, more anterior areas with slightly larger mesh, subequal to diameter of facet; area immediately above scrobes with relatively deep, coarse, transversely elongate, polygonally reticulate to imbricate-reticulate sculpture, area outside this between eye and scrobe completely smooth and shiny; temple and upper gena very shiny with shallow, longitudinally elongate imbricate-reticulate to strigose sculpture, lower gena with sculpture of similar depth to that immediately above scrobes, but a little finer; scrobes smooth; interantennal prominence virtually smooth but with shallow, polygonally reticulate sculpture; narrowest part between eye and scrobal margin about as 2X wide as diameter of anterior ocellus, scrobes deep, meeting dorsally, sharply margined, weakly so dorsally, but carinate below eye, very broadly ∩-shaped, interantennal prominence dorsally broadly rounded, without a median ridge; antenna as in Fig. 940; scape broadened and flattened, broadest about middle, about 2.6X as long as broad; all funicle segments transverse, segments clearly larger and wider distally, linear sensilla present only on F4-F6; clava clearly broadened, about 1.5X as wide as F6, a little longer than the funicle, sensory area slightly enlarged, extending about 0.5X along ventral surface, giving it a strongly obliquely truncate appearance; eye reaching occipital margin, with inconspicuous setae, each clearly shorter than diameter of facet; inner eye margins clearly diverging, wider in front of anterior ocellus; malar sulcus absent; clypeal margin medially quite strongly concave; mandible with 3 acute teeth, upper tooth slightly shorter; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 73, HH 75, FV 12, POL 4, OOL 0, OCL 5.5, AOL 9.5, EL 51.5, EW 36, MS 37, SL 41, SW 16.

Thorax (Fig. 941) with pronotum hardly exposed behind head and about 0.6X as long as mesoscutum; pronotum with shallow, imbricate-reticulate to polygonally reticulate sculpture that is clearly deeper than that in ocellar area; mesoscutum in anterior two-thirds with fairly regular, fine, longitudinally elongate, striate-reticulate sculpture that is hardly deeper than that on pronotum, less elongate medially, remainder with more shallow polygonally reticulate sculpture; axilla and scutellum with polygonally reticulate sculpture that is slightly coarser than that on anterior part of mesoscutum and perhaps a little deeper; visible part of mesoscutum about 2X as broad as long; scutellum about as 1.1X as broad as long, with a sparse, but distinct subapical tuft, setae mostly about 0.3X as long as scutellum; hind femur about 4.7X as long as broad; fore wing with venation and setation as in Figs 943, 944; costal cell with 1 or 2 setae dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 943); mid

tibia with a weak external carina proximally; propodeum (Fig. 941) medially about 0.13X as long as scutellum and smooth. Relative measurements: FWL 96, FWW 37; HWL 80, HWW 19.5.

Gaster with hypopygium reaching about 0.4X to apex; syntergum about as long as mid tibia, with apex weakly angular, more or less rounded; ovipositor exserted, the exserted part about as long as mid tibial spur or 0.3X as long as mid tibia; gaster without "gland-like" structures on Gt1 or Gt5. Relative measurements: OL 52, GL 13 [MT 31].

Variation. Females vary in overall length from about 1.4-1.5mm, the mesoscutum may have silvery setae in the posterior one-third to one-half, the head varies from about 5.5-6X as wide as the frontovertex, the frontovertex may have two to four setae medially between anterior ocellus and scrobes, all funicle segments may be transverse or F1 may be slightly longer than broad, the fore wing varies from about 2.5-2.6X as long as broad, the ovipositor varies from about 3.5-4.0X as long as the gonostylus and the gonostylus varies from about 1.3-1.7X as long mid tibial spur.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Sta Rosa NP, Sn. Emilio 6-C, 22.vi-13.vii.1985 (Janzen, Gauld). Paratypes: **COSTA RICA**, 1♀, **Heredia**, Santo Domingo, INBio Parque, LN 217300 526200, 1100m, #71481, 6.x.2002 (J. Azofeifa). Holotype and paratype in NHMUK.

COMMENTS. *Cheiloneurus pulvinariae* Dozier (1925), a hyperparasitoid recorded from soft scale (Hemiptera: Coccidae) in Puerto Rico may run to *aunes* with a little difficulty. The type material is poorly mounted on slides with the result that many important characters cannot be observed. However, judging by Dozier's description and examination of slide mounted paratypes it seems likely that the mouth margin and temple are pale orange and without any dark markings. In the paratypes the scape is very slightly less than 3X as long as broad, but the clava is slightly shorter than the funicle but longer than F2-F6 combined. The clava is more slender than in *aunes*, being only about 2X as wide as the pedicel whereas in *aunes* the clava is very nearly 3X as wide as the pedicel. Further to this, in the fore wing of *pulvinariae* there are only about 9 setae arranged in two lines of uniform setae below the parastigma in which is weakly downcurved and not strongly widened and the apex of the fore wing has a distinct, triangular, hyaline area, whereas in *aunes* there are about 25 stronger and weaker setae arranged in two groups below the parastigma, the parastigma is very abruptly downcurved and widened proximally and the apex of the forewing is uniformly weakly infuscate without a hyaline area.

See also comments under *lexovus* (p. 431).

***Cheiloneurus elegans* (Dalman)**

(Figs 945-949; Hab. ♀ 136)

Encyrtus elegans Dalman, 1820:151-152. Syntypes, NHRM, Sweden, lost.
Cheiloneurus elegans (Dalman); Westwood, 1833a:343.
Cheiloneurus elegantissmus De Santis, 1964:343-345. Holotype ♀, MLP, Argentina, digital image examined, as subspecies of *elegans* (Dalman). **syn.nov.**

DIAGNOSIS. *Female* (length about 1.3-1.6mm): body generally orange to orange-brown (darker and paler colour forms occur in extralimital specimens, see comments below), gaster mostly dark brown, generally with a weak to moderate metallic sheen, darker areas with a stronger metallic sheen; antenna (Fig. 947) with scape pale orange; pedicel mostly pale orange, some dark brown dorsally; funicle with F1-F5 pale orange to orange-brown, F6 dark brown; clava dark brown; posterior one-third of mesoscutum with dense silvery setae; fore and hind coxae white, mid coxa pale orange; legs generally pale orange, hind femur and tibia mostly brown;

fore wing (Fig. 948) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation and another opposite; head (Fig. 946) about 2.8X as wide as frontovertex, in facial view slightly broader than long, subcircular, genae converging, virtually straight; frontovertex with about 13 setae medially between anterior ocellus and scrobes; eye separated from scrobe by about 2.0X diameter of anterior ocellus, area between eye and scrobe with distinct sculpture, scrobes shallow, weakly margined; interantennal prominence with about 18 inconspicuous setae and dorsally rounded; mandible tridentate; antenna (Fig. 947) with scape about 4.3X as long as broad; all funicle segments quadrate or slightly longer than broad; linear sensilla on F4-F6; clava 3-segmented, slightly longer than F4-F6 combined, apex rounded, sensory area small, not extending along ventral surface; head width slightly greater than flagellum length; mesoscutum (Fig. 945) anteriorly with coarse, lineolate sculpture, posteriorly with very shallow polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed (brachypterous forms occur in extralimital specimens, see comments below); fore wing (Fig. 948) about 3.3X as long as broad; parastigma strongly downcurved; costal cell dorsally naked, ventrally with a complete line of setae; area below proximal part of parastigma with a group of about 10-12, paler setae; apices of postmarginal and stigmal veins connected by a naked, hyaline area that hardly extends into disc (Fig. 949); seta at apex of postmarginal vein about 0.4X as long as marginal vein; mid tibial spur very slightly shorter than basitarsus; propodeum with only about three setae adjacent to spiracle; gaster without "gland-like" structures on Gt1 or Gt5; syntergum about 1.1X as long as mid tibia; ovipositor about 5.0X gonostylus or about 1.8X as long as mid tibia; gonostylus about 1.2X as long as mid tibial spur; exserted part of ovipositor about 0.5X as long as mid tibial spur. *Male*: unknown.

Male. Unknown.

DISTRIBUTION. Canada, USA, Mexico, Costa Rica (**new record**), Argentina, throughout Europe, east of the Urals to Primorsky Kray, Middle East, India, Mongolia and Nigeria (see Noyes, 2019). The record from Nigeria requires confirmation.

HOSTS. Recorded as a hyperparasitoid of various Coccoidea (Aclerdidae, Coccidae, Kermesidae and Pseudococcidae) and Cecidomyiidae (Diptera) (see Noyes, 2019). It is probably a hyperparasitoid of encyrtid primary parasitoids of scale insects (Hemiptera: Coccoidea) and Cecidomyiidae occurring on grasses (Poaceae) and other low herbaceous vegetation (e.g., Asteraceae).

MATERIAL EXAMINED.

Type material. *Cheiloneurus elegans elegantissimus*: Holotype ♀, on card "MUSEO DE LA PLATA holotipo Cheiloneurus elegans elegantissimus Det. De Santis" "s/Cochinilla del quilo-quillo." "CHACRAS de CORIA (Prov. Mendoza) Co: Exp. Museo 25/II/1957" "1968/1". Paratypes ♀♀, 5 slides, "Cheiloneurus elegans elegantissimus Det. De Santis PARATIPO 1968/2 MUSEO DE LA PLATA" "CHACRAS de CORIA (Prov. de Mendoza) s/quillo-quillo con cochinilla y diptera Col: Exp. Museo 25/II/1957 ♀"; other slides with same labels but1968/3 to 1968/6 consecutively (MLP).

Non type material. **COSTA RICA**, 1♀, **Puntarenas**, Monteverde, 15-16.vii.1986 (L. Masner); 1♀, Puntarenas, Est. Altamira, Send. a Casa Coca, LS 331750 574400, 1700m, ii.2002 (C. Hansson, D. Rubi, J. Azofeifa); plus a further 286♀, 89♂, from **SWEDEN**, **DENMARK**, **UNITED KINGDOM**, **FRANCE**, **SPAIN**, **Heredia**, **CZECHIA**, **SLOVAKIA**, **HUNGARY**, **ROMANIA**, **BULGARIA**, **CROATIA**, **MONTENEGRO**, **NORTH MACEDONIA**, **GREECE**, **NORTH CYPRUS**, **TURKEY** and **UZBEKISTAN** (all in NHMUK).

COMMENTS. The syntypes of *Encyrtus elegans* Dalman are missing (see Claridge, 1958; confirmed by Hege Vårdal, NHRM, pers. comm., 2022). However, there is no doubt about the identity of *elegans* which is a well-known species in NW Europe and therefore there is currently no necessity for designating a neotype for the species. However, European material identified as *elegans*, as a whole, does exhibit a wide range of variation which may represent the equivalent of several species currently recognised in the group (see Trjapitzin & Triapitsyn, 2008). These

include fully winged specimens occurring throughout its range to a proportion of brachypterous females appearing in Spain and Greece. Specimens from northwest Europe tend to be darker and mostly brown and metallic and often with a completely dark brown flagellum, whilst those from the Mediterranean countries, especially Spain and Greece, are usually much paler with occasional females being almost completely yellow (Crete and Rhodes) and some males being almost completely orange (Spain and Greece). Intermediate colour forms occur in southern France, Spain and Greece. I believe that this material represents only one very variable species. There is no doubt that the "elegans group", as defined by Trjapitzin & Triapitsyn requires a more comprehensive study, using morphological and molecular data, in order to determine a better understanding of its taxonomy.

I have examined a digital image of the holotype of *Cheiloneurus elegans elegantissimus* De Santis and it is clear that it is the same as *Cheiloneurus elegans* as defined by Claridge (1958). The holotype of *elegantissimus* has more extensive yellow colouration on the mesoscutum than is usual for north-west European specimens of *elegans* but several specimens examined from Spain and Greece show a similar extensive yellow colouration. I therefore have no hesitation in treating *elegantissimus* as a synonym of *elegans*.

Cheiloneurus tainus **Trjapitzin & Triapitsyn**

(Figs 950-957; Hab. ♀ 137,138, ♂ 139,140)

Cheiloneurus tainus Trjapitzin & Triapitsyn, 2008:471-472. Holotype ♀, ZISP, Cuba, not examined.

DIAGNOSIS. *Female* (length macropterous, about 1.2-1.7mm; brachypterous 0.8-1.4mm): body mostly orange with posterior one-third of mesoscutum laterally, posterolateral parts of propodeum and much of gaster pale brown; antenna (Fig. 952) with scape pale orange; pedicel pale orange; funicle mainly orange mixed brown, F5-F6 dark brown; clava mostly pale yellow, dark brown basally; posterior one-third of mesoscutum with dense silvery setae; fore and hind coxae white, mid coxa pale orange; legs mostly white to pale orange, hind leg with brown areas towards apex of femur and base of tibia; fully-developed fore wing (Fig. 955) mostly infuscate with basal cell almost completely hyaline, a small hyaline area at apex of venation and one on opposite margin, apex narrowly hyaline; abbreviated fore wing (Fig. 954) weakly infuscate in basal half or so, apex hyaline; head (Fig. 956) about 3X as wide as frontovertex, in facial view slightly broader than long subcircular with genae converging and weakly curved, more strongly curved towards mouth margin; frontovertex with about 20 inconspicuous setae medially between anterior ocellus and scrobes; eye separated from scrobe by about 2.5X diameter of anterior ocellus, area between eye and scrobe with conspicuous sculpture; scrobes shallow, margin rounded; interantennal prominence with about 20 inconspicuous setae and dorsally rounded; mandible tridentate; antenna (Fig. 952) with scape about 4X as long as broad; funicle with F1 slightly longer than broad, F2 transverse and relatively small, F3-F6 subquadrate; head width slightly greater than flagellum length; linear sensilla on F3-F6; clava 3-segmented, slightly shorter than F3-F6 combined; sensory area small and at apex only, giving it a rounded appearance; mesoscutum (Figs 950, 951) in anterior three-fifths with coarse, longitudinally elongate, striate to striate-reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed (Fig. 955) or shortened (Fig. 954) with apex obliquely truncate and pointed with apex hardly reaching base of gaster; fully developed fore wing about 3.1X as long as broad; parastigma clearly downcurved; costal cell dorsally with not more than two apical setae and ventrally with a complete line of setae; area below proximal part of parastigma with a group of about 20 setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 953); apical bristle of postmarginal vein about 0.5X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum with about five setae adjacent to spiracle, side naked; gaster without "gland-like" structures on Gt1 or Gt5; syntergum about 1.2X as long as mid tibia with apex weakly angular; ovipositor (Fig. 957) about 4X gonostylus or about 1.8-1.9X as long as mid tibia; gonostylus about as long as mid tibial spur; exserted part of ovipositor about 1.5X as long as mid tibial spur. *Male* (Length 0.63-1.02mm): body completely orange except for brown posterior part of mesopleuron, propodeum

and apical two-thirds of gaster; fully developed fore wing hyaline with a weak, median infuscate, band below apex of venation; antenna filamentous with all flagellar segments at least 4-5X as long as broad (relatively shorter in smaller specimens), subequal and clothed with setae that are 2.5-3X as long as diameter of segments; brachypterous fore wing with truncate apex almost transverse; aedeagus slender, about 15X as long as broad and about two-thirds as long as mid tibia; digitus about 3X as long as broad and with a single apical hook.

DISTRIBUTION. USA (Florida), Bahamas, Dominican Republic, Puerto Rico, Saint Kitts and Nevis, Dominica, Saint Lucia, Trinidad and Tobago, Belize, Costa Rica, Ecuador, Peru, Venezuela, Suriname (**new records**) and Cuba.

HOSTS. Recorded below from *Antonina graminis* Maskell (Hemiptera: Pseudococcidae) on *Melinis repens* (Willd.) Zizka (Poales: Poaceae).

MATERIAL EXAMINED.

Non type material. **USA**, 1♀, **Florida**, Eureka nr Ocala, 3.ix.1976 (Z. Bouček); 1♀, Florida, Dade Co., Everglades NP, Long Pine Key, 31.viii-9.xii.1986 (S. & J. Peck); 3♀, Florida, Dade Co., TREC Homestead, ex *Antonina graminis* on Natal grass, 14.x.1987 (F.D. Bennett); 7♀, 1♂, Florida, TREC Homestead, ex *Antonina graminis* on Natal grass, 7.xi.1987 (F.D. Bennett, R. Rueda); 1♀, 1♂, Florida, Dade Co., TREC Homestead, ex *Antonina graminis* on Natal grass, 7.xi.1987 (F.D. Bennett). **BAHAMAS**, 2♀, Rum Cay, Airstrip, v.1983 (B. Bowen). **CUBA**, 1♀, Santiago, Jardin Botanico, 4-17.xii.1995 (L. Masner). **DOMINICAN REPUBLIC**, 1♀, Pedernales, Cabo Rojo, Compaña Alcoa, 17.i.1989 (L. Masner); 1♀, Pedernales, Cabo Rojo, 10m, 28.xi-2.xii.1991 (L. Masner, S.J. Peck); 1♀, Pedernales, 37km N Pedernales, Los Arroyos, 2. xii.1991 (L. Masner, S. Peck). **PUERTO RICO**, 1♀, Patillas, 600m, 25.viii.1987 (V.O. Becker). **SAINT KITTS AND NEVIS**, 4♀, Saint Kitts, Bayford Dairy, 300m, xii.1985 (L.D. Coote); 1♀, Basseterre, xi.1985 (B.J. Buckland). **DOMINICA**, 1♀, St Paul, Springfield Est., 20-27.xi.1994 (L. Masner);2♀, St Mark, Scott's Head Point, s.s., 2.xii.1995 (L. Masner). **SAINT LUCIA**, 1♀, Castries, ii-iii.1983 (K. Bolter). **TRINIDAD AND TOBAGO**, 1♀, **Trinidad**, Caroni, Caroni swamp, edge of mangrove swamp, 1.vii.1976 (J.S. Noyes); 1♀, 2♂, Trinidad, Caroni, Gran Couva, wasteground, 16.vii.1976 (J.S. Noyes); 1♂, Trinidad, Mayaro, Trinity Hills Reserve, rainforest, 5.viii.1976 (J.S. Noyes); 1♀, 1♂, Trinidad, Mayaro, Basse Terre, wasteground, 14.viii.1976 (J.S. Noyes); 1♂, Trinidad, St David, Toko, wasteground, 28.vi.1976 (J.S. Noyes); 1♀, Trinidad, St George, Maracas Valley, edge of rainforest, 23.vi.1976 (J.S. Noyes); 1♀, 10♂, Trinidad, St George, St Augustine, wasteground, 14.vi.1976 (J.S. Noyes); 23♀, 35♂, Trinidad, St George, St Augustine, wasteground, 15.vi.1976 (J.S. Noyes); 3♀, 1♂, Trinidad, St George, St Augustine, wasteground, 16.vi.1976 (J.S. Noyes); 1♂, Trinidad, St George, St Augustine, wasteground, 21.vi.1976 (J.S. Noyes); 1♂, Trinidad, St George, St Augustine, wasteground, 24.vi.1976 (J.S. Noyes); 29♀, 31♂, Trinidad, St George, St Augustine, ex *Antonina graminis* Mask. on grass, vii.1976 (J.S. Noyes); 4♂, Trinidad, St George, St Augustine, Malaise trap, 15.vii-13.viii.1976 (J.S. Noyes); 1♂, Trinidad, St George, St Augustine, Malaise trap, viii.1976 (J.S. Noyes); 1♂, Trinidad, St George, St Augustine, Malaise trap, viii.1976 (F.D. Bennett); 1♂, Trinidad, St George, El Tucuche, s. slope, rainforest, 26.vii.1976 (J.S. Noyes); 1♂, Trinidad, St. George, Arima Valley, 5th mile, edge of rainforest, 3.vii,.1976 (J.S. Noyes); 1♀, Trinidad, St George, Arena Reserve, rainforest, 31.vii.1976 (J.S. Noyes); 1♂, Trinidad, St George, Arena Reserve, rainforest, 3.viii.1976 (J.S. Noyes); 1♀, 1♂, Trinidad, St George, St Augustine, wasteground, 21.vi.1976 (J.S. Noyes); 1♀, Trinidad, St Patrick, Bonasse, coconut plantation, 12.viii.1976 (J.S. Noyes); 1♀, Trinidad, 16km N. Arima, Andrews Trace, montane forest, 17-24. vi.1983 (S. & J. Peck); 1♀, Trinidad, Curepe, 24-29.vii.1977 (F.D. Bennett); 6♀, 11♂, Tobago, St Patrick, Mount Irvine Bay, 19.vii.1976 (J.S. Noyes); 1♂, **Tobago**, St Paul, Parlatuvier Valley, edge of rainforest, 20. vii.1976 (J.S. Noyes). BELIZE, 4♀, Belize, YPT, iii.1993 (Denis-Bolte). **COSTA RICA**, 15♀, **Guanacaste**, Santa Rosa NP, various localities and dates 17.iv.1985-20.xii.1986 (Janzen & Gauld); 1♀, Guanacaste, Guanacaste NP, 1300m, Derrumbé Vn Cacao, iv-v.1988 (Gauld, Janzen); 2♀, Guanacaste, Guanacaste NP (error for Santa Rosa NP), near Playa Naranjo, 11.iii.1990 (J.S. Noyes); 1♀, Guanacaste NP, Est. Pitilla, YPT, iii.1990 (J.S. Noyes); 1♀, Guanacaste, Guanacaste NP, 9km S. Santa Cecilia, Est. Pitilla, ii.1992 (C. Moraga); 3♀, Guanacaste, Pitilla (ACG), 700m, MT/YPT, 24.i-27.ii.1996 (J.S. Noyes); 3♀, Guanacaste, Santa Cruz, PN Marino las Baulas, LN 258050 332690, 0m, 16.viii.2000 and 14.xii.2000 (Y. Cárdenas); 2♀, Guanacaste, BN Diriá, Ret. Alr. Torre Control de Incendio, LN 238550 358650, 600-700m, #66659, xii.2001-i.2002 (I. Jiménez); 2♀, Guanacaste, Santa Cruz, Vista del Mar. Torre Cocesna, LN 357490 235430, #61247,

xii.2000-i.2001 (Y. Cárdenas); 1♀, Guanacaste, PN Palo Verde, Sect. Palo Verde, 150m E Estacion, LN 260952 385020, 10m, YPT, #53297, 4-14.ix.1999 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sector Catalina, Fila Catalina, LN 257400 400000, 200m, #62105, 13.iii-19.iv.2001 (I. Jiménez); 1♀, Guanacaste, San Lorenzo, Tienas Morenas, LN 287800 4427600, iv.1995 (G. Rodriguez); 1♀, **Alajuela**, Upala, Alb. Heliconias, Send. leg Danto, LN 423760 298100, 1100m, #59702, iii-iv.2000 (J.D. Gutierrez); 1♀, Alajuela, Aguas Zarcas, cafe, iii.1990 (P. Hanson); 2♀, Alajuela, Peñas Blancas, 9.v.1987 (E. Cruz); 2♀, Alajuela, PN Arenal, Send. Pilón, LN 457900 26910000, 600m, #29233, 16.x.2000 (G. Carballo); 19♀, Alajuela, PN Arenal, Sect. La Peninsula, LN 453800 271500, 600m, various dates iii.2000-v.2001 (G. Carballo); 1♀, **Heredia**, La Selva BS, 50m, MT/YPT, ii.1991 (J.S. Noyes); 1♀, Heredia, La Selva Biol. Sta., 3km S. Pto Viejo, 10°26'N 84°01'W, 21.i.3-.ii.1991 (J.S. Noyes); 6♀, Heredia, 3km S Puerto Viejo, OTS-La Selva, 100m, xii.1992 and ii-iv.1993 (P. Hanson); 1♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, ii.2003 (J.S. Noyes); 2♀, Heredia, 16km SSE La Virgen, 10°16'N 85°05'W, 1050-1150m, 11/M/TN, 10.ii-21.iv.2001 (INBio/OET-ALAS); 2♀, 16km SSE La Virgen, 10°120'N 85°05'W, 1050-1150m, 11/M/NOTN, 9.ii-21. iv.2001 (INBio/OET-ALAS); 2♀, Heredia, 11km SSE La Virgen, 10°16'N 85°05'W, 450-550m, 05/M/TN, 22.ii-20.iv.2003 (INBio/OET-ALAS); 1♀, Heredia, Rio Frio, Banano, 100m, x.1989 (E. Quirós); 2♀, Heredia, Braulio Carrillo NP (HQ), 250-500m, 10.iv.1985 (L. Masner, H. Goulet); 1♀, **San José**, San Pedro, Tigre Cacao, iii-iv.1990 (P. Hanson); 1♀, San José, Zurqui de Moravia, 1600m, viii.1995 (P. Hanson); 5♀, **Puntarenas**, Manuel Antonio NP, 23-27.viii.1986 (L. Masner); 1♀, Puntarenas, Est. Altamira, Cerro Biolley, LS 332400 572200, 1760m, #64571, 10.viii-10.ix.2001 (D. Rubí); 1♀, Puntarenas, Est. Altamira, Send. Los Gigantes, LS 331800 572100, 1460m, 10.i-10.ii.2002 (D. Rubí); 1♀, Puntarenas, Est. Altamira, 9°03'N 83°00'W, 1450m, ii.2002 (C. Hansson, D. Rubí); 1♀, Puntarenas, Est. Altamira, Send a Casa Coca, LS 331750 574400, 1700m, ii.2002 (C. Hansson, D. Rubí, J. Azofeifa); 1♀, Puntarenas, ACOSA, Albergue Cerro de Oro, 200m, 5-7.v.1995 (E. Flete); 3♀, Puntarenas, 3km SW Rincon, 10m, viii.1991, x.1991 and ii.1992 (P. Hanson); 1♀, Puntarenas, RF Golfo Dulce, 5km W Piedras Blancas, 8°46'N 83°17'W, 200m, 1. iii.1991 (P. Hanson, C. Godoy); 2♀, Puntarenas, RF Golfo Dulce, 24km W Piedras Blancas, 8°46'N 83°24'W, 200m, 1.iii.1991 and ii.1992 (P. Hanson); 1♀, Puntarenas, Pen. Osa, 23km N Puerto Jimenez, La Palma, 10m, i-iv.1991 (P. Hanson); 1♀, Puntarenas, Pen. Osa, 5km N Puerto Jimenez, 8°33'N 83°21'W, 10m, i-ii.1991 (Hanson, Godoy); 1♀, Puntarenas, Pen. Osa, Puerto Jimenez, 10m, ii.1992 (P. Hanson); 20♀, Puntarenas, Pen. Osa, Puerto Jimenez, 8°32'N 83°19'W, 10m, various dates v.1991-iii.1993 (P. Hanson); 2♀, Puntarenas, Golfito, Est. El Tigre, LS 529600 277800, 30m, #57972, 19.vii.2000 (J.A. Azofeifa); 1♀, Puntarenas, RF Golfo Dulce, Est. Agujas, LS 276750 526550, 300m, #71458, 25.vii-25.ix.2002 (J. Azofeifa); 1♀, **Limón**, PN Braulio Carrillio, Est. Queb. González, LN 238380 543100, 400-500m, 23-30.iii.2002 (P. Hanson, C. Godoy); 1♀, Limón, 16km W Guapiles, viii-ix.1989 (P. Hanson); 1♀, Limón, PN Cahuita, 5m, 1.iii.1991 (J.S. Noyes). **ECUADOR**, 1♀, Napo, Tena, 18.ii.1983 (L. Huggert); 4♀, Napo, Tena, ii.1986 (A.T. Finnamore); 2♂, Napo, Tena, 16.ii.1986 (A.T. Finnamore); 2♀, Napo, Laguna Jatuncocha, 20km S Yasuni, ii.1986 (A.T. Finnamore);1♀, Napo, 20km S Nuevo Rocafuerte on Rio Yasuni, Jatuncocha, 5.ii.1986 (A.T. Finnamore); 1♀, Napo, Limoniocha, ii.1986 (A.T. Finnamore); 1♀, Pichin(cha), Tinlandia, 800m, 2.ii.1983 (Masner, Sharkey); 1♀, Pichincha, Rio Palenque Sta., 47km S Santo Domingo, lowland rainforest, 180m, 29.iv-5.v.1987 (Brown, Coote). **PERU**, 1♀, Madre de Dios, Rio Tambopata Res., 12°50'S 69°20'W, 17.x-1.xi.1983 (N.E. Stork); 2♀, Madre de Dios, Laberinto, i.1984 (A.T. Finnamore); 1♀, Madre de Dios, Pto Maldonado, 3.i.1984 (L. Huggert); 2♀, Lima City, S. Marcos Univ. Campus, Malaise trap, 26-27.iv.1983 (C. & M. Vardy); 1♀, Loreto, Iquitos, NE Rio Nanay, 6.ii.1984 (L. Huggert). **VENEZUELA**, 1♀, Aragua, PN H. Pittier, Rancho Grande, 1100m, 9-10.vi.1994 (L. Masner); 1♀, Aragua, Rancho Grande NP, cloud forest, 1100m, viii-ix.1992 (L. Masner). **SURINAME**, 4♀, Saramacca, Voltzberg Nat. Res., ii.1982 (J.M. Carpenter). Material in NHMUK, MZUCR, USNM, CNC, LFCI, ZISP and PPRI.

COMMENTS. Although I have not examined any type material of *tainus*, I am confident that the material included here belongs to this species. The single specimen from Cuba listed above agrees completely with the original description of *tainus* and it also appears to be a common species occurring throughout the region, both fully winged forms and brachypterous forms occurring together.

As suggested by the key, *Cheiloneurus tainus* is very similar to *elegans* and the two can be difficult to separate. The two species can be separated reliably using the characters given in the key.

***Cheiloneurus leda* sp.nov.**
(Figs 958-963; Hab. ♀ 141)

DIAGNOSIS. *Female* (length about 1.6-1.9mm): body mostly orange, generally with a weak metallic sheen; posterior part of mesoscutum dark brown with a metallic sheen, propodeum dark brown and gaster brown mixed pale orange-brown, darker areas with a stronger metallic sheen; antenna (Fig. 960) with scape pale orange, ventral margin brown; pedicel pale orange, brown proximally; funicle proximally white, medially orange and distally dark brown; clava dark brown; mesoscutum in posterior half with dense, golden brown to silvery setae; coxae white; legs mostly white to pale orange with some dark brown areas; fore wing (Fig. 961) mostly infuscate with a V-shaped hyaline area in basal cell, a small hyaline area at apex of venation and a larger one opposite; head (Fig. 962) about 3.7X as wide as frontovertex, in facial view hardly broader than long, subrectangular, genae converging, more strongly curved inwards near mouth; frontovertex with about ten setae medially above scrobes; eye separated from scrobe by about diameter of anterior ocellus, area between eye and scrobe with shallow sculpture, scrobes moderately deep and sharply margined; interantennal prominence with about 12 inconspicuous setae and dorsally rounded; mandible tridentate; antenna (Fig. 960) with scape about 3.5X as long as broad; F1 slightly longer than broad, remaining segments transverse; linear sensilla on F3-F6; clava 3-segmented, about as long as F3-F6 combined, apex with an oblique truncation, sensory area extending about 0.3X along ventral surface of clava; head width slightly less than flagellum length; mesoscutum (Fig. 959) generally with slightly longitudinally elongate polygonally reticulate sculpture, more elongate laterally; scutellum with a distinct, apical tuft of setae and with a short, very thin, apical flange; wings fully developed; fore wing (Fig. 961) about 3.6X as long as broad; parastigma clearly downcurved; costal cell dorsally naked, ventrally with a line of setae that reaches about half way to apex; area below proximal part of parastigma with a group of about 35, mostly paler setae; apices of postmarginal and stigmal veins connected by a naked, hyaline line that hardly extends into disc (Fig. 958); seta at apex of postmarginal vein about 0.6X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with only about three setae adjacent to spiracle; syntergum about 1.2X as long as mid tibia; ovipositor (Fig. 963) about 3.3X gonostylus or about 2.2X as long as mid tibia; gonostylus about 2.2X as long as mid tibial spur; exserted part of ovipositor about 1.3X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.85mm; excluding ovipositor, 1.65mm (CPD).

Head with occiput orange, a dark brown, triangular mark above foramen; frontovertex orange with a weak brassy sheen; scrobal area orange with a weak purple and brassy sheen; temple orange with a diagonal pale brown line across temple towards torulus and a moderate blue, green, coppery and purple sheen; gena orange with a weak brassy sheen; frontovertex clothed with fairly inconspicuous, translucent, pale brown setae along inner eye margins, a line of more conspicuous setae below eye; interantennal prominence with similar, but shorter and more dense setae; maxillary palpus white; antenna (Fig. 960) with radicle pale orange, apex with a broad brown ring; scape very pale orange, almost white, with ventral margin brown in proximal three-fifths and extreme apex brown; pedicel pale orange, pale brown internally towards base; F1-F2 white, F3-F4 pale orange, F5 dark orange-brown, F6 and clava dark brown; pronotum orange with very weak green, brassy and purple reflections, neck dark brown; prosternum pale orange, dark brown in front of coxa; mesoscutum orange with very weak purple and coppery reflections, anterior half or so clothed with slightly flattened, relatively sparse, golden brown setae, posterior half with slightly flattened, relatively dense setae; tegula orange with apex orange-brown; axilla pale orange; scutellum orange at base, side and apex, yellow in middle, clothed with brown setae, subapical tuft black; metanotum orange-brown; mesopleuron orange-brown, anteriorly with a weak blue, brassy and purple sheen, posteriorly with a purple and brassy sheen; mesosternum pale orange; fore coxa white; fore femur white, orange towards apex, with a subapical, V-shaped, brown mark dorsally, tibia pale orange with an incomplete, subbasal, brown ring; tarsus pale orange; mid coxa white; mid femur white, apex pale orange with a distinct, brown, subapical mark internally, tibia white at base, an incomplete, subbasal brown band, otherwise very pale orange,

tibial spur and tarsus very pale orange; hind coxa white; hind femur white at base, otherwise pale orange with dorsal margin brown distally, hind tibia white at base, otherwise pale orange mixed pale brown externally, hind tarsus white, pale orange apically; fore wing (Fig. 961) mostly infuscate, hyaline towards base, along anterior margin distad of venation and at apex; submarginal vein pale orange, venation otherwise brown; propodeum brown with a coppery, brassy, purple and blue sheen, side with a weak green, coppery and brassy sheen, 5 translucent, white setae outside spiracle; gaster brown with a coppery, purple, blue, green and brassy sheen, basal tergites more strongly coppery and brassy; sternites orange, hypopygium mostly brown; visible part of gonostylus white with apex broadly orange-brown.

Head (Fig. 962) about 3.7X as wide as frontovertex, in profile 1.5X as high as deep, anteriorly virtually straight from top of scrobes to mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 85°; frontovertex quite shiny, almost completely smooth between occipital margin and ocelli, anteriorly with fine, shallow, transversely elongate, reticulate to imbricate-reticulate sculpture; narrowest area between eye and scrobe about equal to diameter of anterior ocellus and with shallow, transversely elongate, polygonally reticulate sculpture; temple and gena with shallow, irregular, elongate, reticulate sculpture, that on temple of larger mesh than that on frontovertex; scrobes moderately deep, ∩-shaped, meeting and sharply margined dorsally and below eye; interantennal prominence dorsally rounded and with shallow, polygonally reticulate sculpture; antenna as in Fig. 960; scape broadened and flattened, about 3.5X as long as broad, broadest in middle; F1 very slightly longer than broad, F2 slightly transverse, remaining segments clearly transverse, distal segments broadest; clava hardly broadened, about as long as F3-F6 combined, sutures slightly oblique, sensory area enlarged, extending ventrally about 0.3X along clava, apex obliquely truncate; eye not quite reaching occipital margin, separated by slightly more than diameter of facet, clothed in inconspicuous, fine, short setae, each a little shorter than diameter of facet; inner eye margins subparallel; malar sulcus absent; clypeal margin weakly concave medially; mandible tridentate; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 69, HH 68, FV 18.5, POL 11, OOL 1, OCL 11, AOL 8.5, EL 55.5, EW 37, MS 21, SL 33, SW 9.5.

Thorax (Fig. 959) with pronotum moderately exposed behind head, about 0.8X as long as mesoscutum, pronotum with coarse, polygonally reticulate sculpture that is clearly deeper than that on any part of the frontovertex; mesoscutum with fairly regular polygonally reticulate sculpture that is generally similar to that on pronotum, but clearly deeper and coarser and slightly longitudinally elongate, more so laterally; axilla and scutellum with similar sculpture to mesoscutum; visible part of mesoscutum about 1.6X as broad as long; scutellum about as long as broad, with a distinct, short, very thin apical flange and a distinct subapical tuft, setae mostly about 0.6X as long as scutellum; mid tibia without an external carina; hind femur about 4.2X as long as broad; fore wing with venation and setation as in Figs 958, 961; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 958); propodeum (Fig. 959) medially about 0.25X as long as scutellum and virtually smooth; setae on side short and inconspicuous. Relative measurements: FWL 59, FWW 16.5; HWL 54, HWW 9.

Gaster with hypopygium reaching about 0.4X to apex; syntergum about 1.2X as long as mid tibia, with apex weakly angular; ovipositor clearly exserted, the exserted part about 1.3X as long as mid tibial spur or 0.4X mid tibia.

Paratype. Funicle with linear sensilla present only on F3-F6; gaster without "gland-like" structures on Gt1 or Gt5; ovipositor Fig. 963. Relative measurements: OL 70, GL 21 [MT 32].

Variation. Females vary in overall length from 1.60-1.85mm, the ocelli may form an angle of about 95°, otherwise very little in material available.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Santa Rosa NP, i.1991 (Gauld, Janzen). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Santa Rosa NP, Hacienda 1-0, 10-31.i.1987 (Janzen, Gauld). Holotype in MZUCR, paratype in NHMUK.

COMMENTS. See comments under *feritas* (p. 349).

***Cheiloneurus luceres* sp.nov.**
(Figs 964-967; Hab. ♀ 142)

DIAGNOSIS. *Female* (length about 1.4-1.6mm): body mostly orange, generally with a weak metallic sheen; posterior part of mesoscutum dark brown with a metallic sheen, propodeum dark brown and gaster brown mixed pale orange-brown, paler ventrally, darker areas with a stronger metallic sheen; antenna (Fig. 967) with scape pale orange; pedicel pale orange; flagellum proximally pale orange, distally dark brown; mesoscutum in posterior half with dense, silvery setae; fore and hind coxae white, mid coxa pale orange; legs mostly white to pale orange with some dark brown areas; fore wing remnant infuscate in a pical quarter, otherwise hyaline; head about 3.5X as wide as frontovertex, in facial view a little broader than long, subcircular, genae converging, weakly curved, but more strongly curved inwards near mouth; frontovertex with about four setae medially above scrobes; eye separated from scrobe by slightly more than diameter of anterior ocellus, area between eye and scrobe with shallow sculpture, scrobes shallow with rounded margins; interantennal prominence with about 15 inconspicuous setae and dorsally rounded; mandible tridentate; antenna (Fig. 967) with scape about 3.7X as long as broad; F1 slightly longer than broad, remaining segments quadrate or transverse; linear sensilla on F3-F6; clava 3-segmented, about as long as F3-F6 combined, apex with an oblique truncation, sensory area extending about 0.3X along ventral surface of clava; head width slightly greater than flagellum length; mesoscutum (Fig. 965) medially with mostly polygonally reticulate sculpture, laterally with longitudinally elongate sculpture; scutellum with a distinct, apical tuft of setae; only brachypterous forms known, fore wing (Fig. 966) about 3.8-3.9X as long as broad and barely reaching cercal plates on gaster; apex of fore wing transversely truncate; parastigma clearly downcurved; costal cell naked apart from one or two setae proximally; area below proximal part of parastigma with a group of about nine paler setae; seta at apex of postmarginal vein about as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with only about four setae adjacent to spiracle; syntergum about 1.3X as long as mid tibia; ovipositor (Fig. 964) about 3.9X gonostylus or about 2.0X as long as mid tibia; gonostylus about 3.9X as long as mid tibial spur; exserted part of ovipositor about 0.5X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.56mm; excluding ovipositor, 1.50mm (CPD).

Head orange, generally with a weak brassy and purple sheen; occiput with a weak brown, triangular mark above foramen; frontovertex clothed with fairly inconspicuous, translucent, pale brown setae, a line of more conspicuous setae below eye; interantennal prominence with sparse, inconspicuous setae; maxillary palpus white, apical segment pale orange; antenna (Fig. 967) with radicle and scape pale orange; pedicel and F1-F3 orange, F4 orange-brown, F5-F6 and clava dark brown; pronotum orange with very weak brassy, coppery and purple reflections, a small, dark brown, triangular mark medially; prosternum pale orange anteriorly, a transverse, dark brown line in front of coxa; mesoscutum in anterior half orange with very weak brassy and coppery reflections and clothed with relatively sparse, golden brown and dark brown setae, side and posterior half brownish with weak coppery reflections and clothed with relatively dense, silvery setae; tegula orange with apex orange-brown; axilla slightly dusky orange, clothed with dark brown setae; scutellum orange, paler towards base, clothed with brown setae, subapical tuft black with anterior setae of tuft translucent and pale golden; metanotum orange; mesopleuron orange with a weak brassy and purple sheen, posterior one-quarter orange-brown with a slightly stronger purple and brassy sheen; mesosternum pale orange, laterally brownish; fore coxa white; fore femur very pale orange, tibia and tarsus pale orange; mid coxa pale orange, inner ventral margin dusky; mid femur white, apex pale orange, tibia pale orange with a brown streak externally for about two-thirds its

length, spur and tarsus pale orange; hind coxa white; hind femur pale orange with dorsal margin brownish distally, hind tibia white at base, brownish for about two-thirds its length, otherwise pale orange, tarsus pale orange; remnants of fore wing (Fig. 966) with apical one-quarter infuscate, otherwise hyaline; submarginal vein mostly pale yellow, venation otherwise brown; propodeum pale orange-brown, medially with a purple and slight brassy sheen, laterally and on side with a coppery and green sheen, 3 or 4 translucent, white setae outside spiracle; gaster dorsally orange-brown to brown, darker basally, Gt1 with a moderately strong green and coppery sheen, otherwise gaster dorsally with weak coppery, purple, brassy, green and blue reflections, Gt3-Gt4 pale orange medially, venter pale orange with weak green, purple and brassy reflections, apex of outer plate brown; gonostylus very pale orange.

Head about 3.5X as wide as frontovertex, in profile 1.6X as high as deep, anteriorly virtually straight from top of scrobes to mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, not carinate; ocelli forming an angle of about 80°; frontovertex quite shiny, with fine, shallow, polygonally reticulate sculpture of mesh size subequal to diameter of facet, slightly transversely elongate above scrobes; narrowest point between eye and scrobe very slightly more than diameter of anterior ocellus and with shallow, transversely elongate, polygonally reticulate sculpture; temple and gena with shallow, irregular, elongate, reticulate sculpture, that on temple of larger mesh than that on frontovertex; scrobes quite shallow, ∩-shaped, meeting, not sharply margined; interantennal prominence dorsally rounded and with shallow, polygonally reticulate sculpture; antenna as in Fig. 967; scape slightly broadened and flattened, about 3.7X as long as broad, broadest in middle; F1 very slightly longer than broad, F2 slightly transverse to quadrate, remaining segments transverse, distal segments broadest; clava hardly broadened, about as long as F3-F6 combined, sutures slightly oblique, sensory area enlarged, extending ventrally about 0.3X along clava, apex weakly obliquely truncate; eye not quite reaching occipital margin, separated by about diameter of facet, virtually naked but clothed in sparse, inconspicuous, fine, short setae, each much shorter than diameter of facet; inner eye margins clearly diverging anteriorly; malar sulcus absent; clypeal margin weakly concave medially; mandible with two acute teeth and a truncate upper tooth, virtually tridentate; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 59.5, HH 57, FV 17, POL 10, OOL 1, OCL 7.5, AOL 7.5, EL 43, EW 31.5, MS 19.5, SL 26, SW 7.

Thorax (Fig. 965) with pronotum clearly exposed behind head, about 0.8X as long as mesoscutum, pronotum with polygonally reticulate to imbricate-reticulate sculpture that is a little deeper than that on any part of the frontovertex; mesoscutum medially with fairly coarse, regular polygonally reticulate sculpture that is generally similar to that on pronotum, deeper and coarser and more longitudinally elongate laterally; axilla with similar sculpture to mesoscutum; scutellum with slightly deeper and coarser sculpture than mesoscutum; visible part of mesoscutum about 2.1X as broad as long; scutellum about as long as broad, with a distinct, short, apical flange and a distinct subapical tuft, setae mostly about 0.4X as long as scutellum; mid tibia without a distinct external carina; hind femur about 3.7X as long as broad; wings shortened, fore wing reaching a little way past posterior margin of Gt1, apex truncate, venation and setation as in Figs 966; propodeum (Fig. 965) medially about 0.23X as long as scutellum and virtually smooth; setae on side conspicuous. Relative measurements: FWL 23.5, FWW 6.

Gaster with hypopygium reaching about half-way to apex; syntergum about 1.3X as long as mid tibia, with apex acute; ovipositor slightly exserted, the exserted part slightly more than half as long as mid tibial spur or 0.2X mid tibia.

Paratype. Funicle with linear sensilla present only on F3-F6; gaster without “gland-like” structures on Gt1 or Gt5; ovipositor Fig. 964. Relative measurements: OL 54, GL 14 [MT 26].

Variation. Females vary in overall length from 1.42-1.56mm, otherwise very little in material available.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Cartago**, Turrialba, CATIE, 22.vi.1994 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **Cartago**, same data as holotype; 1♀, Cartago, Turrialba, La Isabel, cafe, 650m, vi.1994 (M. Cerda, P. Hanson); 1♀, Cartago, PN Barbilla, Send. Rio Barbilla, LN 596900 217150, 350m, #62446, 11-27.v.2001 (F. Umaña). Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. Fully winged forms of this species are unknown. If fully winged forms exist, they should be recognisable by the almost completely pale yellow scape and pale proximal funicle segments, dark brown markings on mid and hind tibiae and relatively normal gaster. It is possibly an entirely brachypterous species. In general appearance, it is most similar to *perses* and can be separated by the characters given in the key. In addition, all specimens of *luceres* examined have distinct, short wings that reach level with the posterior margin of the basal gastral tergite, the mid and hind tibiae have dark brown markings, the propodeum has only about 6 setae laterally near the spiracle, and the funicle segments are relatively less broad with F6 being about 1.5X as broad as long. In *perses* the wing remnants hardly reach the metanotum, the mid and hind tibiae have pale orange-brown markings, the propodeum has about 25 setae laterally near the spiracle and the funicle segments are conspicuously broader with F6 being about twice as broad as long.

See also comments under *perses* (p. 383).

Cheiloneurus perses **sp.nov.**

(Figs 968-971; Hab. ♀ 143)

DIAGNOSIS. *Female* (length about 1.7mm): body mostly orange, generally with a weak metallic sheen; mesoscutum dusky, propodeum laterally brown and gaster brown mixed pale orange-brown, darker areas with a stronger metallic sheen; antenna (Fig. 969) with scape pale yellow; pedicel pale orange; flagellum proximally orange, darker distally, F4-F6 and clava dark brown; mesoscutum with evenly distributed, relatively dense, silvery setae; fore and hind coxae white, mid coxa pale orange to orange-brown; legs otherwise mostly white to pale orange with mid and hind tibiae orange-brown; head (Fig. 968) about 2.9X as wide as frontovertex, in facial view hardly broader than long, genae short, converging, hardly curved, but more strongly curved inwards near mouth; frontovertex with about 60, inconspicuous setae medially between anterior ocellus and scrobes; eye separated from scrobe by about 2X diameter of anterior ocellus, area between eye and scrobe with distinct sculpture, scrobes shallow, with rounded margins; interantennal prominence with about 15 inconspicuous setae and dorsally rounded; mandible tridentate; antenna (Fig. 969) with scape about 3.5X as long as broad; F1 slightly longer than broad, remaining segments transverse; linear sensilla on F3-F6; clava 3-segmented, slightly longer than F4-F6 combined, apex with an oblique truncation, sensory area extending about 0.4X along ventral surface of clava; head width about equal to flagellum length; mesoscutum (Fig. 971) generally with fairly uniform polygonally reticulate sculpture, a little more elongate anterolaterally; scutellum with a distinct, apical tuft of setae; wings vestigial; fore wing hardly visible, barely as long as tegula; mid tibial spur slightly longer than basitarsus; propodeum (Fig. 971) with about 25 setae adjacent to spiracle; syntergum about 1.9X as long as mid tibia; ovipositor (Fig. 970) about 4.2X gonostylus or about 2.3X as long as mid tibia; gonostylus about 1.8X as long as mid tibial spur; exserted part of ovipositor about as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.73mm; excluding ovipositor, 1.62mm (CPD).

Head orange, generally with a weak brassy and purple sheen; a broad, brown stripe from top of temple to base of mandible; frontovertex with numerous, scattered, fairly inconspicuous, translucent, pale brown setae, a line of more conspicuous setae below eye; interantennal prominence with numerous setae that are longer and more conspicuous than those on frontovertex; maxillary palpus pale orange; antenna (Fig. 969) with radicle pale orange with a narrow brown apical ring; scape pale yellow; pedicel pale orange, dusky dorsally; F1-F2 orange, F2 internally brownish, F3 orange, internally brown, F4-F6 and clava dark brown; pronotum orange with very weak brassy and purple reflections, neck slightly dusky; prosternum pale orange; mesoscutum pale orange-brown, with a weak, metallic blue sheen and purple reflections, clothed with relatively dense,

silvery setae, posterior margin purple-brown with a weak purple sheen; tegula orange with apex orange-brown; axilla orange, clothed with golden brown setae; scutellum orange, clothed with golden brown and brown setae, subapical tuft black with anterior setae of tuft translucent and pale golden brown; metanotum orange; mesopleuron orange with a weak brassy and purple sheen; mesosternum orange; fore coxa white; fore legs otherwise pale orange; mid coxa orange-brown ventrally otherwise pale orange; mid femur white at base, apically pale orange, tibia pale orange, dorsal margin orange-brown, tarsus pale orange; hind coxa white; femur very pale orange, tibia pale orange, dorsally orange-brown, tarsus very pale orange, virtually white; remnants of fore wing hyaline; propodeum orange medially with a weak coppery and blue sheen, brown laterally with a blue and green sheen, side with a green and purple sheen; about 15 scattered, translucent white setae in spiracular area that extend almost to posterior margin of propodeum; gaster brown with coppery, purple, brassy and green reflections; gonostylus very pale orange.

Head (Fig. 968) about 2.9X as wide as frontovertex, in profile 1.7X as high as deep, anteriorly quite uniformly curved, interantennal prominence slightly protuberant; occipital margin sharp, not carinate; ocelli forming an angle of about 85°; frontovertex quite shiny, with fine, shallow, polygonally reticulate sculpture of mesh size slightly smaller than diameter of facet, scattered piliferous punctures distinct but separated by about 2-3X their own diameters; narrowest point between eye and scrobe very slightly more than 2X diameter of anterior ocellus; temple and gena with shallow, irregular, elongate, reticulate sculpture, that on temple of larger mesh than that on frontovertex; scrobes very shallow, ∩-shaped, meeting, not sharply margined; interantennal prominence dorsally rounded and with shallow, polygonally reticulate sculpture; antenna as in Fig. 969; scape slightly broadened and flattened, about 3.5X as long as broad, broadest in middle; F1 very slightly longer than broad, F2-F3 subquadrate, remaining segments transverse, distal segments broadest; clava hardly broadened, a little longer than F4-F6 combined, sutures slightly oblique, sensory area enlarged, extending ventrally about 0.4X along clava, apex obliquely truncate; eye not quite reaching occipital margin, separated by slightly more than diameter of facet, virtually naked but clothed in sparse, inconspicuous, fine, very short setae, each much shorter than diameter of facet; inner eye margins clearly diverging anteriorly; malar sulcus absent; clypeal margin virtually straight medially; mandible with three acute teeth; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 69, HH 68, FV 24, POL 14, OOL 1.5, OCL 6.5, AOL 11, EL 51.5, EW 33, MS 19, SL 35, SW 10.

Thorax (Fig. 971) with pronotum conical and clearly exposed behind head, about 2.4X as long as mesoscutum, pronotum with coarse, polygonally reticulate to imbricate-reticulate sculpture that is clearly deeper than that on any part of the frontovertex; mesoscutum with fairly regular polygonally reticulate sculpture that is generally similar to that on pronotum, but perhaps a little shallower and slightly more elongate anterolaterally; axilla with similar sculpture to mesoscutum; scutellum with slightly deeper and coarser sculpture than mesoscutum; visible part of mesoscutum about 3X as broad as long; scutellum about 1.2X as long as broad, without a distinct, apical flange but with a distinct subapical tuft, setae mostly about 0.7X as long as scutellum; mid tibia without a distinct external carina; hind femur about 3.7X as long as broad; wings virtually absent, remnants of fore wing hardly reaching metanotum, apex obliquely truncate; propodeum (Fig. 971) medially about 0.4X as long as scutellum and virtually smooth; setae on side conspicuous.

Gaster with hypopygium reaching about half-way to apex; syntergum about 1.2X as long as mid tibia, with apex broadly rounded; ovipositor slightly exserted, the exserted part about as long as mid tibial spur or one-third mid tibia.

Paratype. Funicle with linear sensilla present only on F3-F6; gaster without “gland-like” structures on Gt1 or Gt5; ovipositor Fig. 970. Relative measurements: OL 72, GL 17 [MT 32].

Variation. Very little in material available.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, NW Volcan Orosi, Cerro el Hacha, 1988. Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Murcielago (ACG), 75m, MT, 24.i-4.ii.1996 (J. Ugalde). Holotype in MZUCR, paratype in NHMUK.

COMMENTS. Winged forms of this species are unknown. If short-winged or fully winged forms exist they should be recognisable by the almost completely pale yellow scape and pale proximal funicle segments and relatively slender, elongate gaster. Other character states such as the elongate pronotum and propodeum are probably associated with strong brachyptery and may not be exhibited in winged forms.

See also comments under *luceres* (p. 381).

Cheiloneurus albinotatus **De Santis.**

(Figs 972-976)

Cheiloneurus albinotatus De Santis, 1964:351-353. Holotype ♀, Argentina, MLP, image examined.

DIAGNOSIS. *Female* (length about 1.9-2.0mm): body mostly orange with mesoscutum and metanotum dark brown and gaster orange-brown, darker areas with a weak to moderate metallic sheen; antenna (Fig. 974) with scape pale orange; pedicel brown; flagellum dark brown, but with F1 partially white and F2-F3 white; mesoscutum clothed with dense silvery setae; fore and hind coxae white, mid coxa pale orange; legs white to pale orange; fore wing (Fig. 975) mostly infuscate with basal cell hyaline, a small hyaline area at apex of venation and a similar area opposite wing margin, apex narrowly hyaline; head (Fig. 973) about 4.7X as wide as frontovertex, in facial view slightly longer than broad, genae strongly converging and hardly curved; frontovertex with about 10 inconspicuous setae medially between anterior ocellus and scrobes; eye separated from scrobe by about 2.5X diameter of anterior ocellus, area between eye and scrobe with conspicuous sculpture, scrobes shallow with margin rounded; interantennal prominence with about 15 inconspicuous setae and dorsally rounded; mandible tridentate; antenna (Fig. 974) with scape about 6.5X as long as broad; funicle with F1-F3 longer than broad, F4 quadrate, F5-F6 transverse; head width about equal to length of F1-F5 combined; linear sensilla on F1-F6; clava 3-segmented, about as long as F4-F6 combined; sensory area enlarged and forming an oblique truncation, extending nearly 0.5X along ventral margin; mesoscutum (Fig. 976) overall with uniform, coarse, polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 975) nearly 3.3X as long as broad; parastigma clearly downcurved; costal cell dorsally naked and ventrally with virtually a complete line of setae, but this is narrowly interrupted above parastigma; area below proximal part of parastigma with a group of about 45 setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that hardly continues into disc (Fig. 972); apical bristle of postmarginal vein slightly more than 0.2X as long as marginal vein; mid tibial spur very slightly longer than basitarsus; propodeum (Fig. 976) with about 18 setae adjacent to spiracle, side naked; gaster without "gland-like" structures on Gt1 or Gt5; syntergum hardly longer than mid tibia; ovipositor about 37X gonostylus or about 1.4X as long as mid tibia; gonostylus hardly longer than mid tibial spur; exserted part of ovipositor about 0.6X as long as mid tibial spur. *Male*: unknown.

DISTRIBUTION. Costa Rica (**new record**), Argentina.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material (digital images): Holotype ♀, on slide: "Cheiloneurus albinotatus Det. De Santis HOLOTIPO 1970/1 MUSEO DE LA PLATA", "Baradero (Prov. de Bs. As.) Col. Exp. Museo 19/I/1960 X ♀". Paratypes, 1♀, on slide: "Cheiloneurus albinotatus Det. De Santis PARATIPO 1970/2 MUSEO DE LA PLATA", "Cazon (Prov. de Bs. As.) Col. Exp. Museo 11/II/1960" (MLP).

Non type material. **COSTA RICA**, 1 ♀, **Guanacaste**, Santa Rosa NP, Bosq. Hum. 12-C, 24.v-14.vi.1986 (D. Janzen, I.D. Gauld). Material in NHMUK.

COMMENTS. Through the kindness of Daniel Aquino (MLP) I have examined digital images of the holotype and paratype females of this species. It is a very characteristic species and the images agree very well with the unique Costa Rican specimen differing only in a few minor details. I therefore I have no hesitation in identifying the specimen from Costa Rica as this species.

Cheiloneurus dymorus sp.nov.

(Figs 977-984; Hab. ♀ 144)

DIAGNOSIS. *Female* (length about 1.7-1.9mm): body mostly orange-brown with scutellum orange, mesoscutum, propodeum and gaster darker brown, with a very weak to moderate metallic sheen, darker areas with a stronger metallic sheen, temple and gena with an elongate dark brown stripe; antenna (Fig. 977) with scape pale orange, ventral margin brown proximally; pedicel mostly orange-brown; funicle proximally brown, F4-F6 pale yellow to white; clava dark brown; posterior half of mesoscutum with moderately dense silvery setae; fore and hind coxae white, mid coxa brown, mixed white; legs otherwise mostly brown with some orange areas; wings fully developed or shortened; fully developed fore wing (Fig. 981) mostly infuscate with a vaguely V-shaped hyaline area in basal cell and a small hyaline area at apex of venation; abbreviated fore wing (Fig. 980) weakly infuscate towards base and more strongly so in apical one-fifth, remainder hyaline; head (Fig. 979) about 5.8X as wide as frontovertex, in facial view about 1.4X as long as broad, suboval with genae converging and virtually straight but more strongly curved inwards near mouth; frontovertex with about 7 inconspicuous setae medially between anterior ocellus and scrobes; eye separated from scrobe by about 3X diameter of anterior ocellus, area between eye and scrobe with conspicuous sculpture; scrobes deep, sharply margined; interantennal prominence with about 18 inconspicuous setae and dorsally rounded; mandible tridentate; antenna (Fig. 977) with scape about 6.1X as long as broad; funicle with F1-F3 clearly longer than broad, F4-F6 subquadrate; linear sensilla on F4-F6; clava 3-segmented, nearly as long as F3-F6 combined; sensory area poorly defined, extending ventrally nearly 0.5X length of clava, apex obliquely truncate; head width clearly less than flagellum length, but much more than funicle length; mesoscutum (Fig, 982) with fairly uniform polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, or shortened with apex transversely truncate and just reaching cercal plates of gaster; fully developed fore wing (Fig. 981) about 3.2X as long as broad; parastigma slightly downcurved; costal cell dorsally naked and ventrally virtually naked at most with two or three setae in a line; area below proximal part of parastigma with a group of about 12 setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that hardly continues into disc (Fig. 978); apical bristle of postmarginal vein about 0.5X as long as marginal vein; abbreviated fore wing (Fig. 980) nearly 6X as long as broad; mid tibial spur about as long as basitarsus; propodeum (Fig. 982) with about five to ten silvery setae adjacent to spiracle, side naked; syntergum about 0.9X as long as mid tibia with apex weakly angular; ovipositor (Fig. 983) about 3.7X gonostylus or about 1.3X as long as mid tibia; gonostylus about 1.2X as long as mid tibial spur; exserted part of ovipositor about 0.5X as long as mid tibial spur. *Male*: unknown.

Female (macropterous holotype): length, including ovipositor, 1.85mm; excluding ovipositor, 1.76mm (CPD).

Head generally orange; occiput mostly dark brown; scrobal area pale orange-brown, mouth margin pale orange, a wide brown streak from posterior part of temple to base of mandible; frontovertex with a weak brassy sheen, slightly purplish between posterior ocelli and occipital margin; area between eye and scrobe brassy, purple and coppery; immediately below lowest part of eye with a purple, green, brassy and pale blue lustre; temple weakly brassy, gena with a purple sheen, brown areas on temple and gena with a coppery and purple sheen; frontovertex with inconspicuous pale brown setae along inner eye margins; 2 lines of pale brown, translucent setae between eye and scrobe; gena and interantennal prominence with numerous, scattered, pale brown setae; maxillary palpus dusky orange, terminal segment dark brown; antenna (Fig. 977)

with radicle pale orange-brown, apex dark brown; scape pale orange with ventral margin brown in proximal half, more widely so on inner surface, dorsal margin pale brown at extreme apex; pedicel orange-brown dorsally and laterally, darker proximally, orange ventrally; F1-F3 brown, F4 pale yellow, brownish proximally on ventral surface; F5-F6 white, clava dark brown; pronotum dusky orange with faint brassy, coppery and purple reflections, neck broadly dark brown, side orange-brown; prosternum dark orange-brown; mesoscutum dark brown, anterior one-third to half with predominantly dark reflections, posterior half to two-thirds with predominantly metallic blue and purple reflections, anterior part with scattered brown setae, posterior part with relatively dense silvery setae, posterior margin with a purple sheen; tegula orange, apex slightly dusky orange; axilla orange with coppery and brassy reflections; scutellum pale orange in anterior 0.6X and orange apically, with coppery and brassy reflections, with golden brown setae, subapical tuft black; metanotum dark brown; mesopleuron brown with a weak brassy lustre; fore coxa white; extreme base of fore femur white, rest of femur brown, tibia brown with apex orange, tarsus orange; mid coxa brown, apex white; mid femur white in proximal half, apex orange with a diffuse, incomplete, subapical, brown ring; mid tibia orange-brown externally, mostly orange internally and at apex, spur and tarsus pale orange to orange; hind coxa white; hind femur white at extreme base otherwise dark orange-brown, paler ventrally; hind tibia with basal 0.25X white, apex orange, otherwise dark brown; hind tarsus pale orange; fore wing (Fig. 981) mostly infuscate but hyaline towards base, submarginal vein pale orange, otherwise venation brown; propodeum dark brown with a purple sheen medially, brassy and purple laterally, side with a weak metallic green sheen, a tight group of about 8 conspicuous silvery setae anterolateral to spiracle; gaster dark brown, generally with a brassy and coppery sheen mixed with some metallic blue and green, Gt1 slightly paler and more brassy than Gt2-Gt6, syntergum slightly paler than preceding tergites; gonostylus pale orange.

Head (Fig. 979) about 5.8X as wide as frontovertex, in profile 1.9X as high as deep, anteriorly evenly rounded from occipital margin to just above top of scrobes then slightly angled towards mouth margin with interantennal prominence slightly protuberant; occipital margin sharp, not carinate; ocelli forming an angle of about 50°; frontovertex quite shiny, with conspicuous, coarse, polygonally reticulate sculpture of mesh size slightly smaller than diameter of facet; narrowest point between eye and scrobe about 3X diameter of anterior ocellus and with slightly coarser, more irregular, obliquely elongate sculpture; temple with shallow, irregular, elongate, sculpture; gena with slightly deeper more regular, polygonally reticulate sculpture; scrobes deep, ∩-shaped, meeting, sharply margined dorsally and laterally, carinate laterally; interantennal prominence without median ridge, dorsally rounded and with relatively shallow, polygonally reticulate sculpture; antenna as in Fig. 977; scape subcylindrical, about 6.1X as long as broad; F1-F3 clearly longer than broad, F4-F6 subquadrate, segments larger and broader distad; clava hardly broadened, nearly as long as F3-F6 combined, sutures oblique, sensory area enlarged, extending ventrally about half length of clava, apex strongly obliquely truncate; eye not reaching occipital margin, separated by about 2X diameter of facet, clothed in sparse, inconspicuous, setae, each clearly shorter than diameter of facet; inner eye margins converging slightly in front of anterior ocellus, but clearly diverging above top of scrobes; malar sulcus absent; clypeal margin concave medially; mandible with three acute teeth, upper tooth relatively short; apical segment of maxillary palpus slightly enlarged, about 2X as long as radicle. Relative measurements: HW 67, HH 93, FV 11.5, POL 6, OOL 0, OCL 11.5, AOL 10, EL 60, EW 38, MS 30, SL 43, SW 7.

Thorax (Fig. 982) with pronotum moderately long, exposed behind head, about as long as mesoscutum, with polygonally reticulate sculpture that is similar to that on frontovertex; mesoscutum with similar sculpture to pronotum, but finer and more longitudinally elongate; axilla and scutellum with similar sculpture to mesoscutum but slightly coarser; visible part of mesoscutum about 1.9X as broad as long; scutellum about 1.1X as long as broad, with a distinct subapical tuft, setae about half as long as scutellum; mid tibia without a distinct external carina; hind femur about 6.5X as long as broad; fore wing with venation and setation as in Figs 978, 981; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak (Fig. 978); propodeum (Fig. 982) medially about 0.27X as long as scutellum and virtually smooth, but with some shallow, reticulate sculpture. Relative measurements: FWL 87.5, FWW 27; HWL 78, HWW 14.5.

Gaster with hypopygium reaching about 0.3X to apex; syntergum about 0.8X as long as mid tibia, with apex weakly angular; ovipositor slightly exserted, the exserted part about 0.5X length of mid tibial spur or about 0.2X mid tibia.

Paratype (brachypterous). Funicle with linear sensilla present only on F4-F6; gaster without "gland-like" structures on Gt1 or Gt5; hypopygium Fig. 984; ovipositor Fig. 983. Relative measurements: OL 61, GL16.5 [MT 47.5].

Variation. Females vary in overall length from 1.70-1.93mm, the wings may be shortened so that the fore wing is about 6.5X as long as broad, with apex truncate (Fig. 980), hardly reaching the cercal plates and with only apical one-quarter or so infuscate and, in brachypterous forms, the mesoscutum may be only about 1.5X as broad as long and the propodeum may be about one-third length of scutellum.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Pen. Osa, Puerto Jimenez, 8°32'N 83°19'W, i.1992 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **Puntarenas**, Albergue Cerro de Oro (ACOSA), LS 280000 518500, #4513, 5-7.v.1995 (E. Fletes, B. Gamboa, A. Picado); 1♀, Puntarenas, RF Golfo Dulce, 5km W Piedras Blancas, 8°46'N 83°17'W, vi-vii.1992 (P. Hanson); 1♀, same data as holotype. Holotype in NHMUK, paratypes in NHMUK and MZUCR.

COMMENTS. *Cheiloneurus dymorus* is very similar to *glycon*, both species of very similar in habitus and general colouration and both fully winged and brachypterous forms. *Cheiloneurus dymorus* differs from *glycon* in its generally darker colouration, especially in having the gaster entirely dark brown, almost black with a strong metallic sheen whereas in *glycon* the gaster is almost entirely pale orange with only a weak metallic sheen. In addition, the second valvifer of *dymorus* has a subapical seta, but in *glycon* the subapical seta is absent. As the key suggests, *dymorus* is also quite similar to *meryae*, Apart from being generally darker in colour, *dymorus* differs from *meryae* in having the head about 1.4X as high as wide in facial view and in fully winged forms having the parastigma much less strongly curved downwards so that the widest part of the costal cell is not more than 1.5X as wide as the parastigma. In *meryae* the head is about 1.2X as high as broad in facial view and the parastigma is strongly downcurved so that the widest part of the costal cell is nearly 3X as wide as the parastigma.

The three above named species (*glycon*, *dymorus* and *meryae*) are similar in habitus and general colouration to *Cheiloneurus swezeyi* Ashmead (1903) known only from North America. However, in *swezeyi* the middle segments of the funicle are white in contrast with the darker basal and apical segments, F5 and F6 are always brown or dark brown, the head is about as high as wide and the scape is not more than about 4X as long as broad. In *dymorus* and the other species F5 and F6 are white or pale yellow, the head is conspicuously higher than wide and the scape is at least about 6X as long as broad.

Cheiloneurus glycon **sp.nov.**

(Figs 985-991; Hab. ♀ 145)

DIAGNOSIS. *Female* (length about 1.5-2.0mm): body mostly orange with a very weak to metallic sheen, some darker areas with a stronger metallic sheen, temple and gena with an elongate dark brown stripe; antenna (Fig. 990) with scape pale orange; pedicel pale orange; funicle proximally brown, medially orange, distally white; clava dark brown; posterior two-fifths of mesoscutum with moderately dense silvery setae; fore and hind coxae white, mid coxa orange, sometimes brown ventrally; legs otherwise mostly white to pale orange with some brown areas; wings fully developed (Fig. 987) or shortened (Fig. 986); fully developed fore wing mostly infuscate

with a vaguely V-shaped hyaline area in basal cell and a small hyaline area at apex of venation; abbreviated fore wing weakly infuscate towards base and more strongly so in apical one-fifth, remainder hyaline; head (Fig. 991) about 5.1X as wide as frontovertex, in facial view about 1.3X as long as broad, suboval with genae converging and virtually straight but more strongly curved inwards near mouth; frontovertex with about 13 inconspicuous setae medially between anterior ocellus and scrobes; eye separated from scrobe by about 3X diameter of anterior ocellus, area between eye and scrobe with conspicuous sculpture; scrobes deep, sharply margined; interantennal prominence with about 16 inconspicuous setae and dorsally rounded; mandible tridentate; antenna (Fig. 990) with scape about 6.5X as long as broad; funicle with F1-F2 clearly longer than broad, F3-F6 subquadrate; linear sensilla on F3-F6; clava 3-segmented, slightly shorter than F4-F6 combined; sensory area poorly defined, extending ventrally about 0.4X length of clava, apex obliquely truncate; head width much greater than funicle length but clearly less than flagellum length; mesoscutum (Fig. 985) with fairly uniform polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed (Fig. 987) or shortened (Fig. 986) with apex transversely truncate and not quite reaching cercal plates of gaster; fully developed fore wing about 3.1-3.2X as long as broad; parastigma clearly downcurved; costal cell dorsally naked and ventrally virtually naked at most with two or three setae in a line; area below proximal part of parastigma with a group of about 20 setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that hardly continues into disc (Fig. 989); apical bristle of postmarginal vein about 0.5X as long as marginal vein; abbreviated fore wing (Fig. 986) about 6X as long as broad; mid tibial spur about as long as basitarsus; propodeum (Fig. 985) with about six silvery setae adjacent to spiracle, side naked; syntergum about 0.8X as long as mid tibia with apex weakly rounded; ovipositor (Fig. 988) about 3.5X gonostylus or about 1.2X as long as mid tibia; gonostylus about 1.2X as long as mid tibial spur; exserted part of ovipositor about 0.3X as long as mid tibial spur. *Male*: unknown.

Female (macropterous holotype): length, including ovipositor, 1.95mm; excluding ovipositor, 1.89mm (CPD).

Head generally pale orange; a diffuse brown streak from lowest part of eye towards torulus, but not reaching scrobe, another from top of temple to base of mandible; orange areas with a weak brassy sheen, brown areas with a distinct purple and brassy sheen; frontovertex with inconspicuous pale brown setae along inner eye margins; 2 or 3 lines of similar setae below eye; interantennal prominence clothed with sparse, similar setae; maxillary palpus pale orange, terminal segment dark brown; antenna (Fig. 990) with radicle and scape pale orange; pedicel pale orange, faintly dusky proximally; F1-F2 brown, F3 orange-brown, F4-F6 white, clava dark brown; pronotum orange with faint blue and purple reflections; prosternum orange, brown anterior to coxa; mesoscutum orange, anterior 0.6X clothed in relatively sparse dark brown setae, posterior 0.4X and side clothed in slightly more dense, translucent, silvery setae mixed with a few dark brown setae; tegula orange, apex slightly dusky orange; axilla pale orange with a few brassy reflections; scutellum pale orange in anterior 0.6X and orange apically, with a few brassy reflections, clothed with brown setae, subapical tuft black; metanotum slightly dusky orange; mesopleuron orange with a weak brassy lustre; fore coxa white; base of fore femur white, rest of leg pale orange; mid coxa mostly orange, but pale brown ventrally; mid femur mostly white, apex orange, slightly brownish dorsally at apex, mid tibia orange with dorsal margin brown along most of its length, spur and tarsus pale orange; hind coxa white; hind femur orange, extreme base white, a small brown, subbasal spot dorsally, apex brown, tibia white at extreme base, otherwise dark brown fading to orange distally, tarsus pale orange; fore wing (Fig. 987) mostly infuscate but hyaline towards base, venation pale brown; propodeum orange with a weak brassy and purple sheen, a tight group of 10-12 conspicuous silvery setae anterolateral to spiracle; gaster pale orange with a moderate brassy sheen, proximal tergites slightly dusky; gonostylus pale orange.

Head (Fig. 991) about 5.1X as wide as frontovertex, in profile 2.1X as high as deep, anteriorly evenly rounded from occipital margin to just above top of scrobes then abruptly angled towards mouth margin with interantennal prominence slightly protuberant; occipital margin sharp, not carinate; ocelli forming an angle of about 40°; frontovertex quite shiny, with conspicuous, coarse, polygonally reticulate sculpture of mesh size hardly smaller than diameter of facet; narrowest

point between eye and scrobe about 3X diameter of anterior ocellus and with slightly shallower sculpture; temple with shallow, irregular, elongate, sculpture; gena with slightly deeper more regular, polygonally reticulate sculpture; scrobes deep, ∩-shaped, meeting, sharply margined dorsally and laterally, carinate laterally; interantennal prominence with a weak, median ridge, dorsally rounded and with relatively shallow, polygonally reticulate sculpture; antenna as in Fig. 990; scape subcylindrical, about 6.5X as long as broad; F1-F2 clearly longer than broad, F3-F6 subquadrate, segments larger and broader distad; clava hardly broadened, a little longer than F4-F6 combined, sutures oblique, sensory area enlarged, poorly defined, but extending ventrally about 0.4X length of clava, apex obliquely truncate; eye not reaching occipital margin, separated by about 1.5X diameter of facet, clothed in moderately conspicuous, setae, each generally about as long as diameter of facet; inner eye margins converging slightly in front of anterior ocellus, but clearly diverging above top of scrobes; malar sulcus absent; clypeal margin concave medially; mandible with three acute teeth; apical segment of maxillary palpus slightly enlarged, nearly 3X as long as radicle. Relative measurements: HW 69, HH 93, FV 13.5, POL 6, OOL 1, OCL 13, AOL 12.5, EL 60, EW 37.5, MS 32, SL 45, SW 7.

Thorax (Fig. 985) with pronotum moderately long, exposed behind head, about 0.8X as long as mesoscutum, pronotum with polygonally reticulate sculpture that is very slightly shallower than that on frontovertex; mesoscutum with sculpture similar to frontovertex, slightly deeper anteriorly; axilla and scutellum with similar sculpture to mesoscutum, perhaps a little shallower and more transverse on axilla; visible part of mesoscutum about 1.5X as broad as long; scutellum about 1.1X as long as broad, with a distinct subapical tuft, setae about half as long as scutellum; mid tibia without a distinct external carina; hind femur about 6X as long as broad; fore wing with venation and setation as in Figs 987, 989; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak; propodeum (Fig. 985) medially about 0.4X as long as scutellum and virtually smooth. Relative measurements: FWL 76.5, FWW 24.5; HWL 69, HWW 16.

Gaster with hypopygium reaching about 0.3X to apex; syntergum about 0.9X as long as mid tibia, with apex weakly rounded; ovipositor slightly exserted, the exserted part about one-third length of mid tibial spur or about 0.1X mid tibia.

Paratype (macropterous). Funicle with linear sensilla present only on F4-F6; gaster without "gland-like" structures on Gt1 or Gt5; ovipositor Fig. 988. Relative measurements: OL 54.5, GL 15.5 [MT 46].

Variation. Females vary in overall length from 1.48-1.95mm, F3 may be completely pale yellow, the mid coxa may be ventrally dark brown, the interantennal prominence may not have a distinct median ridge, the wings may be shortened so that the fore wing is about 6X as long as broad, with apex truncate, not quite reaching the cercal plates and with only apical one-quarter or so infuscate and there may be only 4 or 5 translucent, silvery setae anterolateral to propodeal spiracle.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Santa Rosa NP, Sn. Emilio 5-0, 10-31.i.1987 (Janzen, Gauld). Paratypes: **COSTA RICA**, 11♀, **Guanacaste**, various localities and dates, 7.xii.1985-4.iv.1987 (Janzen, Gauld); 1♀, Guanacaste, PN Palo Verde, Sect. Palo Verde, 40m, #61364, 8-17.ii.2001 (I. Jiménez); 1♀, **San José**, Ciudad Colon, Hda El Rodeo, 16.ii.1991 (Hym. Parataxonomists). Holotype in MZUCR, paratypes in NHMUK, MZUCR and USNM.

COMMENTS. See comments under *dymorus* (p. 386).

***Cheiloneurus meryae* sp.nov.**
(Figs 992-997; Hab. ♀ 146)

DIAGNOSIS. *Female* (length about 1.4-2.0mm): body mostly orange with a very weak to metallic sheen, temple and gena with an elongate dark brown stripe, another between eye and scrobe, darker areas with a stronger metallic sheen; antenna (Fig. 990) with scape pale orange; pedicel pale orange; funicle proximally brown, distally white; clava dark brown; posterior half of mesoscutum with moderately dense silvery setae; fore and hind coxae white, mid coxa orange; legs otherwise white to pale orange, hind tibia mostly dark brown; fore wing (Fig. 997) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation; head (Fig. 996) about 5.0-6.5X as wide as frontovertex, in facial view clearly longer than broad, genae converging, straight but curved inwards near mouth; frontovertex with about eight inconspicuous setae medially between anterior ocellus and scrobes; eye separated from scrobe by about 2.5X diameter of anterior ocellus, area between eye and scrobe with distinct sculpture; scrobes shallow, sharply margined; interantennal prominence with about 15 inconspicuous setae and dorsally rounded; mandible tridentate; antenna (Fig. 995) with scape about 6.3X as long as broad; funicle segments proximally clearly longer than broad, distal segments subquadrate; linear sensilla on F3-F6, sometimes absent from F3; clava 3-segmented, about as long as F4-F6 combined; sensory area enlarged, extending ventrally about 0.4X length of clava, apex obliquely truncate; head width hardly greater than funicle length; mesoscutum (Fig. 994) with polygonally reticulate sculpture, a little more longitudinally elongate laterally; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 997) about 3.1X as long as broad; parastigma strongly downcurved; costal cell dorsally naked, ventrally with an incomplete line of setae in basal half or so; area below proximal part of parastigma with a group of about 18 setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 992); apical bristle of postmarginal vein nearly 0.5X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum (Fig. 994) with about three or eight silvery setae adjacent to spiracle, side naked; syntergum about 0.8X as long as mid tibia with apex acute; ovipositor (Fig. 993) about 3.7X gonostylus or about 1.2X as long as mid tibia; gonostylus about as long as mid tibial spur; exserted part of ovipositor about 0.5X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.65mm; excluding ovipositor, 1.56mm (CPD).

Head generally pale orange; a diffuse brown streak from lowest part of eye towards torulus, but not reaching scrobe, another from top of temple to base of mandible; orange areas with a weak brassy sheen, brown areas with a distinct purple and brassy sheen; frontovertex with inconspicuous pale brown setae along inner eye margins; two lines of similar setae below eye; interantennal prominence clothed with sparse, similar setae; maxillary palpus pale orange, terminal segment largely dark brown; antenna (Fig. 995) with radicle and scape pale orange; pedicel pale orange, faintly dusky internally; F1-F2 brown, F3 orange-brown, F4-F6 white, F4 slightly dusky proximally, clava dark brown; pronotum orange with faint blue and purple reflections; prosternum orange, brown anterior to coxa; mesoscutum orange, anterior half clothed in relatively sparse dark brown setae, posterior half and side clothed in slightly more dense, translucent, silvery setae mixed with a few dark brown setae; tegula orange, apex slightly dusky orange; axilla pale orange with a few brassy reflections; scutellum pale orange in anterior 0.6X and orange apically, with a few brassy reflections, clothed with golden brown and dark brown setae, subapical tuft black; metanotum orange; mesopleuron orange with a weak brassy lustre, apical one-third pale brown with a weak purple sheen; fore coxa white; base of fore femur white, rest of leg pale orange; mid coxa largely orange, but brown ventrally; mid femur mostly white, apex orange, orange-brown dorsally at apex, mid tibia orange with dorsal margin pale brown along half of its length, spur and tarsus pale orange; hind coxa white; hind femur orange, extreme base white, apex brown, tibia white at extreme base, otherwise dark brown fading to pale orange distally, tarsus pale orange; fore wing (Fig. 997) mostly infuscate but hyaline towards base, submarginal vein pale orange, rest of venation pale brown; propodeum orange with a weak brassy and purple sheen, a tight group of 7 or 8 conspicuous silvery setae anterolateral to spiracle; gaster pale orange with a moderate brassy sheen, proximal tergites slightly dusky with a weak coppery or purple sheen, Gt1 with a

weak, metallic blue sheen; gonostylus pale orange.

Head (Fig. 996) about 6.4X as wide as frontovertex, in profile about 1.9X as high as deep, anteriorly evenly rounded with interantennal prominence clearly protuberant; occipital margin sharp, not carinate; ocelli forming an angle of about 40°; frontovertex quite shiny, with conspicuous, coarse, polygonally reticulate sculpture of mesh size hardly smaller than diameter of facet; narrowest point between eye and scrobe about 2.5X diameter of anterior ocellus and with similar, slightly coarser sculpture; temple with shallow, irregular, elongate, sculpture; gena with slightly deeper more regular, polygonally reticulate sculpture; scrobes deep, very broadly ∩-shaped, meeting, sharply margined dorsally and laterally, carinate laterally; interantennal prominence dorsally rounded and with relatively shallow, polygonally reticulate sculpture; antenna as in Fig. 995; scape subcylindrical, about 6.3X as long as broad; F1-F2 clearly longer than broad, F3-F6 subquadrate, segments larger and broader distad; clava hardly broadened, about as long as F4-F6 combined, sutures oblique, sensory area enlarged, extending ventrally about 0.4X length of clava, apex obliquely truncate; eye not reaching occipital margin, separated by about diameter of facet, clothed in moderately conspicuous, setae, each generally a little shorter than diameter of facet; inner eye margins converging slightly in front of anterior ocellus, but clearly diverging above top of scrobes; malar sulcus present, but weak; clypeal margin concave medially; mandible with three acute teeth; apical segment of maxillary palpus slightly enlarged, nearly 3X as long as radicle. Relative measurements: HW 64, HH 76, FV 10, POL 4.5, OOL 0.5, OCL 9.5, AOL 9, EL 53, EW 35, MS 26, SL 41, SW 6.5.

Thorax (Fig. 994) with pronotum moderately long, exposed behind head, about as long as mesoscutum, pronotum with polygonally reticulate sculpture that is very slightly shallower than that on frontovertex; mesoscutum with sculpture similar to frontovertex, slightly deeper anteriorly and slightly longitudinally elongate laterally; axilla and scutellum with similar sculpture to mesoscutum, perhaps a little shallower and more transverse on axilla; visible part of mesoscutum about 2.3X as broad as long; scutellum about 1.1X as long as broad, with a distinct subapical tuft, setae about 0.6X as long as scutellum; mid tibia without a distinct external carina; hind femur about 6.3X as long as broad; fore wing with venation and setation as in Figs 992, 997; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak (Fig. 992); propodeum (Fig. 994) medially about 0.26X as long as scutellum and virtually smooth. Relative measurements: FWL 64.5, FWW 20.5; HWL 57, HWW 11.5.

Gaster with hypopygium reaching about 0.3X to apex; syntergum about 0.8X as long as mid tibia, with apex acute; ovipositor slightly exserted, the exserted part about 0.5X length of mid tibial spur or about 0.13X mid tibia.

Paratype. Funicle with linear sensilla present only on F3-F6 or F4-F6; gaster without "gland-like" structures on Gt1 or Gt5; ovipositor Fig. 993. Relative measurements: OL 55, GL 15 [MT 45.5].

Variation. Females vary in overall length from 1.42-1.97mm, the head varies from 5.0-6.5X as wide as FV, the inner eye margins may not converge and there may be only 3 or 4 setae anterolateral to propodeal spiracle.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, RF Golfo Dulce, 3km SW Rincon, 10m, i.1992 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **Alajuela**, Peñas Blancas, 700m, 1° rainforest, x.1987 (E. Cruz); 1♀, Alajuela, San Cristobal, LN 318056 383200, 600-620m, #51900, 17.vi-18.vii.1996 (D. Briceño); 2♀, PN Arenal, Sendero Pilón, LN 269100 457900, 600m, #55839, 23-30.xi.1999 (G. Carballo); 1♀, Alajuela, RF Arenal, Stor Colada, LN 269900 456750, 600m, #56607, v-vi.2000 (G. Carballo); 1♀, Alajuela, PN Arenal, La Catarata, LN 268500 462500, 500m, #62077, 15.iii-24.iv.2001 (G. Carballo); 2♀, **Heredia**, La Selva BS, 50m, MT/YPT, 22.i-3.ii.1991 (J.S. Noyes); 2♀, Heredia, La Selva Biol. Sta., 3km S Pto. Viejo,

10°26'N 84°01'W, MT, 11.iv.1993 and vii.1995 (P. Hanson); 1♀, Heredia, OTS La Selva, 7-20.ii.1994 (V. Behau-Pelletier); 1♀, Heredia, Est. Biol. La Selva, 10°25'N 84°01'W, iv.1994 (INBio-OET); 1♀, **San José**, San Pedro, Tigra Cacao, ii-iv.1990 (P. Hanson); 1♀, San José, Cerro de la Muerte, "paramo", 30.viii.1986 (L. Masner); 1♀, **Cartago**, Turrialba, PN Barbilla, 3km SE Estación, LN 217200 598500, 500-600m, #58441, 19.viii-20.ix.2000 (E. Rojas); 1♀, Cartago, PN Tapanti-Macizo, Send. Arboles Caidos, LN 561400 192500, 1500m, #61077, ix-x.2000 (D. Rubí); 1♀, **Puntarenas**, Res. Priv. Karen Mogensen, LN 205600 420300, 300-400m, #75746, 22.vi-7.x.2003 (W. Porras): 6♀, Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 23-24.ii.2013 (J.S. Noyes); 1♀, Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 19-20.ii.2016 (J.S. Noyes); 1♀, Puntarenas, Reserva Absoluta Cabo Blanco, 9°35'N 85°06'W, 30m, 16-17. ii.2009 (J.S. Noyes); 2♀, Puntarenas, Manuel Antonio NP, iii.1986 (L. Masner); 1♀, Puntarenas, Manuel Antonio, 26.vii.1986 (L. Masner); 1♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 1300m, 8°46'N 82°57'W, 30.ii.2015 (J.S. Noyes); 3♀, Puntarenas, 10km W Golfo Dulce, xii.1989-iii.1990 (Hanson, Gauld); 1♀, Puntarenas, Golfo Dulce, 10km W Pan-Amer Hwy., 100m, vi-vii.1989 (P. Hanson); 10♀, Puntarenas, RF Golfo Dulce, 24km W Piedras Blancas, 8°46'N 83°24'W, 200m, various dates iii.1989-v.1992 (P. Hanson, I.D. Gauld); 1♀, Puntarenas, RF Golfo Dulce, 5km W Piedras Blancas, 8°46'N 83°17'W, iv-v.1991 (P. Hanson, C. Godoy); 1♀, Puntarenas, PN Piedras Blancas, Alrededor de Estac El Bonito, LS 259300 540900, 100m, #72910, 17.i.2003 (J. Azofeifa); 1♀, Puntarenas, Pen. Osa, 8km S R. Rincon, Coopermarti, x.1990 (A. Retama); 9♀, Puntarenas, RF Golfo Dulce, 3km SW Rincon, 10m, various dates iii.1989-iv.1992 (P. Hanson); 1♀, Puntarenas, Pen. Osa, 23km N Puerto Jimenez, La Palma, x-xi.1990 (P. Hanson); 1♀, Puntarenas, Pen. Osa, 5km N Puerto Jimenez, 8°33'N 83°21'W, vi.1992 (P. Hanson); 1♀, Puntarenas, A.C. Osa, Rancho Quemado, LS 292500 511000, 4-25.v.1994 (A. María); 4♀, Puntarenas, RF Golfo Dulce, Est. Agujas, LS 526550 276750, 300m, 15.vi-15.vii.2000, 13.i-15.ii.2001, 10.iv-10.v.2001 and vii.2000 (J. Azofeifa); 1♀, Puntarenas, PN Corcovado, Los Patos, 8°33'N 83°30'W, 200m, ii.2000 (J.S. Noyes, J. Azofeifa); 1♀, PN Corcovado, Los Patos/Sirena, LS 514200 276500, 100m, #64143, 5.v-8.vi.2001 (J. Azofeifa); 1♀, Puntarenas, Est. Sirena, Sendero Ollas, LS 270500 508300, 20.iii-20.iv.1991 (J.C. Saborio, G. Fonseca); 1♀, Puntarenas, Est. Sirena, Sendero Espaveles, LS 331700 572100, 0-10m, iv.1995 (B. Gamboa, A. Picado); 1♀, **Limón**, Puerto Viejo, 3km E Hotel Punta Cocles, 27.ii.1991 (J.S. Noyes); 2♀, Limón, AC Amistad, Hitoy-Cerere, LN 184600 643400, 150m, 25.viii-5.x.1993 (G. Carballo); 1♀, Limón, Cerro Cocori, Finca E. Roja, LN 286000 567500, 150m, iv-vi.1996 (E. Rojas). Holotype in MZUCR, paratypes in NHMUK, MZUCR, CNC and USNM.

COMMENTS. See comments under *dymorus* (p. 386).

The species is named in honour of Sra Mery Berrocal, a friend and one the hosts at Cerro Escondido, Reserva Privada Karen Mogensen where much of the type material was collected.

***Cheiloneurus zeno* sp.nov.**

(Figs 998-1000; Hab. ♀ 147)

DIAGNOSIS. *Female* (length about 1.0-1.3mm): body mostly orange-brown to dark brown, scutellum orange, with a very weak to moderate metallic sheen, darker areas with a stronger metallic sheen; antenna (Fig. 999) with scape pale orange; pedicel orange-brown; flagellum dark brown; mesoscutum clothed in moderately dense silvery setae; coxae orange; legs otherwise orange with hind femur and tibia mostly dark brown; remnants of fore wing (Fig. 998) mostly infuscate with basal half mostly hyaline, apical half infuscate, apex paler; head (Fig. 1000) about 3.0-3.7X as wide as frontovertex, in facial view clearly longer than broad, genae converging, straight but curved inwards near mouth; frontovertex with about ten inconspicuous setae medially between anterior ocellus and scrobes; eye separated from scrobe by about 1.4X diameter of anterior ocellus, area between eye and scrobe with distinct sculpture; scrobes moderately deep, not sharply margined; interantennal prominence with about 20 inconspicuous setae and dorsally rounded; mandible tridentate; antenna (Fig. 999) with scape about 6.4X as long as broad; funicle with F1-F5 clearly longer than broad, F6 quadrate; linear sensilla on F3-F6, sometimes absent from F3; clava 3-segmented, very slightly longer than F4-F6 combined; sensory area slightly enlarged, extending ventrally only about 0.2X length of clava, apex with a weak oblique truncation; head width very slightly greater than funicle length; mesoscutum with fairly uniform, polygonally reticulate sculpture; scutellum with a weak, apical tuft of setae; wings shortened, not reaching

apex of gaster or even cercal plate; fore wing (Fig. 998) about 3.3-3.9X as long as broad, longer wings relatively narrower; parastigma strongly downcurved; costal cell dorsally naked, ventrally with an almost complete line of setae; area below proximal part of parastigma with a group of about eight or nine setae; apices of postmarginal and stigmal veins more or less connected by a naked area (Fig. 998); mid tibial spur about as long as basitarsus; propodeum with about six inconspicuous setae adjacent to spiracle, side naked; syntergum about 0.98X as long as mid tibia with apex narrowly rounded; ovipositor about 4.0X gonostylus or about 1.6X as long as mid tibia; gonostylus about 1.2X as long as mid tibial spur; exserted part of ovipositor about 0.6X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.16mm; excluding ovipositor, 1.10mm (CPD).

Head generally orange; occiput brownish around foramen, temple and posterior part of gena slightly dusky; frontovertex and scrobal area with a weak brassy and purple sheen, area below eye with a stronger coppery and brassy sheen, temple metallic green and coppery, gena mostly coppery; frontovertex with inconspicuous pale brown setae along inner eye margins; a line of similar setae below eye and a few on interantennal prominence; maxillary palpus dark brown; antenna (Fig. 999) with radicle orange, scape pale orange, pedicel orange-brown dorsally and laterally, orange ventrally; flagellum dark brown; pronotum slightly dusky orange with purple reflections; prosternum orange-brown; mesoscutum brown with a brassy and faintly green sheen, clothed in moderately dense silvery setae, except narrow anterior area; tegula orange, apex dusky orange; axilla orange with a few brassy reflections; scutellum orange between axillae and in posterior 0.4X, otherwise pale orange, a few brown setae subapically and subapical tuft black; metanotum orange-brown; mesopleuron dark orange-brown with a weak brassy lustre with some coppery reflections anteriorly; fore coxa pale orange, fore legs otherwise slightly darker pale orange; mid coxa orange, mid leg otherwise pale orange; hind coxa pale orange; hind femur orange, dorsally orange-brown to dark brown, tibia white in proximal 0.3X, otherwise dark brown, extreme apex pale orange, tarsus very pale orange, almost white; fore wing (Fig. 998) mostly infuscate but hyaline towards base, submarginal vein pale orange, rest of venation brown; propodeum brown with a weak purple sheen medially, metallic green laterally and on side, 3 or 4 conspicuous silvery setae outside spiracle; gaster brown, with a moderate brassy and purple sheen with some blue and green reflections, Gt1 darker with a stronger dark blue, green, coppery and brassy sheen; gonostylus pale orange.

Head (Fig. 1000) about 3.7X as wide as frontovertex, in profile about 1.8X as high as deep, anteriorly more or less straight from top of scrobes to mouth margin, with interantennal prominence hardly protuberant; occipital margin sharp, not carinate; ocelli forming an angle of about 60°; frontovertex quite shiny, with conspicuous, coarse, polygonally reticulate sculpture of mesh size subequal to diameter of facet; narrowest point between eye and scrobe about 1.4X diameter of anterior ocellus and with similar, slightly coarser, more elongate sculpture; temple with shallow, irregular, elongate, sculpture; gena with slightly deeper more regular, polygonally reticulate sculpture; scrobes moderately deep, ∩-shaped, meeting, not sharply margined; interantennal prominence dorsally rounded and with relatively shallow, polygonally reticulate sculpture; antenna as in Fig. 999; scape subcylindrical, about 6.4X as long as broad; flagellum slightly flattened from side to side, F1-F5 clearly longer than broad, F6 quadrate, segments larger and broader distad; clava hardly broadened, very slightly longer than F4-F6 combined, sutures oblique, sensory area enlarged, extending ventrally about 0.2X length of clava giving apex a weakly obliquely truncate appearance; eye not reaching occipital margin, separated by about 1.5X diameter of facet, appearing naked, but clothed in sparse, very inconspicuous, short setae, each much shorter than diameter of facet; inner eye margins clearly diverging in front of anterior ocellus; malar sulcus absent; clypeal margin weakly concave medially; mandible with three acute teeth; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 53, HH 58, FV 14.5, POL 5, OOL 2.5, OCL 7, AOL 7.5, EL 39, EW 26, MS 20, SL 35, SW 5.5.

Thorax with pronotum short, hardly exposed behind head, about 0.8X as long as mesoscutum, pronotum with polygonally reticulate sculpture that is of similar depth to that on frontovertex; mesoscutum with sculpture similar to frontovertex; axilla with slightly deeper, more transversely

elongate sculpture than mesoscutum, scutellum with conspicuously deeper longitudinally elongate, striate reticulate sculpture; visible part of mesoscutum about 1.6X as broad as long; scutellum about as long as broad, with a weak subapical tuft, setae about one-quarter as long as scutellum; mid tibia without an external carina; hind femur about 5.2X as long as broad; fore wing slightly reduced, not quite reaching apex of gaster, venation and setation as in Fig. 998; a weak hyaline streak at apex of venation; propodeum medially about 0.29X as long as scutellum and virtually smooth. Relative measurements: FWL 91, FWW 25; HWL 85, HWW 16.5.

Gaster with hypopygium reaching about 0.3X to apex; syntergum about 0.9X as long as mid tibia, with apex narrowly rounded; ovipositor slightly exserted, the exserted part about 0.6X length of mid tibial spur or about 0.2X mid tibia.

Paratype. Funicle with linear sensilla present only on F3-F6 or F4-F6; gaster without "gland-like" structures on Gt1 or Gt5. Relative measurements: OL 51.5, GL 13 [MT 32].

Variation. Females vary in overall length from 1.03-1.31mm, the mid coxa may be very pale orange and concolourous with the fore and hind coxae, the head may be only about 3X as wide as the frontovertex and the wings may be relatively shorter with the fore wing about 3.3X as long as broad and hardly reaching the cercal plate.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Valle Miravalle, Est. Cabro Muco, LN 299769 411243, 1100m, #74102, 4.vii.2003 (J.D. Gutierrez et al.). Paratypes: COSTA RICA, 2♀, **Guanacaste**, same data as holotype. Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. Although *Cheiloneurus zeno* is known only from brachypterous females, it is similar in habitus and general colouration to *cupreicollis*. Other than using the characters given in the key, *zeno* can be separated from *cupreicollis* by having the funicle segments relatively short with F1 less than 2X as long as broad, the apex of the syntergum narrowly rounded, almost angular and the ovipositor a little more than 1.5X as long as the mid tibia whereas in *cupreicollis* the funicle segments are relatively elongate with F1 at least about 3X as long as broad, the apex of the syntergum broadly rounded, almost truncate and the ovipositor is only about as long as the mid tibia. In addition, the subapical tuft on the scutellum is sparser than in *cupreicollis* and shorter, being at most about 0.4X as long as the scutellum, whereas in *cupreicollis* it is at least about half as long.

***Cheiloneurus cupreicollis* Ashmead stat.rev.**

(Figs 1001-1005; Hab. ♀ 148)

Chiloneurus [sic] *cupreicollis* Ashmead, 1886:131. Lectotype ♀ (designated Noyes, 1979:150), USA (Florida), USNM, not examined.

Chiloneurus [sic] *funiculus* Howard, 1897:148. Holotype ♀, Grenada (W.I.), NHMUK, examined. Synonymy with *cupreicollis* by Noyes (1979:150-151).

?*Saronotum australiae* Perkins, 1906:260. Lectotype ♀ (designated Guerrieri, 2006:2398), Australia (Queensland), BPBM, not examined. Synonymy with *flaccus* by Guerrieri (2006:2399).

?*Saronotum americanum* Perkins, 1906:260. Holotype ♀, USA (Ohio), BPBM, not examined. Synonymy with *flaccus* by Burks (1975:147).

Cheiloneurus flaccus; Guerrieri & Viggiani (2005:310), misidentification (non-type material).

DIAGNOSIS. *Female* (length about 1.5-1.9mm): body mostly orange to pale orange-brown, generally with a weak metallic sheen; pronotum, mesoscutum and propodeum dark brown, gaster

dark brown mixed orange-brown, darker areas with a stronger metallic sheen; antenna (Fig. 1003) with scape pale orange; pedicel pale orange-brown; funicle and clava dark brown; mesoscutum with evenly distributed, moderately dense, silvery setae; fore coxa pale yellow, mid coxa brown, hind coxa white to pale orange; fore and mid legs otherwise mostly orange, mid tibia dark brown; hind legs largely dark brown; fore wing (Fig. 1004) mostly infuscate with basal cell almost completely hyaline, small area at apex of venation and area on opposite margin hyaline, apex narrowly hyaline; head (Fig. 1001) about 3X as wide as frontovertex, in facial view about as long as broad, genae straight and converging, curved inwards near mouth; frontovertex with about 13 inconspicuous setae medially between anterior ocellus and scrobes; eye separated from scrobe by about 2X diameter of anterior ocellus, area between eye and scrobe with distinct sculpture, scrobes very shallow with rounded margins; interantennal prominence with about 40 conspicuous setae and dorsally rounded; mandible tridentate; antenna (Fig. 1003) with scape about 6.9X as long as broad; funicle distally conspicuously flattened, F1-F5 longer than broad, F6 quadrate; head width about equal to length of F1-F5 combined; linear sensilla on F3-F6; clava 3-segmented, slightly shorter than F4-F6 combined, apex broadly rounded but sensory area extending about 0.4X along clava; mesoscutum (Fig. 1002) with uniform, shallow, polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 1004) about 3.3X as long as broad; parastigma strongly downcurved; costal cell dorsally naked, ventrally with virtually a complete line of very fine setae; area below proximal part of parastigma with a group of about 15-20 fine setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that hardly continues into disc (Fig. 1005); apical bristle of postmarginal vein about 0.3X as long as marginal vein; mid tibial spur hardly longer than basitarsus; propodeum (Fig. 1002) with about 25 setae adjacent to spiracle extending part way down side; gaster without "gland-like" structures on Gt1 or Gt5; syntergum about 0.7X as long as mid tibia; ovipositor about 4.4X gonostylus or about as long as mid tibia; gonostylus about 0.7X as long as mid tibial spur; exserted part of ovipositor not more than about 0.3X as long as mid tibial spur. *Male*: unknown in Costa Rica, but those from North America are generally slightly smaller than the females and differ only in the structure of the antenna and genitalia and in lacking the narrow hyaline apex to the fore wing. Fore wing infuscate as in female; antenna filiform with all funicle segments about 5X as long as broad and clothed with whorls of setae that are only slightly longer than diameter of segments.

DISTRIBUTION. USA (Hawaii, ?Ohio, Colorado **new record**, Florida), Canada (Quebec, Ontario) (**new record**), Costa Rica (**new record**), ?Australia (Queensland). Other records require confirmation.

HOSTS. Almost certainly parasitoids of Dryinidae (Hymenoptera). *Saronotum americanum,* which may be the same as *cupreicollis*, was recorded as a parasitoid of *Pseudogonatopus* Perkins by Perkins (1906) and Guerrieri & Viggiani (2005, referring to Perkins, 1906) cite the host of *cupreicollis* (as *flaccus* misident.) as *Tetrodontochelys peculiaris* (Brues) (Dryinidae).

MATERIAL EXAMINED.

Type material. *Encyrtus funiculus*, Holotype ♀: GRENADA (WI), "Holo-type", "St John's Riv. (Leeward side) Grenada W.I. H.H. Smith 17 –", "W. Indies.", "99-331", "*Chiloneurus funiculus* How typ.", "*Cheiloneurus funiculus* Howard det. J.S. Noyes 1978 HOLOTYPE", "B.N. Type HYM. 5.1145" (NHMUK).

Non type material. **USA**, 2♀, **Hawaii,** Oahu, Evra Plntn (? - illegible), ex Dryinid cocoon, 12.v.1919 (O.H. Swezey), "*Chrysopophagus americanus* (Perkins) det. Timberlake"; 1♀, Hawaii, Oahu, Evra (? - illegible), ex Dryinid cocoon, Iss. 18.vi.1920 (Timberlake coll.); 1♀, Hawaii (?), ex Dryinid cocoon, Timberlake coll., "*Saronotum americanum* Perkins Timb. det."; 2♀, **Colorado**, Eagle Co., Minturn 7800, 1.v.1987 (J.D. Pinto); 5♀, 6♂, **Florida**, Levy Co., Cedar Key, 23.iv.1989 (J.S. Noyes); **CANADA**, 1♀, **Quebec**, Lac Roddick, 1.xi.1985 (J.S. Noyes); 1♀, **Ontario**, 12m S. New Liskeard, vii.1973 (C. Starr); 1♀, Ontario, Ottawa, McCarthy Woods, 16.ix.1985 (L. Masner); **COSTA RICA**, 1♀, **Guanacaste**, Palo Verde, LN 259000 388400, 10m, 12.viii-12.ix.1991 (R.U. Chavarria, D. Acevedo); 1♀, Guanacaste, Santa Cruz, Vista del Mar, Torre Cocesna, LN 357490 235430, 970m, #61247, xii.2000-i.2001 (V. Cárdenas); 1♀, **Alajuela**, Garita, 12.iii.1997 (P. Hanson). Material in MZUCR and NHMUK.

COMMENTS. I am confident that the Costa Rican specimens noted above belong to *cupreicollis*, although they are generally relatively smaller and slightly paler than any of the specimens examined from Hawaii or North America.

Cheiloneurus cupreicollis was incorrectly synonymised with *flaccus* by Guerrieri & Viggiani (2005). Their illustration of the antenna, and examination of the non-type material listed by them, clearly show that they have misidentified *cupreicollis* as *flaccus*. Both *Cheiloneurus cupreicollis* and *flaccus* have a slender scape, at least about 7X as long as broad, pedicel slightly shorter than F1 and a distinctly flattened flagellum. However, *cupreicollis* has F1 subcylindrical and hardly broadened, nearly 3X as long as broad and F5 very slightly narrower than either F6 or the clava. In *flaccus* all the funicle segments are clearly broadened and flattened so that F1 is only about 1.5X as long as broad and F5 is slightly wider than F6 or the clava.

Saronotum australiae and *S. americanum* have very probably been incorrectly synonymised with *Cheiloneurus flaccus* (see Burks, 1975; Guerrieri, 2006) and are probably the same as *cupreicollis*.

Cheiloneurus repola **sp.nov.**

(Figs 1006-1010; Hab. ♀ 149)

DIAGNOSIS. *Female* (length about 1.1-1.7mm): body mostly orange to pale orange-brown, generally with a weak metallic sheen; mesoscutum and propodeum dark brown, gaster dark brown mixed orange-brown, darker areas with a stronger metallic sheen; antenna (Fig. 1008) with scape pale orange; pedicel pale orange; funicle with proximal segments dark brown mixed pale orange, remainder of flagellum dark brown; mesoscutum with evenly distributed, moderately dense, silvery setae; fore coxa pale orange, mid coxa brown, hind coxa white to pale orange; legs mostly orange but with mid and hind tibia and hind femur dark brown; remnant of fore wing hyaline; head (Fig. 1010) about 2.7X as wide as frontovertex, in facial view a little longer than broad, genae straight and converging, curved inwards near mouth; frontovertex with about 18 inconspicuous setae medially between anterior ocellus and scrobes; eye separated from scrobe by about 3X diameter of anterior ocellus, area between eye and scrobe with distinct sculpture, scrobes very shallow with rounded margins; interantennal prominence with about 35 inconspicuous setae and dorsally rounded; mandible tridentate; antenna (Fig. 1008) with scape about 6.9X as long as broad; flagellum slightly flattened, F1-F3 longer than broad, F4-F6 transverse; head width about equal to length of F1-F5 combined; linear sensilla on F3-F6; clava 3-segmented, slightly longer than F5-F6 combined, apex broadly rounded but sensory area extending about 0.2X along clava; mesoscutum (Fig. 1007) with uniform, shallow, polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings shortened, not reaching base of gaster; fore wing remnant (Fig. 1006) about 4X as long as broad; mid tibial spur about as long as basitarsus; propodeum (Fig. 1007) with about 15 submedial setae as well as 20 setae adjacent to spiracle, latter not extending down side; syntergum very nearly as long as mid tibia; ovipositor (Fig. 1009) about 3.4X gonostylus or about 1.8X as long as mid tibia; gonostylus about 1.8X as long as mid tibial spur; exserted part of ovipositor about as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.69mm; excluding ovipositor, 1.54mm (AD).

Head with occiput pale orange, otherwise generally slightly dusky orange to pale orange-brown, temple and gena slightly darker; frontovertex and scrobal area with weak brassy, blue and purple reflections, more strongly purple between eye and scrobe; temple and gena with a stronger pale blue, brassy, green and coppery sheen, gena more coppery; frontovertex clothed with very short, inconspicuous, translucent, pale brown setae along inner eye margins, gena and interantennal prominence with similar, but more widely scattered setae; maxillary palpus dark brown; antenna (Fig. 1008) with radicle pale orange, extreme apex with a slender brown ring; scape pale orange; pedicel pale orange, slightly dusky dorsally; funicle with F1-F2 pale orange ventrally, dark brown dorsally, F3-F6 and clava dark brown; pronotum dorsally dark brown with brassy, purple and coppery reflections, neck and side dusky orange; prosternum orange; mesoscutum dark brown with a coppery sheen, clothed with moderately dense, translucent, silvery setae; tegula orange with apex orange-brown; axilla orange; scutellum orange, proximal two-thirds paler orange, clothed

with translucent, pale brown setae, subapical tuft black; metanotum orange-brown; mesopleuron chestnut brown, anteriorly with a weak purple, green and brassy sheen, posteriorly with a mixed blue, purple, coppery and brassy sheen; mesosternum chestnut brown; fore leg orange; mid coxa brown; mid femur orange, mid tibia dark brown, apices orange, mid tibial spur more or less white, tarsus pale orange, apex dark brown; hind coxa orange; hind femur brown, hind tibia brown mixed dark brown, tarsus yellow, apex dark brown; fore wing remnant hyaline (Fig. 1006); propodeum dark brown medially with a strong green and coppery sheen, laterally and on side with a strong coppery sheen; a group of about 15 translucent, silvery setae outside spiracle that extends nearly to posterior margin of propodeum; gaster mostly orange-brown, basal tergites with a moderately strong coppery sheen, side and venter predominantly with a brassy and coppery sheen; gonostylus very pale orange, extreme apex dark brown.

Head (Fig. 1010) about 2.7X as wide as frontovertex, shallow in profile, about 1.7X as high as deep, anteriorly quite uniformly curved, interantennal prominence slightly protuberant; occipital margin rounded; ocelli forming an angle of about 85°; frontovertex slightly shiny, with distinct, coarse, fairly regular, polygonally reticulate sculpture of mesh size subequal to diameter of eye facet; narrowest area between eye and scrobe slightly more than 3X as wide as diameter of anterior ocellus, area immediately below lowest part of eye with distinct, polygonally reticulate sculpture; scrobes very shallow, not meeting, not sharply margined; interantennal prominence and gena with similar sculpture to frontovertex, dorsally broadly meeting frontovertex; temple with similar sculpture, but of slightly larger mesh; antenna as in Fig. 1008; scape subcylindrical, about 6.9X as long as broad; funicle with segments slightly bilaterally flattened, F1-F3 longer than broad, F4-F6 transverse, F5 broadest, segments mostly broader and slightly shorter distally; clava not broadened, slightly longer than F5-F6 combined, sutures hardly oblique, sensory area enlarged, but extending ventrally not more than 0.2X along clava, apex broadly rounded; eye not reaching occipital margin, separated by about 3X diameter of facet, clothed in inconspicuous, short setae, each much shorter than diameter of facet; inner eye margins strongly diverging anteriorly; malar sulcus absent; clypeal margin weakly concave medially; mandible tridentate; apical segment of maxillary palpus about 1.5X as long as radicle and relatively broad and flattened, only about 2.5X as long as broad. Relative measurements: HW 54, HH 61, FV 20, POL 9.5, OOL 2.5, OCL 10, AOL 7, EL 42, EW 25, MS 23, SL 38, SW 5.5.

Thorax (Fig. 1007) with pronotum medially exposed behind head, about as long as mesoscutum, pronotum and mesoscutum with polygonally reticulate sculpture that is similar to that on frontovertex; axilla and scutellum with similar sculpture to mesoscutum, but coarser and deeper, slightly elongate on side of scutellum; visible part of mesoscutum about 1.9X as broad as long; scutellum about 1.1X as long as broad, with a distinct subapical tuft, setae mostly about 0.8X as long as scutellum; mid tibia without an external carina; hind femur about 5.2X as long as broad; fore wing reduced (Fig. 1006), not quite reaching posterior margin of propodeum; propodeum (Fig. 1007) medially about 0.36X as long as scutellum, completely smooth, about 10 scattered submedial setae present as well as about 20 long, conspicuous setae on each side near spiracle. Relative measurements:

Gaster with hypopygium reaching about half-way to apex; syntergum about as long as mid tibia, with apex narrowly truncate; ovipositor clearly exserted, the exserted part about as long as mid tibial spur or one-third mid tibia.

Paratype. Funicle with linear sensilla present only on F3-F6; gaster without “gland-like” structures on Gt1 or Gt5; ovipositor Fig. 1009. Relative measurements: FWL 16.5, FWW 4; OL 68, GL 20 [MT 37].

Variation. Females vary in overall length from 1.09-1.65mm and the paratypes are generally paler than the holotype with the dorsal part of the pronotum being orange-brown, and the scutellum and paler parts of the legs being pale orange

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Guanacaste NP (error for Santa Rosa NP), 7km E HQ, "small house", 9-10.iii.1990 (J.S. Noyes). Paratypes: **COSTA RICA**, 4♀, **Guanacaste**, same data as holotype. Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. The form of the antenna, narrow fore wing and numerous medial setae on frontovertex suggest that *Cheiloneurus repola* is close to *compressicornis*. It can be separated from all related species by the strongly reduced wings and presence of about 8-15 submedial setae on the propodeum. No other Costa Rican species is known to have submedial setae on the propodeum.

See also comments under *compressicornis* (p. 398).

Cheiloneurus compressicornis Ashmead
(Figs 1011-1018; Hab. ♀ 150,151)

Chrysopophagus compressicornis Ashmead, 1894:246. Lectotype ♀ (here designated), USA (Missouri), USNM, examined.

DIAGNOSIS. *Female* (length about 1.2-1.6mm): body mostly orange to pale orange-brown, generally with a weak metallic sheen; mesoscutum dark brown with a slightly coppery and brassy, metallic green sheen, propodeum dark brown, gaster dark brown mixed orange-brown, darker areas with a stronger metallic sheen; antenna (Fig. 1013, 1014) with scape pale orange; pedicel pale orange, sometimes slightly dusky; funicle with F1 orange-brown, rest of flagellum dark brown; mesoscutum with evenly distributed, moderately dense, silvery setae; fore and hind coxae white or pale yellow, mid coxa pale brown; legs mostly orange but with hind tibia dark brown, sometimes also hind femur; fore wing (Fig. 1017, 1018) mostly infuscate with basal cell almost completely hyaline, small area at apex of venation and area on opposite margin hyaline, apex narrowly hyaline; head (Fig. 1011, 1012) about 2.8-2.9X as wide as frontovertex, in facial view about 1.1-1.3X as long as broad, genae straight and converging, curved inwards near mouth; frontovertex with about 25 inconspicuous setae medially between anterior ocellus and scrobes; eye separated from scrobe by about 3X diameter of anterior ocellus, area between eye and scrobe with distinct sculpture, scrobes very shallow with rounded margins; interantennal prominence with about 30-35.inconspicuous setae and dorsally rounded; mandible tridentate; antenna (Fig. 1013, 1014) with scape about 6.3-8.0X as long as broad; flagellum slightly flattened, F1-F2 longer than broad, F3-F6 quadrate or transverse; head width at least slightly greater than length of funicle; linear sensilla on F2-F6, sometimes absent from F2; clava 3-segmented, about as long as F4-F6 combined, apex broadly rounded but sensory area extending a little more than 0.3X along clava so that clava is asymmetric in profile; mesoscutum with uniform, shallow, polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed; fore wing (Figs 1013, 1014) about 2.8-3.2X as long as broad; parastigma strongly downcurved; costal cell dorsally naked, ventrally with a line of very fine setae that reaches about three-quarters to apex; area below proximal part of parastigma with a group of about 50 fine setae; apices of postmarginal and stigmal veins connected by a naked, hyaline line that hardly extends into disc (Fig. 1015); seta at apex of postmarginal vein about 0.5X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum with about 5-20 setae adjacent to spiracle not extending down side; gaster without "gland-like" structures on Gt1 or Gt5; syntergum about 0.8X as long as mid tibia; ovipositor (Fig. 1016) about 4.4X gonostylus or about 1.4X as long as mid tibia; gonostylus about 0.9X as long as mid tibial spur; exserted part of ovipositor about 0.4-0.5X as long as mid tibial spur. *Male* (length 1.00-1.36mm): generally very similar to female but for antenna and genitalia; colouration similar to that of female, although the scutellum and mesopleuron may be dark orange brown; frontovertex usually slightly dusky to pale brown and with a weak metallic green and coppery sheen in ocellar area; fore wing generally hyaline, but with an incomplete, infuscate band across wing from marginal vein; flagellum filamentous, funicle segments cylindrical, subequal in width, longer than broad and gradually becoming shorter distally, F1 nearly 5X as long as broad, F6 about 3X as long as broad, clava about 5X as long as broad, segments clothed in whorls of long setae, longest about 3X as long a diameter of segment.

DISTRIBUTION. USA (newly recorded from Arizona and Texas [**new records**]), Mexico and Costa Rica (**new record**) (see also Noyes, 1919).

HOSTS. Recorded as a hyperparasitoid, and possibly tertiary parasitoid, of various species of *Chrysopa* (Neuroptera: Chrysopidae) in association with encyrtid, perilampid and ichneumonid primary or hyperparasitoids (see Noyes, 2019). Recorded below from "brown lacewing" (probably Neuroptera: Hemerobiidae), *Chrysopa* cocoon and pupa of *Chrysoperla harrisi* (Fitch) (Neuroptera: Chrysopidae) and in association with *Phenacoccus cevalliae* Cockerell and as a parasitoid of *Phenacoccus solani* Ferris (Hemiptera: Pseudococcidae). It is likely that the species is hyperparasitic on both mealybugs and their lacewing predators.

MATERIAL EXAMINED.

Type material. Syntypes of *compressicornis*: USA, 1♀, Missouri "Miss", "♀", "♀ Type No. 1465 U.S.N.M." "Chrysopophaga compressicornis Ashm ♀" "USNM ENT 00802838". This female is in good condition and is designated LECTOTYPE of *compressicornis* in the interests of nomenclatural stability (USNM).

Non type material. **USA**, 1♀, **California**, Uplands, ex *Chrysopa* cocoon, 28.vii.1919 (H.M. Armitage) "*Chrysopophagus compressicornis* Ashm. Timb. det."; 1♀, California, San Marino, ex brown lacewing, i.1927 (A.I. Basinger, Coll), "Compared with Syntype of *C. compressicornis* A." "*Cheiloneurus compressicornis* Ashm"; 1♀, **Arizona**, Phoenix, *Phenacoccus cevalliae*, Lot No. 43-8395, 16.vi.1943, B.M. 1982-101, "*Cheiloneurus compressicornis* Ashm. det Gahan"; 2♀, 2♂, **Texas**, Tom Green Co., San Angelo: Corp. of Eng., Prickly Pear Project, 1.xi.1983, 26.x.1983 and 10.x,1984 (Gilreath-Hackler Coll.); 2♀, 1♂, Texas, Coleman Co., Coleman: Horne Ranch, 18.x.1984 and 16.ix.1984 (Gilreath-Hackler Coll.) (one specimen mounted with mummies of Pseudococcidae); 1♂, **South Carolina**, Greensboro, E.V. 63, collected on cotton, 5.ix.1913, Hunter No 3414, "BM 1982-101"; 1♂, South Carolina, Batesburg, E.V. 39 (45), Par. iss 8.ix.1913, Hunter No 3414, "BM 1982-101", 1♀, South Carolina, Batesburg, E.V. 28? (73), Par. iss 10.ix.1913, Hunter No 3414, "BM 1982-101", "*Cheiloneurus compressicornis* Ash. det Crawford"; 7♀, 1♂, South Carolina, Pickens Co., Clemson, ex pupa *Chrysoperla harrisi* (Fitch) on wild cherry, CR-2, 24.vi.1985 (J.R. Brushwein). **MEXICO**, 1♀, Nuevo León, Monterrey, Huinala, ex *Phenacoccus solani* on root of *Parthenium*, v.1983 (F.D. Bennett). **COSTA RICA**, 1♀, **Guanacaste**, Santa Rosa NP, Bosq. Hum. 9-0, 16.xi-7.xii.1985 (Janzen, Gauld); 1♀, Guanacaste, Santa Rosa NP, H4C, 27.ix-18.x.1986 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, PN Santa Rosa, 10°51'N 85°37'W, 300m, 24.ii.2009 (J.S. Noyes); 1♀, Guanacaste, PN Palo Verde, Sector Catalina, LN 257400 400000, 230m, #44947, 8.i-8.ii.2000 (I. Jiménez); 1♀, Guanacaste, Santa Cruz, PN Marino Las Baulas, LN 258040 332690, 0m, #59488, 16.viii.2000 (Y. Cardenas); 1♀, **Alajuela**, San Ramon BS, 700m, viii-ix.1995 (P. Hanson); 1♀, **San José**, Ciudad Colon, 800m, ii.1990 (L. Fournier). 1♀, **Cartago**, Turrialba, CATIE, v.1994 (P. Hanson); 1♀, **Puntarenas**, Manuel Antonio NP, 8-14.xii.1987 (Greniere, Bertrand); 1♀, Puntarenas, Pen. Osa, Puerto Jimenez, 10m, ii-iii.1993 (P. Hanson). Material in NHMUK, MZUCR and CNC.

COMMENTS. The head of the lectotype of *compressicornis* is badly collapsed which makes comparison difficult, but I am confident that it is the same species as the material listed above. The species is very close to, and may be the same as, *Cheiloneurus dubius*, described from males "parasitic in all probability, on a species of *Lecanium*" (Howard, 1885) associated with pines. As *compressicornis* is well known as a hyperparasitoid of immature Chrysopidae via encyrtid primary parasitoids and the taxonomy of males is difficult I am not formally treating the two as synonymous pending a more detailed study of males of this genus.

The material examined shows some notable variation in the relative length of the head (hardly longer than high to nearly 1.3X as high as wide), corresponding relative length of gena and the relative length of F1 in relation to pedicel length (slightly shorter to slightly longer than pedicel), relative density of darker setae below the distal part of the parastigma (see Figs 1017, 1018), as well as other variation noted under diagnosis. Costa Rican specimens differ slightly from North American specimens in having the mesoscutum slightly less metallic green and with a more coppery and brassy sheen. North American specimens are also a little larger, being up to 1.86mm in length and generally have F1 relatively slightly longer in relation to the pedicel and the fore wing varying from 2.8-3.0X as long as broad. Some North American specimens also have the subhyaline apical area of the forewing slightly larger than in Costa Rican specimens.

Cheiloneurus compressicornis might be very similar to the fully winged form of *repola*, if it exists. Apart from the differences highlighted in the key and above, *compressicornis* differs from *repola* in having the sensory area of the clava extending a little more than 0.3X along the ventral surface of the clava and the ovipositor is about 4.4X as long as the gonostylus. In *repola* the sensory part of the clava is at the apex only, extending less than 0.2X along the ventral surface, and the ovipositor is about 3.4X as long as the gonostylus.

Cheiloneurus nankingensis Li & Xu, recently described from Jiangsu province, China and reared as a hyperparasitoid of *Phenacoccus solenopsis* Tinsley (Hemiptera: Pseudococcidae) via its primary parasitoid *Aenasius arizonensis* (Girault) (Hymenoptera: Encyrtidae) (Li et al, 2020) is extremely close to *compressicornis* and may be synonymous. It is likely that both the host and primary parasitoid of *nankingensis* originated in North America and that all three have been accidentally introduced from there into China. However, I hesitate to formally treat *nankingensis* and *compressicornis* as synonymous because the male of *nankingensis* appears to have completely hyaline fore wings, whereas males of *compressicornis* have a distinct infuscate area below the apex of the venation.

***Cheiloneurus leone* sp.nov.**
(Figs 1019-1024)

DIAGNOSIS. *Female* (length about 1.8mm): body mostly orange, generally with a weak metallic sheen; mesoscutum, metanotum and mesopleuron brown, gaster brown mixed orange, darker areas with a weak to moderate metallic sheen; antenna (Fig. 1023) with scape pale orange; pedicel pale orange-brown; funicle and clava dark brown; mesoscutum with evenly distributed dense silvery setae; fore coxa orange, mid coxa dark brown, hind coxa dark orange-brown; fore and mid legs otherwise orange, hind legs largely dark brown; fore wing (Fig. 1020) mostly infuscate with basal cell almost completely hyaline, small area at apex of venation and apex narrowly hyaline; head (Fig. 1024) about 3.5X as wide as frontovertex, in facial view clearly longer than broad, genae straight and converging, curved inwards near mouth; frontovertex with about 30 inconspicuous setae medially between anterior ocellus and scrobes; eye separated from scrobe by about 2X diameter of anterior ocellus, area between eye and scrobe with distinct sculpture, scrobes shallow with rounded margins; interantennal prominence with about 40 conspicuous setae and dorsally rounded; mandible tridentate; antenna (Fig. 1023) wioth scape about 8X as long as broad; funicle flattened, F1-F3 longer than broad, F4-F6 transverse; head width about equal to length of F1-F5 combined; linear sensilla on F3-F6; clava 3-segmented, slightly longer than F5-F6 combined, apex broadly rounded but sensory area extending about one-third along clava; mesoscutum (Fig. 1021) with very uniform, shallow, polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 1020) about 3.3X as long as broad; parastigma strongly downcurved; costal cell dorsally naked, ventrally with virtually a complete line of very fine setae; area below proximal part of parastigma with a group of about 60 fine setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that hardly continues into disc (Fig. 1022); apical bristle of postmarginal vein missing, but probably about 0.4X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum (Fig. 1021) with about 35 setae adjacent to spiracle extending part way down side; syntergum about 0.8X as long as mid tibia; ovipositor (Fig. 12019) about 4.5X gonostylus or about 1.5X as long as mid tibia; gonostylus about 0.9X as long as mid tibial spur; exserted part of ovipositor about 0.3X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.77mm; excluding ovipositor, 1.71mm (CPD).

Head with occiput pale orange, otherwise generally slightly dusky orange to pale orange-brown, ocellar area, temple and gena slightly darker; frontovertex and scrobal area with weak brassy, blue and purple reflections; a weak, narrow, metallic blue line between eye and torulus, outside this a broader metallic, coppery purple line; temple and gena with a metallic green and coppery purple sheen; frontovertex clothed with very short, inconspicuous, translucent, pale brown setae along inner eye margins, gena and interantennal prominence with similar, but more widely scattered setae; maxillary palpus dark brown, virtually black; antenna (Fig. 1023) with radicle pale orange-

brown; scape pale orange; pedicel pale orange-brown; funicle and clava dark brown, almost black; pronotum largely orange-brown with a weak, brassy and purple sheen, neck and side orange; prosternum orange; mesoscutum dark brown with a strong coppery and brassy sheen, clothed with dense, translucent, silvery setae; tegula orange with apex orange-brown; axilla orange; scutellum with anterior three-fifths yellow, posterior part orange, clothed with golden brown to dark brown setae, subapical tuft black; metanotum dark brown; mesopleuron chestnut brown, anteriorly with a weak green and brassy sheen, posteriorly with a mixed blue, purple, coppery and brassy sheen; mesosternum orange-brown; fore leg orange, apex of tarsus dark brown; mid coxa brown, mid leg otherwise orange, mid tibial spur pale orange, apex of tarsus dark brown; hind coxa, femur and tibia dark orange-brown to dark brown, hind tarsus pale orange, apex dark brown; fore wing (Fig. 1020) mostly infuscate, hyaline towards base; submarginal vein pale yellow, venation otherwise pale brown; propodeum dark brown with a moderate purple and coppery sheen mixed metallic blue and brassy laterally; about 20 translucent, silvery setae outside spiracle that extend nearly to posterior margin of propodeum; gaster largely brown, but pale orange dorsally distad of cercal plates, apex of syntergum brown, basal tergites with a moderately strong, mixed, blue, purple, coppery and green sheen, side and venter predominantly brassy weakly mixed with purple and blue; gonostylus pale orange, apex brownish.

Head (Fig. 1024) about 3.5X as wide as frontovertex shallow in profile about 2.0X as high as deep, anteriorly more or less uniformly curved, interantennal prominence hardly protuberant above torulus; occipital margin sharp, not carinate; ocelli forming an angle of about 60°; frontovertex slightly shiny, with distinct, fairly regular, polygonally reticulate sculpture of mesh size hardly smaller than diameter of eye facet, deepest in ocellar area; narrowest area between eye and scrobe slightly more than 2X as wide as diameter of anterior ocellus, area immediately below lowest part of eye with distinct, polygonally reticulate sculpture; scrobes very shallow, meeting, narrowly ∩-shaped, not sharply margined; interantennal prominence with similar sculpture to frontovertex, dorsally rounded; temple with slightly shallower, irregular, elongate sculpture, gena with slightly deeper, more regular, polygonally reticulate sculpture; antenna as in Fig. 1023; scape subcylindrical, about 8X as long as broad; funicle with segments distinctly bilaterally flattened, F1-F3 slightly longer than broad, F4-F6 transverse, F4 and F5 widest; funicle with linear sensilla present only on F3-F6; clava not broadened, only slightly longer than F5-F6 combined, sutures hardly oblique, sensory area enlarged, extending ventrally about one-third along clava, but apex broadly rounded appearance; eye not reaching occipital margin, separated by a little more than 2X diameter of facet, clothed in numerous, inconspicuous, short setae, each a little shorter than diameter of facet; inner eye margins strongly diverging anteriorly; malar sulcus absent; clypeal margin weakly concave medially; mandible tridentate; apical segment of maxillary palpus relatively broad and conspicuous, but hardly longer than radicle. Relative measurements: HW 72, HH 89, FV 20.5, POL 11, OOL 1, OCL 9.5, AOL 12, EL 58, EW 34, MS 29, SL 55, SW 7.

Thorax (Fig. 1021) with pronotum medially exposed behind head, about as long as mesoscutum and with irregular, polygonally reticulate sculpture that is a little shallower than that on frontovertex; mesoscutum with similar sculpture to pronotum, but shallower and a little more regular; axilla with similar sculpture to that on frontovertex; scutellum with similar sculpture to that on axilla, but partly indistinct and more elongate on side; visible part of mesoscutum about 2.2X as broad as long; scutellum about as long as broad, with a distinct subapical tuft, setae mostly slightly more than half as long as scutellum; mid tibia without an external carina; hind femur about 6X as long as broad; fore wing with venation and setation as in Figs 1022, 1023; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak; propodeum (Fig. 1021) medially about 0.32X as long as scutellum, completely smooth. Relative measurements: FWL 78, FWW 24; HWL 69, HWW 14.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium reaching about half-way to apex; syntergum about as long as mid tibia, with apex narrowly slightly angular; ovipositor (Fig. 1019) slightly exserted, the exserted part about one-third length of mid tibial spur or about 0.1X mid tibia. Relative measurements: OL 74.5, GL 16.5 [MT 50.5].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Guanacaste NP (error for Santa Rosa NP), near HQ, MT/YPT, 2-10.iii.1990 (J.S. Noyes). Holotype in NHMUK.

COMMENTS. *Cheiloneurus leone* is very close to *banksi* (Howard, 1898) and *flaccus* (Walker, 1847), both known from the southern USA. All three species have the flagellar segments broadened and flattened with F5 broadest and at least as wide as F6 or clava or a little wider and the apex of the clava symmetrically rounded. It is closer to *flaccus* in having slightly more slender funicle segments with F3 longer than broad, F4 subquadrate and F5 transverse whilst in *banksi* F3-F5 are all transverse. It differs from both *flaccus* and *banksi* in having F1 apically not more than 1.2X as wide as the pedicel whereas in both *flaccus* and *banksi* F1 is conspicuously broadened apically and very nearly 2X as wide as the pedicel. In general *flaccus* is darker in having the scape dark brown, the scutellum proximally dark brown and the hind basitarsus dark brown whereas in *leone* and *banksi* the scape, scutellum and hind basitarsus are yellow or pale orange.

***Cheiloneurus betes* sp.nov.**

(Figs 1025-1029; Hab. ♀ 152)

DIAGNOSIS. *Female* (length about 1.2-1.6mm): body mostly orange with posterior part of mesoscutum, propodeum and gaster dark brown, mouth margin brown, temple and gena with a diagonal brown streak, paler areas with a weak metallic sheen, darker areas with a weak to moderate metallic sheen; antenna (Fig. 1027) with scape mostly pale orange, ventral margin brown; pedicel white with a dark brown streak; funicle pale orange, mixed brown; clava dark brown; mesoscutum with silvery setae in posterior half; coxae white; legs otherwise white to pale orange, with some brown areas; fore wing (Fig. 1029) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation, a larger one opposite and a subtriangular hyaline area at apex; head about 6.6X as wide as frontovertex, in facial view slightly broader than long, subcircular, genae converging, weakly curved inwards, more strongly so near mouth; frontovertex with one seta medially between anterior ocellus and scrobes; eye separated from scrobe by about 1.5X diameter of anterior ocellus, area between eye and scrobe completely smooth; scrobes deep, sharply margined and carinate below eye; interantennal prominence dorsally rounded, with a weak median ridge and with about 30 inconspicuous setae; mandible tridentate; antenna (Fig. 1027) with scape about 1.7X as long as broad; funicle with segments transverse; linear sensilla on F5-F6; clava 3-segmented, about as long as pedicel and funicle combined, sensory area enlarged, extending about 0.7X along ventral surface of clava, apex obliquely truncate; head width greater than flagellum length but slightly less than pedicel and flagellum combined; mesoscutum (Fig. 1028) anteriorly with fine, longitudinally elongate, striate to striate-reticulate sculpture, posteriorly with polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 1029) about 2.5-2.6X as long as broad; parastigma downcurved; costal cell dorsally naked but for a single setae at apex, ventrally naked but for two lines of setae in proximal 0.4X; area below proximal part of parastigma with an irregular line of five or six setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 1026); apical bristle of postmarginal vein slightly more than 0.5X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum with about four or five silvery setae adjacent to spiracle, side naked; syntergum about 0.8X as long as mid tibia with apex more or less rounded; ovipositor (Fig. 1025) about 3.7X gonostylus or about 1.4X as long as mid tibia; gonostylus about 1.2X as long as mid tibial spur; exserted part of ovipositor about 0.3X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.62mm; excluding ovipositor, 1.53mm (CPD).

Head largely pale orange; occiput with a triangular brown spot above foramen; frontovertex slightly dusky, ocellar area with a weak blue and purple sheen, anterior parts of frontovertex with

a slightly weaker green sheen, area immediately above scrobes brassy and above this purple; temple, gena and area below eye with a weak brassy, purple and green sheen; scrobal area with a very weak brassy and purple sheen; a curved brown line between mouth margin and toruli; temple with a diagonal brown line from occipital margin connecting outside torulus with a brown line along mouth margin; frontovertex clothed with inconspicuous, pale brown setae, a line of more conspicuous, translucent setae below eye; interantennal prominence with moderately dense, short, translucent setae; antenna (Fig. 1027) with radicle pale orange, apex narrowly dark brown; scape very pale orange, apex white, ventral margin brown nearly to apex; pedicel mostly white with a dark brown streak along dorsal surface; funicle mostly pale orange but segments internally marked brown; clava dark brown almost black; maxillary palpus white; pronotum mostly orange, neck and area above coxa dark brown; propleuron orange, in front of coxa dark brown; prosternum yellow; mesoscutum orange (Fig. 1028) in anterior half, posterior half dark brown with a strong metallic blue-green and green sheen, posterior margin purple-brown with a slight brassy and purple sheen, anterior part clothed in relatively sparse golden brown and dark brown setae, posterior part with relatively dense silvery setae, mixed with a few dark brown setae; tegula orange, apex orange-brown; axilla and scutellum orange, clothed in translucent golden brown and dark brown setae, scutellar tuft black; metanotum orange; mesopleuron mostly orange with a weak brassy sheen, posteriorly slightly dusky with a slight purple and green sheen; mesosternum pale orange; fore coxa white; fore femur mostly white, apical one-third orange and pale brown, tibia pale orange, dorsal margin pale brown proximally, tarsus pale orange, pale orange-brown at apex; mid coxa white, ventrally dirty white, mid femur white, slightly dusky towards apex, tibia largely pale orange with knee brown, an incomplete brown subbasal ring and dorsal margin brown along two-thirds of its length, spur and tarsus very pale orange, almost white; hind coxa white; hind femur white at extreme base, otherwise pale orange but margined brown distally with a small, brown, apical spot, tibia pale orange, with an incomplete, subbasal brown ring and a brown spot on ventral margin beyond this, tarsus pale orange, brown at apex; fore wing (Fig. 1029) mostly infuscate, hyaline towards base and at apex; submarginal vein largely very pale orange, otherwise venation brown; propodeum orange medially with a slight brassy lustre, laterally brown with a slight blue and purple sheen, side orange with a weak brassy sheen, 6 or 7 translucent, pale setae outside spiracle; gaster dark brown with a coppery, purple and green sheen, Gt1 metallic green and brassy, medially purple, orange proximally on side, syntergum largely orange laterally, side and venter mainly with coppery, green, blue and brassy reflections; gonostylus very pale orange.

Head about 6.6X as wide as frontovertex, in profile about 1.7X as high as deep, frontovertex quite flat just above scrobes then abruptly curved towards mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, weakly carinate; ocelli forming an angle of about 45°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture, slightly deeper in ocellar area, mesh size slightly smaller than diameter of eye facet; area immediately above scrobes with slightly transversely elongate sculpture, interantennal prominence with shallow sculpture, temple completely smooth adjacent to eye, otherwise with shallow, irregular, longitudinally elongate sculpture, gena with slightly deeper, irregular, reticulate sculpture; area between eye and scrobe about as 1.5X as broad as diameter of anterior ocellus and completely smooth; scrobes deep, meeting dorsally, sharply margined, carinate below eye, very broadly ∩-shaped, interantennal prominence dorsally rounded and with a weak median ridge; antenna as in Fig. 1027; scape strongly broadened and flattened, broadest in distal half, about 1.7X as long as broad; funicle with all segments transverse, clearly becoming wider and larger distally so that F6 is largest and widest; clava strongly broadened, about as long as pedicel and funicle combined, sutures oblique, sensory area very enlarged, extending about 0.7X along ventral surface of clava, giving it a distinct, strongly, obliquely truncate appearance; eye reaching occipital margin, clothed with numerous, conspicuous short setae that are a little shorter than diameter of facet; inner eye margins clearly converging below anterior ocellus; malar sulcus absent; clypeal margin medially weakly concave; mandible with one acute tooth and a broad, concave truncation, more or less tridentate; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 99, HH 96, FV 15, POL 7, OOL 0.5, OCL 9, AOL 9, EL 67, EW 52, MS 44, SL 45, SW 27.

Thorax (Fig. 1028) with pronotum hardly exposed behind head and only about 0.5X as long as mesoscutum; pronotum with fairly regular, polygonally reticulate sculpture that is slightly deeper

than that in ocellar area; mesoscutum in anterior half with fine, longitudinally elongate, striate to striate-reticulate sculpture of similar depth to sculpture on pronotum, posterior part with slightly shallower polygonally reticulate sculpture; axilla and scutellum with polygonally reticulate sculpture of similar depth to that on pronotum but of slightly larger mesh on scutellum, sculpture on scutellum more elongate laterally; visible part of mesoscutum about 2X as broad as long; scutellum nearly 1.2X as broad as long with a distinct subapical tuft, setae mostly about 0.5X as long as scutellum; hind femur about 4.2X as long as broad; fore wing with venation and setation as in Figs 1026, 1029; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 1026); mid tibia with a weak external subbasal carina for about half its length; propodeum (Fig. 1028) medially about 0.16X as long as scutellum and virtually smooth. Relative measurements: FWL 105, FWW 42; HWL 88, HWW 25.

Gaster with hypopygium reaching about 0.4X to apex; syntergum about 0.9X as long as mid tibia, with apex weakly angular, more or less rounded; ovipositor slightly exserted, about one-third as long as mid tibial spur or 0.1X as long as mid tibia.

Paratype. Funicle with linear sensilla present only on F5-F6; gaster without "gland-like" structures on Gt1 or Gt5; ovipositor Fig. 1025. Relative measurements: OL 37, GL 10 [MT 27].

Variation. Females vary in overall length from 1.18-1.62mm, F1-F4 may be slightly dusky externally, the brown marks on the hind tibia may be connected externally and the fore wing varies from 2.5-2.6X as long as broad.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Heredia**, OTS La Selva, 100m, canopy fog *Pentaclethra*, FPM/03, 6.iii.1993 (INBio/OET). Holotype in MZUCR, paratype in NHMUK.

COMMENTS. *Cheiloneurus betes* is superficially similar to *praenitens* Waterston (1922), a hyperparasitoid of *Trioza* Förster (Hemiptera: Triozidae) known from Jamaica and Cuba. Both species have a strongly broadened scape and generally pale orange colouration. However, in *betes* the scape is about 1.7X as long as broad and abruptly narrowed subapically, the clava is relatively large and longer than the pedicel and funicle combined, the mouth margin is marked dark brown and the hind tibia does not have a pair of brown rings. In *praenitens* the scape is about 2.3X as long as broad and gradually narrowed subapically, the clava is about as long as the funicle, the mouth margin is orange and the hind tibia has a pair of faint brown rings.

See also comments under *nasica* (p. 441).

Cheiloneurus diaces **sp.nov.**

(Figs 1030-1036)

DIAGNOSIS. *Female* (length about 1.5mm): body mostly orange with some dark brown to black areas with a weak to moderate metallic sheen on head, mesoscutum, and gaster; mouth margin brown, temple and gena with a diagonal, brown streak; antenna (Fig. 1034) with scape mostly pale orange with ventral margin brown; pedicel pale orange with a dark brown longitudinal streak; funicle generally orange to orange-brown, F6 dark brown; clava dark brown; posterior half of mesoscutum with dense silvery setae; fore and mid coxae white, mid coxa pale orange; legs mostly pale orange with distinct brown areas; fore wing (Fig. 1030) mostly infuscate with basal cell almost completely hyaline, a small hyaline area at apex of venation and an opposite hyaline area on posterior wing margin, apex with a large, subtriangular hyaline area; head (Fig. 1035) about 9X as wide as frontovertex, in facial view hardly broader than long, subcircular with genae weakly converging, but slightly more so near mouth margin; frontovertex with one or

two setae medially above scrobes; eye separated from scrobe by about 2X diameter of anterior ocellus, area between eye and scrobe completely smooth, scrobal margin sharp; interantennal prominence with about 20 inconspicuous setae and with a distinct median keel dorsally; mandible with three teeth; antenna (Fig. 1034) with scape about 1.9X as long as broad; funicle segments quadrate or transverse; head width slightly less than flagellum length; linear sensilla on F5-F6; clava 3-segmented, about as long as funicle; sensory area large and forming an oblique truncation, extending about 0.5X along ventral margin; mesoscutum (Fig. 1036) anteriorly with fine striate sculpture, posteriorly with relatively shallow, uniform, polygonally reticulate sculpture; scutellum with a distinct apical tuft of setae; wings fully developed; fore wing (Fig. 1030) about 2.5X as long as broad; parastigma clearly downcurved; costal cell more or less naked at apex, with a ventrally line of setae in proximal half; area below proximal part of parastigma with a line of three pale setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that extends as a curved line someway into disc (Fig. 1032); apical bristle of postmarginal vein about 0.8X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with about six setae adjacent to spiracle, side naked; syntergum about as long as mid tibia; ovipositor (Fig. 1031) about 3.8X gonostylus or 1.5X as long as mid tibia; gonostylus slightly longer than mid tibial spur; exserted part of ovipositor about 0.3X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.52mm; excluding ovipositor, 1.47mm (CPD).

Head mostly pale orange to orange-brown; occiput pale orange; frontovertex generally orange-brown, occipital margin pale orange, ocellar area distinctly metallic blue and purple, more anteriorly with only a weak purple sheen and some blue reflections along inner eye margin; temple and gena pale orange with a narrow, oblique brown streak from about mid way along occipital margin towards, but not reaching, torulus; temple and upper gena with a very weak brassy, green and purple sheen; scrobal area and area between eye and scrobe with a very weak brassy and purple sheen, additionally slightly coppery below eye; lower part of gena with very weak purple and brassy reflections; scrobes delimited dorsally by a very weak, narrow, pale brown line that laterally hardly reaches level with torulus; area below toruli with a curved, brown, submarginal line that more or less meets the mouth margin below torulus; frontovertex clothed with inconspicuous, pale brown setae; maxillary palpus white; antenna (Fig. 1034) with radicle pale orange, apex brown; scape mostly pale orange, extreme distal apex white, ventral margin narrowly bordered dark brown nearly to apex, dark margin relatively broad proximally on inner surface; pedicel mostly pale orange with a dark brown streak internally along its length; F1-F4 pale orange-brown, F3-F4 mixed pale orange dorsally, F5 mostly pale orange, mixed brown ventrally, F6 dark brown, clava dark brown, virtually black; pronotum mostly orange, neck broadly brown; pronotum dark brown immediately above coxa; mesoscutum orange in anterior half, posterior half dark brown with a dark metallic blue sheen with purple reflections, paler area clothed in relatively sparse brown setae, darker area clothed in dense, translucent, silvery setae, posterior margin slightly dusky orange with a slight purple sheen; tegula orange with apex dark brown; axilla and scutellum orange, axilla clothed with brown setae, scutellum clothed with translucent pale brown setae, subapical tuft black; metanotum orange; mesopleuron pale orange, slightly dusky posteriorly, anteriorly with a weak brassy and purple sheen, posteriorly with a weak copper, purple and green sheen; fore coxa white; fore femur concolourous with coxa basally, apex pale orange with a pale brown spot on dorsal margin, tibia pale orange with dorsal margin brown subbasally, tarsus orange; mid coxa pale orange; mid leg otherwise coloured similarly to fore leg, except that mid tibia has dorsal margin brown for most of its length and the mid tibial spur and tarsus are pale orange; hind coxa white, femur concolourous at base, but mostly pale orange, dark brown at extreme apex, tibia pale orange with dorsal margin brown subbasally, tarsus orange; fore wing (Fig. 1030) mostly infuscate, hyaline towards base and at apex; submarginal vein pale brown, rest of venation brown; propodeum pale orange-brown, laterally with a weak blue sheen, on sides with a weak purple and blue sheen, some translucent setae near spiracle; gaster dark brown, dorsally with brassy, coppery, purple and green reflections, sides and venter similar, but basal tergite laterally with a distinct metallic, blue-green sheen; outer plates of ovipositor with weak blue, brassy and purple reflections; gonostylus pale orange.

Head (Fig. 1035) nearly 9X as wide as frontovertex, in profile about 1.6X as high as

deep, anteriorly quite straight below top of scrobes, interantennal prominence virtually flat level with torulus; occipital margin sharp, not carinate; ocelli forming an angle of about 45°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh size conspicuously smaller than diameter of eye facet; area between eye and scrobe completely smooth; scrobes shallow, very broadly ∩-shaped, but separated dorsally by a narrow carinate ridge extending medially from interantennal prominence to dorsal scrobal margin which is mostly sharp, scrobe roundly margined laterally and completely smooth; temple and posterior gena virtually smooth, with shallower, more irregular and longitudinally elongate sculpture than on main part of frontovertex, anterior gena with slightly deeper, irregular, reticulate sculpture; antenna as in Fig. 1034; scape broadened and flattened, about 1.9X as long as broad; funicle with F1 quadrate, remaining segments clearly transverse, segments broadest distad, linear sensilla present only on F5-F6; clava strongly broadened, about as long as funicle and pedicel combined, sutures oblique, sensory area enlarged, extending ventrally about 0.5X along clava, giving it an obliquely truncate appearance; eye reaching occipital margin, virtually naked, but clothed in extremely short setae that are conspicuously shorter than diameter of facet; inner eye margins converging strongly below anterior ocellus before diverging above scrobes; malar sulcus more or less absent, but weakly indicated immediately below eye; clypeal margin evenly concave; mandible with 3 teeth, middle tooth longest, upper tooth apically obtuse; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 66, HH 67, FV 7.5, OD 4.5, POL 4.5, OOL 0, OCL 6, AOL 10, EL 50, EW 34, MS 34, SL 34, SW 17.5.

Thorax (Fig. 1036) with irregular, polygonally reticulate sculpture on pronotum that is similar to that on frontovertex; mesoscutum posteriorly with polygonally reticulate sculpture that is conspicuously deeper and coarser than that on frontovertex, anteriorly in middle with lineolate reticulate sculpture and remainder with very fine longitudinally striate sculpture; axilla and scutellum mostly with fairly regular, polygonally reticulate sculpture, but that on scutellum more longitudinally elongate especially on side where it becomes coarse striate; visible part of mesoscutum about 2.4X as broad as long; scutellum very slightly broader than long with a distinct subapical tuft, setae mostly about 0.5X as long as scutellum; hind femur about 4.5X as long as broad; fore wing with venation and setation as in Figs 1030, 1032; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 1032); mid tibia with a distinct longitudinal carina externally for about 0.6X its length; propodeum with a single seta posterior to spiracle and 4 or 5 anterior to it, side completely smooth, medially about 0.17X as long as scutellum and virtually smooth. Relative measurements: FWL 74, FWW 29.5; HWL 57, HWW 15.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium (Fig. 1033) reaching about 0.4X to apex; syntergum very nearly as long as mid tibia, with apex acute; ovipositor (Fig. 1031) hardly exserted, the exserted part about one-quarter as long as mid tibial spur or less than 0.1X as long as mid tibia. Relative measurements: OL 54, GL 14 [MT 37].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Cacao (ACG), 1100m, MT/YPT, 26.i-24. ii.1996 (J.S. Noyes). Holotype in NHMUK.

COMMENTS. *Cheiloneurus diaces* is very similar to *letos*, both species being generally pale orange in colour with mesoscutum dark posteriorly, and having a relatively narrow frontovertex, a relatively long clava, flattened and broadened scape, and a single line of below the parastigma. The two species can be separated by the relative width of the scape (about 1.9X as long as broad in *diaces* and 2.4X in letos) and the distribution of setae on the ventral surface of the costal cell of

the fore wing (apical two-thirds naked in *diaces*, a narrowly interrupted line in *letos*).

Cheiloneurus diaces is superficially very similar to *inimicus* Compere (1925), a hyperparasitoid of soft scales (Hemiptera: Coccidae) in the southern USA. The two can immediately be separated because in *diaces* the top of the scrobes is carinately margined, the clava is very large, longer than the pedicel and funicle combined and the scape is more than 2X as long as wide, whereas in *inimicus* the top of the scrobes is rounded, the clava is shorter than the funicle and the scape is much more than twice as long as broad.

See also comments under *jeroba* (p. 410), *finator* (p. 417) and *fautrix* (p. 425).

Cheiloneurus ariston **sp.nov.**

(Figs 1037-1043; Hab. ♀ 153)

DIAGNOSIS. *Female* (length about 1.2-1.8mm): body mostly orange with propodeum laterally and gaster basally and apically dark brown, mouth margin brown, temple and gena with a diagonal brown streak, paler areas with a weak metallic sheen, darker areas with a weak to moderate metallic sheen; antenna (Fig. 1041) with scape mostly pale orange, ventral margin partially brown; pedicel pale orange with a dark brown streak; funicle almost completely orange, F1-F2 slightly dusky; clava dark brown; mesoscutum with silvery setae in posterior half; fore and hind coxae white, mid coxa pale orange; legs otherwise more or less completely white to pale orange with some dark brown areas; fore wing (Fig. 1042) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation, a weaker one opposite and a subtriangular hyaline area at apex; head (Fig. 1040) about 5.4-5.6X as wide as frontovertex, in facial view about as long as broad, subcircular, genae converging, moderately curved inwards, more strongly so near mouth; frontovertex with about 3-7 setae medially between anterior ocellus and scrobes; eye separated from scrobe by about diameter of anterior ocellus or a little less, area between eye and scrobe completely smooth; scrobes moderately deep, sharply margined and carinate below eye; interantennal prominence dorsally acute, with a distinct median ridge and with about 20-30 inconspicuous setae; mandible more or less tridentate; antenna (Fig. 1041) with scape about 2.5-2.7X as long as broad; funicle with segments hardly longer than broad or transverse; linear sensilla on F4-F6; clava 3-segmented, slightly longer than funicle, sensory area enlarged, extending about 0.5X along ventral surface of clava, apex obliquely truncate; head width slightly less than flagellum length; mesoscutum (Fig. 1043) anteriorly with fairly coarse, longitudinally elongate, striate-reticulate sculpture, posteriorly with shallower polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 1042) about 2.5-2.6X as long as broad; parastigma downcurved; costal cell dorsally naked but for one or two setae at apex, ventrally with a complete or nearly complete line of setae; area below proximal part of parastigma with up to nine or ten setae arranged in two lines, these continued as a single line along cubital vein towards base of wing; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 1037); apical bristle of postmarginal vein about 0.3X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum with about 5-7 silvery setae adjacent to spiracle, side naked; syntergum very slightly shorter than mid tibia with apex more or less rounded; ovipositor (Fig. 1038) about 3.8X gonostylus or about 1.4X as long as mid tibia; gonostylus about 1.1-1.3X as long as mid tibial spur; exserted part of ovipositor about 0.3-0.9X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.50mm; excluding ovipositor, 1.46mm (CPD).

Head largely orange; occiput pale orange with a small, triangular, dark brown mark above foramen; frontovertex orange with a weak brassy sheen, some stronger purple and blue reflections in ocellar area; area between eye and scrobe with a purple and brassy sheen; a curved brown line between mouth margin and toruli; temple with a brown line from occipital margin connecting outside torulus with brown line along mouth margin; temple and gena with a weak brassy, purple and green sheen, stronger purple in brown areas; scrobal area with a very weak brassy and purple sheen; frontovertex clothed with inconspicuous, pale brown setae, a line of more conspicuous, translucent setae below eye; interantennal prominence with moderately dense, short, translucent setae; antenna (Fig. 1041) with radicle pale orange, apex narrowly dark brown; scape orange

ventral margin brown ventrally from base to widest part, brown area more extensive on inner surface; pedicel mostly pale orange with a dark brown streak along inner surface; funicle almost entirely orange, but F1 brown ventrally; clava dark brown; maxillary palpus very pale orange; pronotum mostly orange, neck and area above coxa dark brown; propleuron orange, in front of coxa dark brown; prosternum pale orange; mesoscutum orange in anterior two-thirds, posterior one-third slightly dusky, hardly darker with purple and dark blue reflections, posterior margin purple-brown with a slight brassy and purple sheen, anterior part clothed in relatively sparse golden brown and dark brown setae, posterior part with relatively dense silvery setae, mixed with a few dark brown setae; tegula orange, apex orange-brown; axilla and scutellum orange, clothed mainly with dark brown setae, but also a few translucent pale brown setae, scutellar tuft black; metanotum orange-brown; mesopleuron mostly orange with a weak brassy sheen, posteriorly brown with a distinct brassy and purple sheen; mesosternum orange; fore coxa white; fore femur mostly white, apical one-third orange and pale brown, tibia pale orange, dorsal margin pale brown proximally, tarsus pale orange; mid coxa very pale, dusky orange; mid femur white, slightly dusky and pale orange towards apex, tibia largely pale orange with knee brown, an incomplete brown subbasal ring and dorsal margin brown along half its length, spur and tarsus pale orange; hind coxa white; hind femur white at extreme base, otherwise pale orange but weakly margined brown distally, tibia pale orange, tarsus pale orange; fore wing (Fig. 1042) mostly infuscate, hyaline towards base and at apex; submarginal vein largely dusky, pale orange, otherwise venation brown; propodeum orange, medially with a slight brassy lustre, laterally with a slight purple and brassy sheen, side with a weak green, brassy and purple sheen, 3 or 4 translucent, pale setae anterolateral to spiracle; gaster mostly orange with a green, brassy and purple lustre, Gt1 and Gt2 orange-brown laterally, Gt3-Gt5 slightly dusky medially, apex of syntergum dark brown, metallic sheen stronger on darker areas; gonostylus very pale orange.

Head (Fig. 1040) about 5.4X as wide as frontovertex, in profile about 1.6X as high as deep, frontovertex weakly curved to top of scrobes then abruptly angled towards mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, weakly carinate; ocelli forming an angle of about 45°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture, slightly deeper in ocellar area, mesh size generally slightly smaller than diameter of eye facet, sculpture slightly transversely elongate immediately above scrobes; interantennal prominence with shallow sculpture; temple virtually completely smooth adjacent to eye, otherwise with shallow, irregular, longitudinally elongate sculpture, gena with slightly deeper, irregular, reticulate sculpture; area between eye and scrobe about 0.75X as wide as diameter of anterior ocellus and completely smooth; scrobes moderately deep, meeting dorsally, sharply margined, carinate below eye, very broadly ∩-shaped, interantennal prominence dorsally acute and with a distinct median ridge; antenna as in Fig. 1041; scape broadened and flattened, broadest below middle and subtriangular, about 2.5X as long as broad; F1 very slightly longer than broad, F2-F6 transverse, segments wider and larger distally so that F6 is largest and widest; clava broadened, slightly longer than funicle, sutures oblique, sensory area very enlarged, extending about 0.5X along ventral surface, giving it a distinct, strongly, obliquely truncate appearance; eye reaching occipital margin, clothed with inconspicuous, short setae that are much shorter than diameter of facet; inner eye margins subparallel and diverging below anterior ocellus; malar sulcus absent; clypeal margin medially virtually straight; mandible with one acute tooth and a broad, slightly concave truncation, virtually tridentate; apical segment of maxillary palpus not enlarged, but about 2X as long as radicle. Relative measurements: HW 86.5, HH 89.5, FV 16, POL 6.5, OOL 0, OCL 7.5, AOL 9, EL 59, EW 47, MS 35, SL 46, SW 18.5.

Thorax (Fig. 1043) with pronotum hardly exposed behind head and about 0.6X as long as mesoscutum; pronotum with fairly regular, polygonally reticulate sculpture that is about as deep as that between posterior ocelli; mesoscutum in anterior two-thirds with fairly coarse, longitudinally elongate, striate-reticulate sculpture of similar depth to that on pronotum, sculpture more distinctly cellular medially, posterior one-third with slightly shallower polygonally reticulate sculpture; axilla and scutellum with fairly coarse polygonally reticulate sculpture of similar depth to that on pronotum but axilla with slightly larger mesh, and scutellum medially of smaller mesh, but laterally of larger mesh and conspicuously longitudinally elongate; visible part of mesoscutum about 1.8X as broad as long; scutellum very slightly longer than broad with a distinct subapical

tuft, setae mostly about half as long as scutellum; hind femur about 4.7X as long as broad; fore wing with venation and setation as in Figs 1037, 1041; costal cell with 2 or 3 setae dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 1037); mid tibia with a weak external subbasal carina for about half its length; propodeum (Fig. 1043) medially about 0.11X as long as scutellum and virtually smooth. Relative measurements: FWL 88, FWW 34.5; HWL 74, HWW 19.

Gaster with hypopygium reaching about 0.4X to apex; syntergum about 0.9X as long as mid tibia, with apex weakly angular, more or less rounded; ovipositor slightly exserted, about 0.3X as long as mid tibial spur or 0.1X as long as mid tibia.

Paratype. Funicle with linear sensilla present only on F4-F6; gaster without "gland-like" structures on Gt1 or Gt5; hypopygium (Fig, 1039); ovipositor (Fig, 1038). Relative measurements: OL 56.5, GL 15 [MT 41].

Variation. Females vary in overall length from 1.23-1.75mm, the head varies from about 5.4-5.6X as wide as the frontovertex, the interantennal has about 20-30 inconspicuous setae, the scape is about 2.5-2.7X as long as broad, the fore wing is about 2.5-2.6X as long as broad and the exserted part of ovipositor may be about 0.3-0.9X as long as mid tibial spur.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Maritza (ACG), 700m, MT/YPT, 20.i-24.ii.1996 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, same data as holotype; 1♀, **Puntarenas**, PN Corcovado, Los Patos, 200m, 8°33'N 83°30'W, ii.2000 (J.S. Noyes, J. Azofeifa); 1♀, Puntarenas, Golfito, Est. Agujas, LS 526550 276750, 300m, #61207, 22.xii.2000-9.i.2001 (J. Azofeifa); 1♀, Puntarenas, PN Corcovado, Est. Agujas, Queb. La Bonanza, LS 275700 524800, 500m, ii-iii.2001 (J. Azofeifa). Holotype in MZUCR, paratypes in NHMUK and MZUCR.

COMMENTS. *Cheiloneurus ariston* can be distinguished from other similar species (*alopes*, *dirce*, *amethes*, *omorus*, etc.) by the largely pale orange scape and funicle. Other similar species have the scape and funicle more extensively marked brown.

Cheiloneurus jeroba **sp.nov.**

(Figs 1044-1047)

DIAGNOSIS. *Female* (length about 1.5mm): body mostly orange with posterior three-fifths of mesoscutum and gaster dark brown, mouth margin dark brown, temple and gena with a diagonal brown streak, paler areas with a weak metallic sheen, darker areas with a weak to moderate metallic sheen; antenna (Fig. 1045) with scape mostly pale orange, ventral margin brown; pedicel pale orange with a dark brown streak; funicle mostly pale orange-brown mixed dark brown; clava dark brown; mesoscutum with silvery setae in posterior three-fifths; fore and hind coxae white, mid coxa pale orange; legs otherwise white to pale orange, with a few brown areas; fore wing (Fig. 1044) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation, a larger, vaguely hyaline area opposite and apex hyaline; head about 6.0X as wide as frontovertex, in facial view about as broad as long, subcircular, genae converging, evenly curved but slightly more strongly curved inwards near mouth; frontovertex with two setae medially between anterior ocellus and scrobes; eye separated from scrobe by slightly less than diameter of anterior ocellus, area between eye and scrobe completely smooth; scrobes moderately deep, sharply margined below eye; interantennal prominence dorsally rounded with about 40 fairly conspicuous setae; mandible with two acute teeth and a truncation; antenna (Fig. 1045) with scape about 2.6X as long as broad; all funicle segments transverse; linear sensilla on F5-F6; clava very large, 3-segmented, about as long as pedicel and funicle combined; sensory area enlarged, extending ventrally about

0.6X length of clava, apex strongly obliquely truncate; head width nearly as much as length of pedicel and flagellum combined; mesoscutum (Fig. 1047) anteriorly with fine, longitudinally elongate, striate to striate-reticulate sculpture, posteriorly with polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 1044) about 2.5X as long as broad; parastigma downcurved; costal cell dorsally naked save for two or three apical setae, ventrally with a complete line of setae; area below proximal part of parastigma with a group of about 16 or 17 setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues some way into disc (Fig. 1046); apical bristle of postmarginal vein about 0.4X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with 10 or 11 silvery setae adjacent to spiracle, side naked; syntergum about as long as mid tibia with apex narrowly angular. *Male*: unknown.

Female (holotype): length, 1.47mm (AD).

Head with occiput pale orange, otherwise mostly orange; occiput with a brown spot above foramen; frontovertex a little dusky, ocellar area with distinct deep metallic blue and purple reflections, anterior part with weaker purple and blue reflections; temple, gena and area below eye with a weak brassy, purple and green sheen; scrobal area with a very weak brassy and purple sheen, mouth margin dark brown; temple with a short diagonal brown line from occipital margin towards torulus; frontovertex clothed with inconspicuous, pale brown setae, a line of more conspicuous, translucent setae below eye; antenna (Fig. 1045) with radicle pale orange, apex brown; scape pale orange, ventral margin pale brown internally; pedicel pale orange with an internal dark brown streak along its length; funicle pale orange-brown externally, dark brown internally; clava dark brown; maxillary palpus white; pronotum mostly orange, neck dark brown; prosternum orange, anterior to coxa brown; mesoscutum orange in anterior two-fifths posterior three-fifths dark brown with a dark, metallic blue and purple sheen, posterior margin purple-brown with a slight purple and brassy sheen, anterior part clothed in relatively sparse dark brown setae, posterior part with relatively dense silvery setae, mixed with a few dark brown setae; tegula orange, apex orange-brown; axilla and scutellum orange, clothed in dark brown setae, scutellar tuft black; metanotum dusky orange; mesopleuron mostly orange with a weak brassy sheen, posterior half slightly dusky with a slight purple and green sheen; fore coxa white; fore femur largely white, apically pale orange, tibia pale orange margined pale brown subbasally, tarsus pale orange-brown; mid coxa mostly pale orange, dusky proximally; mid femur white, tibia pale orange with dorsal margin brown in proximal one-third, spur and tarsus very pale orange, almost white; hind coxa white; hind femur pale orange with a small brown apical spot, tibia very pale orange with a weak, dorsal, subbasal brown mark, tarsus very pale orange; fore wing (Fig. 1044) mostly infuscate, hyaline towards base; submarginal vein largely yellow, otherwise venation brown; propodeum orange, laterally with a slight green lustre, 12 or 13 translucent, white setae outside spiracle; gaster dark brown, with a green, brassy, coppery and purple lustre, Gt1 more conspicuously green dorsally, gonostylus dark brown.

Head about 6X as wide as frontovertex in profile about 1.8X as high as deep, anteriorly quite straight below top of scrobes, interantennal prominence hardly protuberant; occipital margin sharp, acute, but not carinate; ocelli forming an angle of about 40°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture, deeper in ocellar area, shallower anterior, mesh size slightly smaller than diameter of eye facet; interantennal prominence with shallow sculpture, scrobes completely smooth, temple and posterior gena with shallow, irregular, longitudinally elongate sculpture, anterior gena with slightly deeper, irregular, reticulate sculpture; area between eye and scrobe completely smooth, a little narrower than diameter of anterior ocellus; scrobes moderately deep, meeting dorsally, sharply margined only immediately below eye, very broadly ∩-shaped, interantennal prominence dorsally rounded; antenna as in Fig. 1045; scape broadened and flattened, about 2.6X as long as broad; funicle with all segments transverse, larger and broader distad; funicle with linear sensilla present only on F5-F6; clava enlarged, as long as pedicel and funicle combined, sutures oblique, sensory area enlarged, extending ventrally about 0.6X along clava, giving it a distinct, strongly obliquely truncate appearance; eye reaching occipital margin, clothed with extremely short setae that are much shorter than diameter of facet; inner eye margins converging below anterior ocellus; malar sulcus absent; clypeal margin weakly concave medially;

mandible with 2 acute teeth, and a truncation; apical segment of maxillary palpus hardly enlarged, hardly longer than radicle. Relative measurements: HW 90, HH 90, FV 15, POL 8, OOL 0, OCL 8.5, AOL 14, EL 64, EW 51, MS 42, SL 38, SW 14.5.

Thorax (Fig. 1047) with irregular, polygonally reticulate sculpture on pronotum that is similar to that on frontovertex in ocellar area; mesoscutum in anterior two-fifths with fine, longitudinally elongate striate to striate-reticulate sculpture, posterior two-fifths with fairly regular, polygonally reticulate sculpture that is slightly shallower than that on pronotum; axilla and scutellum with similar sculpture to pronotum, but perhaps a little coarser, axilla posteriorly weakly sculptured, sculpture on scutellum more elongate laterally; visible part of mesoscutum about 1.8X as broad as long; scutellum about as broad as long with a distinct subapical tuft, setae mostly about 0.4X as long as scutellum; hind femur about 3.8X as long as broad; fore wing with venation and setation as in Figs 1044, 1046; costal cell dorsally with 1 or 2 setae at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 1046); mid tibia without an external carina; propodeum (Fig. 1047) medially about 0.10X as long as scutellum and more or less smooth, but with some shallow sculpture dorsally on side. Relative measurements: FWL 113.5, FWW 45; HWL 94, HWW 26.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium reaching about 0.4X to apex; syntergum about as long as mid tibia, with apex narrowly angular; ovipositor with apex missing, gonostyli missing.

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Cartago**, Turrialba, CATIE, 22.ii.1991 (J.S. Noyes). Holotype in NHMUK.

COMMENTS. Even though apical parts of ovipositor are missing the species is being described here because of the short funicle and unusually enlarged clava. The only other similar species with a large clava is *diaces*. *Cheiloneurus jeroba* can be distinguished from *diaces* by the scape being at least about 2.6X as long as broad, the head about 6X as wide as the frontovertex, the scrobal margin not sharply margined medially, the mandible with 2 teeth and a distinct truncation, the ventral surface of the costal cell of the fore wing having a complete line of setae and a group of about 15 setae below the parastigma. In diaces the scape is less than 2X as long as broad, the head is more than 8X as wide as the frontovertex, the scrobal margin is sharp medially, the mandible is tridentate, the ventral surface of the costal cell is virtually naked, with only a few setae in proximal half and there is only a single line of at most 6 or 7 setae below the parastigma.

Cheiloneurus letos **sp.nov.**

(Figs 1048-1053; Hab. ♀ 154)

DIAGNOSIS. *Female* (length about 1.3-1.4mm): body mostly orange with posterior part of mesoscutum, propodeum and gaster at least partially dark brown, sometimes completely so, mouth margin brown, temple and gena with a diagonal brown streak, paler areas with a weak metallic sheen, darker areas with a weak to moderate metallic sheen; antenna (Fig. 1053) with scape mostly pale orange, ventral margin brown; pedicel white or pale orange with a dark brown streak; funicle pale orange and mixed brown to almost completely dark brown; clava dark brown; mesoscutum with silvery setae in posterior half; fore and hind coxae white, mid coxa orange-brown; legs otherwise white to pale orange, with some brown areas; fore wing (Fig. 1050) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation, a larger one opposite and a subtriangular hyaline area at apex; head (Fig. 1051) about 5.7-7X as wide as frontovertex, in facial

view very slightly broader than long, subcircular, genae converging, moderately curved inwards, more strongly so near mouth; frontovertex with 1 or 2 setae medially between anterior ocellus and scrobes; eye separated from scrobe by about diameter of anterior ocellus, area between eye and scrobe completely smooth; scrobes deep, sharply margined and carinate below eye; interantennal prominence dorsally rounded, without a median ridge and with about 20-30 inconspicuous setae; mandible tridentate; antenna (Fig. 1053) with scape about 2.3-2.4X as long as broad; funicle with segments hardly longer than broad or transverse; linear sensilla on F5-F6; clava 3-segmented, about as long as funicle, sensory area enlarged, extending about 0.6X along ventral surface of clava, apex obliquely truncate; head width greater than flagellum length but slightly less than pedicel and flagellum combined; mesoscutum (Fig. 1052) anteriorly with fairly coarse, longitudinally elongate, striate to striate-reticulate sculpture, posteriorly with shallower polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 1050) about 2.6-2.7X as long as broad; parastigma downcurved; costal cell dorsally naked but for 1 or 2 setae at apex, ventrally with a nearly complete line of setae; area below proximal part of parastigma with an irregular line of 4 to 8 setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 1049); apical bristle of postmarginal vein about 0.6X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum with about four to eight silvery setae adjacent to spiracle, side naked; syntergum very nearly as long as mid tibia with apex more or less rounded; ovipositor (Fig. 1048) about 3.8-4.0X gonostylus or about 1.4-1.6X as long as mid tibia; gonostylus about 1.2-1.4X as long as mid tibial spur; exserted part of ovipositor about 0.4X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.34mm; excluding ovipositor, 1.28mm (CPD).

Head largely orange; occiput pale orange to orange-brown; frontovertex orange-brown, ocellar area brown between posterior ocelli and with a purple and green sheen, this continued towards occipital margin; area around anterior ocellus with a slight coppery sheen, frontovertex otherwise mostly with a green to blue-green sheen, slightly purplish above scrobes; area between eye and scrobe bordered metallic blue and purple laterally towards middle, otherwise with a green and brassy lustre, weakly mixed purple; temple and gena with a weak brassy, purple and green sheen; scrobal area with a very weak brassy and purple sheen; a curved brown line between mouth margin and toruli; temple with a brown line from occipital margin connecting outside torulus with brown line along mouth margin, the latter with a metallic green sheen; frontovertex clothed with inconspicuous, pale brown setae, a line of more conspicuous, translucent setae below eye; interantennal prominence with moderately dense, short, translucent setae; antenna (Fig. 1053) with radicle pale orange, apex narrowly dark brown; scape very pale orange, apex white, ventral margin brown nearly to apex, brown area more extensive on inner surface; pedicel mostly white with a dark brown streak along inner surface; funicle brown to dark brown, F1-F4 clothed dorsally with contrasting, pale, translucent setae; clava dark brown; maxillary palpus white; pronotum mostly orange, neck dark brown, area above coxa slightly dusky; propleuron orange, in front of coxa dark brown; prosternum yellow; mesoscutum orange in anterior half, posterior half dark brown with a strong metallic blue-green and green sheen, posterior margin purple-brown with a slight brassy and purple sheen, anterior part clothed in relatively sparse golden brown and dark brown setae, posterior part with relatively dense silvery setae, mixed with a few dark brown setae; tegula orange, apex orange-brown; axilla and scutellum orange, clothed in translucent golden brown and dark brown setae, scutellar tuft black; metanotum orange-brown; mesopleuron mostly orange with a weak brassy sheen, posteriorly brown with a distinct purple and green sheen; mesosternum orange; fore coxa white; fore femur mostly white, apical one-third orange and pale brown, tibia pale orange, dorsal margin pale brown proximally, tarsus pale orange-brown; mid coxa orange-brown, apex white dorsally; mid femur white, slightly dusky towards apex, tibia largely pale orange with knee brown, an incomplete brown subbasal ring and dorsal margin brown along half its length, spur and tarsus very pale orange, almost white; hind coxa white; hind femur white at extreme base, otherwise pale orange but margined brown distally with a small, brown, apical spot, tibia pale orange, with an incomplete, subbasal brown ring, tarsus pale orange; fore wing (Fig. 1050) mostly infuscate, hyaline towards base and at apex; submarginal vein largely pale orange, otherwise venation brown; propodeum brown, medially with a slight brassy lustre,

laterally with a slight green and purple sheen, side with a blue-green and brassy sheen, 1 or 2 translucent, pale setae anterior to spiracle and 1 or 2 outside it; gaster dark brown with a coppery, purple and green sheen, Gt1 metallic green and brassy, medially purple, side and venter mainly with coppery, green, blue and brassy reflections; gonostylus very pale orange.

Head (Fig. 1051) about 5.7X as wide as frontovertex, in profile about 1.5X as high as deep, frontovertex quite flat just above scrobes then abruptly curved towards mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, weakly carinate; ocelli forming an angle of about 55°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture, slightly deeper in ocellar area, mesh size generally slightly smaller than diameter of eye facet; area immediately above scrobes with slightly transversely elongate sculpture, interantennal prominence with shallow sculpture, temple virtually completely smooth adjacent to eye, otherwise with shallow, irregular, longitudinally elongate sculpture, gena with slightly deeper, irregular, reticulate sculpture; area between eye and scrobe about as wide as diameter of anterior ocellus and completely smooth; scrobes deep, meeting dorsally, sharply margined, carinate below eye, very broadly ∩-shaped, interantennal prominence dorsally rounded and without a median ridge; antenna as in Fig. 1053; scape strongly broadened and flattened, broadest in middle, about 2.4X as long as broad; F1 very slightly longer than broad, F2 quadrate, F3-F6 transverse, segments wider and larger distally so that F6 is largest and widest; clava strongly broadened, about as long as funicle, sutures oblique, sensory area very enlarged, extending about 0.6X along ventral surface, giving it a distinct, strongly, obliquely truncate appearance; eye reaching occipital margin, clothed with very inconspicuous short setae that are much shorter than diameter of facet; inner eye margins subparallel and diverging below anterior ocellus; malar sulcus absent; clypeal margin medially weakly concave; mandible with 1 acute tooth and a broad, slightly concave truncation, virtually tridentate; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 74, HH 72, FV 13, POL 5.5, OOL 0, OCL 5, AOL 7, EL 55, EW 40, MS 30, SL 34, SW 14.

Thorax (Fig. 1052) with pronotum hardly exposed behind head and about as long as mesoscutum; pronotum with fairly regular, polygonally reticulate sculpture that is about as deep as that between posterior ocelli; mesoscutum in anterior half with fairly coarse, longitudinally elongate, striate to striate-reticulate sculpture of similar depth to that on pronotum, posterior part with slightly shallower polygonally reticulate sculpture; axilla and scutellum with fairly coarse polygonally reticulate sculpture of similar depth to that on pronotum but axilla with slightly larger mesh, and scutellum medially of smaller mesh, but laterally of larger mesh and conspicuously longitudinally elongate; visible part of mesoscutum about 2.3X as broad as long; scutellum hardly broader than long with a distinct subapical tuft, setae mostly about one-third as long as scutellum; hind femur about 4X as long as broad; fore wing with venation and setation as in Figs 1049, 1050; costal cell naked dorsally or with a single seta at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 1049); mid tibia with a weak external subbasal carina for about half its length; propodeum (Fig. 1052) medially about 0.12X as long as scutellum and virtually smooth. Relative measurements: FWL 67, FWW 25.5; HWL 58, HWW 13.5.

Gaster with hypopygium reaching about 0.4X to apex; syntergum about as long as mid tibia, with apex slightly angular, more or less rounded; ovipositor slightly exserted, about 0.4X as long as mid tibial spur or 0.13X as long as mid tibia.

Paratype. Funicle with linear sensilla present only on F5-F6; gaster without "gland-like" structures on Gt1 or Gt5; ovipositor Fig. 1048). Relative measurements: OL 47.5, GL 12 [MT 30.5].

Variation. Females vary in overall length from 1.34-1.41mm, the funicle varies from almost completely pale orange or dark brown, the hind tibia may have the incomplete, subbasal brown ring extended into a longitudinal brown streak running for about two-thirds length of tibia, the head is about 5.7-7X as wide as frontovertex, the interantennal prominence has about 20-30 inconspicuous setae, scape is about 2.3-2.4X as long as broad; F1 may be quadrate and F2 transverse, the fore wing varies from 2.6-2.7X as long as broad, there may be 7 or 8 translucent setae in the vicinity of the propodeal spiracle, the ovipositor is about 3.8-4.0X as long as the gonostylus or about 1.4-1.6X as long as mid tibia and the gonostylus is about 1.2-1.4X as long as the mid tibial spur;

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown, but one paratype was collected from *Virola* Aubl.. (Magnoliales: Myristicaceae).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, Est. Biol. La Selva, 10°26'N 84°01'W, iv.1996 (OET/INBio). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Santa Cruz, PN Marino las Baulas, LN258040 332690, 0m, #59488, 16.viii.2000 (V. Cardenas); 1♀, **Heredia**, La Selva BS, 10°26'N 84°01'W, 50-150m, fog *Virola*, FVK/01, i.1993 (INBio-OET); 1♀, **Heredia**, Est. Biol. La Selva, 10°26'N 84°01'W, ii.2003 (J.S. Noyes). Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. See comments under *diaces* (p. 405) and *fautrix* (p. 425).

***Cheiloneurus cero* sp.nov.**
(Figs 1054-1060)

DIAGNOSIS. *Female* (length about 1.5mm): body mostly orange with some brown areas with a weak to moderate metallic sheen on head, mesoscutum and gaster; mouth margin narrowly dark brown; temple with a distinct diagonal, brown streak to gena; antenna (Fig. 1060) with scape pale orange; pedicel pale orange with a pale brown longitudinal streak; flagellum dark brown; posterior part of mesoscutum with dense silvery setae; fore and hind coxae white, mid coxa pale orange; legs mostly white to pale orange with some brown areas; fore wing (Fig. 1059) mostly infuscate with basal cell almost completely hyaline, a small hyaline area at apex of venation and an opposite hyaline area on posterior wing margin, apex weakly infuscate, not hyaline; head (Fig. 1056) about 4.5X as wide as frontovertex, in facial view slightly longer than broad, subcircular with genae converging and fairly evenly curved; frontovertex naked medially above scrobes; eye separated from scrobe by about 0.6X diameter of anterior ocellus, area between eye and scrobe with very shallow sculpture, virtually completely smooth, scrobal margin rounded; interantennal prominence with about 40 inconspicuous setae and with a weak, dorsal, median ridge; mandible tridentate; antenna (Fig. 1060) with scape about 2.9X as long as broad; funicle with F1 subquadrate, remaining segments clearly transverse; head width nearly equal to length of pedicel and funicle combined; linear sensilla on F3-F6; clava 3-segmented, slightly shorter than funicle; sensory area enlarged and forming an oblique truncation, extending about 0.5X along ventral margin; mesoscutum (Fig. 1057) anteriorly with coarse, longitudinally elongate, striate-reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed; fore wing (Fig, 1059) about 2.6X as long as broad; parastigma slightly downcurved; costal cell dorsally with two apical setae and ventrally with a complete line of setae; area below proximal part of parastigma with a group of about 10-12 setae in two lines that connect with a line of setae on cubital vein track toward wing base; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 1058); apical bristle of postmarginal vein about 0.5X as long as marginal vein; mid tibial spur clearly shorter than basitarsus; propodeum (Fig. 1057) with about seven or eight setae adjacent to spiracle, side naked; syntergum about 0.9X as long as mid tibia; ovipositor (Fig. 1054) about 3.8X gonostylus or about 1.1X as long as mid tibia; gonostylus about as long as mid tibial spur; exserted part of ovipositor about 0.3X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.52mm; excluding ovipositor, 1.48mm (CPD).

Head generally pale orange; occiput with a brown, triangular mark above foramen; frontovertex slightly dusky with a weak purple, blue and green lustre, strongest in ocellar area; temple and upper gena with a weak brassy and purple sheen, lower gena similar but less shiny; area between eye and scrobe with a weak green and purple sheen; lower face with a curved, dark brown line between toruli and mouth margin; temple with a diagonal, pale brown line to top of gena, not reaching dark

brown line above mouth margin; frontovertex clothed with inconspicuous, translucent, pale brown setae, a line of fine, translucent setae between eye and scrobe; maxillary palpus white; antenna (Fig. 1060) with radicle pale orange; scape pale orange; pedicel pale orange, a pale brown streak internally along its length; funicle and clava dark brown; pronotum orange with neck broadly dark brown; prosternum orange, dark brown outside coxa; mesoscutum orange in anterior half, posteriorly dark brown with a moderate dark, metallic blue and purple sheen, posterior margin purple-brown, anterior part clothed in relatively sparse dark brown setae, posterior part clothed in relatively dense, translucent, silvery setae mixed with a few dark brown setae; tegula orange with apex orange-brown; axilla and scutellum orange clothed with dark brown setae, subapical tuft black; metanotum orange-brown; mesopleuron pale orange, posteriorly orange-brown, anterior part with a very weak brassy sheen, posterior part with a weak brassy, coppery and purple sheen; fore coxa white; fore femur white with apical one-third pale orange, weakly marked pale brown, tibia largely pale orange with a very weak subbasal, pale brown band, tarsus pale orange; mid coxa pale orange; mid femur white, apex pale orange, tibia mostly pale orange but with an incomplete subbasal brown band and with dorsal margin brownish for about one-third its length, spur and tarsus pale orange; hind coxa white; hind femur white proximally with distal two-thirds pale orange, knee narrowly brown, tibia and tarsus pale orange; fore wing (Fig. 1059) mostly infuscate, hyaline towards base, but weakly infuscate at apex; parastigma yellow, remainder of venation brown; propodeum orange, side orange-brown with a weak green, coppery and purple sheen, about 5 or 6 pale, translucent setae near spiracle; gaster dark brown with a green, brassy, coppery and purple sheen, Gt1 with a blue sheen laterally; gonostylus very pale orange.

Head (Fig. 1056) about 4.5X as wide as frontovertex, in profile about 1.7X as high as deep, anteriorly interantennal prominence hardly protuberant level with torulus; occipital margin sharp, not carinate; ocelli forming an angle of about 65°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh slightly smaller than diameter of eye facet, ocellar area with slightly deeper sculpture; narrowest area between eye and scrobe about 0.7X as wide as diameter of anterior ocellus, area immediately below lowest part of eye with very shallow sculpture, virtually completely smooth and shiny; scrobes shallow, broadly ∩-shaped, not sharply margined; interantennal prominence with similar sculpture to frontovertex, clothed in sparse translucent setae, dorsally acute and with a weak median ridge, scrobes meeting; temple virtually smooth with very shallow, irregular, elongate sculpture, gena with slightly deeper, irregular, reticulate sculpture; antenna as in Fig. 1060; scape broadened and flattened, about 3X as long as broad, broadest in middle; funicle with F1 subquadrate, F2-F6 clearly transverse; linear sensilla present only on F3-F6; clava clearly broadened, slightly shorter than funicle, sutures oblique, sensory area enlarged, extending ventrally about 0.4X along clava, giving it an obliquely truncate appearance; eye reaching occipital margin, virtually naked, but with sparse, very short setae, each much shorter than diameter of facet; inner eye margins more or less parallel; malar sulcus absent; clypeal margin weakly concave medially; mandible tridentate, teeth short; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 72, HH 68, FV 16, POL 7, OOL 0, OCL 4.5, AOL 7, EL 45, EW 37, MS 32, SL 29, SW 10.

Thorax (Fig. 1057) with irregular, polygonally reticulate sculpture on pronotum that is about as deep as that on frontovertex; mesoscutum in posterior two-fifths with fairly regular, polygonally reticulate sculpture that is clearly deeper than that on frontovertex, sculpture in anterior three-fifths coarse striate-reticulate and about as deep as that on pronotum; axilla with similar sculpture to pronotum, scutellum with slightly deeper and more longitudinally elongate sculpture; axilla and scutellum with similar sculpture to that on anterior part of mesoscutum, elongate on sides of scutellum; visible part of mesoscutum about 1.9X as broad as long; scutellum about 1.1X as broad as long with a distinct subapical tuft, setae mostly about 0.4X as long as scutellum; mid tibia without a distinct, external carina; hind femur about 4X as long as broad; fore wing with venation and setation as in Figs 1058, 1059; costal cell dorsally with 1 seta at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 1058); propodeum (Fig. 1057) medially about 0.12X as long as scutellum and virtually smooth, side virtually completely smooth. Relative measurements: FWL 63, FWW 24.5; HWL 53, HWW 13.

Gaster without “gland-like” structures on Gt1 or Gt5; hypopygium (Fig. 1055) reaching about half-way to apex; syntergum about 0.9X as long as mid tibia, with apex rounded; ovipositor (Fig.

1054) slightly exserted, the exserted part about one-quarter length of mid tibial spur or less than 0.1X mid tibia. Relative measurements: OL 39.5, GL 10.5 [MT 35].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, 24km W Piedras Blancas, 8°46'N 83°24'W, iii.1992 (P. Hanson). Holotype in NHMUK.

COMMENTS. *Cheiloneurus cero* is very similar to *mora*, but apart from having a relatively slightly larger clava and larger sensory area on the clava (see key), *cero* differs from *mora,* and many other similar species (*dirce*, *amethes*, *omorus*, *alopes*, etc.) in having the apex of the fore wing weakly infuscate, without a distinct hyaline area. It also differs from *mora* in having the diagonal brown mark on the temple pale and clearly not reaching the brown line along the mouth margin, the hind tibia is also virtually completely pale orange, whereas in *mora* the dark brown line on the temple connects with the dark brown on the mouth margin and the hind tibia is orange with a brown subbasal band and a diagonal brown stripe externally for about two-thirds of its length. Additionally in *cero* the curved hyaline streak connecting the postmarginal and stigmal veins is much better defined and longer than in *mora* (compare Figs 1058 and 1109). There are also minor differences in head width and relative proportions of constituent parts of the ovipositor, but as these are based on only two individuals they might be unreliable.

Cheiloneurus finator **sp.nov.**

(Figs 1061-1066; Hab. ♀ 155)

DIAGNOSIS. *Female* (length about 1.6-1.8mm): body mostly dark brown with a weak to moderate metallic sheen, orange areas on head, mesoscutum, scutellum and mesopleuron; antenna (Fig. 1062) with scape white to very pale orange margined dark brown; pedicel and flagellum dark brown; posterior half of mesoscutum with silvery setae; coxae white; legs mainly pale orange, knees dark brown; fore wing (Fig. 1063) mostly infuscate with basal cell hyaline except a small area proximally, a small hyaline area at apex of venation and opposite on posterior wing margin, apex with a hyaline triangular area; head (Fig. 1066) about 12-15X as wide as frontovertex, in facial view about as wide as long, subrectangular, genae hardly converging, more strongly curved inwards towards mouth margin; frontovertex naked medially; eye separated from scrobe by about 1.2-1.5X diameter of ocellus, area between eye and scrobe with deep, lineolate-reticulate sculpture, scrobal margin sharp; interantennal prominence dorsally rounded with about 50 conspicuous, silvery setae; mandible with two lower, acute teeth and an upper, rounded truncation; antenna (Fig. 1062) with scape about 3.6-3.7X as long as broad; funicle with F1-F3, sometimes only F1, slightly longer than broad, remaining segments transverse; head width about 0.8X length of flagellum; linear sensilla on F4-F6; clava 3-segmented, nearly as long as funicle; sensory area large and forming an oblique truncation, extending about 0.6X along ventral margin; mesoscutum (Fig. 1064) mostly with fine, longitudinally elongate polygonally reticulate sculpture, anteriorly and on sides more strigose, posterior half medially polygonally reticulate; scutellum with a distinct apical tuft of setae; wings fully developed; fore wing (Fig. 1063) about 2.5-2.6X as long as broad; parastigma distinctly curved downwards; costal cell dorsally naked or with 1 or 2 setae at apex and ventrally with a complete line of setae; area below proximal part of parastigma with a group of about 25 pale setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that extends a little way into disc (Fig. 1061); apical bristle of postmarginal vein slightly less than 0.3X as long as marginal vein; mid tibial spur slightly shorter than basitarsus; propodeum with about 20 setae around each spiracle, these extending posteriorly towards hind coxa; syntergum

about as long as mid tibia; ovipositor (Fig. 1065) about 3.1X gonostylus or 1.4X as long as mid tibia; gonostylus about 1.5X as long as mid tibial spur; exserted part of ovipositor about half as long as mid tibial spur to about as long. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.77mm; excluding ovipositor, 1.68mm (CPD).

Head mostly orange-brown, largely with metallic areas; occiput largely pale orange, upper part and area between occipital margin and posterior ocelli metallic green with come coppery reflections; more anterior part of frontovertex more weakly metallic green and purple; area above scrobes mixed metallic purple, green, coppery and brassy, margined laterally and above by a narrow, metallic purple line; outside this, area immediately below eye strongly shining metallic blue and brassy-green, slightly coppery along eye margin; temple and upper gena shining metallic green and coppery, lower gena with a much less shiny brassy and purple sheen and pale orange immediately above mandibular bases; scrobal area with a weak brassy, green and coppery sheen, interantennal prominence with a weak purple and blue sheen; lower face with an irregular dark brown band between toruli and mouth margin, this with a slight metallic green sheen; frontovertex clothed with inconspicuous, translucent, pale brown setae, a line of fine, translucent setae between eye and scrobe; maxillary palpus white; antenna (Fig. 1062) with radicle orange, apex narrowly ringed dark brown; scape with extreme apex white, otherwise pale orange, distinctly margined brown ventrally, widely so towards base internally so that basal quarter or so is completely brown; pedicel dark brown dorsally, pale orange ventrally; flagellum entirely dark brown; pronotum orange-brown to dark brown, prosternum mostly concolourous; mesoscutum orange in anterior one-third, posterior two-thirds dark brown with very weak metallic blue and purple reflections posterior margin purple-brown, anterior half of mesoscutum clothed in relatively sparse golden brown setae, posterior half clothed in translucent, silvery setae that are slightly more dense, especially laterally and mixed with a few dark brown setae; tegula orange with apex orange-brown; axilla and scutellum orange clothed with golden brown setae, subapical tuft black with anterior setae translucent and pale; metanotum dark brown; mesopleuron slightly dusky orange, posteriorly orange-brown to brown, anterior part with a very weak brassy sheen, posterior part with a weak brassy, coppery and purple sheen; fore coxa white; fore femur white with apical one-third brown, extreme apex pale orange, tibia largely pale orange with a weak subbasal brown band, tarsus pale orange; mid coxa white; mid femur white with an incomplete, narrow, subapical brown band, tibia narrowly white proximally, mostly pale orange but with an incomplete subbasal brown band and with dorsal margin brown for about half its length, spur and tarsus pale orange; hind coxa white, femur white proximally with apical third pale orange-brown margined brown, tibia brown in proximal two-fifths, otherwise pale orange, tarsus pale orange; fore wing (Fig. 1063) mostly infuscate, hyaline towards base and weakly so at apex; submarginal vein pale orange, venation otherwise dark brown; propodeum dark brown, side metallic green mixed slightly coppery, spiracular area with dense silvery setae that extend almost to posterior margin; gaster entirely dark brown with a green, coppery, brassy and purple reflections, Gt1 quite strongly metallic green, distally purple, laterally coppery, outer plate of ovipositor similar to rest of gaster, but with some weak blue reflections; gonostylus very pale orange almost white.

Head (Fig. 1066) about 15X as wide as frontovertex, in profile about 1.5X as high as deep, anteriorly quite straight below top of scrobes, interantennal prominence hardly protuberant level with torulus; occipital margin sharp, not carinate; ocelli forming an angle of about 30°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh conspicuously smaller than diameter of eye facet, ocellar area with conspicuously deeper sculpture, area immediately above scrobes with coarser, more irregular sculpture; narrowest area between eye and scrobe slightly wider than diameter of anterior ocellus, between eye and scrobe with deep lineolate reticulate sculpture, but area immediately below lowest part of eye completely smooth and shiny; scrobes deep, broadly ∩-shaped, sharply margined dorsally, margin below eye carinate; interantennal prominence with similar sculpture to frontovertex, clothed in about 50 translucent setae, dorsally rounded, scrobes meeting; temple virtually smooth with very shallow, irregular, elongate sculpture, gena with slightly deeper, irregular, reticulate sculpture; antenna as in Fig. 1062; scape slightly broadened and flattened, about 3.6X as long as broad, broadest in

proximal half; funicle with F1-F3 slightly longer than broad, F4 quadrate, F5-F6 transverse; clava broadened, about as long as F2-F6 combined, sutures oblique, sensory area enlarged, extending ventrally about 0.6X along clava, giving it an obliquely truncate appearance; eye reaching occipital margin, clothed with numerous conspicuous setae, each about as long as diameter of facet; inner eye margins strongly converging anteriorly, diverging a little way above scrobes; malar sulcus absent; clypeal margin weakly concave medially; mandible with 2 acute teeth and a truncation; apical segment of maxillary palpus not enlarged, about 1.3X as long as radicle. Relative measurements: HW 69, HH 69, FV 4.5, POL 4, OOL 0, OCL 8, AOL 10, EL 53.5, EW 38, MS 35, SL 41.5, SW 11.5.

Thorax (Fig. 1064) with irregular, polygonally reticulate sculpture on pronotum that is conspicuously deeper than that on most of frontovertex; mesoscutum mostly with fine, longitudinally elongate polygonally reticulate sculpture, anteriorly and on sides more strigose, posterior half medially with polygonally reticulate sculpture that is of similar depth to that behind posterior ocellus, axilla and scutellum with similar sculpture to that on mesoscutum but only elongate on sides of scutellum; visible part of mesoscutum about 1.7X as broad as long; scutellum about as long as broad with a distinct subapical tuft, setae mostly about one-third as long as scutellum; mid tibia with a distinct, subbasal, external carina for about one-third its length, spur slightly shorter than basitarsus; hind femur about 5.5X as long as broad; fore wing with venation and setation as in Figs 1063; costal cell dorsally naked at apex, ventrally with a complete line of setae; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 1061); propodeum (Fig. 1064) medially about 0.12X as long as scutellum and virtually smooth, side virtually completely smooth, but with some shallow, reticulate sculpture dorsally. Relative measurements: FWL 72.5, FWW 21; HWL 60, HWW 14.

Gaster with hypopygium reaching about half-way to apex; syntergum slightly longer than mid tibia, with apex acute; ovipositor slightly exserted, the exserted part about half as long as mid tibial spur or about 0.15X mid tibia.

Paratype. Antenna with linear sensilla on F4-F6; gaster without "gland-like" structures on Gt1 or Gt5; ovipositor Fig. 1065. Relative measurements: OL 51.5, GL 16.5 [MT 36].

Variation. Females vary in overall length from about 1.6-1.8mm, the head is 12-15X as wide as the frontovertex, the eye is separated from scrobe by about 1.2-1.5X the diameter of the anterior ocellus, the scape is about 3.6-3.7X as long as broad; the funicle has F1 or F1-F3 slightly longer than broad, remaining segments transverse, the fore wing is about 2.5-2.6X as long as broad, the costal cell is dorsally naked or with 1 or 2 apical setae and the exserted part of the ovipositor varies from about half as long as mid tibial spur to about as long.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, OTS La Selva, 10°26'N 84°01'W, i-iii.1993 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **Puntarenas**, PN Corcovado, Los Patos, 8°33'N 83°30'W, 200m, ii.2000 (J.S. Noyes, J.A. Azofeifa). Holotype and paratype in NHMUK.

COMMENTS. *Cheiloneurus finator* can be distinguished from many similar species (*dirce, amethes, alopes, omorus, etc.)* by having about 20-25, conspicuous, silvery setae surrounding each propodeal spiracle, in other similar species there may be fewer than 10, sometimes not more than 5. *Cheiloneurus finator* also differs from most of these species in having the frontovertex less than 0.1X head width. Similar species with a narrow frontovertex are *alopes*, *dirce*, *diaces*, *miranda* and *orbona.* Apart from having relatively few setae surrounding the propodeal spiracle, these species have the head orange with a distinct diagonal brown stripe on temple and gena, whereas finator has the frontovertex and temple largely metallic and lacks the brown genal stripe.

***Cheiloneurus idifex* sp.nov.**
(Figs 1067-1073)

DIAGNOSIS. *Female* (length about 1.6-1.8mm): body largely orange, posterior part of mesoscutum, propodeum laterally and gaster brown, darker areas with a weak to moderate metallic sheen; mouth margin brown; temple and gena with a diagonal, brown streak; antenna (Figs 1072, 1073) with scape pale orange, ventral margin brown; pedicel mostly orange with a longitudinal brown streak; funicle dark brown with all segments mixed pale orange dorsally; clava dark brown; mesoscutum with dense silvery setae in posterior half; coxae white; legs mostly white to pale orange with some brown areas; fore wing (Fig. 1071) mostly infuscate, basal cell mostly hyaline, a small hyaline area at apex of venation, apex with a triangular hyaline area; head (Fig. 1067) about 5.2-5.4X as wide as frontovertex, in facial view very clearly broader than long, subcircular, genae evenly curved, converging, more strongly curved inwards near mouth; frontovertex with 2-4 setae medially between anterior ocellus and scrobes; eye separated from scrobe by slightly less than diameter of anterior ocellus, area between eye and scrobe smooth and shiny; scrobes deep, sharply margined, carinate below eye, interantennal prominence with about 45 inconspicuous setae, dorsally rounded, without a median ridge; mandible tridentate; antenna (Figs 1072, 1073) with scape about 3.8-4.4X as long as broad; funicle with F1 longer than broad, with F2-F5 slightly longer than broad or subquadrate, F6 transverse; linear sensilla on F3-F6; clava 3-segmented, about as long as F2-F6 combined; sensory area enlarged, extending ventrally about 0.5X length of clava, apex obliquely truncate; head width slightly greater than flagellum length; anterior three-fifths of mesoscutum (Fig. 1068) with fairly regular, striate-reticulate sculpture, posterior part with regular polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 1071) about 2.6-2.8X as long as broad; parastigma downcurved; costal cell dorsally naked, ventrally with a complete line of setae, or narrowly interrupted above parastigma; area below proximal part of parastigma with a group of about 14 uniform, fine setae connecting to a line of four or five setae along cubital vein track; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 1070); apical bristle of postmarginal vein about 0.6X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum (Fig. 1068) with about 4 or 5 inconspicuous setae adjacent to spiracle, side naked; syntergum about as long as mid tibia with apex angular; ovipositor about 3.5-3.7X gonostylus or about 1.8-1.9X as long as mid tibia; gonostylus about 1.3-1.5X as long as long mid tibial spur; exserted part of ovipositor about 0.5-0.7X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.64mm; excluding ovipositor, 1.51mm (CPD).

Head generally slightly dusky orange; occiput pale orange with a dark brown, triangular mark above foramen; scrobes, interantennal prominence and posterior part of gena pale orange; mouth margin dark brown below torulus, connected by a broad, dark brown line that curves away from mouth margin medially; temple and gena with a broad, oblique, dark brown streak from occipital margin to mouth margin below torulus; area between occipital margin and posterior ocelli with a weak, dark blue sheen, frontovertex otherwise with a weak, pale blue and brassy sheen; area between eye and scrobe with a stronger brassy, green, coppery and purple sheen this bordered by a distinct, metallic coppery, purple and blue area towards frontovertex; temple and upper gena generally with a relatively strong brassy, green and blue-green sheen but brown stripe with a purple, coppery and blue sheen, lower gena with a weak purple and brassy sheen; interantennal prominence dorsally with a weak purple lustre, otherwise weakly brassy; mouth margin with a metallic green and blue-green sheen with some coppery-purple reflections; frontovertex clothed with fairly inconspicuous, translucent pale brown setae, these continued as a line below eye and scattered on gena, relatively dense and conspicuous on interantennal prominence; antenna (Fig. 1072) with radicle pale orange with a narrow, dark brown apical ring; scape largely pale orange, with ventral margin dark brown for almost all its length, broader internally; pedicel pale orange with a complete, dark brown streak internally; funicle generally dark brown but all segments mixed pale orange dorsally, distal segments more distinctly so; clava dark brown; maxillary palpus white; pronotum mostly orange with weak purple and brassy reflections, neck dark brown; propleuron

pale orange, dark brown in front of coxa; prosternum pale orange; anterior half to three-fifths of mesoscutum orange with weak purple reflections, clothed in relatively sparse, conspicuous, black setae, posterior half or so dark brown with a distinct, metallic, dark blue sheen, clothed in relatively dense, silvery setae, posterior margin dark orange-brown with a weak brassy and purple sheen with coppery reflections; tegula orange, apex dark orange-brown with a weak purple sheen; axilla orange, with weak coppery reflections and with a few black and golden brown setae; scutellum orange, with weak coppery reflections, anteriorly with golden brown setae, posteriorly with black setae, subapical tuft black; metanotum orange-brown; mesopleuron orange, posterior one-third brown; anterior part with a weak brassy sheen, mixed purple anteriorly, posterior part with a stronger brassy, green, coppery and purple sheen; mesosternum pale orange; fore coxa white; fore femur mostly white, apical one-third brown, tibia pale orange, a little dusky proximally, tarsus pale orange; mid coxa dirty white, mixed brown externally and ventrally towards mid-line; mid femur white, pale orange at apex, tibia mostly pale orange, but narrowly white at base with an incomplete, subbasal brown ring that is continued as a dark brown streak externally in proximal half or so, spur and tarsus pale orange; hind coxa white; hind femur white at base, but mostly pale orange, extreme apex dark brown, tibia mostly pale orange, but mixed brown in proximal half, tarsus pale orange; fore wing(Fig. 1071) mostly infuscate, largely hyaline towards base, apical and posterior areas hyaline, submarginal vein pale orange otherwise venation brown; propodeum slightly dusky, pale orange medially with a weak brassy and purple sheen, laterally dark brown with a distinct metallic, green, blue-green and purple sheen, side metallic green and blue-green, about 6 translucent pale brown or silvery setae in a line outside spiracle; gaster mainly dark brown with a slight brassy purple sheen, Gt1 and Gt2 dorsally mixed relatively strongly coppery, green and purple, sides of tergites with a relatively strong green and blue-green sheen with coppery and purple reflections, sternites with coppery, blue, green, purple and brassy reflections; gonostylus very pale orange.

Head (Fig. 1067) in facial view about 5.2X as wide as frontovertex with gena convex and converging, in profile about 1.5X as high as deep, frontovertex slightly angled level with posterior ocelli, then weakly and evenly curved to top of scrobes, strongly angled at top of scrobes towards mouth margin, with interantennal prominence hardly protuberant; occipital margin sharp, carinate; a shallow groove present on eye margin behind ocellus; ocelli forming an angle of about 55°; frontovertex virtually smooth, but with shallow, fine polygonally reticulate sculpture of mesh size very slightly smaller than eye facet, area between eye and scrobe completely smooth and shiny; temple and upper gena completely smooth adjacent to eye, posterior areas with very shallow, longitudinally elongate, strigose to striate-reticulate sculpture; anterior part of lower gena with shallow, polygonally reticulate sculpture; scrobes smooth; interantennal prominence virtually smooth but with fine, shallow, polygonally reticulate sculpture; narrowest part between eye and scrobal margin slightly less than diameter of anterior ocellus, scrobes deep, meeting dorsally, sharply margined, carinate below eye, very broadly ∩-shaped, interantennal prominence dorsally broadly rounded, without a median ridge; antenna as in Fig. 1072; scape slightly broadened and flattened, broadest below middle, about 4.4X as long as broad; funicle with F1 slightly longer than broad, F2-F5 subquadrate, F6 transverse, segments clearly larger and wider distally, linear sensilla present only on F3-F6; clava slightly broadened, about 1.4X as wide as F6, about as long as F2-F6 combined, sutures oblique, sensory area slightly enlarged, extending about 0.5X along ventral surface, giving it a strongly obliquely truncate appearance; eye reaching occipital margin, with extremely short, inconspicuous setae, each much shorter than diameter of facet; inner eye margins subparallel, narrowest part of frontovertex about midway between anterior ocellus and scrobes; malar sulcus absent; clypeal margin medially weakly emarginate; mandible with 3 teeth, middle and upper teeth slightly rounded; apical segment of maxillary palpus not enlarged, about 1.5X as long as radicle. Relative measurements: HW 88, HH 81, FV 17, POL 6, OOL 0, OCL 5, AOL 9.5, EL 63, EW 48, MS 33, SL 42, SW 9.5.

Thorax (Fig. 1067) with pronotum hardly exposed behind head and about 0.5X as long as mesoscutum; pronotum with shallow, fine, imbricate-reticulate to polygonally reticulate sculpture that is conspicuously deeper than sculpture on frontovertex; mesoscutum (Fig. 1068) with sculpture that is clearly deeper than that on pronotum, anterior three-fifths mainly with regular, fine, longitudinally elongate, striate-reticulate reticulate sculpture, tending to polygonally reticulate

along mid-line, posterior two-fifths with slightly shallower, regular polygonally reticulate sculpture; axilla and scutellum with polygonally reticulate sculpture that is of similar depth to that on mesoscutum, sculpture laterally on scutellum more elongate; visible part of mesoscutum about 2.1X as broad as long; scutellum about as long as broad, with a distinct subapical tuft, setae mostly about 0.4X as long as scutellum; hind femur about 4.3X as long as broad; fore wing with venation and setation as in Figs 1070, 1071; costal cell with 1 dorsal seta at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 1070); mid tibia with a weak external carina in proximal half; propodeum (Fig. 1068) medially about 0.15X as long as scutellum and smooth. Relative measurements: FWL 106.5, FWW 40.5; HWL 91, HWW 22.5.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium reaching about 0.4X to apex; syntergum about as long as mid tibia, with apex angular; ovipositor (Fig. 1069) exserted, the exserted part about 0.7X as long as mid tibial spur or 0.3X as long as mid tibia. Relative measurements: OL 66, GL 19 [MT 35].

Variation. Females vary in overall length from about 1.6-1.8mm, the head is about 5.2-5.4X as wide as the frontovertex, the frontovertex has 2-4 setae medially between the anterior ocellus and the scrobes, the fore wing is about 2.6-2.8X as long as broad, the ovipositor is about 3.5-3.7X as long as the gonostylus or about 1.8-1.9X as long as the mid tibia, the gonostylus is about 1.3-1.5X as long as long as the mid tibial spur and the exserted part of the ovipositor is about 0.5-0.7X as long as the mid tibial spur.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, Est. Biol. La Selva, 10°24'N 84°01'W, 50-150m, canopy fog *Eugenia* sp. FOT/76/1-40, 5.i.2000 (INBio/OET). Paratypes: **COSTA RICA**, 1♀, **Puntarenas**, Est. Altamira, Send. Los Gigantes, LS 331800 572100, 1460m, 10.i-10.ii.2002 (D. Rubí). Holotype and paratype in NHMUK.

Cheiloneurus orbona sp.nov.

(Figs 1074-1079; Hab. ♀ 156)

DIAGNOSIS. *Female* (length about 1.3-1.7mm): body mostly white to orange with a very weak to metallic sheen, temple and gena with an elongate dark brown stripe, mouth margin dark brown, base of gaster dark brown, darker areas with a stronger metallic sheen; antenna (Fig. 1075) with scape pale orange, ventral margin dark brown; pedicel pale orange with a dark brown streak; funicle brown, mixed orange; clava dark brown; posterior half of mesoscutum with moderately dense silvery setae; coxae white; legs otherwise white to pale orange with some brown on mid leg; fore wing mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation, another opposite and apex with a triangular hyaline area; head about 10-20X as wide as frontovertex, in facial view very slightly longer than broad, subcircular with genae converging slightly curved but more strongly curved inwards near mouth; frontovertex with about 4 inconspicuous setae medially between anterior ocellus and scrobes; eye separated from scrobe by about 1.4X diameter of anterior ocellus, area between eye and scrobe smooth; scrobes shallow, sharply margined in part; interantennal prominence with about 20 inconspicuous setae and dorsally rounded; mandible virtually tridentate; antenna (Fig. 1075) with scape about 3.5X as long as broad; funicle segments usually clearly longer than broad, F6 sometimes subquadrate; linear sensilla on F4-F6; clava 3-segmented, about as long as F3-F6 combined; sensory area enlarged, extending ventrally about 0.4X length of clava, apex obliquely truncate; head width slightly less than flagellum length; mesoscutum (Fig. 1079) in anterior half and laterally with longitudinally elongate, striate reticulate sculpture, posterior half with polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 1077) about 2.6X as long as broad; parastigma

clearly downcurved; costal cell dorsally with a single apical seta, ventrally with a line of setae that is narrowly interrupted above parastigma; area below proximal part of parastigma with a line of four to six setae that connects with another, less distinct, line directed towards base of wing; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues well into disc (Fig. 1074); apical bristle of postmarginal vein nearly 0.5X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with about five inconspicuous setae adjacent to spiracle, side naked; syntergum about 0.8X as long as mid tibia with apex angular; ovipositor(Fig. 1076) about 3.8X gonostylus or about 1.2X as long as mid tibia; gonostylus about as long as mid tibial spur; exserted part of ovipositor about 0.5X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.50mm; excluding ovipositor, 1.39mm (CPD).

Head generally pale orange; occiput with a small, triangular, brown mark above foramen; temple with an oblique brown streak reaching about half-way to torulus; mouth margin narrowly brown; frontovertex very slightly dusky with weak coppery reflections near occipital margin, otherwise with weak blue and purple reflections, more strongly purple above top of scrobes; area between eye and scrobe brassy with a very weak purple sheen; temple with a brassy sheen, gena with a much weaker brassy, mixed purple sheen; scrobal area with a weak brassy sheen; frontovertex with inconspicuous, translucent, pale brown setae along inner eye margins, a similar line below eye; interantennal prominence with a line of similar setae on each side along most of its length; maxillary palpus white; antenna (Fig. 1075) with radicle and scape pale orange, ventral margin of scape narrowly dark brown; pedicel pale orange, with a dark brown streak internally along its length; F1-F5 brown, distally mixed with some orange dorsally, F6 and clava dark brown; pronotum orange with faint brassy, blue, copper and purple reflections; prosternum very pale orange, virtually white medially; mesoscutum orange, anterior half with weak coppery and brassy reflections and clothed in relatively sparse dark brown setae, posterior half and side with a weak brassy and slightly purple sheen and clothed in more dense, translucent, silvery setae that are conspicuously more dense laterally; tegula orange, apex slightly dusky orange; axilla pale orange with weak brassy reflections; scutellum orange with a few coppery and brassy reflections, clothed with golden brown and dark brown setae, subapical tuft black; metanotum pale orange; mesopleuron white with a weak brassy lustre; fore coxa white; proximal half of fore femur white, rest of leg pale orange; mid coxa white; mid femur mostly white, apex orange, with a narrow, incomplete, brown, subapical band; mid tibia pale orange, extreme base white with a narrow, pale brown, subbasal band; mid tibial spur and tarsus pale orange; hind coxa white; extreme apex of hind femur pale brown, otherwise remainder of leg pale orange; fore wing (Fig. 1077) mostly infuscate but hyaline towards base and at apex, submarginal vein very pale orange, rest of venation pale brown; propodeum orange with a weak brassy and purple sheen, side with a weak metallic blue sheen, 4 inconspicuous silvery setae anterior to spiracle; gaster mostly pale orange with blue, green brassy and purple reflections, Gt1 dark brown with a strong metallic blue and blue-green sheen, distinctly coppery medially, Gt2 dark brown with a metallic green sheen, Gt2-Gt4 similar to Gt2 but slightly less metallic and mixed orange, Gt1-Gt4 additionally mixed coppery on side; gonostylus very pale orange, virtually white.

Head about 21X as wide as frontovertex, in profile about 1.7X as high as deep, anteriorly more or less straight from top of scrobes to mouth margin with interantennal prominence slightly protuberant; occipital margin sharp, not carinate; ocelli forming an angle of about 35°; frontovertex quite shiny, with shallow polygonally reticulate sculpture of mesh size clearly smaller than diameter of facet; narrowest point between eye and scrobe about 1.4X diameter of anterior ocellus and smooth; temple virtually smooth, with extremely shallow, irregular, elongate, sculpture; gena with slightly deeper, polygonally reticulate sculpture; scrobes quite shallow, Λ-shaped, not quite meeting, sharply margined laterally; interantennal prominence dorsally acute, with a distinct, median ridge and with relatively shallow, polygonally reticulate sculpture; antenna as in Fig. 1075; scape broadened and flattened, about 3.5X as long as broad; F1-F5 clearly slightly longer than broad, F6 subquadrate, segments larger and broader distad; clava 3-segmented, about as long as F3-F6 combined, sutures oblique, sensory area enlarged, extending ventrally about 0.4X length of clava, apex obliquely truncate; eye slightly overreaching occipital margin, clothed in moderately conspicuous, setae, each a little shorter than diameter of facet; inner eye margins

strongly converging anteriorly; malar sulcus absent; clypeal margin concave medially; mandible with two acute teeth and a truncation; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 64, HH 66, FV 3, POL 3, OOL 0, OCL 6, AOL 7.5, EL 48, EW 37, MS 31, SL 35, SW 10.

Thorax (Fig. 1079) with pronotum hardly exposed behind head, about 0.6X as long as mesoscutum, pronotum, mesoscutum with longitudinally elongate, striate-reticulate sculpture laterally and in anterior half that is slightly deeper and coarser than that in ocellar area, posterior half with polygonally reticulate sculpture; axilla and scutellum with polygonally reticulate sculpture that is slightly deeper and coarser than that in ocellar area, more elongate laterally on scutellum; visible part of mesoscutum about 2X as broad as long; scutellum about as broad as long, with a distinct subapical tuft, setae mostly about half as long as scutellum; mid tibia with a short, indistinct external carina; hind femur about 5.5X as long as broad; fore wing with venation and setation as in Figs 1074, 1077; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak (Fig. 1074); propodeum (Fig., 1079) medially about 0.16X as long as scutellum and with some extremely shallow, polygonally reticulate sculpture, virtually smooth. Relative measurements: FWL 68, FWW 26,5; HWL 57, HWW 13.

Gaster with hypopygium reaching about 0.4X to apex; syntergum about 0.8X as long as mid tibia, with apex angular; ovipositor slightly exserted, the exserted part about 0.5X length of mid tibial spur or about 0.2X mid tibia.

Paratype. Funicle with linear sensilla present only on F4-F6; gaster without "gland-like" structures on Gt1 or Gt5; hypopygium Fig, 1078; ovipositor (Fig. 1076). Relative measurements: OL 48, GL 12.5 [MT 40].

Variation. Females vary in overall length from 1.26-1.68mm, the mid femur may be virtually lacking the subapical brown ring, smaller specimens may have the head only about 9X as wide as the frontovertex and F6 may be slightly longer than broad.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Maritza (ACG), 700m, MT/YPT, 20.i-24.ii.1996 (J.S. Noyes). Paratypes: **COSTA RICA**, 8♀, **Guanacaste**, same data as holotype; 1♀, Guanacaste, Maritza (ACG), 600m, LN 326900 373000, #47554, xi.1996 (C. Zuñiga); 1♀, **Heredia**, La Selva BS, 50m, MT/YPT, 22.i-3.ii.1991 (J.S. Noyes); 2♀, **Puntarenas**, 13km NE Dominical, RB Rio Magnolia, 9°20'N 83°47'W, 800m, 22-24.ii.2015 (J.S. Noyes); 1♀, Puntarenas, Bahia Drake, Tamandua Biol. Sta., 8°40'N 83°39'W, 89m, 16-17.ii.2015 (J.S. Noyes); 1♀, Puntarenas, Golfito, Est. Agujas, LS 526550 276750, 10m (error for 300m), #57901, 21.ii.2000 (J. Azofeifa); 4♀, Puntarenas, PN Corcovado, Los Patos, 8°33'N 83°30'W, 200m, ii.2000 (J.S. Noyes, J. Azofeifa); 1♀, Puntarenas, Los Charcos de Osa, 8°40'N 83°30'W, 50m, 15-16.ii.2010 (J.S. Noyes); 1♀, Puntarenas, PN Piedras Blancas, Est. El Bonito, 8°43'N 83°13'W, 100m, 13-14.ii.2012 (J.S. Noyes); 1♀, **Limón**, RB Hitoy Cerere, 9°40'N 83°02'W, 100m, ii.2004 (Noyes). Holotype in MZUCR, paratypes in NHMUK, MZUCR and USNM.

COMMENTS. See comments under *finator* (p. 417).

***Cheiloneurus fautrix* sp.nov.**

(Figs 1080-1084; Hab. ♀ 157)

DIAGNOSIS. *Female* (length about 1.0-1.5mm): body mostly orange with some dark brown to black areas with a weak to moderate metallic sheen on head and gaster; posterior half of mesoscutum slightly darker than anterior half; mouth margin brown or with only a brown spot below each torulus; temple and gena with a diagonal, brown streak; antenna (Fig. 1081) with scape mostly pale orange with ventral margin brown; pedicel pale orange with a dark brown

longitudinal streak; funicle generally brown mixed orange; clava dark brown; posterior half of mesoscutum with dense silvery setae; coxae white; legs mostly white to pale orange with brown areas; fore wing (Fig. 1083)mostly infuscate with basal cell almost completely hyaline, a small hyaline area at apex of venation and an opposite hyaline area on posterior wing margin, apex with a subtriangular hyaline area; head (Fig. 1082) about 5X as wide as frontovertex, in facial view slightly broader than long, subcircular with genae converging and fairly uniformly curved; frontovertex with two or three setae medially above scrobes; eye separated from scrobe by a little less than diameter of anterior ocellus, area between eye and scrobe completely smooth, scrobal margin mostly rounded but moderately sharp below eye; interantennal prominence with about 10 inconspicuous setae and with a dorsal, median ridge; mandible with one tooth and a broad, slightly concave truncation; antenna (Fig. 1081) with scape about 2.5X as long as broad; funicle segments quadrate to transverse; head width about the same as flagellum length; linear sensilla on F3-F6; clava 3-segmented, slightly longer than F4-F6 combined; sensory area enlarged and forming an oblique truncation, extending about 0.2X along ventral margin; mesoscutum (Fig. 1080) anteriorly with coarse, longitudinally elongate lineolate-reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 1083) about 2.4X as long as broad; parastigma strongly downcurved; costal cell with one or two setae at apex and a complete line of setae ventrally; area below proximal part of parastigma with a line of about 10 pale setae that curves towards base of wing along cubital vein track, one or two setae outside this; apices of postmarginal and stigmal veins connected by a naked hyaline area that clearly extends further into disc as a curved line; apical bristle of postmarginal vein about 0.5X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum with up to about 5 setae adjacent to spiracle, side naked; syntergum about 0.8X as long as mid tibia; ovipositor about 3.6X gonostylus or hardly shorter than mid tibia; gonostylus slightly shorter than mid tibial spur; ovipositor not exserted. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.48mm; excluding ovipositor, 1.37mm (CPD).

Head mostly pale orange; occiput with a dark brown, triangular mark above foramen; frontovertex with a weak blue and purple sheen; temple and upper gena with a weak pale blue and brassy sheen, lower gena and area between eye and scrobe with a weak purple sheen; scrobal area with a very weak pale blue, purple and brassy sheen; lower face with a median, curved, brown, submarginal line subparallel to mouth margin extending laterally to below torulus; temple with an oblique brown streak extending a little more than half-way from occipital margin behind eye towards torulus; frontovertex clothed with inconspicuous, pale brown setae; maxillary palpus white; antenna (Fig. 1081) with radicle pale orange, apex narrowly ringed brown; scape pale orange, narrowly margined brown ventrally; pedicel mostly pale orange with a dark brown streak internally along its length; F1-F2 brown slightly mixed pale orange, F3-F5 pale orange mixed brown, F6 brown, inconspicuously mixed pale orange, clava dark brown; pronotum mostly orange, neck marked brownish; mesoscutum orange, posterior half or so with a weak metallic purple sheen and slightly dusky laterally, posterior margin weakly purple-brown with a weak purple sheen, anterior half of mesoscutum clothed in relatively sparse dark brown setae, posterior half clothed in relatively dense, translucent, silvery setae mixed with one or two dark brown setae; tegula orange with apex orange-brown; axilla and scutellum orange, axilla clothed with brown setae, scutellum clothed mostly with brown setae, anterior setae paler, subapical tuft black; metanotum pale orange; mesopleuron pale orange, brown in posterior one-third, anteriorly with a weak brassy and purple sheen, posteriorly with a weak purple sheen; fore coxa white; fore femur concolourous with coxa basally, apex pale orange, tibia and tarsus pale orange; mid coxa white; mid leg otherwise coloured similarly to fore leg, except that mid tibia is dorsally margined dark brown for some of its length; hind coxa white, femur concolourous at base, but mostly pale orange, knee brown, tibia and tarsus pale orange; fore wing (Fig. 1083) mostly infuscate, hyaline towards base and at apex; venation yellow-brown; propodeum pale orange, laterally and on side with a weak metallic pale blue and purple sheen, 1 or 2 pale brown setae anterior to spiracle; gaster pale orange with 2 basal tergites dorsally dark brown with a moderate metallic green, blue, coppery and brassy sheen, remainder of gaster with a much weaker purple, green and brassy sheen, apex of syntergum and apex of outer plate of ovipositor brown; gonostylus very pale orange.

Head (Fig. 1082) about 5X as wide as frontovertex, in profile about 1.5X as high as deep, anteriorly quite straight below top of scrobes, interantennal prominence hardly protuberant level with torulus; occipital margin sharp, not carinate; ocelli forming an angle of about 50°; frontovertex quite shiny, with very shallow, fairly regular, polygonally reticulate sculpture of mesh slightly smaller than diameter of eye facet; area between eye and scrobe completely smooth; scrobes shallow, Λ-shaped and mostly roundly margined externally, but moderately sharp below eye; interantennal prominence with a dorsal, median ridge that connects to frontovertex and narrowly separates the scrobes; temple and posterior gena virtually smooth, with very shallow, irregular, elongate sculpture, anterior part of gena with slightly deeper, irregular, reticulate sculpture; antenna as in Fig. 1081; scape broadened and flattened, about 2.5X as long as broad; funicle with F1 and F2 subequal and subquadrate, a little smaller than F3, remaining segments quadrate to slightly transverse, distal segments broadest and largest; clava slightly broadened, a little longer than F4-F6 combined, sutures hardly oblique, sensory area enlarged, but extending ventrally only about 0.2X along clava, giving it a slightly obliquely truncate appearance; eye very slightly overreaching occipital margin, clothed in fairly conspicuous, but short setae each much shorter than diameter of facet; inner eye margins weakly converging anteriorly, but diverging a little way above scrobes; malar sulcus absent; clypeal margin concave medially with very inconspicuous, shallow, narrow bilateral lobes; mandible with 1 acute tooth and a broad, slightly concave truncation, appearing virtually tridentate; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 57 HH 53, FV 11.5, POL 4, OOL 0, OCL 4.5, AOL 6, EL 39, EW 30, MS 25, SL 26, SW 9.

Thorax (Fig. 1080) with irregular, polygonally reticulate sculpture on pronotum that is a little deeper than that on frontovertex; mesoscutum in posterior third with polygonally reticulate sculpture that is hardly deeper than that on frontovertex, anterior two-thirds with moderately fine, deeper, longitudinally elongate lineolate-reticulate sculpture; axilla and scutellum mostly with, polygonally reticulate sculpture that is conspicuously deeper and coarser than that on frontovertex, that on scutellum more longitudinally elongate; visible part of mesoscutum about 1.7X as broad as long; scutellum hardly broader than long with a distinct subapical tuft, setae mostly about 0.4X as long as scutellum; hind femur about 3.7X as long as broad; fore wing with venation and setation as in Figs 1083, 1084; costal cell with 1 or 2 dorsal setae at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 1084); mid tibia with an indistinct, longitudinal, subbasal carina externally for about 0.25X its length; propodeum (Fig. 1080) with only 1 or 2 inconspicuous seta near spiracle, side completely smooth, medially about 0.14X as long as scutellum and with very shallow, irregular sculpture, virtually smooth. Relative measurements: FWL 55, FWW 22.5; HWL 44, HWW 12.

Gaster with hypopygium reaching slightly more than half-way to apex; syntergum about 0.8X as long as mid tibia, with apex narrowly rounded; ovipositor not exserted.

Paratype. Funicle with linear sensilla present only on F3-F6; gaster without "gland-like" structures on Gt1 or Gt5. Relative measurements: OL 29, GL 8 [MT 30].

Variation. Females vary in overall length from 0.97-1.48mm, the brown line above the mouth margin may be more or less absent, limited to a brown spot below each torulus, the ventral margin of the scape may be almost completely pale orange or more widely brown than in the holotype, F3 might be hardly larger than F2 and there may be up to 5 setae surrounding the propodeal spiracle.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Golfo Dulce, 24km W Piedras Blancas, 200m, ix-xi.1989 (P. Hanson). Paratypes: **COSTA RICA,** 1♀, **Guanacaste**, Maritza (ACG), 700m, MT/YPT, 20.i-24.ii.1996 (J.S. Noyes); 1♀, **Alajuela**, PN Arenal, La Peninsula, 10°27'N 84°40'W, 600m, 25.ii.2003 (J.S. Noyes); 1♀, **Heredia**, 10km W Puerto Viejo, La Selva Verde, 3.iii.1991 (A.E.H. Howden); 1♀, Heredia, Est.

Biol. La Selva, 10°25'N 84°01'W, canopy fog *Meliosoma vernicosa*, FOT/44/01-40, 8.i.2000 (INBio-OET); 1♀, Heredia, Estacion Biologica La Selva, 10°26'N 84°01'W, 22-24.ii.2012 (J.S. Noyes); 1♀, Heredia, Estacion Biologica La Selva, 10°26'N 84°01'W, 26-27.ii.2015 (J.S. Noyes); 1♀, **Puntarenas**, Pen. Osa, 8km S. R. Rincon, Coopermarti, xii.1990 (A. Retama); 2♀, Puntarenas, 10km W Golfo Dulce, xii.1989-iii.1990 (Hanson, Gauld); 1♀, Puntarenas, RF Golfo Dulce, 5km W Piedras Blancas, 8°46'N 83°17'W, 100m, viii.1992 (P. Hanson); 5♀, Puntarenas, RF Golfo Dulce, 24km W Piedras Blancas, 8°46'N 83°24'W, 200m, various dates xii.1990-iii.1992 (P. Hanson); 1♀, Puntarenas, Pen Osa, Puerto Jimenez, 8°32'N 83°19'W, xii.1990 (P. Hanson); 1♀, Puntarenas, Pen Osa, Puerto Jimenez, 8°32'N 83°21'W, 10m, x-xi.1991 (P. Hanson); 1♀, Puntarenas, Golfito, Est. Agujas, La Tigrilla, LS 523600 274500, 600m, #61191, xi-xii.2000 (J. Azofeifa); 1♀, Puntarenas, PN Corcovado, Est. Sirena, 50m, x-xi.1990 (P. Hanson); 1♀, **Limón**, Res. Biol. Hitoy Cerere, 9°40'N 83°02'W, 100m, 22-23.ii.2010 (J.S. Noyes). Holotype in MZUCR, paratypes in NHMUK, MZUCR and CNC.

COMMENTS. *Cheiloneurus fautrix* can be characterised by the lack of a distinct dark brown band and virtual lack of a metallic sheen on the posterior half of the mesoscutum. Other similar, largely orange, species (*diaces*, *letos*, *inimicus*, etc.) have a dark brown band on the posterior half of the mesoscutum that is distinctly metallic).

See also comments under *lexovus* (p. 431)

***Cheiloneurus aesernia* sp.nov.**

(Figs 1085-1089)

DIAGNOSIS. *Female* (length about 1.4mm): body mostly orange with some brown areas with a weak to moderate metallic sheen on head, and gaster; lower face with a curved brown line between mouth and toruli; temple and gena with a diagonal, brown streak; antenna (Fig. 1088) with scape mostly pale orange with ventral margin brown; pedicel pale orange with a dark brown longitudinal streak; funicle mainly orange-brown, F6 brown; clava dark brown; posterior half of mesoscutum with dense silvery setae; coxae white; legs mostly white to pale orange with brown areas; fore wing (Fig. 1086) mostly infuscate with basal cell almost completely hyaline, a small hyaline area at apex of venation and an opposite hyaline area on posterior wing margin, apex with a subtriangular hyaline area; head about 6.4X as wide as frontovertex, in facial view slightly broader than long, subcircular with genae converging and fairly uniformly curved, but slightly more curved inwards near mouth margin; frontovertex with two setae medially above scrobes; eye separated from scrobe by slightly less than diameter of anterior ocellus, area between eye and scrobe completely smooth, scrobal margin sharp, carinate below eye; interantennal prominence with about 14 inconspicuous setae and with a dorsal median ridge; mandible with one tooth and a broad, slightly concave truncation; antenna (Fig. 1088) with scape about 2.3X as long as broad; funicle segments subquadrate to transverse; head width slightly less than flagellum length; linear sensilla on F4-F6; clava 3-segmented, about as long as F2-F6 combined; sensory area enlarged and forming an oblique truncation, extending nearly 0.4X along ventral margin; mesoscutum (Fig. 1087) anteriorly with coarse, longitudinally elongate lineolate-reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 1086) about 2.4X as long as broad; parastigma slightly downcurved; costal cell dorsally with two setae at apex, with a complete line of setae ventrally; area below proximal part of parastigma with a line of about 8-10 pale setae that curves along cubital vein track towards wing base; apices of postmarginal and stigmal veins connected by a naked hyaline area that curves a little way into disc (Fig. 1089); apical bristle of postmarginal vein about 0.5X as long as marginal vein; mid tibial spur about as long basitarsus; propodeum with three or four setae adjacent to spiracle, side naked; syntergum slightly longer than 0.8X mid tibia; ovipositor (Fig. 1085) about 4.0X gonostylus or about 1.3X as long as mid tibia; gonostylus about as long as mid tibial spur; exserted part of ovipositor about 0.7X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.40mm; excluding ovipositor, 1.31mm (CPD).

Head mostly pale orange; frontovertex very slightly dusky with a weak blue, purple and brassy sheen, much stronger in ocellar area; temple and upper gena with a weak brassy, lower gena with

a very weak brassy and purple sheen, area between eye and scrobe with a slightly stronger blue and purple sheen; scrobal area with a weak brassy and purple sheen; lower face with a median, curved, brown line between toruli and mouth margin that more or less connects laterally with a stronger, oblique brown streak from temple behind eye; frontovertex clothed with inconspicuous, pale brown setae, a line of translucent setae between eye and scrobe; maxillary palpus white; antenna (Fig. 1088) with radicle pale orange, apex narrowly ringed orange-brown; scape pale orange, distinctly margined brown ventrally, more widely so internally near base; pedicel mostly pale orange with a dark brown streak internally along its length; funicle segments mainly orange-brown, mixed dark brown on inner surface, F6 brown, clava dark brown; pronotum mostly orange, neck and side above coxa brown; mesoscutum orange, posterior two-fifths with a purple and blue sheen, orange behind this with posterior margin brown, anterior half of mesoscutum clothed in relatively sparse golden brown to dark brown setae, posterior half clothed in relatively dense, translucent, silvery setae mixed with a few dark brown setae; tegula orange with apex orange-brown; axilla and scutellum orange, axilla clothed with brown setae, scutellum clothed anteriorly with golden brown setae, otherwise setae dark brown, subapical tuft black; metanotum slightly dusky orange; mesopleuron pale orange, brown in posterior one-third, anteriorly with a weak brassy and purple sheen, posteriorly with a weak purple sheen; fore coxa white; fore femur concolourous with coxa basally, apex pale orange, tibia and tarsus pale orange; mid coxa white; mid leg otherwise coloured similarly to fore leg, except that mid tibia has a brown streak dorsally for much of its length; hind coxa white, femur concolourous at base, but mostly pale orange, knee brown, tibia and tarsus pale orange, tibia with a very weak, brown subbasal ring; fore wing (Fig. 1086) mostly infuscate, hyaline towards base and at apex; venation yellow-brown; propodeum pale orange, side with a weak brassy sheen, 5 or 6 white setae near spiracle; gaster mostly very pale orange with basal tergite brown dorsally with a slight blue sheen, remainder of gaster with a much weaker purple, green and brassy sheen, extreme apex of syntergum and apex of outer plate of ovipositor brown; gonostylus very pale orange, almost white.

Head about 6.4X as wide as frontovertex, in profile about 1.4X as high as deep, anteriorly quite straight below top of scrobes, interantennal prominence hardly protuberant level with torulus; occipital margin sharp, not carinate; ocelli forming an angle of about 40°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh conspicuously smaller than diameter of eye facet; area between eye and scrobe slightly shorter than diameter of anterior ocellus, smooth; scrobes quite deep, broadly ∩-shaped and sharply margined, distinctly carinate below eye; interantennal prominence with similar sculpture to frontovertex, dorsally more or less acute, with a distinct median ridge that continues as a very shallow ridge to meet frontovertex, not separating scrobes; temple with very shallow, irregular, elongate sculpture, gena with slightly deeper, irregular, reticulate sculpture; antenna as in Fig. 1088; scape broadened and flattened, about 2.3X as long as broad; funicle with segments broader and larger distad, proximal segments subquadrate, distal segments transverse, linear sensilla present only on F4-F6; clava broadened, about as long as F2-F6 combined, sutures oblique, sensory area enlarged, extending ventrally 0.4X along clava, giving it an obliquely truncate appearance; eye reaching occipital margin, naked; inner eye margins slightly converging anteriorly, diverging a little way above scrobes; malar sulcus absent; clypeal margin weakly concave medially; mandible with 1 tooth and a broad, slightly concave truncation; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 58, HH 55.5, FV 9, POL 4, OOL 0, OCL 5, AOL 7.5, EL 43, EW 31, MS 27, SL 30.5, SW 13.

Thorax (Fig. 1087) with irregular, polygonally reticulate sculpture on pronotum that is a little deeper than that on frontovertex; mesoscutum in posterior one-third with polygonally reticulate sculpture that a little deeper than that on frontovertex, anterior two-thirds with coarser, deeper, longitudinally elongate lineolate-reticulate sculpture; axilla and scutellum mostly with fairly regular, polygonally reticulate sculpture that is conspicuously deeper and coarser than that on frontovertex, but sculpture on scutellum more elongate, especially laterally; visible part of mesoscutum about 2X as broad as long; scutellum about as long as broad with a distinct subapical tuft, setae mostly a little less than half as long as scutellum; hind femur about 4.3X as long as broad; fore wing with venation and setation as in Figs 1086, 1089; costal cell with at most only a single seta at apex; apices of postmarginal and stigmal veins connected by a distinct, naked,

hyaline streak; propodeum (Fig. 1087) with side completely smooth, medially about 0.14X as long as scutellum and with very shallow, irregular sculpture, virtually smooth. Relative measurements: FWL 56, FWW 23; HWL 46, HWW 11.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium not quite reaching halfway to apex; syntergum slightly more than 0.9X as long as mid tibia, with apex hardly angular; ovipositor (Fig. 1085) slightly exserted, the exserted part about two-thirds as long as mid tibial spur or slightly less than one-fifth mid tibia. Relative measurements: OL 96.5, GL 24 [MT 76].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Limón**, RB Hitoy Cerere, 9 40'N 83°02'W, 100m, ii.2004 (Noyes). Holotype in NHMUK.

COMMENTS. *Cheiloneurus aesernia* is similar in general habitus to *gyges* and the two species could be confused. Apart from the lack of a distinct brown band on the posterior half of the mesoscutum (present in *gyges*), *aesernia* can be separated from *gyges* by having a slightly more slender clava, which is hardly more than 2X as wide as the pedicel, and a smaller apical sensory area that is only reaches about one-third along the ventral margin of clava. In *gyges* the clava is relatively larger and very nearly 3X as wide as the pedicel and the sensory area reaches about halfway along the ventral margin of the clava.

Cheiloneurus gyges **sp.nov.**

(Figs 1090-1094; Hab. ♀ 158)

DIAGNOSIS. *Female* (length about 1.4-1.6mm): body mostly orange with some brown areas with a weak to moderate metallic sheen on head, mesoscutum and gaster; lower face with a curved brown line between mouth and toruli; temple and gena with a diagonal, brown streak; antenna (Fig. 1092) with scape mostly pale orange with ventral margin brown; pedicel pale orange with a dark brown longitudinal streak; funicle mainly orange-brown, F6 brown; clava dark brown; posterior three-fifths of mesoscutum with dense silvery setae; coxae white; legs mostly white to pale orange with brown areas; fore wing (Fig. 1093) mostly infuscate with basal cell almost completely hyaline, a small hyaline area at apex of venation and an opposite hyaline area on posterior wing margin, apex with a subtriangular hyaline area; head (Figs 1091, 1094) about 6-7X as wide as frontovertex, in facial view slightly broader than long, subcircular with genae converging and fairly uniformly curved, but slightly more curved inwards near mouth margin; frontovertex with one or two setae medially above scrobes; eye separated from scrobe by slightly less than diameter of anterior ocellus, area between eye and scrobe completely smooth, scrobal margin sharp, carinate below eye; interantennal prominence with about 13-22 inconspicuous setae and with a dorsal median ridge; mandible with two teeth and a truncation; antenna (Fig. 1092) with scape about 2.5X as long as broad; funicle segments subquadrate to transverse; head width hardly shorter than flagellum length; linear sensilla on F4-F6; clava 3-segmented, about as long as F2-F6 combined; sensory area enlarged and forming an oblique truncation, extending about 0.5X along ventral margin; mesoscutum anteriorly with coarse, longitudinally elongate lineolate-reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 1093) about 2.4-2.6X as long as broad; parastigma slightly downcurved; costal cell dorsally with up to two setae at apex, with a complete line of setae ventrally; area below proximal part of parastigma with a line of about 8-10 pale setae that curves along cubital vein track towards wing base, one or two setae outside this; apices of postmarginal and stigmal veins connected by a naked hyaline area that curves a little way into disc (Fig. 1090); apical bristle of postmarginal

vein about 0.5-0.7X as long as marginal vein; mid tibial spur about as long basitarsus; propodeum with three to eight setae adjacent to spiracle, side naked; syntergum about 0.8-0.9X mid tibia; ovipositor about 3.8-4.0X gonostylus or about 1.3-1.4X as long as mid tibia; gonostylus about 1.1-1.2X as long as mid tibial spur; exserted part of ovipositor about 0.7X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.46mm; excluding ovipositor, 1.40mm (CPD).

Head mostly pale orange; frontovertex with a weak blue, green and purple sheen, stronger in ocellar area; temple and upper gena with a weak brassy and purple sheen, lower gena with a very weak brassy, coppery and purple sheen, area between eye and scrobe with a slightly stronger green, coppery and purple sheen; scrobal area with a weak brassy and purple sheen; lower face with a median, curved, brown line between toruli and mouth margin that connects laterally with a stronger, oblique brown streak from temple behind eye; frontovertex clothed with inconspicuous, pale brown setae, a line of translucent setae between eye and scrobe; maxillary palpus white; antenna (Fig. 1092) with radicle pale orange, apex narrowly ringed orange-brown; scape pale orange, distinctly margined brown ventrally, more widely so internally near base; pedicel mostly pale orange with a dark brown streak internally along its length; funicle with F1-F5 largely pale orange, dark brown ventrally, more widely so on proximal segments, F6 dark orange-brown, clava dark brown; pronotum mostly orange, neck and side above coxa brown; mesoscutum orange, posterior two-fifths with a purple and blue sheen, behind this orange-brown with a weak purple sheen, anterior half of mesoscutum clothed in relatively sparse golden brown to dark brown setae, posterior half clothed in relatively dense, translucent, silvery setae mixed with a few dark brown setae; tegula orange with apex orange-brown; axilla and scutellum orange, axilla clothed with brown setae, scutellum clothed anteriorly with golden brown setae, otherwise setae dark brown, subapical tuft black; metanotum slightly dusky pale orange; mesopleuron pale orange, mixed brown in posterior one-third, anteriorly with a weak brassy and purple sheen, posteriorly with a weak purple sheen; fore coxa white; fore femur concolourous with coxa basally, apex pale orange, tibia and tarsus pale orange; mid coxa white; mid leg otherwise coloured similarly to fore leg, except that mid tibia has a brown streak dorsally for much of its length and the remnants of a narrow, brown, subbasal ring; hind coxa white, femur concolourous at base, but mostly pale orange, knee brown, tibia and tarsus pale orange, tibia with a very weak, longitudinal brown streak; fore wing (Fig. 1093) mostly infuscate, hyaline towards base and at apex; venation yellow-brown; propodeum pale orange, dusky on side with a weak blue and brassy sheen, 5 or 6 white setae near spiracle; gaster mostly pale orange, Gt1 brown dorsally with a slight blue sheen, rest of gaster with a weak purple, green, coppery and brassy sheen, Gt2-Gt6 brown laterally, apex of syntergum and apex of outer plate of ovipositor pale brown; gonostylus very pale orange, almost white.

Head (similar to Fig. 1091) about 6.1X as wide as frontovertex in profile about 1.5X as high as deep, anteriorly quite straight below top of scrobes, interantennal prominence hardly protuberant level with torulus; occipital margin sharp, not carinate; ocelli forming an angle of about 50°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh conspicuously smaller than diameter of eye facet; area between eye and scrobe about as wide as diameter of anterior ocellus, smooth; scrobes quite deep, broadly ∩-shaped and sharply margined, distinctly carinate below eye; interantennal prominence with similar sculpture to frontovertex, dorsally narrowly rounded, with a distinct median ridge, not separating scrobes; temple virtually smooth with very shallow, irregular, elongate sculpture, gena with slightly deeper, irregular, reticulate sculpture; antenna as in Fig. 1092; scape broadened and flattened, about 2.5X as long as broad; funicle with segments broader and larger distad, proximal segments subquadrate, distal segments transverse; clava broadened, slightly longer than F2-F6 combined, sutures oblique, sensory area enlarged, extending ventrally about half-way along clava, giving it an obliquely truncate appearance; eye reaching occipital margin, naked; inner eye margins slightly converging anteriorly, diverging a little way above scrobes; malar sulcus absent; clypeal margin weakly concave medially; mandible with 2 teeth and a truncation, more or less tridentate; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 70, HH 66, FV 11.5, POL 6, OOL 0, OCL 6.5, AOL 7.5, EL 48, EW 37, MS 30, SL 33, SW 13.

Thorax with irregular, polygonally reticulate sculpture on pronotum that is a little deeper than that on frontovertex; mesoscutum in posterior two-fifths with fairly regular, polygonally reticulate sculpture that is conspicuously deeper and coarser than that on frontovertex, anterior three-fifths with sculpture coarser and longitudinally lineolate-reticulate; axilla and scutellum mostly with fairly regular, polygonally reticulate sculpture that is conspicuously deeper and coarser than that on frontovertex, but more elongate laterally on scutellum; visible part of mesoscutum about 1.8X as broad as long; scutellum about as long as broad with a distinct subapical tuft, setae mostly a little less than half as long as scutellum; hind femur about 4.6X as long as broad; fore wing with venation and setation as in Figs 1090, 1093; costal cell dorsally naked at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 1090); propodeum with side completely smooth, medially about 0.15X as long as scutellum and with very shallow, irregular sculpture, virtually smooth. Relative measurements: FWL 60, FWW 22.5; HWL 50, HWW 11.5.

Gaster with hypopygium not quite reaching half-way to apex; syntergum nearly as long as mid tibia, with apex weakly angular; ovipositor slightly exserted, the exserted part about two-thirds as long as mid tibial spur or about one-fifth mid tibia.

Paratype. Funicle with linear sensilla present only on F4-6; gaster without "gland-like" structures on Gt1 or Gt5. Relative measurements: OL 50.5, GL 12 [MT 36].

Variation. Females vary in overall length from 1.42-1.55mm, the head may be about 7X as wide as the frontovertex, otherwise very little in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, Est. Biol. La Selva, 10°25'N 84°01'W, iv.1994 (INBio-OET). Paratypes: **COSTA RICA**, 2♀, **Heredia**, OTS-La Selva, 10°26'N 84°01'W, xi.1993 (ALAS); 1♀, Heredia, OTS La Selva, 10°26'N 84°01'W, 75m, 23.ii.2006 (J.S. Noyes); 1♀, Heredia, Estacion Biológica La Selva, 10°26'N 84°01'W, 1-2.iii.2007 (J.S. Noyes). Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. See comments under *aesernia* (p. 427) and *lexovus* (p. 431).

***Cheiloneurus lexovus* sp.nov.**
(Figs 1095-1098; Hab. ♀ 159)

DIAGNOSIS. *Female* (length about 1.1mm): body mostly orange, mesoscutum posteriorly, propodeum laterally and gaster partially brown, darker areas with a weak to moderate metallic sheen; mouth margin dark brown; temple and gena with a dark brown, diagonal stripe; antenna (Fig. 1096) with scape pale orange, proximally and ventral margin brown; pedicel pale orange with a longitudinal dark brown stripe; funicle dusky pale orange mixed dark brown; clava dark brown; mesoscutum with silvery setae in posterior half; fore and hind coxae white, mid coxa pale orange; legs largely white to pale orange a few brown areas on femora and tibiae; fore wing mostly infuscate, basal cell mostly hyaline, a hyaline area at apex of venation, another opposite and apex with a relatively large, subtriangular hyaline area; head (Fig. 1097) about 6.6X as wide as frontovertex, in facial view clearly broader than long, subcircular, genae evenly curved, converging, more strongly curved inwards near mouth; frontovertex with 2 setae medially between anterior ocellus and scrobes; eye separated from scrobe by about 1.2X diameter of anterior ocellus, area between eye and scrobe completely smooth; scrobes moderately deep, not sharply margined, interantennal prominence with about 15 inconspicuous setae, dorsally with a distinct median longitudinal ridge; mandible tridentate; antenna (Fig. 1096) with scape about 3.2X as long as broad; funicle with some segments very slightly longer than broad, remaining segments transverse; clava 3-segmented, slightly shorter than F2-F6 combined; sensory area

enlarged, extending ventrally about 0.3X length of clava, apex obliquely truncate; head width about equal to flagellum length; mesoscutum (Fig. 1095) anteriorly with fine, striate to striate-reticulate sculpture, posteriorly with polygonally reticulate sculpture that advances medially into anterior part; scutellum with an distinct, subapical tuft of setae; wings fully developed, fore wing about 2.5X as long as broad; parastigma weakly downcurved; costal cell dorsally with 1 or 2 apical setae, ventrally with a complete line of setae; area below proximal part of parastigma with a line of about 4 or 5 fine setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that extends a little way into disc; apical bristle of postmarginal vein about 0.4X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with only 2 inconspicuous setae adjacent to spiracle, side naked; syntergum about 0.9X as long as mid tibia with apex acute; ovipositor (Fig. 1098) about 3.3X gonostylus or about 1.5X as long as mid tibia; gonostylus about 1.4X as long as long mid tibial spur; exserted part of ovipositor about 0.6X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.08mm; excluding ovipositor, 1.02mm (CPD).

Head pale orange; frontovertex slightly dusky with a slight coppery and metallic dark blue sheen, slightly coppery between posterior ocelli; temple and gena with weak brassy and coppery sheen and a diagonal dark brown stripe from middle of posterior margin of temple to about mid way between lowest eye margin and base of mandible; scrobal area generally with a weak brassy sheen, top and outer margin of scrobe with a weak coppery sheen, lower face with a transverse, narrow, curved, dark brown line above mouth margin originating just outside torulus about midway between torulus and mouth margin and conspicuously curved upwards between lowest margins of toruli; frontovertex with a few very inconspicuous translucent setae; antenna (Fig. 1096) with radicle pale orange, apex narrowly dark brown; scape mostly pale orange, ventral margin very narrowly dark brown for most of its length on outer surface, inner surface more broadly dark brown in proximal one-half; pedicel very pale orange with a dark brown streak laterally along inner surface; F1-F3 mostly very slightly dusky pale orange but inner surface dark brown level with dark brown streak on pedicel, F4 similar but paler, F5 pale orange, F6 dark brown; clava dark brown; palpi pale orange; thorax mostly orange; pronotum with a weak brassy and coppery sheen, neck brown, posterior margin translucent, other areas orange; mesoscutum with anterior one-half orange with dark brown setae, posterior margin narrowly slightly dusky orange, remainder a moderate to strong metallic dark blue and violet band clothed with silvery setae; tegula orange with apex narrowly pale grey-brown with a slight coppery sheen; axilla and scutellum pale orange, matt, scutellum with some dark brown and translucent, golden setae, subapical tuft dark brown; metanotum dusky pale orange with a slight brassy sheen; propleuron mostly orange but with a dark brown spot immediately above fore coxa; mesopleuron with an overall slight brassy sheen, pale orange with posterior one-third dark brown with a moderate coppery sheen; prosternum and mesosternum pale orange; fore coxa white, proximal half of femur white, distal half of femur very pale orange, tibia white at extreme base, remainder pale orange, tarsus pale orange with apical tarsomere dusky; mid coxa very pale orange, slightly dusky ventrally, femur white proximally, otherwise extremely pale orange, tibia mostly very pale orange, with extreme base white and a very faint pale brown subbasal dorsal streak that is connected externally to base of tibia almost forming a Y-shaped mark, spur very pale orange, tarsus very pale orange, pretarsus brown; hind coxa white, femur very slightly dusky very pale orange, brown dorsally towards apex, tibia dark brown at extreme base, otherwise very pale orange, tarsus very pale orange; fore wing similar to that of *amethes* (Fig. 1139) proximally hyaline to level with base of marginal vein, very weakly infuscate at extreme base, a broadly triangular hyaline area in apical 0.15X, a narrow curved, hyaline, line connecting postmarginal and stigmal veins and extending about 0.27X into wing disc, submarginal vein mostly pale orange otherwise pale brown; propodeum medially pale orange with a weak coppery sheen, area around spiracle brown with a weak pale blue-green sheen mixed with a little purple; dorsum of gaster largely pale orange, TI-TII dark brown with a coppery and metallic dark green sheen, TIII-TV slightly dusky with coppery red, brassy and metallic green reflections, TVI and syntergum mostly pale orange with green and coppery red sheen, apex brown, side and venter of gaster dusky pale orange with brassy, coppery, coppery red and dark green reflections, apex of hypopygium dark brown; gonostylus virtually white.

Head (Fig. 1097) about 6.6X as wide as frontovertex and about 1.4X as high as deep; occipital margin sharp and without a median groove to foramen; ocelli forming an angle of about 35°; frontovertex shiny, with shallow, polygonally reticulate sculpture of mesh size about equal to diameter of eye facet or a little smaller, sculpture much shallower above scrobes; bottoms of scrobes completely smooth, other parts of scrobal area, including interantennal prominence and mouth margin with very shallow sculpture, almost smooth; temple and posterior gena completely smooth adjacent to eye margin but otherwise with shallow, irregular, longitudinally elongate polygonally reticulate sculpture; eye separated from scrobe by about 1.2X diameter of anterior ocellus, area between scrobe and eye completely smooth; scrobes moderately deep, somewhat Λ-shaped, not quite meeting dorsally, separated by a carinate ridge extending from dorsal part of interantennal prominence to frontovertex, interantennal prominence with a median longitudinal ridge along most of its length, dorsal margin of scrobe narrowly rounded, lateral margin weakly carinate above level of torulus; antenna as in Fig. 1096; scape conspicuously broadened and flattened, about 3.2X as long as broad; funicle with F1-F4 subequal but F1-F2 and F4 very slightly longer than broad, subquadrate, F3 quadrate, F5-F6 subequal, F5 very slightly longer than broad, F6 quadrate, linear sensilla present only on F5-F6; clava slightly shorter than F2-F6 combined, outer suture oblique, sensory area about 0.6X as long as ventral surface, forming an oblique truncation that extends about 0.3X along clava; eye very slightly overreaching occipital margin, naked; malar sulcus absent; mandible with 2 subequal acute lower teeth and very short, rounded, upper, third tooth. Relative measurements: HW 73, HH 69, FV 11, OD 4, POL 5, OOL 0, OCL 6, AOL 8, EL 53.5, EW 40, MS 34, SL 35, SW 11.

Thorax (Fig. 1095) with fairly regular, coarse, polygonally reticulate sculpture on pronotum that is slightly deeper than that in ocellar area and generally of similar mesh size; sculpture on mesoscutum of similar depth, but mostly fine, longitudinally striate to striate-reticulate in anterior half and regular polygonally reticulate in posterior half with this polygonally reticulate sculpture ending medially, in a narrow triangular area, almost to anterior margin of mesoscutum; sculpture on axilla similar to that on pronotum; scutellum mostly with relatively coarse, slightly deeper, longitudinally elongate, polygonally reticulate sculpture more or less arranged in whorls; visible part of mesoscutum about 2.5X as broad as long; scutellum about as long as broad, subapical tuft distinct, longest setae about 0.5X as long as scutellum; hind femur about 4.2X as long as broad; fore wing with venation and setation similar to that of *amethes* (Fig. 1139); costal cell without dorsal setae at apex, but with a complete line of setae ventrally; a naked streak connects apices of postmarginal and stigmal veins; propodeum (Fig. 1095) with only 2 setae in spiracular area, medially about 0.1X as long as scutellum and smooth. Relative measurements: FWL 80, FWW 31.5; HWL 65, HWW 16.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium reaching about 0.4X to apex; syntergum about 0.9X as long as mid tibia, apex angular, more or less acute; ovipositor (Fig. 1098) exserted, the exserted part about 0.6X as long as mid tibial spur or about 0.2X as long as mid tibia. Relative measurements: OL 39.5, GL 12 [MT 26].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, PN Bosque Diría, 10°10'N 85°34'W, 200m, 14-15.ii.2011 (J.S. Noyes). Holotype in NHMUK.

COMMENTS. As the key suggests, *Cheiloneurus lexovus* is close to *gyges*. Apart from the characters given in the key *lexovus* differs in having linear sensilla only on F5-F6, fine striate to striate-reticulate sculpture on the anterior part of mesoscutum and the ovipositor about 3.3X as long as the gonostylus. In *gyges* linear sensilla are present on F4-F6, the anterior part of the

mesoscutum has coarse, longitudinally elongate lineolate-reticulate sculpture and the ovipositor is about 3.8-4.0X as long as the gonostylus. *Cheiloneurus lexovus* may run to *fautrix* if the posterior brown band on the mesoscutum is considered faint. However, in *lexovus* the frontovertex is about 0.15X head width, the mid tibia is about two-thirds as long as the ovipositor and hardly more than 2X as long as the gonostylus, whereas in *fautrix* the frontovertex is about 0.2X head width and the mid tibia is about as long as the ovipositor and more than 3X as long as the gonostylus. *Cheiloneurus lexovus* is also similar to *omorus* and might run to this species in the key if the setae on the ventral surface of the costal cell are difficult to see. In *lexovus*, the temple has a strong, diagonal dark brown mark nearly reaching the base of mandible, F5 is pale orange, contrasting with F6 which is dark brown, the maxillary palpi are pale orange, the hind tibia is very pale orange with some brown at its extreme base, the frontovertex is about 0.15X head width, the clava is slightly shorter than F2-F6 combined, and the exserted part of the ovipositor is about 0.6X as long as the mid tibial spur. Whereas, in *omorus* the diagonal brown mark on the temple is extremely faint and short, F5 is more or less concolourous with F6, the maxillary palpi are white, the hind tibia is dirty white with an external brown streak and incomplete subbasal brown ring, the frontovertex it is about 0.2X head width, the clava is about as long as the funicle and the exserted part of the ovipositor is about 0.3X as long as the mid tibial spur.

Cheiloneurus numitor **sp.nov.**
(Figs 1099-1104)

DIAGNOSIS. *Female* (length about 1.4mm): body mostly orange with posterior half of mesoscutum, propodeum and parts of gaster dark brown, mouth margin brown, temple and gena with a diagonal brown streak, paler areas with a weak metallic sheen, darker areas with a weak to moderate metallic sheen; antenna (Fig. 1104) with scape mostly orange, ventral margin brown; pedicel pale orange with a dark brown streak; funicle dark brown; clava dark brown; mesoscutum with silvery setae in posterior half; fore coxa white, mid and hind coxae pale orange; legs otherwise white to pale orange, with some pale brown areas; fore wing (Fig. 1101) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation and a narrow, subtriangular hyaline area at apex; head about 4.7X as wide as frontovertex, in facial view slightly broader than long, suboval, genae converging, hardly curved but distinctly curved near mouth margin; frontovertex with three setae medially between anterior ocellus and scrobes; eye separated from scrobe by slightly more than diameter of anterior ocellus, area between eye and scrobe completely smooth; scrobes moderately deep, sharply margined below eye; interantennal prominence dorsally rounded, without a median ridge and with about 25 inconspicuous setae; mandible virtually tridentate; antenna (Fig. 1104) with scape about 2.5X as long as broad; funicle with F1 quadrate, other segments transverse; linear sensilla on F3-F6; clava 3-segmented, about as long as F2-F6 combined, sensory area enlarged, extending ventrally nearly 0.5X length of clava, apex obliquely truncate; head width slightly more than flagellum length; mesoscutum (Fig. 1100) anteriorly with fairly coarse lineolate-reticulate sculpture, posteriorly with polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 1101) about 2.4X as long as broad; parastigma downcurved; costal cell dorsally naked save for two or three apical setae, ventrally with a complete line of setae; area below proximal part of parastigma with 9-13 setae arranged in two lines connecting with a line along cubital vein towards base; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues some way into disc (Fig. 1099); apical bristle of postmarginal vein about 0.5X as long as marginal vein; mid tibial spur hardly shorter than basitarsus; propodeum with about eight silvery setae adjacent to spiracle, side naked; syntergum about 0.8X as long as mid tibia with apex more or less rounded; ovipositor (Fig. 1102) about 4.0X gonostylus or about 1.3X as long as mid tibia; gonostylus nearly 1.2X as long as mid tibial spur; exserted part of ovipositor about 0.3X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.35mm; excluding ovipositor, 1.30mm (CPD).

Head largely pale orange; occiput with a triangular brown spot above foramen; frontovertex dusky, ocellar area brown with a conspicuous dark blue and green sheen, especially strong

between posterior ocelli, anterior parts of frontovertex with a weaker blue and green sheen, area immediately above scrobes brassy and above this narrowly purple; temple, gena and area below eye with a weak brassy, purple and green sheen; scrobal area with a very weak brassy and purple sheen; mouth margin brown and connecting with a diagonal brown line from occipital margin; frontovertex clothed with inconspicuous, pale brown setae, a line of more conspicuous, translucent setae below eye; antenna (Fig. 1104) with radicle pale orange, apex broadly brown; scape orange, ventral margin brown, more widely so on inner surface; pedicel orange with an internal dark brown streak along its length; flagellum dark brown; maxillary palpus white, apical segment pale orange, dorsal margin dark brown; pronotum mostly orange, neck brown; prosternum dusky orange, anterior to coxa brown; mesoscutum orange in anterior half, posterior half dark brown with a distinct, dark, metallic blue-green sheen, posterior margin purple-brown with a slight purple and brassy sheen, anterior part clothed in relatively sparse dark brown setae, posterior part with relatively dense silvery setae, mixed with a few dark brown setae; tegula orange, apex orange-brown; axilla and scutellum orange, clothed in translucent golden brown and dark brown setae, scutellar tuft black; metanotum brown; mesopleuron mostly orange with a weak brassy sheen, posterior half orange-brown with a slight purple and green sheen; fore coxa white; fore femur largely white, apically pale orange, tibia pale orange, dorsal margin pale brown, tarsus dark orange-brown; mid coxa mostly pale orange, dusky proximally; mid femur white at base, otherwise pale orange mixed brown towards apex, tibia largely pale orange with knee brown, an incomplete brown subbasal ring and dorsal margin brown along most of its length, spur and tarsus pale orange; hind coxa pale orange; hind femur pale orange with a small brown apical spot, tibia pale orange, largely dark orange-brown externally along about half its length, tarsus dusky pale orange; fore wing (Fig. 1101) mostly infuscate, hyaline towards base and at apex; submarginal vein largely pale orange, otherwise venation brown; propodeum orange-brown with a slight brassy lustre, side with a slight blue and green sheen, 6 or 7 translucent, setae outside spiracle; gaster dark brown, dorsally with a purple sheen and green, coppery and brassy reflections, Gt1 strong metallic green with a slight brassy sheen; sides and venter mainly with a metallic green sheen and coppery and brassy reflections; gonostylus very pale orange.

Head about 4.7X as wide as frontovertex, in profile about 1.5X as high as deep, anteriorly quite straight below top of scrobes, interantennal prominence hardly protuberant; occipital margin sharp, not carinate; ocelli forming an angle of about 50°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture, slightly deeper in ocellar area, mesh size slightly smaller than diameter of eye facet; area immediately above scrobes with slightly transversely elongate sculpture, interantennal prominence with shallow sculpture, scrobes with distinct sculpture, temple and posterior gena with shallow, irregular, longitudinally elongate sculpture, anterior gena with slightly deeper, irregular, reticulate sculpture; area between eye and scrobe a little broader than diameter of anterior ocellus and virtually completely smooth; scrobes moderately deep, meeting dorsally, sharply margined only immediately below eye, very broadly ∩-shaped, interantennal prominence dorsally rounded and without a median ridge; antenna as in Fig. 1104; scape broadened and flattened, about 2.5X as long as broad; funicle with F1 quadrate, other segments transverse, larger and broader distad; linear sensilla present only on F3-F6; clava clearly broadened, about as long as F2-F6 combined, sutures oblique, sensory area enlarged, extending nearly half-way along clava, giving it a distinct, strongly obliquely truncate appearance; eye reaching occipital margin, appearing naked but clothed with extremely short setae that are much shorter than diameter of facet; inner eye margins converging weakly below anterior ocellus; malar sulcus absent; clypeal margin medially virtually straight; mandible with one acute tooth and a broad concave truncation, virtually tridentate; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 80, HH 76.5, FV 17, POL 7, OOL 0, OCL 6.5, AOL 10, EL 54, EW 44, MS 36, SL 40, SW 16.

Thorax (Fig. 1100) with irregular, polygonally reticulate sculpture on pronotum that is similar in depth to that in ocellar area; mesoscutum in anterior three-fifths with coarse longitudinally elongate, lineolate-reticulate sculpture that is slightly deeper than that on pronotum, posterior two fifths with more regular, slightly shallower, polygonally reticulate sculpture; axilla and scutellum with polygonally reticulate sculpture of similar depth to that on pronotum, sculpture on scutellum more elongate laterally; visible part of mesoscutum about 2X as broad as long; scutellum about

as long as broad with a distinct subapical tuft, setae mostly nearly half as long as scutellum; hind femur about 4.4X as long as broad; fore wing with venation and setation as in Figs 1099, 1101; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 1099); mid tibia with an indistinct, external subbasal carina for about half its length; propodeum (Fig. 1100) medially about 0.15X as long as scutellum and with some very shallow, irregular, reticulate sculpture. Relative measurements: FWL 104.5, FWW 43.5; HWL 82.5, HWW 21.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium (Fig. 1103) reaching about half-way to apex; syntergum about 0.8X as long as mid tibia, with apex very weakly angular, more or less rounded; ovipositor (Fig. 1102) slightly exserted, about one-third as long as mid tibial spur or 0.1X as long as mid tibia. Relative measurements: OL 41.5, GL 10.5 [MT 32].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Limón**, RB Hitoy Cerere, Valle de la Estrella, Send. Toma de Agua, LN 184300 643500, 140m, #54234, 8.v.1999 (F. Umaña). Holotype in NHMUK.

COMMENTS. The left antenna is missing from the holotype, but it is in otherwise good condition.

Cheiloneurus numitor is very similar to *metheus*, the two being most easily separated by the presence of a complete line of setae on the ventral surface of the costal cell of the fore wing in *numitor*. Other features that separate the species are in *numitor* the gaster is entirely dark brown, the head is about 2.7X as wide as the frontovertex, linear sensilla are present on F3, the scape about 2.5X as long as broad and the syntergum is about 0.8X as long as the mid tibia with the apex almost rounded forming a strongly obtuse angle. In *metheus* the gaster is orange dorsally with the extreme apex of the syntergum brown, the head is about 4.4X as wide as the frontovertex, linear sensilla are absent from F3, the scape is about 3X as long as broad and the syntergum is about as long as the mid tibia with the apex forming a distinctly acute angle.

Cheiloneurus mora **sp.nov.**

(Figs 1105-1110)

DIAGNOSIS. *Female* (length about 1.2mm): body mostly orange with some brown areas with a weak to moderate metallic sheen on head, mesoscutum and gaster; mouth margin narrowly dark brown; temple with a distinct diagonal, brown streak to gena; antenna (Fig. 1106) with scape mostly pale orange with ventral margin broadly brown; pedicel pale orange with a dark brown longitudinal streak; funicle brown; clava dark brown; posterior part of mesoscutum with dense silvery setae; fore and hind coxae white, mid coxa pale orange; legs mostly white to pale orange with some dark brown areas; fore wing (Fig. 1108) mostly infuscate with basal cell almost completely hyaline, a small hyaline area at apex of venation and an opposite hyaline area on posterior wing margin, apex with a triangular hyaline area; head about 4X as wide as frontovertex, in facial view slightly longer than broad, subcircular with genae converging and evenly curved; frontovertex naked medially above scrobes; eye separated from scrobe by about diameter of anterior ocellus, area between eye and scrobe completely smooth, scrobal margin rounded; interantennal prominence with about 25 inconspicuous setae and with a weak, dorsal, median ridge; mandible with two teeth and a truncation, almost tridentate; antenna (Fig. 1106) with scape about 3.5X as long as broad; funicle with F1 quadrate, remaining segments transverse; head width about 1.2X flagellum length; linear sensilla on F3-F6; clava 3-segmented, slightly shorter than funicle; sensory area enlarged and forming an oblique truncation, extending nearly 0.5X along ventral margin; mesoscutum (Fig. 1105) anteriorly with coarse, longitudinally elongate, striate-reticulate sculpture; scutellum with

a distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 1108) about 2.5X as long as broad; parastigma slightly downcurved; costal cell dorsally naked but ventrally with a complete line of setae; area below proximal part of parastigma with a group of about 14 setae that continue part way along cubital vein track toward wing base; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc (Fig. 1109); apical bristle of postmarginal vein about 0.6X as long as marginal vein; mid tibial spur very slightly shorter than basitarsus; propodeum with about four or five setae adjacent to spiracle, side naked; syntergum about as long as mid tibia; ovipositor (Fig. 1110) about 4.2X gonostylus or about 1.5X as long as mid tibia; gonostylus very slightly longer than mid tibial spur; exserted part of ovipositor about 0.3X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.23mm; excluding ovipositor, 1.19mm (CPD).

Head generally pale orange; occiput with a brown, triangular mark above foramen; frontovertex slightly dusky with a weak purple, blue and green lustre, strongest in ocellar area; temple and upper gena with a weak green and purple sheen, lower gena with a blue, coppery and brassy sheen; area between eye and scrobe with a weak green and purple sheen; lower face with a curved, dark brown line between toruli and mouth margin that connects with a diagonal brown line from temple; frontovertex clothed with inconspicuous, translucent, pale brown setae, a line of fine, translucent setae between eye and scrobe; maxillary palpus white; antenna (Fig. 1106) with radicle pale orange; scape pale orange, internally with ventral margin broadly dark brown in proximal half; pedicel pale orange with a dark brown streak internally along its length; funicle brown, F6 partially orange-brown and clava dark brown; pronotum orange with neck broadly dark brown; prosternum orange, dark brown outside coxa; mesoscutum orange in anterior one-fifths, posterior two-fifths with a strong, dark, metallic blue and purple sheen, posterior margin purple-brown, anterior part clothed in relatively sparse dark brown setae, posterior part clothed in relatively dense, translucent, silvery setae mixed with a few dark brown setae; tegula orange with apex orange-brown; axilla and scutellum orange clothed with dark brown setae, subapical tuft black; metanotum orange-brown; mesopleuron pale orange, posteriorly orange-brown, anterior part with a very weak brassy sheen, posterior part with a weak brassy, coppery and purple sheen; fore coxa white; fore femur white with apical one-third pale orange, weakly marked pale brown, tibia largely pale orange with a very weak subbasal, pale brown band, tarsus pale orange; mid coxa pale orange; mid femur white, apex pale orange, tibia mostly pale orange but with an incomplete subbasal brown band and with dorsal margin brownish for about half its length, spur and tarsus pale orange; hind coxa white; hind femur white proximally with distal two-thirds pale orange, knee narrowly brown, tibia pale orange with an incomplete, brown, subbasal band and a diagonal brown stripe externally for about two-thirds of its length, tarsus pale orange; fore wing (Fig. 1108) mostly infuscate, hyaline towards base and at apex; parastigma yellow, remainder of venation brown; propodeum orange, side brown with a weak green and purple sheen, about 5 or 6 pale, translucent setae near spiracle; gaster mainly dark brown with a green, brassy, coppery and purple sheen, anterior part of syntergum and side of gaster orange; gonostylus pale orange.

Head about 4X as wide as frontovertex, in profile about 1.6X as high as deep, anteriorly interantennal prominence hardly protuberant level with torulus; occipital margin sharp, not carinate; ocelli forming an angle of about 60°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh slightly smaller than diameter of eye facet, ocellar area with slightly deeper sculpture; narrowest area between eye and scrobe slightly wider than diameter of anterior ocellus, area immediately below lowest part of eye completely smooth and shiny; scrobes shallow, broadly ∩-shaped, not sharply margined; interantennal prominence with similar sculpture to frontovertex, clothed in sparse translucent setae, dorsally acute and with a weak median ridge, scrobes meeting; temple virtually smooth with very shallow, irregular, elongate sculpture; gena with slightly deeper, irregular, reticulate sculpture; antenna as in Fig. 1106; scape broadened and flattened, about 3X as long as broad, broadest in middle; funicle with F1 quadrate, F2-F6 clearly transverse; linear sensilla present only on F3-F6; clava clearly broadened, slightly shorter than funicle, sutures oblique, sensory area enlarged, extending ventrally about 0.4X along clava, giving it an obliquely truncate appearance; eye reaching occipital margin, naked; inner eye margins more or less parallel; malar sulcus absent; clypeal margin weakly concave medially;

mandible tridentate with 2 acute teeth and a broadly rounded upper tooth; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 60, HH 57.5, FV 15, POL 6, OOL 0, OCL 3.5, AOL 7.5, EL 38, EW 28, MS 29, SL 26, SW 8.5.

Thorax (Fig. 1105) with irregular, polygonally reticulate sculpture on pronotum that is about as deep as that on frontovertex; mesoscutum in posterior half with fairly regular, polygonally reticulate sculpture that is clearly deeper than that on frontovertex, sculpture in anterior half coarse striate-reticulate and about as deep as that on pronotum; axilla with similar sculpture to pronotum, scutellum slightly deeper and more longitudinally elongate sculpture; axilla and scutellum with similar sculpture to that on anterior part of mesoscutum, elongate on sides of scutellum; visible part of mesoscutum about 2.2X as broad as long; scutellum about 1.1X as broad as long with a distinct subapical tuft, setae mostly about 0.4X as long as scutellum; mid tibia without a distinct, external carina; hind femur about 3.8X as long as broad; fore wing with venation and setation as in Figs 1108, 1109; costal cell dorsally with 1 seta at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 1109); propodeum (Fig. 1105) medially about 0.13X as long as scutellum and virtually smooth, side virtually completely smooth. Relative measurements: FWL 53, FWW 21; HWL 45, HWW 11.5.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium (Fig. 1107) reaching about half-way to apex; syntergum about as long as mid tibia, with apex weakly angular; ovipositor (Fig. 1110) slightly exserted, the exserted part about one-third length of mid tibial spur or about 0.1X mid tibia. Relative measurements: OL 39.5, GL 9.5 [MT 27].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, RF Monte Alto, Send. La Ceiba, LN 221100 382950, 600m, #65008, 21.ix-22.x.2001 (I. Jiménez). Holotype in NHMUK.

COMMENTS. *Cheiloneurus izhevskyi* Trjapitzin & Triapitsyn (2007), described from Mexico, may run to *mora* in the key to Costa Rican species presented here because the scape is described as being brown-yellow with only the ventral margin dark brown. These authors compared *izhevskyi* with *noxius* and *lineascapus*, two species that are considered here to be close to *nigrescens* Howard, all three species having a characteristic light stripe along the middle of the scape. For this reason, I think it is unlikely that *izhevskyi* is similar to *mora*, and should be easy enough to distinguish from it because the scrobes of *izhevskyi* are sharply margined, whereas in *mora* and similar species the scrobal margins are rounded.

See also comments under *cero* (p. 415).

Cheiloneurus ceiba **sp.nov.**

(Figs 1111-1113; Hab. ♀ 160)

DIAGNOSIS. *Female* (length about 1.2mm): body mostly orange with posterior part of mesoscutum, propodeum and parts of gaster dark brown, mouth margin brown, temple and gena with a diagonal brown streak, paler areas with a weak metallic sheen, darker areas with a weak to moderate metallic sheen; antenna (Fig. 1111) with scape mostly orange, ventral margin brown; pedicel pale orange with a dark brown streak; flagellum dark brown; mesoscutum with silvery setae in posterior half or so; fore and hind coxae white, mid coxa pale orange; legs otherwise white to pale orange, with some pale brown areas; fore wing (Fig. 1112) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation, a larger one opposite and a subtriangular hyaline area at apex; head about 6.3X as wide as frontovertex, in facial view slightly broader than long, subrectangular, genae converging, distinctly curved inwards; frontovertex with one seta

medially between anterior ocellus and scrobes; eye separated from scrobe by about 2X diameter of anterior ocellus, area between eye and scrobe completely smooth; scrobes moderately deep, sharply margined below eye; interantennal prominence dorsally rounded, with a median ridge and about 10-12 inconspicuous setae; mandible tridentate; antenna (Fig. 1111) with scape about 1.8X as long as broad; funicle segments subquadrate, increasing in size towards clava; linear sensilla on F5-F6; clava 3-segmented, about as long as F3-F6 combined, sensory area enlarged, extending ventrally about 0.3X length of clava, apex obliquely truncate; head width slightly more than flagellum length; mesoscutum anteriorly with fine, longitudinally elongate, striate-reticulate sculpture, posteriorly with polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 1112) about 2.5X as long as broad; parastigma downcurved; costal cell dorsally naked save for three or four apical setae, ventrally with a line of setae that is widely interrupted above parastigma; area below proximal part of parastigma with a line of five or six setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues some way into disc (Fig. 1113); apical bristle of postmarginal vein about 0.6X as long as marginal vein; mid tibial spur hardly longer than basitarsus; propodeum with about five silvery setae adjacent to spiracle, side naked; syntergum about 0.8X as long as mid tibia with apex more or less rounded; ovipositor about 3.7X gonostylus or about 1.3X as long as mid tibia; gonostylus about as long as mid tibial spur; exserted part of ovipositor about 0.3X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.22mm; excluding ovipositor, 1.17mm (CPD).

Head largely pale orange; occiput with a weak triangular brown spot above foramen; frontovertex slightly dusky, ocellar area with a blue and green sheen, anterior parts of frontovertex with a weaker blue and green sheen, area immediately above scrobes brassy and above this narrowly purple; temple, gena and area below eye with a weak brassy, purple and green sheen; scrobal area with a very weak brassy and purple sheen, top of scrobes delimited by a narrow brown line, this continuing a little way to the median, dorsal ridge of the interantennal prominence; a curved brown line between mouth margin and toruli; temple with a diagonal brown line from occipital margin towards torulus only reaching position of malar sulcus; frontovertex clothed with inconspicuous, pale brown setae, a line of more conspicuous, translucent setae below eye; antenna (Fig. 1111) with radicle pale orange, apex narrowly brown; scape very pale orange, apex white, ventral margin brown nearly to apex; pedicel very pale orange with an internal dark brown streak along its length; flagellum dark brown; maxillary palpus white; pronotum mostly orange, neck brown; prosternum pale orange, anterior to coxa brown; mesoscutum orange in anterior half, posterior half dark brown with a distinct, dark, metallic blue-green sheen, posterior margin purple-brown with a slight brassy and purple sheen, anterior part clothed in relatively sparse dark brown setae, posterior part with relatively dense silvery setae, mixed with a few dark brown setae; tegula orange, apex orange-brown; axilla and scutellum orange, clothed in translucent golden brown and dark brown setae, scutellar tuft black; metanotum orange; mesopleuron mostly orange with a weak brassy sheen, posteriorly slightly dusky with a slight purple and green sheen; fore coxa white; fore femur largely white, apically pale orange with dorsal margin pale brown, tibia pale orange, dorsal margin pale brown proximally, tarsus pale orange, pale orange-brown at apex; mid coxa very pale orange, virtually white; mid femur white, slightly dusky towards apex, tibia largely pale orange with knee brown, an incomplete brown subbasal ring and dorsal margin brown along most of its length, spur and tarsus very pale orange, almost white; hind coxa white; hind femur pale orange with a small brown apical spot, tibia pale orange, marked brownish externally along about half its length, tarsus pale orange, brown at apex; fore wing (Fig. 1112) mostly infuscate, hyaline towards base and at apex; submarginal vein largely pale orange, otherwise venation brown; propodeum pale orange-brown with a slight brassy lustre, laterally with a pale blue sheen, side with a pale blue and purple sheen; 4 or 5 translucent, pale setae outside spiracle; gaster dorsally dark brown with a green, brassy, coppery and purple sheen, syntergum pale orange, apex brown, sides and venter mainly orange-brown, with coppery, green, brassy and blue reflections; gonostylus very pale orange.

Head about 6.3X as wide as frontovertex, in profile about 1.4X as high as deep, anteriorly quite straight below top of scrobes, interantennal prominence hardly protuberant; occipital margin

sharp, not carinate; ocelli forming an angle of about 50°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture, slightly deeper in ocellar area, mesh size slightly smaller than diameter of eye facet; area immediately above scrobes with slightly transversely elongate sculpture, interantennal prominence with shallow sculpture, scrobes with distinct sculpture, temple and posterior gena with shallow, irregular, longitudinally elongate sculpture, anterior gena with slightly deeper, irregular, reticulate sculpture; area between eye and scrobe about twice as broad as diameter of anterior ocellus and virtually completely smooth; scrobes moderately deep, not quite meeting dorsally, sharply margined only immediately below eye, very broadly ∩-shaped, interantennal prominence dorsally acute and with a median ridge that connects with frontovertex; antenna as in Fig. 1111; scape broadened and flattened, about 1.8X as long as broad; funicle with F1 very slightly longer than broad, F2-F4 quadrate, F1-F4 subequal in size, F5-F6 larger, subequal and subquadrate; clava hardly broadened, about as long as F3-F6 combined, sutures oblique, sensory area enlarged, extending about one-third along clava, giving it a distinct, obliquely truncate appearance; eye reaching occipital margin, clothed with extremely short setae that are much shorter than diameter of facet; inner eye margins converging weakly below anterior ocellus; malar sulcus absent; clypeal margin medially virtually straight; mandible with 2 acute teeth and a truncation, virtually tridentate; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 72, HH 66, FV 11.5, POL 6, OOL 0, OCL 6, AOL 8, EL 48, EW 37, MS 36, SL 36, SW 20.

Thorax with irregular, polygonally reticulate sculpture on pronotum that is similar in depth to that in ocellar area; mesoscutum in anterior half with fine, longitudinally elongate, striate-reticulate sculpture of similar depth to sculpture on pronotum, posteriorly with slightly shallower, polygonally reticulate sculpture; axilla and scutellum with polygonally reticulate sculpture of similar depth to that on pronotum and of slightly larger mesh on scutellum, sculpture on scutellum more elongate laterally; visible part of mesoscutum about 1.5X as broad as long; scutellum about 1.1X as long as broad with a distinct subapical tuft, setae mostly about two-thirds as long as scutellum; hind femur about 4.2X as long as broad; fore wing with venation and setation as in Figs 1112, 1113; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 1113); mid tibia with an distinct, external subbasal carina for about half its length; propodeum medially about 0.1X as long as scutellum and virtually smooth. Relative measurements: FWL 86, FWW 35; HWL 68.5, HWW 16.5.

Gaster with hypopygium reaching about half-way to apex; syntergum about 0.9X as long as mid tibia, with apex very weakly angular, more or less rounded; ovipositor slightly exserted, about one-third as long as mid tibial spur or 0.1X as long as mid tibia.

Paratype. Funicle with linear sensilla present only on F5-F6; gaster without "gland-like" structures on Gt1 or Gt5. Relative measurements: OL 37, GL 10 [MT 28].

Variation. Females vary in overall length from 1.20-1.22mm, the brown line delimiting the top of the scrobes may not extend onto the median dorsal ridge of the interantennal prominence, the head may be only about 5.1X as wide as the frontovertex, otherwise very little in material available.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Santa Rosa NP, Sn. Emilio 6-C, 24.viii-14.ix.1985 (Janzen, Gauld). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Santa Rosa NP, Sn. Emilio 6-C, 22.vi-13.vii.1985 (Janzen, Gauld). Holotype in MZUCR, paratype in NHMUK.

COMMENTS. *Cheiloneurus ceiba* is very close to *nasica* but can be separated reliably using the characters given in the key.

***Cheiloneurus nasica* sp.nov.**
(Figs 1114-1120; Hab. ♀ 161)

DIAGNOSIS. *Female* (length about 0.9-1.6mm): body mostly orange with some dark brown to black areas with a weak to moderate metallic sheen on head, mesoscutum, and gaster; mouth margin brown, temple and gena with a diagonal, brown streak; antenna (Fig. 1120) with scape mostly pale orange with ventral margin brown; pedicel pale orange with a dark brown longitudinal streak; funicle generally orange-brown, sometimes proximally brown, distally pale orange; clava dark brown; posterior half of mesoscutum with dense silvery setae; coxae pale orange, sometimes fore and hind coxae white; legs mostly pale orange with some brown areas; fore wing (Figs 1115, 1118) mostly infuscate with basal cell almost completely hyaline, a small hyaline area at apex of venation and an opposite hyaline area on posterior wing margin, apex with a moderately large, subtriangular hyaline area; head (Fig. 1117) about 4.5-7X as wide as frontovertex, in facial view very slightly broader than long, subcircular with genae strongly converging, moderately curved, but more strongly so near mouth margin; frontovertex naked medially or with up to four setae medially above scrobes; eye separated from scrobe by about 1.3-1.5X diameter of anterior ocellus, area between eye and scrobe completely smooth, scrobal margin sharp, carinate; interantennal prominence with about 10-25 inconspicuous setae and with a distinct median keel dorsally; mandible with one tooth teeth and a broad slightly concave truncation; antenna (Fig. 1120) with scape about 2.3X as long as broad; funicle segments quadrate or slightly transverse; head width about equal to flagellum length; linear sensilla on F4-F6, sometimes absent from F4; clava 3-segmented, slightly longer than F2-F6 combined; sensory area large and forming an oblique truncation, extending about 0.4X along ventral margin; mesoscutum (Fig. 1114) anteriorly with fine striate sculpture, posteriorly with fairly uniform polygonally reticulate sculpture; scutellum with a distinct apical tuft of setae; wings fully developed; fore wing (Figs 1115, 1118) about 2.3-2.5X as long as broad; parastigma clearly downcurved; costal cell dorsally more or less naked at apex, sometimes with 1 or 2 setae, and ventrally with a single line of setae that is broadly interrupted above parastigma; area below proximal part of parastigma with a line of pale setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that extends someway into disc (Fig. 1116); apical bristle of postmarginal vein about 0.7X as long as marginal vein; mid tibial spur about as long as basitarsus; propodeum with up to 4 setae adjacent to spiracle, side naked; syntergum about as long as mid tibia; ovipositor (Fig. 1119) about 3.7-4.0X gonostylus or 1.4-1.6X as long as mid tibia; gonostylus about 1.0-1.3X as long as mid tibial spur; exserted part of ovipositor about 0.5X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.49mm; excluding ovipositor, 1.40mm (CPD).

Head mostly orange; occiput pale orange; ocellar area to top of scrobes with a weak metallic blue and purple sheen, relatively strong between posterior ocelli, area immediately above scrobes more strongly purple; area between eye and scrobe with a very weak purple sheen; a narrow, brown streak on temple from about mid way along occipital margin to half-way down gena, this with a weak purple sheen; anterior part of gena weakly metallic purple and blue; scrobes delimited dorsally by a narrow dark brown line that extends laterally to level with outer margin of torulus; mouth margin dark brown between mandibular bases, this line not connected to the genal stripe and curving away from mouth margin between toruli so that clypeal margin is orange medially; frontovertex clothed with inconspicuous, pale brown setae; antenna (Fig. 1120) with radicle pale orange, apex brown; scape mostly pale orange, dorsal margin slightly dusky, ventral margin narrowly bordered dark brown nearly to apex; pedicel mostly pale orange with a dark brown streak internally along its length; F1-F3 brown, darker dorsally, F4 slightly dusky pale orange, a little darker dorsally, F5-F6 pale orange, clava dark brown, almost black; pronotum mostly pale orange, neck brown; mesoscutum orange in anterior half, posterior half dark brown with a distinct metallic blue and green sheen, paler area clothed in relatively sparse brown setae, darker area clothed in relatively dense, translucent silvery setae, posterior margin purple-brown; tegula orange with apex translucent dark brown; axilla and scutellum orange, axilla clothed with brown setae, scutellum clothed with translucent pale brown setae, subapical tuft black; metanotum orange; mesopleuron pale orange-brown, a little darker posteriorly, anteriorly with a weak brassy

and purple sheen, posteriorly with a weak copper and purple sheen; fore coxa very pale orange, almost white; fore femur concolourous with coxa basally, apex slightly darker orange, marked brown on dorsal margin, tibia pale orange with a diffuse brown, subbasal ring in proximal half, tarsus orange; mid coxa pale orange; mid leg otherwise coloured similarly to fore leg; hind leg, including coxa, coloured similarly to fore leg, but apical half of tibia and tarsus conspicuously paler orange; fore wing (Fig. 1115) mostly infuscate, hyaline towards base and at apex; submarginal vein yellow, rest of venation brown; propodeum medially orange, laterally and on side brown with a moderate metallic blue and purple sheen, some translucent setae outside spiracle; gaster largely dark brown with brassy, coppery, purple and green reflections, basal tergite with a much stronger blue-green, coppery and brassy sheen, syntergum pale orange, sides and venter brown, proximally pale orange; outer plates of ovipositor with weak blue, brassy and purple reflections; gonostylus pale orange, brownish proximally.

Head (Fig. 1117) about 7X as wide as frontovertex, in profile about 1.8X as high as deep, anteriorly quite straight below top of scrobes, interantennal prominence hardly protuberant level with torulus; occipital margin sharp, not carinate; ocelli forming an angle of about 50°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh size conspicuously smaller than diameter of eye facet; scrobes deep, meeting dorsally, sharply margined above, carinate below eye, but roundly margined outside lower part of torulus, very broadly ∩-shaped; dorsal half of interantennal prominence with a distinct, median keel and completely smooth, lower part with similar sculpture to frontovertex, scrobe completely smooth; temple and posterior gena with shallower, more irregular and longitudinally elongate sculpture than on main part of frontovertex, anterior gena with relatively coarse, irregular, reticulate sculpture; area between eye and scrobe completely smooth; antenna as in Fig. 1120; scape broadened and flattened, about 2.3X as long as broad; funicle with F1 and F5 quadrate, remaining segments slightly transverse, segments broadest distad; clava broadened, hardly longer than F2-F6 combined, sutures oblique, sensory area enlarged, extending ventrally about 0.4X along clava, giving it an obliquely truncate appearance; eye very slightly overreaching occipital margin, appearing naked, but clothed with extremely short setae that are very much shorter than diameter of facet; inner eye margins converging slightly below anterior ocellus before diverging above scrobes; malar sulcus absent; clypeal margin very slightly emarginate medially; mandible with 1 tooth and a broad, slightly concave, truncation, almost tridentate; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 73, HH 70, FV 10.5, OD 4.5, POL 5, OOL 0, OCL 5.5, AOL 8, EL 49, EW 38, MS 32, SL 36, SW 16.

Thorax (Fig. 1114) with irregular, polygonally reticulate sculpture on pronotum that is similar to that on frontovertex; mesoscutum in anterior three-fifths with fine, striate sculpture, posterior part with fairly regular, polygonally reticulate sculpture that is slightly deeper and finer than that on pronotum; axilla and scutellum with similar sculpture to disc of mesoscutum, but clearly a little deeper and coarser; visible part of mesoscutum about 2X as broad as long; scutellum a little broader than long with a distinct subapical tuft, setae mostly about 0.4X as long as scutellum; hind femur about 4.1X as long as broad; fore wing with venation and setation as in Figs 1115, 1116; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak; mid tibia with a distinct longitudinal carina externally for about 0.4X its length; propodeum with only 4 or 5 anterior to spiracle, side completely smooth, medially about 0.17X as long as scutellum and virtually smooth. Relative measurements: FWL 53, FWW 21.5; HWL 42.5, HWW 16.5.

Gaster with hypopygium reaching about 0.4X to apex; syntergum about as long as mid tibia, with apex narrowly rounded; ovipositor hardly exserted, the exserted part about half as long as mid tibial spur or about 0.2X as long as mid tibia.

Paratype. Funicle with linear sensilla present only on F4-F6; gaster without “gland-like” structures on Gt1 or Gt5; ovipositor Fig. 1119. Relative measurements: OL 48, GL 13 [MT 34].

Variation. Females vary in overall length from 0.90-1.61mm, the funicle varies from generally orange-brown, to proximally brown and distally pale orange, some specimens have F6 brown other F6 yellow, the fore and hind coxae vary from white to pale orange, the mid coxa may or may not have an external brown spot; the head may be 4.5-7.0X frontovertex width, the eye may separated from the scrobe by about 1.3-1.5X the diameter of the anterior ocellus, the interantennal

prominence may or may not be connected to frontovertex by a very fine carinate ridge, linear sensilla may be absent from F4; mandible varies from tridentate to one tooth and a broad truncation, the fore wing varies from about 2.3-2.5X as long as broad, the costal cell dorsally may be naked or may have 1 or 2 apical setae, the ovipositor varies from about 3.7-4.0X gonostylus or 1.4-1.6X as long as mid tibia and the gonostylus may be about 1.0-1.3X as long as the mid tibial spur.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Reared as a hyperparasitoid of *Acerophagus alexte* Noyes parasitising *Nipaecoccus nipae* (Maskell) (Hemiptera: Pseudococcidae) on *Psidium guajava* Linnaeus (Myrtales: Myrtaceae), and also reared from *Orthezia* Bosc d'Antic (Hemiptera: Ortheziidae) on *Impatiens* Linnaeus (Ericales: Balsaminaceae).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, Santo Domingo, ex *Nipaecoccus nipae* on *Psidium guava*, i.1987 (P. Hanson). Paratypes: **COSTA RICA**, 7♀, **Guanacaste**, Maritza (ACG), 700m, MT/YPT, 20.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, PN Palo Verde, LN 260952 385020, 0-50m, red de golpe, #53999, xi.1999 (I. Jiménez); 1♀, Guanacaste, ZP Nosara, Fila Maravilla, LN 221350 381700, 800m, #66663, xi-xii.2001 (I. Jiménez); 1♀, Guanacaste, BN Diría, Ret. Alr. Torre Control de Incendio, 600-700m, #66659, xii.2001-i.2002 (I. Jiménez); 31♀, **Heredia**, same data as holotype; 1♀, Heredia, Santo Domingo, 1100m, cafetal, 9.ix.1994 (M. Cerda, P, Hanson); 10♀, Heredia, Santo Domingo, INBio Parque, LN 217300 526200, 1100m, various dates i.2001-6.x.2002 (R. Zuñiga, J.S. Noyes, D. Rubí, J. Azofeifa); 1♀, Heredia, Santo Domingo, INBio Parque, 9°59'N 84°6'W, 1100m, 12.ii.2011 (J.S. Noyes); 1♀, Heredia, Santo Domingo, INBio Parque, 9°59'N 84°6'W, 1100m, 11.ii.2012 (J.S. Noyes); 1♀, **San José**, Zurqui de Moravia, 1600m, i.1996 (P. Hanson); 1♀, San José, San Pedro, Montes de Oca, 1100m, *Impatiens Orthezia*, ix.1991 (P. Hanson); 1♀, San José, San Pedro, 1200m, 19.ii.2001 (J.S. Noyes); 1♀, San José, San Gerardo de Dota, El Manantial, 9°34'N 83°48'W, 2250m, 18-20.ii.2010 (J.S. Noyes); 1♀, **Puntarenas**, RF Golfo Dulce, Est. Agujas, La Bonanza, LS 275500 521950, 15.vi-15.vii.1999 (J. Azofeifa). Holotype in MZUCR, paratypes in NHMUK, MZUCR and USNM.

COMMENTS. *Cheiloneurus nasica* is superficially very similar in general habitus and colour to *inimicus* Compere, a species that has been recorded from many parts of the New World as a hyperparasitoid of soft scales (Hemiptera: Coccidae). It is possible that some records of *inimicus* are based on misidentifications of *nasica*. *Cheiloneurus inimicus* can be separated from *nasica* by lacking a distinct, brown, oblique, genal stripe, the scape being about 2.6-2.7X as long as broad and the antennal scrobes having rounded dorsal margins. In *nasica* there is a strong, dark brown, oblique, genal stripe, the scape is about 2.2-2.3X as long as broad and the scrobes are sharply margined.

Cheiloneurus praenitens Waterston, known from Jamaica and Cuba, is also very similar to *nasica* and would run to *nasica* in the key presented here. However, in *praenitens* the head is less than 4X as wide as the frontovertex, the sensory area of the clava reaches a little less than one third along its ventral surface, the mid tibia is less than 0.6X as long as the mid tibia and the hind tibia as a pair of brown rings. In *nasica* the head is at least 4.5X as wide as the frontovertex, the sensory area of the clava reaches 0.4X along the ventral surface, the mid tibia is about 0.7X as long as the ovipositor and the hind tibia does not have a pair of brown rings.

See also comments under *betes* (p. 403).

Cheiloneurus alopes **sp.nov.**

(Figs 1121-1126)

DIAGNOSIS. *Female* (length about 1.8mm): body mostly orange with some brown areas with a weak to moderate metallic sheen on head, mesoscutum and gaster; mouth margin narrowly dark brown; temple with a distinct diagonal, brown streak to gena; antenna (Fig. 1125) with

scape mostly pale orange with ventral margin brown; pedicel pale orange with a dark brown longitudinal streak; funicle mainly pale orange, some segments slightly dusky; clava dark brown; posterior half of mesoscutum probably with dense silvery setae; coxae white, mid coxa off-white; legs mostly white to pale orange with brown areas; fore wing (Fig. 1126) mostly infuscate with basal cell almost completely hyaline, a small hyaline area at apex of venation and an opposite hyaline area on posterior wing margin, apex hyaline; head about 8.2X as wide as frontovertex, in facial view hardly broader than long, subcircular with genae converging and uniformly curved, slightly more curved inwards near mouth margin; frontovertex with two setae medially above scrobes; eye separated from scrobe by about 1.3X diameter of anterior ocellus, area between eye and scrobe completely smooth, scrobal margin sharp; interantennal prominence with about 20 inconspicuous setae and with a dorsal median ridge; mandible with three teeth; antenna (Fig. 1125) with scape about 2.6X as long as broad; funicle with F3 clearly transverse, remaining segments subquadrate; head width very slightly greater than flagellum length; linear sensilla on F4-F6; clava 3-segmented, very slightly longer than F3-F6 combined; sensory area enlarged and forming an oblique truncation, extending about 0.4X along ventral margin; mesoscutum (Fig. 1121) anteriorly with fine, longitudinally elongate, lineolate-reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 1126) about 2.5X as long as broad; parastigma slightly downcurved; costal cell dorsally naked, with a line of setae ventrally that is broadly interrupted above parastigma; area below proximal part of parastigma with a line of about four pale setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that curves a little way into disc (Fig. 1122); apical bristle of postmarginal vein about 0.5X as long as marginal vein; mid tibial spur very slightly longer than basitarsus; propodeum with five or six setae adjacent to spiracle, side naked; syntergum about 0.9X as long as mid tibia; ovipositor about 4.2X gonostylus or about 1.4X as long as mid tibia; gonostylus about as long as mid tibial spur; exserted part of ovipositor about 0.3X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.81mm; excluding ovipositor, 1.75mm (CPD).

Head mostly pale orange; frontovertex with a weak blue, green and purple sheen, stronger blue and purple in ocellar area; temple and upper gena with a weak brassy sheen mixed pale blue, green and purple, lower gena with a very weak brassy and purple sheen, area between eye and scrobe with a slightly stronger purple sheen; scrobal area with a weak brassy and purple sheen; scrobes delimited dorsally by a curved, pale brown line; lower face with a median, curved, brown line between toruli and mouth margin that meets mouth margin near base of mandible; temple with a diagonal brown streak from temple behind eye towards torulus; frontovertex clothed with inconspicuous, pale brown setae, a line of fine, translucent setae between eye and scrobe; maxillary palpus white, apical segment pale orange; antenna (Fig. 1125) with radicle pale orange, apex narrowly ringed orange-brown; scape pale orange, white at extreme apex, distinctly margined brown ventrally, more widely so internally towards base; pedicel mostly pale orange with a dark brown streak internally along its length; funicle segments largely pale orange, dark brown internally, F1-F5 dark brown ventrally, F1 mostly, F5 hardly; clava dark brown; pronotum mostly orange, neck with a dark brown spot; prosternum outside coxa dark brown; mesoscutum anteriorly orange, posterior half with a dark brown band with strong metallic blue and purple reflections, behind this narrowly orange, posterior margin mostly brown with a weak purple sheen, anterior half of mesoscutum probably clothed in relatively sparse golden brown to dark brown setae, posterior half probably clothed in relatively dense, translucent, silvery setae mixed with a few dark brown setae (most setae missing in holotype); tegula orange with apex orange-brown; axilla and scutellum orange, axilla clothed with brown setae, scutellum clothed anteriorly with golden brown setae, otherwise setae dark brown, subapical tuft black; metanotum orange; mesopleuron pale orange, orange-brown posteriorly, anterior part with a very weak brassy sheen, posterior part with a weak brassy, coppery and purple sheen; fore coxa white; fore femur concolourous with coxa basally, apex pale orange, tibia and tarsus pale orange; mid coxa off-white; mid leg otherwise similarly coloured to fore leg, except that tibia has remnants of a faint, narrow, brown, subbasal ring; hind coxa white, femur concolourous proximally and pale orange apically, knee brown, tibia and tarsus pale orange; fore wing (Fig. 1126) mostly infuscate, hyaline towards base and at apex; submarginal vein pale orange, venation otherwise brown; propodeum orange, brown with a blue and purple sheen on side, 4 white setae near spiracle; gaster largely pale orange to orange-brown,

apex of syntergum and apex of outer plate of ovipositor brown, Gt1 and sides of Gt2-Gt4 dark brown, Gt1 dorsally with a strong metallic green, purple and coppery sheen, gaster otherwise generally with a mixed coppery, purple, green, blue and brassy sheen that is weakest on paler areas; gonostylus very pale orange.

Head about 8.2X as wide as frontovertex, in profile about 1.8X as high as deep, anteriorly quite straight below top of scrobes, interantennal prominence hardly protuberant level with torulus; occipital margin sharp, carinate; ocelli forming an angle of about 45°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh conspicuously smaller than diameter of eye facet; area between eye and scrobe about as wide as diameter of anterior ocellus, smooth; scrobes shallow, more or less Λ-shaped, sharply margined above; interantennal prominence with similar sculpture to frontovertex, dorsally with a strong, carinate, median ridge that does not quite reach frontovertex, not quite separating scrobes; temple virtually smooth with very shallow, irregular, elongate sculpture, gena with slightly deeper, irregular, reticulate sculpture; antenna as in Fig. 1125; scape broadened and flattened, about 2.6X as long as broad; funicle with segments broader and larger distad, proximal segments subquadrate, distal segments transverse; linear sensilla present only on F4-F6; clava broadened, nearly as long as F2-F6 combined, sutures oblique, sensory area enlarged, extending ventrally nearly 0.4X along clava, giving it an obliquely truncate appearance; eye reaching occipital margin, clothed with inconspicuous short setae, each much shorter than diameter of facet; inner eye margins clearly converging anteriorly, diverging a little way above scrobes; malar sulcus absent; clypeal margin weakly concave medially; mandible with 1 tooth and a broad, concave truncation, more or less tridentate; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 82, HH 80, FV 10, POL 7, OOL 0, OCL 6, AOL 10.5, EL 56, EW 44, MS 35, SL 41, SW 16.

Thorax (Fig. 1121) with irregular, polygonally reticulate sculpture on pronotum that is of similar depth to that on frontovertex; mesoscutum with polygonally reticulate sculpture in posterior two-fifths that is a little deeper than that on frontovertex, anterior three-fifths with fine, longitudinally elongate, striate to striate-reticulate sculpture; axilla mostly with fairly regular, polygonally reticulate sculpture that is conspicuously deeper and coarser than that on frontovertex, scutellum with longitudinally striate-reticulate sculpture that is coarser than that on anterior part of mesoscutum; visible part of mesoscutum about 2.4X as broad as long; scutellum about as long as broad with a distinct subapical tuft, setae mostly about half as long as scutellum; mid tibia with a distinct, subbasal, external carina for about half its length; hind femur about 4.2X as long as broad; fore wing with venation and setation as in Figs 1122, 1126; costal cell dorsally with 1 or 2 at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak; propodeum (Fig. 1121) with side completely smooth, medially about 0.1X as long as scutellum and virtually smooth. Relative measurements: FWL 84, FWW 33; HWL 71, HWW 18.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium (Fig. 1124) reaching about half-way to apex; syntergum about 0.8X as long as mid tibia, with apex more or less obtuse; ovipositor slightly exserted, the exserted part about one-third as long as mid tibial spur or about one-seventh mid tibia. Relative measurements: OL 65.5, GL 15.5 [MT 46].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Guanacaste NP, East. Cacao, 1200m, 13.ii.1995 (L. Masner). Holotype in NHMUK.

COMMENTS. *Cheiloneurus alopes* is extremely close to *janzeni* and *amethes,* all three having very fine striate to lineolate-reticulate sculpture on the anterior part of the mesoscutum and almost identical pattern of infuscation on setation of the fore wing. Other superficially similar species (e.g. *aesernia*, *gyges*) have the sculpture on the anterior part of the mesoscutum coarse and

composed of elongate reticulate cells, the hyaline streak connecting the apices of the postmarginal and stigmal veins less well defined, less curved and shorter and the apical hyaline area of the fore wing less extensive and the setation at the base of the wing different. Apart from F6 being paler than the clava (see key), *alopes* differs from *janzeni* in having the scape about 2.6X as long as broad whereas in *janzeni* the scape is a little more than 3X as long as broad. In addition to the relatively narrower frontovertex (see key), *alopes* differs from *amethes* in having the scape about 2.6X as long as broad, no linear sensilla on F3, the clava slightly more than 2X as wide as the pedicel and the ovipositor about 1.4X as long as the mid tibia, whereas in *amethes* the scape is about 2.9X as long as broad, linear sensilla are present on F3, the clava is slightly less than 2X as wide as the pedicel and the ovipositor is about 1.7X as long as the mid tibia.

See also comments under *cero* (p. 415) and *finator* (p. 417).

***Cheiloneurus janzeni* sp.nov.**
(Figs 1127-1131; Hab. ♀ 162)

DIAGNOSIS. *Female* (length about 1.0-1.5mm): body mostly orange with some brown areas with a weak to moderate metallic sheen on head, mesoscutum and gaster; mouth margin narrowly dark brown; temple with a distinct diagonal, brown streak to gena; antenna (Fig. 1131) with scape mostly pale orange with ventral margin brown; pedicel pale orange with a dark brown longitudinal streak; funicle mainly pale orange, some segments slightly dusky, F6 dark brown; clava dark brown; posterior half of mesoscutum with dense silvery setae; fore and hind coxae white, mid coxae pale orange; legs mostly white to pale orange with brown areas; fore wing (Fig. 1130) mostly infuscate with basal cell almost completely hyaline, a small hyaline area at apex of venation and an opposite hyaline area on posterior wing margin, apex hyaline; head (Fig. 1127) about 8X as wide as frontovertex, in facial view about as broad as long, subcircular with genae converging and uniformly curved, slightly more curved inwards near mouth margin; frontovertex with two setae medially above scrobes; eye separated from scrobe by about 1.3-1.4X diameter of anterior ocellus, area between eye and scrobe completely smooth, scrobal margin sharp below eye; interantennal prominence with about 24 inconspicuous setae and with a dorsal median ridge; mandible with three teeth; antenna (Fig. 1131)with scape about 3.3X as long as broad; funicle segments subquadrate; head width about equal to flagellum length; linear sensilla on F4-F6; clava 3-segmented, about as long as F3-F6 combined; sensory area enlarged and forming an oblique truncation, extending about 0.3X along ventral margin; mesoscutum (Fig. 1128) anteriorly with fine, longitudinally elongate, lineolate-reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 1130) about 2.5-2.6X as long as broad; parastigma slightly downcurved; costal cell dorsally naked or with one seta at apex, with a line of setae ventrally that is broadly interrupted above parastigma; area below proximal part of parastigma with a line of about four to six pale setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that curves a little way into disc (Fig. 1129); apical bristle of postmarginal vein about 0.5-0.6X as long as marginal vein; mid tibial spur very slightly longer than basitarsus; propodeum with two or three setae adjacent to spiracle, side naked; syntergum about 0.9X as long as mid tibia; ovipositor about 3.7X gonostylus or about 1.4X as long as mid tibia; gonostylus about as long as mid tibial spur; exserted part of ovipositor about 0.4X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.30mm; excluding ovipositor, 1.25mm (CPD).

Head mostly pale orange; frontovertex with a weak blue, green and purple sheen, stronger in ocellar area; temple and upper gena with a weak brassy sheen, lower gena with a very weak brassy and purple sheen, area between eye and scrobe with a slightly stronger purple sheen; scrobal area with a weak brassy and purple sheen; lower face with a median, curved, brown line between toruli and mouth margin that meets mouth margin near base of mandible; temple with a distinct, diagonal pale brown streak from temple behind eye towards torulus; frontovertex clothed with inconspicuous, pale brown setae, a line of translucent setae between eye and scrobe; maxillary palpus white; antenna (Fig. 1131) with radicle pale orange, apex narrowly ringed orange-brown; scape pale orange, distinctly margined brown ventrally, more widely so internally towards base,

upper margin weakly brown; pedicel mostly pale orange with a dark brown streak internally along its length; funicle segments largely pale orange, F1-F3 slightly dusky on sides, F6 dark brown, clava dark brown; pronotum mostly orange, neck and side above coxa brown; mesoscutum anteriorly orange, posterior half shining blue-green, behind this, posterior margin brown with a weak purple sheen, anterior half of mesoscutum clothed in relatively sparse golden brown to dark brown setae, posterior half clothed in relatively dense, translucent, silvery setae mixed with a few dark brown setae; tegula orange with apex orange-brown; axilla and scutellum orange, axilla clothed with brown setae, scutellum clothed anteriorly with golden brown setae, otherwise setae dark brown, subapical tuft black; metanotum slightly dusky pale orange; mesopleuron pale orange, slightly dusky posteriorly, anterior part with a very weak brassy sheen, posterior part with a weak purple sheen; fore coxa white; fore femur concolourous with coxa basally, apex pale orange, tibia and tarsus very pale orange, tarsus slightly dusky; mid coxa pale orange; mid leg otherwise similarly coloured to fore leg, tibia with remnants of a narrow, brown, subbasal ring; hind coxa white, femur, tibia and tarsus pale orange; fore wing (Fig. 1130) mostly infuscate, hyaline towards base and at apex; submarginal vein pale yellow, venation otherwise pale brown; propodeum dusky pale orange, slightly darker on side and with a weak blue and purple sheen, 2 or 3 white setae near spiracle; gaster largely pale orange to orange-brown, apex of syntergum and apex of outer plate of ovipositor pale brown, Gt1 dark brown dorsally, Gt2-Gt4 dark brown medially, Gt5 similar but paler, Gt1 with a distinct metallic green sheen laterally, otherwise gaster generally with a mixed coppery, purple, green, blue and brassy sheen that is weakest on paler areas; gonostylus very pale orange, almost white.

Head (Fig. 1127) about 7.7X as wide as frontovertex, in profile about 1.5X as high as deep, anteriorly quite straight below top of scrobes, interantennal prominence hardly protuberant level with torulus; occipital margin sharp, not carinate; ocelli forming an angle of about 40°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture of distinctly smaller mesh than diameter of eye facet; area between eye and scrobe hardly wider than diameter of anterior ocellus, smooth; scrobes shallow, more or less Λ-shaped, sharply margined; interantennal prominence with similar sculpture to frontovertex, dorsally with a strong, carinate, median ridge that reaches frontovertex and separates scrobes; temple and upper gena completely smooth, lower gena with shallow, irregular sculpture; antenna as in Fig. 1131; scape broadened and flattened, about 3.3X as long as broad; funicle with segments broader and larger distad, segments subquadrate; clava broadened, about as long as F3-F6 combined, sutures oblique, sensory area enlarged, extending ventrally about 0.3X along clava, giving it an obliquely truncate appearance; eye slightly overreaching occipital margin, clothed with sparse, inconspicuous short setae, each much shorter than diameter of facet; inner eye margins clearly converging in front of anterior ocellus, diverging a little way above scrobes; malar sulcus absent; clypeal margin weakly concave medially; mandible with three teeth; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 85, HH 83, FV 11, POL 5, OOL 0, OCL 5, AOL 9, EL 57, EW 49, MS 40, SL 43, SW 13.

Thorax (Fig. 1128) with irregular, polygonally reticulate sculpture on pronotum that is of similar depth to that on frontovertex; mesoscutum with polygonally reticulate sculpture in posterior half that is a little deeper than that on frontovertex, anterior half with fine, longitudinally elongate, lineolate-reticulate sculpture; axilla mostly with fairly regular, polygonally reticulate sculpture that is conspicuously deeper and coarser than that on frontovertex, scutellum with longitudinally striate-reticulate sculpture that is similar to that on anterior part of mesoscutum; visible part of mesoscutum about 2.0X as broad as long; scutellum about 1.1X as long as broad with a distinct subapical tuft, setae mostly about 0.7X as long as scutellum; hind femur about 4.7X as long as broad; fore wing with venation and setation as in Figs 1129, 1130; costal cell dorsally naked at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak Fig. 1129; propodeum (Fig. 1128) with side completely smooth, medially about 0.16X as long as scutellum and with very shallow, irregular sculpture, virtually smooth. Relative measurements: FWL 82.5, FWW 32.5; HWL 67.5, HWW 16.5.

Gaster with hypopygium reaching about half-way to apex; syntergum about 0.9X as long as mid tibia, with apex weakly angular; ovipositor slightly exserted, the exserted part about 0.4X as long as mid tibial spur or about 0.15X mid tibia.

Paratype. Funicle with linear sensilla present only on F4-F6; gaster without "gland-like" structures on Gt1 or Gt5. Relative measurements: OL 69, GL 18.5 [MT 50].

Variation. Females vary in overall length from 1.31-1.53mm, otherwise very little in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Holotype ♀: **COSTA RICA**, **Puntarenas**, RP Karen Mogensen, Send. Quebr. Perez, LN 205300 419750, 200-400m, #75744, 6.x.2003 (W. Porras). Paratypes: **COSTA RICA**, 1♀, **Puntarenas**, same data as holotype; 1♀, Puntarenas, San Luis, Monteverde, LN 449250 250850, 1000-1350m, #2883, i.1994 (Z. Fuentes). Holotype in NHMUK, paratypes in MZUCR and NHMUK.

COMMENTS. This species is named in honour of Prof. Dan Janzen for his heroic efforts to understand and preserve natural tropical ecosystems, in particular within Costa Rica.

See comments under *alopes* (p. 443), *dirce* (p. 448) and *omorus* (p. 455).

Cheiloneurus dirce **sp.nov.**

(Figs 1132-1138; Hab. ♀ 163)

DIAGNOSIS. *Female* (length about 1.4mm): body mostly orange with some brown areas with a weak to moderate metallic sheen on head, mesoscutum and gaster; mouth margin narrowly dark brown; temple with a distinct diagonal, brown streak to gena; antenna (Fig. 1132) with scape mostly pale orange with ventral margin brown; pedicel pale orange with a dark brown longitudinal streak; flagellum dark brown; posterior part of mesoscutum with dense silvery setae; coxae white; legs mostly white to pale orange with some dark brown areas; fore wing (Fig. 1138) mostly infuscate with basal cell almost completely hyaline, a small hyaline area at apex of venation and an opposite hyaline area on posterior wing margin, apex hyaline; head (Fig. 1137) about 10X as wide as frontovertex, in facial view very slightly longer than broad, subcircular with genae converging and weakly curved, more strongly curved inwards near mouth margin; frontovertex with two setae medially above scrobes; eye separated from scrobe by about 1.5X diameter of anterior ocellus, area between eye and scrobe completely smooth, scrobal margin sharp; interantennal prominence with about 15 inconspicuous setae and with a dorsal, median ridge; mandible more or less tridentate; antenna (Fig. 1132) with scape about 2.5X as long as broad; funicle with segments subquadrate; head width a little less than 0.9X flagellum length; linear sensilla on F4-F6; clava 3-segmented, very slightly longer than F3-F6 combined; sensory area enlarged and forming an oblique truncation, extending about 0.4X along ventral margin; mesoscutum (Fig. 1135) anteriorly with coarse, longitudinally elongate, striate to striate-reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 1138) about 2.7X as long as broad; parastigma slightly downcurved; costal cell dorsally naked, with a line of setae ventrally that is broadly interrupted above parastigma; area below proximal part of parastigma with a line of about four to six pale setae these continued along cubital vein track toward wing base, two or three setae outside these; apices of postmarginal and stigmal veins connected by a naked hyaline area that clearly curves someway into disc (Fig. 1136); apical bristle of postmarginal vein about 0.5X as long as marginal vein; mid tibial spur very slightly longer than basitarsus; propodeum (Fig. 1135) with a single seta adjacent to spiracle, side naked; syntergum about 0.8X as long as mid tibia; ovipositor (Fig. 1134) about 3.5X gonostylus or about 1.1X as long as mid tibia; gonostylus about 0.9X as long as mid tibial spur; exserted part of ovipositor about 0.3X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.35mm; excluding ovipositor, 1.31mm (CPD).

Head mostly pale orange; frontovertex slightly dusky with a blue, purple and brassy sheen, strongly metallic blue and purple between posterior ocelli; temple and upper gena with a weak pale blue, purple and brassy, lower gena much less shiny with a weak purple sheen, area between eye and scrobe with a slightly stronger green and purple sheen; scrobal area with a weak brassy and purple sheen; occiput with a small, triangular, dark brown mark above foramen; scrobes delimited dorsally by an interrupted, weak, pale brown line; lower face with a curved, brown line between toruli and mouth margin; temple with a diagonal brown streak from temple behind eye towards torulus; frontovertex clothed with inconspicuous, pale brown setae, a line of fine, translucent setae between eye and scrobe; maxillary palpus white; antenna (Fig. 1132) with radicle orange-brown, apex narrowly ringed dark brown; scape pale orange, distinctly margined brown ventrally, widely so towards base internally so that basal quarter or so is completely brown; pedicel mostly pale orange-brown with a dark brown streak internally along its length; flagellum entirely dark brown; pronotum mostly orange, neck with a dark brown spot, area above coxa dark brown; prosternum dark brown outside coxa; mesoscutum anteriorly orange, posterior half with a dark metallic blue band with purple reflections, behind this narrowly orange with a purple sheen, posterior margin mostly purple-brown, anterior half of mesoscutum clothed in relatively sparse golden brown to dark brown setae, posterior half clothed in relatively dense, translucent, silvery setae mixed with a few dark brown setae; tegula orange with apex orange-brown; axilla and scutellum orange, axilla and anterior part of scutellum clothed with golden brown setae, otherwise setae on scutellum dark brown, subapical tuft black; metanotum orange; mesopleuron pale orange, orange-brown posteriorly, anterior part with a very weak brassy sheen, posterior part with a weak brassy, coppery and purple sheen; fore coxa white; fore femur concolourous with coxa basally, apex pale orange, a little dusky along margins distally, tibia and tarsus pale orange; mid coxa white; mid femur white with an incomplete, narrow, subapical brown band, tibia narrowly white proximally, mostly pale orange but with dorsal margin brown along much of its length with an incomplete subbasal brown band, spur and tarsus pale orange; hind coxa white, femur concolourous proximally and very pale orange apically, knee brown, tibia and tarsus pale orange; fore wing (Fig. 1138) mostly infuscate, hyaline towards base and at apex; submarginal vein brown, venation otherwise dark brown; propodeum medially orange, laterally and on side dark brown with a metallic blue and purple sheen, a white seta anterior to spiracle; gaster entirely dark brown to black with a coppery and purple sheen, basal tergite largely metallic green dorsally, other tergites largely metallic green laterally, outer plate of ovipositor with a mixed blue, green, coppery and purple sheen; gonostylus very pale orange.

Head (Fig. 1137) about 10X as wide as frontovertex, in profile about 1.6X as high as deep, anteriorly quite straight below top of scrobes, interantennal prominence hardly protuberant level with torulus; occipital margin sharp, not carinate; ocelli forming an angle of about 40°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh conspicuously smaller than diameter of eye facet; area between eye and scrobe about 1.5X diameter of anterior ocellus, smooth; scrobes shallow, broadly ∩-shaped, not sharply margined; interantennal prominence with similar sculpture to frontovertex, dorsally acute with a distinct median ridge connects with the frontovertex, thus separating toruli; temple virtually smooth with very shallow, irregular, elongate sculpture, gena with slightly deeper, irregular, reticulate sculpture; antenna as in Fig. 1132; scape broadened and flattened, about 2.5X as long as broad; funicle with segments quadrate to slightly longer than broad, proximal segments longer than broad, distal segments quadrate, gradually increasing in size and width; clava broadened about as long as F2-F6 combined, sutures oblique, sensory area enlarged, extending ventrally about half-way along clava, giving it an obliquely truncate appearance; eye reaching occipital margin, clothed with very inconspicuous short setae, each much shorter than diameter of facet; inner eye margins clearly converging anteriorly, diverging a little way above scrobes; malar sulcus absent; clypeal margin very weakly convex medially; mandible with 2 acute teeth and a truncation, virtually tridentate; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 61.5, HH 62, FV 6, POL 4, OOL 0, OCL 6, AOL 10, EL 49, EW 35, MS 30, SL 33, SW 13.

Thorax (Fig. 1135) with irregular, polygonally reticulate sculpture on pronotum that is

conspicuously deeper than that on frontovertex; mesoscutum with polygonally reticulate sculpture in posterior two-fifths that is a little deeper than that on frontovertex, anterior three-fifths with coarse, longitudinally elongate, striate to striate-reticulate sculpture; axilla mostly with fairly regular, polygonally reticulate sculpture that is conspicuously deeper and coarser than that on frontovertex, scutellum with similar polygonally-reticulate sculpture medially, sides with longitudinally striate-reticulate sculpture that is much coarser than that on anterior part of mesoscutum; visible part of mesoscutum about 1.7X as broad as long; scutellum very slightly longer than broad with a distinct subapical tuft, setae mostly a little less than one-third as long as scutellum; mid tibia with a distinct, subbasal, external carina for about half its length; hind femur about 4.9X as long as broad; fore wing with venation and setation as in Figs 1136, 1138; costal cell dorsally naked at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 1136); propodeum (Fig. 1135) with side completely smooth, medially about 0.13X as long as scutellum and with some shallow, irregular, reticulate sculpture. Relative measurements: FWL 63.5, FWW 23.5; HWL 52, HWW 12.

Gaster with hypopygium reaching about half-way to apex; syntergum about 0.8X long as mid tibia, with apex weakly angular; ovipositor slightly exserted, the exserted part about one-third as long as mid tibial spur or about 0.1X mid tibia.

Paratype. Funicle with linear sensilla present only on F4-F6; gaster without "gland-like" structures on Gt1 or Gt5; hypopygium Fi,. 1133; ovipositor Fig. 1134. Relative measurements: OL 43.5, GL 12.5 [MT 38].

Variation. Very little in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Maritza (ACG), 700m, MT/YPT, 20.i-24. ii.1996 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, same data as holotype. Holotype in MZUCR, paratype in NHMUK.

COMMENTS. Although generally similar to *janzeni* and *alopes* in having a narrow frontovertex, *dirce* differs from these other species in having relatively coarse elongate polygonally reticulate sculpture on the anterior part of the mesoscutum and the parastigma only weakly downcurved. In *janzeni* and *alopes* the sculpture on the anterior part of the mesoscutum is fine striate to lineolate-reticulate and the parastigma is quite strongly downcurved. *Cheiloneurus dirce* also differs from the other two species in having a dark, entirely metallic gaster whereas in *janzeni* and *alopes* the gaster is largely pale orange and only weakly metallic.

See also comments under *cero* (p. 415) and *finator* (p. 417).

Cheiloneurus amethes **sp.nov.**

(Figs 1139-1145)

DIAGNOSIS. *Female* (length about 1.5mm): body mostly orange with some brown areas with a weak to moderate metallic sheen on head, mesoscutum and gaster; mouth margin narrowly dark brown; temple with a distinct diagonal, brown streak to gena; antenna (Fig. 1142) with scape mostly pale orange with ventral margin brown; pedicel pale orange with a dark brown longitudinal streak; funicle mainly brown, F4-F5 mixed with some orange; clava dark brown; posterior part of mesoscutum with dense silvery setae; fore and hind coxae white, mid coxa orange; legs mostly white to pale orange with some dusky areas; fore wing (Fig. 1139) mostly infuscate with basal cell almost completely hyaline, a small hyaline area at apex of venation and an opposite hyaline area on posterior wing margin, apex hyaline; head (Fig. 1144) about 4.6X as wide as frontovertex, in facial view very slightly broader than long, subcircular with genae converging and weakly curved,

more strongly curved inwards near mouth margin; frontovertex with four setae medially above scrobes; eye separated from scrobe by about 1.2X diameter of anterior ocellus, area between eye and scrobe completely smooth, scrobal margin sharp; interantennal prominence with about 20 inconspicuous setae and with a weak, dorsal, median ridge; mandible with one tooth and a broad, slightly concave truncation; antenna (Fig. 1142) with scape about 2.9X as long as broad; funicle with segments subquadrate; head width about equal to flagellum length; linear sensilla on F3-F6; clava 3-segmented, very slightly longer than F3-F6 combined; sensory area enlarged and forming an oblique truncation, extending about 0.3X along ventral margin; mesoscutum (Fig. 1145) anteriorly with fine, longitudinally elongate, striate to striate-reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 1139) about 2.5X as long as broad; parastigma slightly downcurved; costal cell dorsally with two or three apical setae and a line of setae ventrally that is broadly interrupted above parastigma; area below proximal part of parastigma with a line of about four to six pale setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that curves a little way into disc (Fig. 1143); apical bristle of postmarginal vein about 0.6X as long as marginal vein; mid tibial spur very slightly longer than basitarsus; propodeum (Fig. 1145) with about four setae adjacent to spiracle, side naked; syntergum about as long as mid tibia; ovipositor (Fig. 1141) about 3.7X gonostylus or about 1.7X as long as mid tibia; gonostylus about 1.4X as long as mid tibial spur; exserted part of ovipositor about 0.5X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.45mm; excluding ovipositor, 1.38mm (CPD).

Head mostly pale orange; frontovertex slightly dusky with a blue and purple sheen, strongest between posterior ocelli; temple and upper gena with a weak brassy sheen mixed purple, lower gena much less shiny with a very weak brassy and purple sheen, area between eye and scrobe with a slightly stronger purple sheen; scrobal area with a weak brassy and purple sheen; scrobes delimited dorsally by a curved, pale brown line; lower face with a brown spot below each torulus that are connected by a very faint, curved, brown line; temple with a diagonal brown streak from temple behind eye towards torulus; frontovertex clothed with inconspicuous, pale brown setae, a line of fine, translucent setae between eye and scrobe; maxillary palpus white; antenna (Fig. 1142) with radicle pale orange, apex narrowly ringed orange-brown; scape pale orange, white at extreme apex, distinctly margined brown ventrally, more widely so internally towards base; pedicel mostly pale orange with a dark brown streak internally along its length; F1-F3 brown, F4-F5 orange, brown ventrally, F6 brown; clava dark brown; pronotum mostly orange, neck with a dark brown spot; prosternum dark brown outside coxa; mesoscutum anteriorly orange, posterior half with a metallic blue and purple band, behind this narrowly orange, posterior margin mostly brown with a weak purple sheen, anterior half of mesoscutum clothed in relatively sparse dark brown setae, posterior half clothed in relatively dense, translucent, silvery setae mixed with a few dark brown setae; tegula orange with apex orange-brown; axilla and scutellum orange, axilla clothed with brown setae, scutellum clothed anteriorly with golden brown setae, otherwise setae dark brown, subapical tuft black; metanotum orange; mesopleuron pale orange, orange-brown posteriorly, anterior part with a very weak brassy sheen, posterior part with a weak brassy, coppery and purple sheen; fore coxa white; fore femur concolourous with coxa basally, apex pale orange, a little dusky along margins distally, tibia and tarsus pale orange; mid coxa pale orange; mid leg otherwise similarly coloured to fore leg, except that tibia is faintly infuscate subbasally; hind coxa white, femur concolourous proximally and pale orange apically, knee brown, tibia and tarsus pale orange; fore wing (Fig. 1139) mostly infuscate, hyaline towards base and at apex; submarginal vein pale orange, venation otherwise pale brown; propodeum orange, brown with a blue and purple sheen laterally, side orange, 4 white setae near spiracle; gaster largely pale orange to orange-brown, apex of syntergum brown, outer plate of ovipositor and apex of hypopygium brown, Gt1-Gt4 brown, darker proximally, gaster with a mixed coppery, purple, green, blue and brassy sheen that is weakest on paler areas, sides of Gt1-Gt4 with a much stronger metallic green lustre; gonostylus very pale orange.

Head (Fig. 1144) about 4.6X as wide as frontovertex, in profile about 1.6X as high as deep, anteriorly quite straight below top of scrobes, interantennal prominence hardly protuberant

level with torulus; occipital margin sharp, not carinate; ocelli forming an angle of about 70°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh conspicuously smaller than diameter of eye facet; area between eye and scrobe hardly wider than diameter of anterior ocellus, smooth; scrobes shallow, broadly ∩-shaped, sharply margined above, margin below eyes carinate; interantennal prominence with similar sculpture to frontovertex, dorsally rounded with a weak, median ridge that does not extend past scrobal depression; temple virtually smooth with very shallow, irregular, elongate sculpture, gena with slightly deeper, irregular, reticulate sculpture; antenna as in Fig. 1142; scape broadened and flattened, about 2.9X as long as broad; funicle with segments broader and larger distad, proximal segments subquadrate, distal segments transverse, F1-F3 subequal, F5-F6 subequal; linear sensilla present only on F3-F6; clava slightly broadened about as long as F2-F6 combined, sutures oblique, sensory area enlarged, extending ventrally a little more than 0.4X along clava, giving it an obliquely truncate appearance; eye reaching occipital margin, clothed with very inconspicuous short setae, each much shorter than diameter of facet; inner eye margins converging very slightly anteriorly, diverging a little way above scrobes; malar sulcus absent; clypeal margin weakly concave medially; mandible with 1 tooth and a broad, slightly concave truncation; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 62, HH 59, FV 13.5, POL 6.5, OOL 0, OCL 4.5, AOL 6.5, EL 40, EW 32, MS 29, SL 30.5, SW 10.5.

Thorax (Fig. 1145) with irregular, polygonally reticulate sculpture on pronotum that is of similar depth to that on frontovertex; mesoscutum with polygonally reticulate sculpture in posterior two-fifths that is a little deeper than that on frontovertex, anterior three-fifths with fine, longitudinally elongate, striate to striate-reticulate sculpture; axilla mostly with fairly regular, polygonally reticulate sculpture that is conspicuously deeper and coarser than that on frontovertex, scutellum with longitudinally striate-reticulate sculpture that is much coarser than that on anterior part of mesoscutum; visible part of mesoscutum about 2.1X as broad as long; scutellum hardly broader than long with a distinct subapical tuft, setae mostly about half as long as scutellum; mid tibia with a distinct, subbasal, external carina for about half its length; hind femur about 3.8X as long as broad; fore wing with venation and setation as in Figs 1139, 1143; costal cell dorsally with 1 or 2 at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 1143); propodeum (Fig. 1145) with side completely smooth, medially about 0.12X as long as scutellum and virtually smooth. Relative measurements: FWL 65.5, FWW 26; HWL 54, HWW 13.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium (Fig. 1140) reaching about half-way to apex; syntergum about long as mid tibia, with apex angular; ovipositor (Fig. 1141) slightly exserted, the exserted part about half as long as mid tibial spur or not quite one-fifth mid tibia. Relative measurements: OL 57.5, GL 15.5 [MT 34].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Cacao (ACG) 1100m, MT/YPT, 26.i-24. ii.1996 (J.S. Noyes). Holotype in NHMUK.

COMMENTS. *Cheiloneurus amethes* is somewhat similar to *omorus*. Apart from having the scrobes sharply margined below the eye, *amethes* has linear sensilla on F3 and the dark area on the mesoscutum is medially about 0.7X as long as the side of an axilla laterally. In *omorus* the scrobal margin is rounded below the eye, linear sensilla are absent from F3 and the dark area of the mesoscutum is medially slightly longer than the side of an axilla.

See also comments under *cero* (p. 415), *finator* (p. 417) and *alopes* (p. 443).

***Cheiloneurus metheus* sp.nov.**
(Figs 1146-1150; Hab. ♀ 164)

DIAGNOSIS. *Female* (length about 1.2-1.3mm): body mostly orange with posterior four-fifths of mesoscutum, propodeum and parts of gaster dark brown, mouth margin pale brown, temple and gena with a diagonal brown streak, paler areas with a weak metallic sheen, darker areas with a weak to moderate metallic sheen; antenna (Fig. 1146) with scape mostly pale orange, ventral margin brown; pedicel pale orange with a dark brown streak; funicle mostly dark orange-brown, mixed pale orange, F6 dark brown; clava dark brown; mesoscutum with silvery setae in posterior four-fifths; fore and hind coxae white, mid coxa pale orange; legs otherwise white to pale orange, with some dark brown areas; fore wing (Fig. 1147) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation and a narrow hyaline area at apex; head about 4.4X as wide as frontovertex, in facial view slightly broader than long, suboval, genae converging, strongly and evenly curved; frontovertex with two setae medially between anterior ocellus and scrobes; eye separated from scrobe by slightly more than diameter of anterior ocellus, area between eye and scrobe completely smooth; scrobes moderately deep, sharply margined below eye; interantennal prominence subtriangular with an inconspicuous median ridge and with about 25 inconspicuous setae; mandible virtually tridentate; antenna (Fig. 1146) with scape about 2.9X as long as broad; funicle with all segments transverse; linear sensilla on F4-F6; clava 3-segmented, very nearly as long as funicle, sensory area enlarged, extending ventrally nearly 0.5X length of clava, apex obliquely truncate; head width slightly more than flagellum length; mesoscutum (Fig,. 1150) anteriorly with fairly coarse lineolate-reticulate sculpture, posteriorly with polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 1147) about 2.8X as long as broad; parastigma downcurved; costal cell dorsally naked save for an apical seta, ventrally with a line of setae that is interrupted above parastigma; area below proximal part of parastigma with 11 or 12 setae arranged in two lines; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues a little way into disc; apical bristle of postmarginal vein about 0.5X as long as marginal vein; mid tibial spur very slightly shorter than basitarsus; propodeum (Fig. 1150) with about five to seven silvery setae adjacent to spiracle, side naked; syntergum about as long as mid tibia with apex acutely angular; ovipositor about 4.1X gonostylus or about 1.5X as long as mid tibia; gonostylus hardly longer than mid tibial spur; exserted part of ovipositor about 0.3X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.19mm; excluding ovipositor, 1.15mm (CPD).

Head largely pale orange; occiput with a brown spot above foramen; frontovertex with weak brassy, blue and purple reflections, area immediately above scrobes with a purple sheen; temple, gena and area below eye with a weak brassy, purple and green sheen; scrobal area with a very weak brassy and purple sheen; mouth margin pale brown and connecting with a diagonal pale brown line from occipital margin; frontovertex clothed with inconspicuous, pale brown setae, a line of more conspicuous, translucent setae below eye; antenna (Fig. 1146) with radicle pale orange, apex narrowly brown; scape pale orange, ventral margin weakly infuscate in proximal half; pedicel pale orange with an internal dark brown streak along its length; F1-F5 pale orange externally, dark orange-brown internally, F6 dark brown, clava dark brown; maxillary palpus white; pronotum mostly orange, neck pale brown; prosternum orange, anterior to coxa brown; mesoscutum orange in anterior one-fifth or less, posterior four-fifths dark brown with a weak blue-green sheen with some purple reflections, posterior margin purple-brown with a slight purple and brassy sheen, anterior part clothed in relatively sparse dark brown setae, posterior part with relatively dense silvery setae, mixed with a few dark brown setae; tegula orange, apex orange-brown; axilla and scutellum orange, clothed in translucent golden brown and dark brown setae, scutellar tuft black, apex of scutellum slightly dusky; metanotum brown; mesopleuron mostly orange with a weak brassy sheen, posterior half very slightly dusky with a slight purple and green sheen; fore coxa white; fore femur largely white, apically pale orange, tibia pale orange, dorsal margin pale brown subbasally, tarsus pale orange-brown; mid coxa mostly pale orange, dusky proximally; mid femur white, pale orange mixed brown towards apex, tibia pale orange with an incomplete brown subbasal ring and dorsal margin brown along most of its length, spur

and tarsus very pale orange; hind coxa white; hind femur pale orange with a small brown apical spot, tibia pale orange, largely dark brown externally along about half its length, tarsus very pale orange; fore wing (Fig. 1147) mostly infuscate, hyaline towards base and at apex; submarginal vein largely pale orange, otherwise venation brown; propodeum orange, laterally slightly dusky with a slight green and purple lustre, 4 or 5 translucent, white setae outside spiracle; gaster pale orange dorsally with a weak brassy, green and purple sheen, sides of gaster and apex of syntergum brownish with a stronger green, blue, brassy, coppery and purple lustre, venter dusky pale orange with a less conspicuous sheen; gonostylus very pale orange.

Head (similar to that of *letos* Fig. 1051) about 4.4X as wide as frontovertex, in profile about 1.4X as high as deep, anteriorly quite straight below top of scrobes, interantennal prominence hardly protuberant; occipital margin sharp, not carinate; ocelli forming an angle of about 50°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture, hardly deeper in ocellar area, mesh size slightly smaller than diameter of eye facet; area immediately above scrobes with slightly transversely elongate sculpture, interantennal prominence with shallow sculpture, scrobes with distinct sculpture, temple and posterior gena with shallow, irregular, longitudinally elongate sculpture, anterior gena with slightly deeper, irregular, reticulate sculpture; area between eye and scrobe a little broader than diameter of anterior ocellus and virtually completely smooth; scrobes moderately deep, meeting dorsally, sharply margined only immediately below eye, very broadly ∩-shaped, interantennal prominence subtriangular, narrowly rounded dorsally and with an inconspicuous median ridge; antenna as in Fig. 1146; scape broadened and flattened, about 2.9X as long as broad; funicle with all segments transverse, larger and broader distad; clava clearly broadened, about as long as funicle, sutures oblique, sensory area enlarged, extending nearly half-way along clava, giving it a distinct, strongly obliquely truncate appearance; eye reaching occipital margin, appearing naked but clothed with extremely short setae that are much shorter than diameter of facet; inner eye margins clearly diverging below anterior ocellus; malar sulcus absent; clypeal margin virtually straight medially; mandible with 1 acute tooth and a broad concave truncation, virtually tridentate; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 70, HH 66, FV 16, POL 8, OOL 0, OCL 7, AOL 10, EL 49, EW 39, MS 30.5, SL 32, SW 11.

Thorax (Fig. 1150) with irregular, polygonally reticulate sculpture on pronotum that is similar in depth to that on frontovertex; mesoscutum with fairly coarse longitudinally elongate, lineolate-reticulate sculpture in anterior half or so, about as deep as that on pronotum; axilla and scutellum with similar sculpture to pronotum, but a little coarser and deeper, sculpture on scutellum very slightly more elongate laterally; visible part of mesoscutum about 3X as broad as long; scutellum about as 1.1X as broad as long with a distinct subapical tuft, setae mostly about half as long as scutellum; hind femur about 4.2X as long as broad; fore wing with venation and setation as in Figs 1147, 1148; costal cell naked or with 1 or 2 setae dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 1148); mid tibia with an indistinct, external subbasal carina for about half its length; propodeum (Fig. 1150) medially a little less than 0.1X as long as scutellum and more or less smooth. Relative measurements: FWL 73.5, FWW 26; HWL 64, HWW 13.5.

Gaster with hypopygium reaching about 0.4X to apex; syntergum about as long as mid tibia, with apex acutely angular; ovipositor slightly exserted, about one-third as long as mid tibial spur or 0.1X as long as mid tibia.

Paratype. Funicle with linear sensilla present only on F4-F6; gaster without "gland-like" structures on Gt1 or Gt5; hypopygium Fig. 1149. Relative measurements: OL 47.5, GL 11.5 [MT 32].

Variation. Females vary in overall length from 1.15-1.29mm, the mesoscutum may be only about 2.4X as broad as long and with anterior one-third orange, the gaster may be pale orange ventrally and Gt1 may be almost completely dark brown with a distinct metallic green sheen, otherwise little in material examined,

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Pen. Osa, Puerto Jimenez, 8°32'N 83°19'W, iii.1992 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **Heredia**, Santo Domingo, INBio, 1100m, YPT (compost), 6-7.iii.1996 (L. Masner); 1♀, **Puntarenas**, Pen. Osa, 5km N Puerto Jimenez, 10m, x.1990 (P. Hanson). Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. See comments under *numitor* (p. 434).

***Cheiloneurus omorus* sp.nov.**
(Figs 1151-1156; Hab. ♀ 165)

DIAGNOSIS. *Female* (length about 1.0-1.1mm): body mostly orange, mesoscutum posteriorly, propodeum laterally and gaster partially brown, darker areas with a weak to moderate metallic sheen; mouth margin dark brown; temple with a very faint diagonal, brown streak; antenna (Fig. 1152) with scape mostly pale orange with ventral margin brown; pedicel pale orange with a longitudinal, dark brown streak; funicle mainly pale orange, some segments slightly dusky; clava dark brown; posterior half to two-thirds of mesoscutum with dense silvery setae; coxae white, mid coxa sometimes pale orange; legs mostly white to pale orange with brown areas; fore wing (Fig. 1155) mostly infuscate with basal cell almost completely hyaline, a small hyaline area at apex of venation and an opposite hyaline area on posterior wing margin, apex hyaline; head (Fig. 1153) about 5-5.4X as wide as frontovertex, in facial view about as broad as long, sometimes clearly broader than long, subcircular with genae converging and uniformly curved, slightly more curved inwards near mouth margin; frontovertex with one or two setae medially above scrobes; eye separated from scrobe by about 1.8-2X diameter of anterior ocellus, area between eye and scrobe completely smooth, scrobal margin rounded; interantennal prominence with about 15 inconspicuous setae and with a dorsal median ridge; mandible with one tooth and a broad, concave truncation, sometimes appearing tridentate; antenna (Fig. 1152) with scape about 3.1X as long as broad; funicle segments subquadrate to transverse; head width slightly greater than flagellum length; linear sensilla on F5-F6; clava 3-segmented, about as long as funicle; sensory area enlarged and forming an oblique truncation, extending about 0.4X along ventral margin; mesoscutum (Fig. 1151) anteriorly with fairly fine, longitudinally elongate, lineolate-reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed; fore wing (Fig. 1155) about 2.4-2.6X as long as broad; parastigma slightly downcurved; costal cell naked dorsally or with one or two setae at apex, with a line of setae ventrally that is broadly interrupted above parastigma; area below proximal part of parastigma with up to 8 pale setae arranged in 1 or 2 lines; apices of postmarginal and stigmal veins connected by a naked hyaline area that curves a little way into disc; apical bristle of postmarginal vein about 0.6X as long as marginal vein; mid tibial spur very slightly longer than basitarsus; propodeum (Fig. 1151) with two or three setae adjacent to spiracle, side naked; syntergum about 0.9X as long as mid tibia; ovipositor (Fig. 1156) about 3.5-3.6X gonostylus or about 1.5X as long as mid tibia; exserted part of ovipositor about 0.3-0.5X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.05mm; excluding ovipositor, 1.00mm (CPD).

Head mostly pale orange; frontovertex with a weak blue, green and purple sheen, stronger in ocellar area; temple and upper gena with a weak brassy sheen, lower gena with a very weak brassy and purple sheen, area between eye and scrobe with a slightly stronger purple sheen; scrobal area with a weak brassy and purple sheen; lower face with a median, curved, brown line between toruli and mouth margin that meets mouth margin near base of mandible; temple with an extremely faint, diagonal pale brown streak from temple behind eye towards torulus; frontovertex clothed with inconspicuous, pale brown setae, a line of translucent setae between eye and scrobe; maxillary palpus white; antenna (Fig. 1152) with radicle pale orange, apex narrowly ringed orange-brown; scape pale orange, distinctly margined brown ventrally, more widely so internally towards base, upper margin weakly brown; pedicel mostly pale orange with a dark

brown streak internally along its length; funicle segments largely pale orange, F1-F3 slightly dusky on sides, F6 slightly dusky internally, clava dark brown; pronotum mostly orange, neck and side above coxa brown; mesoscutum anteriorly orange, posterior half shining blue-green and green with slight purple reflections, behind this narrowly orange, posterior margin brown with a weak purple sheen, anterior half of mesoscutum clothed in relatively sparse golden brown to dark brown setae, posterior half clothed in relatively dense, translucent, silvery setae mixed with a few dark brown setae; tegula orange with apex orange-brown; axilla and scutellum orange, axilla clothed with brown setae, scutellum clothed anteriorly with golden brown setae, otherwise setae dark brown, subapical tuft black; metanotum slightly dusky pale orange; mesopleuron pale orange, slightly dusky posteriorly, anterior part with a very weak brassy sheen, posterior part with a weak purple sheen; fore coxa white; fore femur concolourous with coxa basally, apex pale orange with a dorsal brown streak, tibia and tarsus very pale orange, tibia with a brown dorsal streak; mid coxa white; mid leg otherwise similarly coloured to fore leg, except that femur has remnants of a narrow, brown, subapical ring and tibia has remnants of a narrow, brown, subbasal ring; hind coxa white, femur largely concolourous, but with a dorsal, brown streak internally and a partial brown, subapical streak ventrally, knee brown, tibia dirty white with an external brown streak and an incomplete subbasal brown ring, tarsus off-white, distally pale orange to brown; fore wing (Fig. 1155) mostly infuscate, hyaline towards base and at apex; submarginal vein pale yellow, venation otherwise pale brown; propodeum dusky pale orange, slightly darker on side and with a weak blue and purple sheen, 2 or 3 white setae near spiracle; gaster largely pale orange to orange-brown, apex of syntergum and apex of outer plate of ovipositor pale brown, Gt1 dark brown dorsally, Gt2-Gt4 dark brown medially, Gt5 similar but paler, Gt1 with a distinct metallic green sheen laterally, otherwise gaster generally with a mixed coppery, purple, green, blue and brassy sheen that is weakest on paler areas; gonostylus very pale orange, almost white.

Head (Fig. 1153) about 5X as wide as frontovertex, in profile about 1.6X as high as deep, anteriorly quite straight below top of scrobes, interantennal prominence hardly protuberant level with torulus; occipital margin sharp, not carinate; ocelli forming an angle of about 50°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh slightly smaller than diameter of eye facet; area between eye and scrobe nearly 2X as wide as diameter of anterior ocellus, smooth; scrobes shallow, more or less Λ-shaped, not sharply margined; interantennal prominence with similar sculpture to frontovertex, dorsally with a strong, carinate, median ridge that reaches frontovertex and separates scrobes; temple virtually smooth with very shallow, irregular, elongate sculpture, gena with slightly deeper, irregular, reticulate sculpture; antenna as in Fig. 1152; scape broadened and flattened, about 3.1X as long as broad; funicle with segments broader and larger distad, proximal segments subquadrate, distal segments transverse; clava broadened, about as long as funicle, sutures oblique, sensory area enlarged, extending ventrally about 0.4X along clava, giving it an obliquely truncate appearance; eye reaching occipital margin, clothed with inconspicuous short setae, each a little shorter than diameter of facet; inner eye margins subparallel, diverging a little way above scrobes; malar sulcus absent; clypeal margin weakly concave medially; mandible with 1 tooth and a broad, concave truncation, more or less tridentate; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 52, HH 50, FV 10.5, POL 4, OOL 0, OCL 3, AOL 7.5, EL 33, EW 27, MS 23, SL 25, SW 8.

Thorax (Fig. 1151) with irregular, polygonally reticulate sculpture on pronotum that is of similar depth to that on frontovertex; mesoscutum with polygonally reticulate sculpture in posterior half that is a little deeper than that on frontovertex, anterior half with fairly fine, longitudinally elongate, lineolate-reticulate sculpture; axilla mostly with fairly regular, polygonally reticulate sculpture that is conspicuously deeper and coarser than that on frontovertex, scutellum with longitudinally striate-reticulate sculpture that is similar to that on anterior part of mesoscutum; visible part of mesoscutum about 1.9X as broad as long; scutellum about 1.1X as long as broad with a distinct subapical tuft, setae mostly about 0.7X as long as scutellum; hind femur about 4.3X as long as broad; fore wing with venation and setation as in Figs 1154, 1155; costal cell dorsally with 1 or 2 at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak (Fig. 1154); propodeum (Fig. 1151) with side completely smooth, medially about 0.16X as long as scutellum and with very shallow, irregular sculpture, virtually smooth. Relative

measurements: FWL 47.5, FWW 19; HWL 28.5, HWW 7.

Gaster with hypopygium reaching about half-way to apex; syntergum about 0.9X as long as mid tibia, with apex weakly angular; ovipositor slightly exserted, the exserted part about one-third as long as mid tibial spur or about one-tenth mid tibia.

Paratype. Funicle with linear sensilla present only on F5-F6; gaster without "gland-like" structures on Gt1 or Gt5; ovipositor Fig. 1156. Relative measurements: OL 38.5, GL 11 [MT 25].

Variation. Females vary in overall length from 0.95-1.08mm, F6 may be almost completely pale brown, the posterior half to two-thirds of the mesoscutum may have dense silvery setae, the head is about 5-5.4X as wide as the frontovertex and in facial view may be clearly broader than long, the eye is separated from scrobe by about 1.8-2X diameter of the anterior ocellus, the mandible may appear tridentate, the fore wing varies from about 2.4-2.6X as long as broad, the costal cell is dorsally naked or with one or two apical setae at apex, the gonostylus is about 1.1-1.4X as long as the mid tibial spur and the exserted part of ovipositor is about 0.3-0.5X as long as the mid tibial spur.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, San Joaquin de Flores, LN 220900 519700, 1064m, #5487, 7.vi-2.ix.1995 (C. Viquez). Paratypes: **COSTA RICA**, 2♀, **Guanacaste**, Santa Rosa NP, Hacienda 2-C, 14.vi-8.vii.1986 and 16.v-6.vi.1987 (D. Janzen, I.D. Gauld); 1♀, **Guanacaste**, PN Palo Verde, 10°21'N 85°21'W, 20m, 21.iii.2013 (J.S. Noyes); 1♀, **Heredia**, Santo Domingo, INBio Parque, LN 526250 217400, 1100m, iii.2002 ((J.A. Azofeifa, J.S. Noyes). Holotype in MZUCR, paratypes in NHMUK and MZUCR.

COMMENTS. Of the Costa Rica species, *Cheiloneurus omorus* is most similar to *janzeni* but differs in the females being smaller, only about 1.1mm long, lacking a conspicuous diagonal brown streak on temple and gena, having F6 conspicuously paler than clava, the hind tibia distinctly marked with brown, head about 5X as wide as the frontovertex, the clava as long as the funicle, irregular, shallow sculpture on the temple and upper gena, the scrobal margin rounded below the eye and the eye separated from the scrobes by about 2X its own diameter. Females of *janzeni* are up to 1.5mm long, have a strong diagonal brown stripe on the temple and gena, F6 dark brown and concolourous with the clava, the hind tibia immaculate, the head about 8X as wide as the frontovertex, the clava about as long as F3-F6 combined, the temple and upper gena completely smooth, the scrobal margin sharp below the eye and the eye separated from the scrobe by about its own diameter. *Cheiloneurus omorus* is also very similar to *inimicus* Compere, a species that has been recorded from many parts of the New World as a hyperparasitoid of soft scales (Hemiptera: Coccidae). Both species have a similar general colouration and habitus and also have the scrobal margin rounded below the eye. As with *nasica* (see p. 439) it is possible that some records of *inimicus* are based on misidentifications of *omorus*. It differs from *inimicus* in having the mouth margin distinctly marked with brown, the scape slightly more than 3X as long as broad and the dark band on the posterior part of the mesoscutum is quite strongly metallic green, blue-green or blue. In *inimicus* the mouth margin is pale orange and the scape is about 2.6-2.7X as long as broad and the band on the mesoscutum has only weak dark blue reflections.

See also comments under *cero* (p. 415), *finator* (p. 417), *lexovus* (p. 431) and *amethes* (p. 450).

***Cheiloneurus nebucha* sp.nov.**

(Figs 1157-1159)

DIAGNOSIS. *Female* (length about 1.3mm): body mostly orange with posterior one third of mesoscutum and gaster dark brown, mouth margin dark brown, temple and gena with a diagonal brown streak, paler areas with a weak metallic sheen, darker areas with a weak to moderate metallic

sheen; antenna (Fig. 1158) with scape mostly pale orange, ventral margin brown; pedicel pale orange with a dark brown streak; funicle mostly dark orange-brown, F6 dark brown; clava dark brown; mesoscutum with silvery setae in posterior one-third; fore and hind coxae white, mid coxa pale orange; legs otherwise white to pale orange, with some dark brown areas; fore wing (Fig. 1159) mostly infuscate with basal cell mostly hyaline, a small hyaline area at apex of venation, another opposite and apex with a moderately-sized, subtriangular hyaline area; head about 6.0X as wide as frontovertex, in facial view clearly broader than long, suboval, genae converging, evenly curved but more strongly curved inwards near mouth; frontovertex with two setae medially between anterior ocellus and scrobes; eye separated from scrobe by about 2X diameter of anterior ocellus, area between eye and scrobe completely smooth; scrobes shallow, not sharply margined; interantennal prominence triangular with about 10 inconspicuous setae; mandible tridentate; scape about 2.8X as long as broad; F1-F4 subquadrate, F5-F6 slightly longer than broad; linear sensilla on F5-F6; clava 3-segmented, slightly longer than F3-F6 combined; sensory area slightly enlarged, extending ventrally only about 0.2X length of clava, apex obliquely truncate; head width slightly less than flagellum length; mesoscutum anteriorly with fine, longitudinally elongate, striate sculpture, posteriorly with polygonally reticulate sculpture; scutellum with a distinct, apical tuft of setae; wings fully developed, fore wing (Fig. 1159) about 2.6X as long as broad; parastigma downcurved; costal cell dorsally naked save for an apical seta, ventrally with a line of setae that is interrupted more than once above parastigma; area below proximal part of parastigma with a line of about four or five setae; apices of postmarginal and stigmal veins connected by a naked hyaline area that continues some way into disc (Fig. 1157); apical bristle of postmarginal vein about 0.8X as long as marginal vein; mid tibial spur slightly longer than basitarsus; propodeum with two or three silvery setae adjacent to spiracle, side naked; syntergum about 0.9X as long as mid tibia with apex angular; ovipositor about 3.6X gonostylus or about 1.5X as long as mid tibia; gonostylus about 1.4X as long mid tibial spur; exserted part of ovipositor about 0.9X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.25mm; excluding ovipositor, 1.16mm (CPD).

Head mostly pale orange; frontovertex orange-brown, ocellar area metallic green and blue-green with eye margins coppery purple, anterior part with a blue and green sheen, immediately above scrobes with a purple sheen; temple, gena and area below eye with a weak brassy, purple and green sheen; scrobal area with a very weak brassy and purple sheen, scrobes dorsally delimited by a narrow brown line; mouth margin dark brown; temple with a diagonal brown line from occipital margin towards torulus; frontovertex clothed with a few, inconspicuous, pale brown setae, a line of more conspicuous, translucent setae below eye; antenna (Fig. 1158) with radicle pale orange, apex brown; scape pale orange, extreme apex white, ventral margin narrowly brown, inner surface more extensively marked with brown and with a small, brown, subapical spot near dorsal margin; pedicel pale orange with an internal dark brown streak along its length; F1-F5 dark orange-brown, F6 and clava dark brown; maxillary palpus white; pronotum mostly pale orange, neck dark brown; mesoscutum orange in anterior two-thirds, posterior one-third dark brown with dark, metallic blue and purple reflections, posterior margin purple-brown with a slight brassy sheen, anterior part clothed in relatively sparse dark brown setae, posterior part with relatively dense silvery setae, mixed with a few dark brown setae; tegula orange, apex orange-brown; axilla and scutellum orange, clothed in golden brown to dark brown setae, scutellar tuft black; metanotum dusky orange; mesopleuron mainly orange with a weak brassy sheen, posterior half dark orange-brown with a purple and green sheen; fore coxa white; fore femur largely white, apically pale orange, dorsal margin orange-brown distally, tibia and tarsus pale orange; mid coxa mostly pale orange; mid femur white, narrowly brown towards apex, tibia pale orange with dorsal margin dark brown in proximal half, spur and tarsus pale orange; hind coxa white; hind femur pale orange, a ventral, dark brown mark at apex, tibia pale orange, a weak, dorsal, subbasal brown mark, tarsus very pale orange; fore wing (Fig. 1159) mostly infuscate, hyaline towards base and at apex; venation brown; propodeum pale orange medially, dark orange-brown laterally with a blue and purple sheen, side additionally metallic green, 2 translucent, white setae anterior to spiracle; gaster dark brown, with

brassy, coppery, purple, and green reflections, more strongly coppery and purple dorsally, Gt1 with additional blue reflections, syntergum pale orange-brown; gonostylus pale orange.

Head about 6X as wide as frontovertex, in profile about 1.3X as high as deep, anteriorly quite straight below top of scrobes, interantennal prominence not protuberant; occipital margin sharp, not carinate; ocelli forming an angle of about 50°; frontovertex quite shiny, with shallow, fairly regular, polygonally reticulate sculpture of mesh size slightly smaller than diameter of eye facet; area immediately above scrobes virtually smooth; interantennal prominence with shallow sculpture, almost smooth, scrobes completely smooth, temple and posterior gena virtually smooth but with very shallow, irregular, longitudinally elongate sculpture, anterior gena with slightly deeper, irregular, reticulate sculpture; area between eye and scrobe completely smooth, about 2X as wide as diameter of anterior ocellus; scrobes shallow, not meeting dorsally, not sharply margined, very broadly ∩-shaped, interantennal prominence triangular and meeting frontovertex medially above; antenna as in Fig. 1158; scape broadened and flattened, about 2.8X as long as broad; funicle with F1-F4 subquadrate, relatively small and subequal, F5-F6 very slightly longer than broad, relatively large and subequal, segments broadest distad; funicle with linear sensilla present only on F5-F6; clava not broadened, slightly longer than F3-F6 combined, sutures oblique, sensory area enlarged, but extending ventrally only about 0.2X along clava, giving it an indistinct, obliquely truncate appearance; eye reaching occipital margin, appearing naked, but clothed with extremely short setae that are very much shorter than diameter of facet; inner eye margins clearly converging below anterior ocellus; malar sulcus absent; clypeal margin very slightly concave medially; mandible with 2 acute teeth and a rounded upper tooth; apical segment of maxillary palpus hardly enlarged, hardly longer than radicle. Relative measurements: HW 66, HH 60, FV 11, POL 5.5, OOL 0, OCL 3.5, AOL 8, EL 43, EW 34, MS 30, SL 34, SW 12.

Thorax with irregular, polygonally reticulate sculpture on pronotum that is similar to that on frontovertex in ocellar area; mesoscutum in anterior two-thirds with fine, longitudinally elongate, striate sculpture, posterior one-third with polygonally reticulate sculpture that is slightly shallower than that on pronotum; axilla and scutellum with similar sculpture to pronotum perhaps a little coarser, axilla posteriorly weakly sculptured, sculpture on scutellum laterally more longitudinally elongate; visible part of mesoscutum about 1.9X as broad as long; scutellum about 1.1X as broad as long with a distinct subapical tuft, setae mostly about half as long as scutellum; hind femur about 3.8X as long as broad; fore wing with venation and setation as in Figs 1157, 1159; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a distinct, naked, hyaline streak; mid tibia with a subbasal, external carina for about one-third its length; propodeum naked but for 2 setae anterior to spiracle, side completely smooth; propodeum medially about 0.11X as long as scutellum and more or less smooth. Relative measurements: FWL 82, FWW 31.5; HWL 65, HWW 15.5.

Gaster without "gland-like" structures on Gt1 or Gt5; hypopygium reaching about half-way to apex; syntergum about 0.9X as long as mid tibia, with apex weakly angular; ovipositor slightly exserted, the exserted part nearly as long as mid tibial spur or about one-quarter as long as mid tibia). Relative measurements: OL 41, GL 11.5 [MT 26.5].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, La Selva BS, 10°26'N 84°01'W, 50-150m, fog *Pentaclethra macroloba*, FPM/04, 6.v.1993 (INBio-OET). Holotype in NHMUK.

Genus *PROCHILONEURUS* Silvestri

Prochiloneurus Silvestri, 1915:350. Type species: *Prochiloneurus pulchellus* Silvestri, by original designation and monotypy.

Achrysopophagus Girault, 1915a:89. Type species: *Achrysopophagus oviductus* Girault, by original designation. Synonymy with *Prochiloneurus* by Viggiani (1966:224).

Parachrysopophagus Agarwal, 1965:65. Type species *Achrysopophagus insolitus* Alam, by original designation (as subgenus of *Achrysopophagus*). Synonymy with Prochiloneurus by Hayat (2006:96).

Neoprochiloneurus Viggiani, 1966:95. Type species: *Prochiloneurus bolivari* Mercet, by monotypy. Synonymy with *Prochiloneurus* by Noyes (1978:223).

Prochiloneuroides Hayat, Alam & Agarwal, 1975:61. Type species: *Prochiloneurus clavatus* Compere, by original designation. Synonymy with *Prochiloneurus* by Hayat (1981:22-23).

Female. Overall length about 0.8-2.5mm.

Body varying from completely yellow or orange to dark brown and largely metallic green; mesoscutum often posteriorly with a strong metallic dark band clothed with dense silvery setae; legs varying from completely yellow or pale orange to mostly dark brown; fore wing distinctly infuscate, apex hyaline, the hyaline area about as wide as length of marginal vein, distal margin of infuscate area curved, subparallel to apical wing margin.

Head with a sometimes inconspicuous, narrow, shiny bottomed groove along eye margin from posterior ocellus almost to occipital margin; malar sulcus absent or present and conspicuous; antenna attached very near to mouth margin, torulus separated by not more than one-third its own width; pedicel and flagellum subcylindrical, segments becoming broader distally, clava much broader than F1, with a distinct oblique apical truncation that is at least half its length; mandible with 3 acute teeth; palp formula 4-3.

Mesoscutum without notaular lines, mostly with imbricate-reticulate reticulate sculpture, cells rarely uniform, mostly at least some anterior cells obliquely, longitudinally elongate, rarely all sculpture longitudinally elongate striate-reticulate to striate and slightly diverging posteriorly; scutellum with similar or distinctly deeper imbricate-reticulate sculpture, sometimes very elongate and arranged in whorls; scutellum with a subapical tuft composed of tightly packed, scale-like setae that are arranged in paired submedian straight lines, tuft rarely completely absent; fore wing fully developed, very rarely shortened; fully developed fore wing relatively narrow, about 2.7-3.2X as long as broad with a naked, hyaline streak connecting apex of postmarginal and stigmal veins; submarginal vein with parastigma at least slightly broadened and conspicuously downcurved; marginal vein long, at least 5X as long as broad, at least 3X as long as the stigmal vein, postmarginal vein about half as long as stigmal vein; filum spinosum present.

Hypopygium reaching apex of gaster; syntergum with apex broadly truncate, very slightly concave; ovipositor always conspicuously exserted, sheaths together forming a uniform, slender cylindrical tube; gonostylus free.

Male. Length about 0.6-1.8mm.

Body dark brown with a slight to moderate metallic sheen; fore wing hyaline; antenna with 6 funicle segments, all longer than broad and clothed with whorls of long setae that are at least about 3X as long as diameter of segments; clava entire and usually slightly shorter than F5 and F6 combined; sculpture of mesoscutum and scutellum usually similar to that of female; scutellum without a subapical tuft but sometimes with a distinct group of longer setae; fore wing with venation similar to that of female but marginal vein usually relatively shorter; phallobase with parameres distinct and fairly elongate, each with a subapical seta; cuspis seta present; digiti each about 3-4X as long as broad and with a single apical tooth; aedeagus mostly about two-thirds as long as mid tibia, slender, about 20X as long as broad with apex broadly rounded, nearly truncate.

DISTRIBUTION. Cosmopolitan (see Noyes, 2019).

HOSTS. Secondary parasitoids of mealybugs (Hemiptera: Pseudococcidae) via encyrtid (Hymenoptera: Encyrtidae) primary parasitoids, e.g. *Anagyrus* Howard (see Noyes, 2019). One species may be a secondary parasitoid of ladybirds (Coleoptera: Coccinellidae) (see Trjapitzin, 1989).

COMMENTS. *Prochiloneurus* is very similar to *Cheiloneurus* and may be problematic when trying to separate the two since the species of both genera are mostly secondary parasitoids of Coccoidea (Hemiptera). However, it is likely that *Prochiloneurus* is restricted to secondary parasitism in mealybugs (Hemiptera: Pseucoccidae) whilst *Cheiloneurus* has a much broader range of primary hosts (several families of Coccoidea, leaf hoppers and possibly predators associated with various sternorrhynchous hemipterans). *Prochiloneurus* can be distinguished from *Cheiloneurus* by the combination of the relatively close placement of the antennal torulus to the mouth, the curved distal margin of the fore wing infuscation, the setae of the subapical tuft on the scutellum arranged in distinct submedian lines, the hypopygium reaching the apex of the gaster, the broadly truncate, slightly concave, apex of the syntergum and the well-exserted ovipositor with the gonostyli together forming a uniform, cylindrical, slender tube. In *Cheiloneurus* the antennal torulus is separated from the mouth margin by at least its own width, the distal margin of the infuscation of the forming is rarely curved, the setae forming the subapical tuft are scattered and not placed in distinct submedian lines, the hypopygium rarely extends to the apex of the gaster, the apex of the syntergum is always convex, rounded or acute and the gonostyli of the ovipositor, if exserted, do not form a cylindrical or slender tube.

The ovipositor structure in *Prochiloneurus* is probably an adaptation to oviposition into primary hosts that are covered in protective waxy filaments, i.e. mealybugs. It would allow the female to exsert the ovipositor to its full length enabling the parasitoid to "reverse" into the primary host from the side, thus avoiding the waxy filaments. On the other hand the ovipositor of *Cheiloneurus* would probably only allow the female to oviposit into the host directly from above. This would inhibit oviposition into primary hosts covered in waxy filaments but facilitate oviposition into primary hosts such as Coccidae and Dryinidae.

IDENTIFICATION. 42 species Worldwide, including 12 described as new below. Trjapitzin, 1989 (key to 8 Palaearctic species); Sunita & Khan, 2011 (key to 12 Indian species); Wang et al. (key to 4 Chinese species).

Key to Costa Rican species of *Prochiloneurus*
(Females)

1. Exserted part of ovipositor at least about 0.9X as long as mid tibia 2
- Exserted part of ovipositor not more than about 0.6X as long as mid tibia 5

2 (1) Scape (Figs. 1161, 1165) less than 4X as long as broad 3
- Scape (Figs 1170, 1178) more than 4X as long as broad 4

3 (2) Antenna (Fig. 1161) with F1-F5 pale yellow mixed brown contrasting with virtually black F6 and clava; exserted part of ovipositor at least 1.2X as long as mid tibia . ..... *surwaka* **sp.nov**. (p. 461)
Antenna (Fig. 1165) with F4-F6 completely white contrasting with virtually black clava and brown F1-F2; exserted part of ovipositor about as long as mid tibia .... *alasirus* **sp.nov.** (p. 463)

4 (2) Flagellum (Fig. 1170) unicolorous dark brown ..... *olax* **sp.nov.** (p. 465)
- Funicle (Fig. 1178) with all segments at least partly white, F4-F6 completely white, contrasting with virtually black clava ..... *armidus* **sp.nov.** (p. 467)

5 (1) Antenna (Fig. 1181) with F1-F3 almost completely white, contrasting with remaining segments of flagellum which are dark brown ..... *akea* **sp.nov.** (p. 469)

- Antenna (Figs 1197, 221) with proximal funicle segments not white and not contrasting so strongly with those more distal, occasionally (e.g. Figs 1204, 1209, 1218) F1-F5 yellowish or dark brown mixed yellowish 6

6 (5) Gaster completely dark brown and shiny; propodeum uniform dark orange-brown to dark brown, at most with only a small orange area anterior to each spiracle *7*
- Gaster with at least with syntergum mostly pale orange; propodeum uniform orange or orange medially with area around spiracle pale brown to dark brown 9

7 (6) Scape (Fig 1185) less than 5X as long as broad, wider medially .... *abelio* **sp.nov.** (p. 470)
- Scape (Figs 1192, 1197) more than 6X as long as broad and of uniform width throughout 8

8 (7) Head orange and in facial view as long as broad (Fig. 1191); dorsal margin of scrobes rounded; scape mostly orange without a brown band at about two-thirds along its length (Fig. 1192); ventral line of setae in costal cell continuous (Fig. 1193) .... *helleria* **sp.nov.** (p. 473)
- Head dark brown except for scrobal area and in facial view, at least about 1.1X as long as broad (Fig. 1199); dorsal margin of scrobes sharp, carinate; scape orange and white marked dark brown, with a brown band at about two-thirds along its length (Fig. 1197); ventral line of setae in costal cell interrupted towards apex (Fig. 1198) ..... *lenus* **sp.nov.** (p. 475)

9 (6) Mesopleuron orange-brown, posterior margin pale orange ..... *aethus* **sp.nov**. (p. 477)
- Mesopleuron either uniform orange, or orange with posterior one-third pale brown ...10

10 (9) Spiracular area of propodeum dark brown with a strong metallic sheen; mesoscutum with more than posterior half completely dark and metallic blue or green; head in facial view (Fig. 1207) at least about 1.2X as high as broad; fore wing (Fig. 1206, 1210) with a group of about 4-10 paler setae in hyaline area below distal half of parastigma adjacent to posterior part of triangular-shaped area of darker setae in infuscate area along inner margin of linea calva 11
- Spiracular area of propodeum orange or sometimes slightly dusky with a slight metallic sheen, if brown with a metallic sheen then not more than posterior half of mesoscutum is dark with a metallic blue or green sheen; head in facial view (Fig. 1213) not more than about 1.1X as high as broad; fore wing (Figs 1216, 1219, 1226) without any paler setae in hyaline are below distal half of parastigma (sometimes a vertical line of up to 5 paler setae below proximal half of parastigma but these clearly separated by a naked hyaline area from darker setae below distal part of parastigma) 12

11 (10) Exposed part of mesoscutum without any orange, completely dark and metallic blue or green (occasionally part of mesoscutum beneath pronotum may be orange); head without a distinct dark brown stripe on temple and gena; scape (Fig. 1204) 5.5-6.8X as long as broad; mesoscutum with moderately uniform reticulate sculpture throughout, anterior part not striate ..... *modestus* (Timberlake) (p. 479)
- Exposed part of mesoscutum narrowly orange anteriorly; head with a very distinct dark brown stripe on temple and gena; scape (Fig. 1209) 4.7-5.0X as long as broad; anterior half of mesoscutum with largely slightly oblique, diverging, longitudinally striate sculpture contrasting strongly with more regular reticulate sculpture in posterior half ..... *dactylopii* (Howard) (p. 481)

12 (10) Posterior one-third or so of mesopleuron pale brown contrasting with orange anterior part; hind tibia entirely orange ..... *thonus* **sp.nov.** (p. 482)

- Mesopleuron uniformly orange; hind tibia largely dark brown 13

13 (12) Scape less than 4X as long as broad ..... *lucetia* **sp.nov.** (p. 485)
- Scape at least 5X as long as broad ..... *zunigai* **sp.nov.** (p. 488)

***Prochiloneurus surwaka* sp.nov.**
(Figs 1160-1164; Hab. ♀ 166)

DIAGNOSIS. *Female* (length about 1.5-2.2mm): head orange, temple and gena with a distinct brown streak; antenna (Fig. 1161) with F1-F4 brown mixed white dorsally, F5 brown mixed pale orange; F6 and clava dark brown; thorax mostly orange, posterior two-thirds of mesoscutum dark brown with a moderate dark blue sheen and clothed with dense silvery setae; mesopleuron pale orange; fore wing (Fig. 1164) with a group of 3 to 5 setae below proximal half of parastigma but without a group of pale setae below distal half; hyaline apex of fore wing about as wide as 1.5X length of marginal vein; fore wing without a subapical band of paler setae; propodeum orange, laterally pale brown with a metallic sheen, with about 10 silvery setae surrounding spiracle; gaster entirely dark brown with a metallic sheen; head (Fig. 1163) very slightly broader than high and about 4.9X as wide as frontovertex; antennal scrobes sharply margined, carinate laterally; scape (Fig. 1161) slightly broadened and flattened, about 2.7X as long as broad; paler parts of mesoscutum (Fig. 1160) generally with obliquely elongate, strigose reticulate sculpture, posterior, darker part with more regular, rounded, polygonally reticulate sculpture; apical scutellar tuft about 0.4X as long as scutellum; fore wing (Fig. 1164) about 3.0X as long as broad; line of setae on ventral surface of costal cell broadly interrupted above parastigma; exserted part of ovipositor about 0.8-1.0X as long as gaster. *Male*: Unknown.

Female (holotype): length, including ovipositor, 2.19mm; excluding ovipositor, 1.56mm (CPD).

Head generally orange; occiput pale orange with a dark brown triangular mark above foramen and hypostomal area more or less narrowly bordered brown; temple and gena with a distinct, brown streak from occipital margin to scrobal margin near torulus; area between occipital margin and posterior ocelli with a weak purple sheen, ocellar area with a weak purple and blue sheen, frontovertex in front of ocelli with a weak blue and green sheen, blue and purple immediately above scrobes; area between eye and scrobe with a weak brassy, coppery and purple sheen; temple with a slightly stronger metallic green sheen, coppery along eye margin and on brown areas; gena with a very weak brassy, coppery, purple and green sheen; interantennal prominence mostly with a very weak brassy sheen, slightly purplish dorsally; frontovertex with inconspicuous, translucent, pale brown setae along inner eye margins, these continued below eye; gena and interantennal prominence with numerous, scattered setae, those on interantennal prominence more dense; maxillary palpus pale yellow, terminal segment pale orange-brown; antenna with radicle dark brown; scape largely orange, apical one-third white, extreme apex dark brown, ventral margin narrowly dark brown for most of its length, more widely so on internal surface; pedicel mostly dusky orange, with a complete dark brown streak internally; flagellum (Fig. 1161) with F1-F4 largely white dorsally, ventrally brown, more widely brown on proximal segments, F5 mostly brown, but pale orange dorsally, F6 and clava dark brown; pronotum pale orange with weak purple, coppery and brassy reflections, posterior margin translucent and neck with a dark brown, triangular mark; propleuron and prosternum orange; anterior one-third or less of mesoscutum orange with weak purple reflections and with relatively sparse dark brown setae, posterior two-thirds or so dark brown with a moderately strong, dark blue sheen with some violet reflections and clothed with relatively dense silvery setae, posterior margin of mesoscutum orange-brown with a weak brassy and purple sheen; tegula orange, apex orange-brown; axilla orange with very weak brassy and coppery reflections, with dark brown setae; scutellum orange with weak coppery and brassy reflections, with translucent, golden brown setae, posteriorly with black setae, sub apical tuft black, apical setae off-white and translucent; metanotum orange-brown; mesopleuron pale orange with a weak brassy and purple sheen; mesosternum pale orange; fore coxa white; fore femur white, orange towards apex, tibia and tarsus orange; mid coxa orange; mid femur mostly white, but apically pale orange with dorsal margin brown, tibia pale orange with a brown streak

externally for about two-thirds its length, spur and tarsus orange; hind coxa white; hind femur white proximally becoming orange distally with apex dark brown, tibia pale orange with a diffuse brown streak externally for much of its length, tarsus pale orange; fore wing (Fig. 1164) mostly infuscate but hyaline towards base and at apex, submarginal vein pale orange, rest of venation brown; propodeum orange with a slight brassy sheen, laterally brownish with a metallic blue, green and purple sheen, about 10 translucent silvery setae around spiracle; gaster dark brown, mainly with coppery, brassy, blue and green reflections, Gt1 with a distinct coppery, purple and blue sheen, sides of tergites largely metallic blue and green mixed with some copper; gonostylus very pale orange.

Head (Fig. 1163) about 4.9X as wide as frontovertex, in profile about 1.5X as high as deep, anteriorly fairly evenly curved from occipital margin to top of scrobes, virtually straight from top of scrobes to mouth margin, interantennal prominence weakly protuberant between toruli; occipital margin sharp, weakly carinate; vertex with a short groove about midway between posterior ocellus and occipital margin; ocelli forming an angle of about 55°; frontovertex quite shiny, with shallow, fairly regular, fine, transversely imbricate-reticulate to polygonally reticulate sculpture of mesh size generally a little smaller than diameter of facet, area above scrobes with coarser, more irregular, transversely elongate sculpture; narrowest point between eye and scrobe about 0.17X length of scape and completely smooth; temple with shallow, irregular, transversely elongate, sculpture, gena with similar, but slightly deeper, more longitudinally elongate sculpture; scrobes deep, very broadly ∩-shaped, meeting, dorsally very smooth, sharply margined dorsally and laterally, margin carinate laterally; interantennal prominence without median ridge, broadly rounded and largely with weak, regular, polygonally reticulate sculpture but completely smooth dorsally; antenna as in Fig. 1161; scape broadened and flattened, broadest about middle, about 2.7X as long as broad; F1 slightly longer than broad, F2 subquadrate, F3-F6 clearly transverse, segments larger and broader distad; clava clearly broadened, slightly longer than funicle, sutures oblique, sensory area enlarged, extending ventrally nearly 0.7X length of clava, apex strongly obliquely truncate; eye not quite reaching occipital margin, separated by about diameter of facet, appearing naked but clothed in very inconspicuous short setae that are much shorter than diameter of facet; inner eye margins clearly diverging below anterior ocellus; malar sulcus absent; clypeal margin straight medially; mandible with three teeth; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 63.5, HH 61, FV 13, POL 6, OOL 0, OCL 8, AOL 7, EL 42, EW 33.5, MS 21.5, SL 34.5, SW 13.

Thorax (Fig. 1160) with polygonally reticulate sculpture on pronotum and mesoscutum that is similar to that in ocellar area, but of slightly smaller mesh, a little deeper on pronotum and anterior part of mesoscutum; paler parts of mesoscutum obliquely elongate, strigose reticulate sculpture, darker parts with more regular, rounded, polygonally reticulate sculpture; axilla and scutellum with sculpture slightly deeper and coarser and of slightly larger mesh; visible part of mesoscutum about 2.2X as broad as long; scutellum about as broad as long, with a distinct subapical tuft, setae about 0.4X as long as scutellum; mid tibia with an inconspicuous external carina for about half its length; hind femur about 4.1X as long as broad; fore wing with venation and setation as in Figs 1162, 1164; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak; propodeum (Fig. 1160) medially about 0.19X as long as scutellum and smooth. Relative measurements: FWL 72, FWW 24; HWL 54, HWW 13.

Gaster with syntergum about 0.7X as long as mid tibia; exserted part of ovipositor about as long as gaster or 1.4X mid tibia.

Paratype. Funicle with linear sensilla present only on F6. Relative measurements: OL 97.5, GL 52 [MT 36].

Variation. Females vary in overall length from 1.53-2.19mm, the exserted part of the ovipositor can vary from about 1.2-1.5X as long as the mid tibia depending on how distended the gaster is after drying, otherwise very little in material available.

Male. Unknown.

DISTRIBUTION. Costa Rica, Venezuela.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, Santo Domingo, INBio Parque, LN 526250 217400, 1100m, iii.2002 (J.A. Azofeifa, J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Santa Cruz, Vista del Mar, Torre Cocesna, LN 357490 235340, 970m, #60713, viii-ix.2000 (Y. Cárdenas); 4♀, Guanacaste, Nandayure, Bellavista, Cerro Azul, LN 214769 387000, 1050m, 1.v-19.vii.2003 (W. Porras); 3♀, **Heredia**, same data as holotype; 6♀, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 14-15.ii.2005, 19-20.ii.2009, 23-24.ii.2013 and 19-20.ii.2016 (J.S. Noyes). **VENEZUELA**, 1♀, Aragua, Rancho Grande, 1460m, 4-14.vii.1986 (B. Gill). Holotype in MZUCR, paratypes in NHMUK and MZUCR.

Prochiloneurus alasirus sp.nov.
(Figs 1165-1169)

DIAGNOSIS. *Female* (length about 1.3mm): head orange, frontovertex slightly dusky, temple and gena with a faint brown streak; funicle (Fig. 1165) with F1-F2 orange-brown, F3-F6 mostly white; clava dark brown; thorax largely orange, posterior two-thirds of mesoscutum dark brown with a metallic green sheen and clothed with dense silvery setae; mesopleuron orange; fore wing with a group of 5 or 6 weaker setae below proximal half of parastigma but without a group of pale setae below distal half; hyaline apex of fore wing slightly less than 1.5X as wide as length of marginal vein; fore wing without a subapical band of very slightly paler setae; propodeum orange, laterally with a metallic green and blue-green sheen, with about 3 or 4 silvery setae near spiracle; gaster entirely dark brown with a metallic sheen; head (Fig. 1169) about as broad as high and about 5X as wide as frontovertex; antennal scrobes weakly margined, lateral margin rounded; scape slightly broadened and flattened, about 2.9X as long as broad, broadest in middle; paler parts of mesoscutum (Fig. 1167) generally with obliquely elongate, strigose reticulate sculpture, posterior, darker part with more regular, rounded, polygonally reticulate sculpture; apical scutellar tuft about 0.3X as long as scutellum; fore wing (Fig. 1168) about 2.9X as long as broad; line of setae on ventral surface of costal cell narrowly interrupted above parastigma; exserted part of ovipositor nearly as long as gaster. *Male*: Unknown.

Female (holotype): length, including ovipositor, 1.29mm; excluding ovipositor, 0.97mm (AD).

Head generally orange; occiput with a dark brown triangular mark above foramen and hypostomal area bordered brown; frontovertex slightly dusky; temple and gena with a faint, brown streak from occipital margin to scrobal margin near torulus; mouth margin with brown areas below toruli connected by a faint, curved, brown line; area between occipital margin and posterior ocelli with faint brassy and pale blue reflections, ocellar area with slightly stronger metallic blue and purple reflections, anterior part of frontovertex with a faint, metallic blue sheen, purple immediately above scrobes; area between eye and scrobe with a faint brassy and purple sheen; temple with a stronger metallic green, brassy and coppery sheen, especially on brown areas, gena similar but sheen weaker and with some mixed purple; frontovertex with inconspicuous, translucent, pale brown setae along inner eye margins, these continued below eye; gena and interantennal prominence with numerous, scattered setae; maxillary palpus white; antenna with radicle orange, apex dark brown; scape largely orange, apical one-third white, extreme apex brown, ventral margin narrowly faintly brown for most of its length, more widely so on internal surface, a faint, incomplete brown band at about two-thirds; pedicel mostly brown, apex and venter orange; flagellum with F1-F2 orange-brown, F3 mainly white but a little dusky ventrally at base, F4-F6 white, clava dark brown; pronotum orange with weak coppery and brassy reflections, posterior margin translucent; propleuron and prosternum orange; mesoscutum with anterior one-third, or less, orange with weak brassy and coppery reflections and with relatively sparse brown setae, posterior two-thirds or more metallic green with some blue reflections and clothed with relatively dense silvery setae, posterior margin orange-brown with a weak brassy and purple sheen; tegula orange, apex orange-brown; axilla orange with very weak brassy and coppery reflections, with dark brown setae; scutellum orange with weak coppery and brassy reflections, with translucent, golden brown setae, posteriorly with black setae, tuft black, apical setae off-white

and translucent; metanotum dusky orange; mesopleuron orange with a weak brassy, coppery and purple sheen; mesosternum orange; fore coxa very pale orange, almost white, fore tibia faintly brownish subbasally, fore legs otherwise pale orange; mid coxa very pale orange; mid femur very pale orange, almost white, tibia pale orange with a brown streak externally for most of its length, spur and tarsus pale orange; hind coxa very pale orange, almost white; hind femur pale orange, virtually white towards base, brownish towards apex, tibia mostly pale orange, subbasally white, externally largely brown, tarsus pale orange; fore wing (Fig. 1168) mostly infuscate but hyaline towards base and at apex, submarginal vein pale orange, rest of venation brown; propodeum orange, medially with a purple sheen, laterally with a metallic green and blue-green sheen, about 3 or 4 translucent silvery setae around spiracle; gaster dark brown, mainly with a purple and coppery sheen with brassy, blue and green reflections, sides of tergites largely metallic blue and green mixed with some copper; gonostylus pale orange.

Head (Fig. 1169) about 5X as wide as frontovertex, in profile about 1.7X as high as deep, anteriorly fairly evenly curved from occipital margin to top of scrobes, virtually straight from top of scrobes to mouth margin, interantennal prominence weakly protuberant between toruli; occipital margin sharp, not carinate; vertex with a short, indistinct groove behind each posterior ocellus; ocelli forming an angle of about 50°; frontovertex quite shiny, ocellar area with deeper, fairly regular, fine, polygonally reticulate sculpture of mesh size subequal to diameter of facet, anterior parts of frontovertex with more irregular, shallower sculpture that is mainly of slightly larger mesh size than diameter of facet, area above scrobes mainly with slightly coarser, more irregular, transversely elongate sculpture; narrowest point between eye and scrobe about 0.18X length of scape, with very shallow sculpture, almost completely smooth; temple with shallow, irregular, transversely elongate, sculpture, gena with similar, but slightly deeper, more longitudinally elongate sculpture; scrobes moderately deep, very broadly ∩-shaped, meeting, dorsally very smooth and weakly margined, lateral margin more or less rounded; interantennal prominence without median ridge, broadly rounded and largely with weak, regular, polygonally reticulate sculpture but completely smooth dorsally; antenna as in Fig. 1165; scape slightly broadened and flattened, broadest about middle, about 2.9X as long as broad; F1 very slightly longer than broad, F2-F6 clearly transverse, segments larger and broader distad, linear sensilla present only on F6; clava clearly broadened, nearly as long as funicle and pedicel together, sutures oblique, sensory area enlarged, extending ventrally about 0.7X length of clava, apex strongly obliquely truncate; eye virtually reaching occipital margin, separated by much less than diameter of facet, clothed in inconspicuous short setae that are much shorter than diameter of facet; inner eye margins clearly diverging below anterior ocellus; malar sulcus absent; clypeal margin weakly convex medially; mandible with three teeth; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 51, HH 51.5, FV 11, POL 4.5, OOL 0, OCL 6, AOL 5.5, EL 34, EW 26, MS 21(?), SL 28, SW 9.5.

Thorax (Fig. 1167) with polygonally reticulate sculpture on pronotum that is finer than that in ocellar area; sculpture on mesoscutum similar to that in ocellar area; paler anterior part of mesoscutum with slightly oblique, longitudinally elongate, strigose reticulate sculpture, darker, posterior part with more regular, rounded, polygonally reticulate sculpture; axilla and scutellum with similar sculpture to mesoscutum but clearly of smaller mesh and a little deeper; visible part of mesoscutum about 1.8X as broad as long; scutellum about as long as broad, with a distinct tuft that is situated almost in middle, setae about 0.3X as long as scutellum; mid tibia without a conspicuous external carina; hind femur about 4X as long as broad; fore wing with venation and setation as in Figs 1168; costal cell with a single seta dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak; propodeum medially about 0.25X as long as scutellum and smooth. Relative measurements: FWL 53, FWW 18; HWL 41, HWW 8.

Gaster with syntergum about 0.8X as long as mid tibia; exserted part of ovipositor nearly as long as gaster or mid tibia; hypopygium Fig. 1166. Relative measurements: OL 56, GL 27 [MT 26].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Guanacaste NP (error for Santa Rosa NP), 7km E of HQ, "small house", 8-10.iii.1990 (J.S. Noyes). Holotype in NHMUK.

***Prochiloneurus olax* sp.nov.**
(Figs 1170-1176)

DIAGNOSIS. *Female* (length about 2.3mm): head orange, frontovertex slightly dusky, temple and gena with a dark brown streak; funicle and clava dark brown; thorax largely orange, posterior half of mesoscutum dark brown with a pale blue metallic sheen and clothed with dense silvery setae; mesopleuron orange; fore wing (Fig. 1171) with a group of 7 or 8 paler setae below proximal half of parastigma which converges slightly with delta of darker setae below marginal vein, without a distinct group of pale setae below distal half of parastigma; hyaline apex of fore wing slightly less than 1.5X as wide as length of marginal vein; fore wing without a subapical band of very slightly paler setae; propodeum orange, laterally a little dusky with a weak purple and blue sheen and about 20 silvery setae around spiracle; gaster entirely dark brown with a metallic sheen; head (Fig. 1174) in facial view very slightly higher than broad and about 5.3X as wide as frontovertex; antennal scrobes sharply margined, lateral margin carinate; antenna (Fig. 1170) with scape subcylindrical, about 6.5X as long as broad, broadest in middle; anterior, paler part of mesoscutum (Fig. 1173) generally with fine, obliquely elongate, striate-reticulate sculpture, darker part with more regular, rounded, polygonally reticulate sculpture; apical scutellar tuft about 0.4X as long as scutellum; fore wing (Fig. 1171) about 2.7X as long as broad; line of setae on ventral surface of costal cell broadly interrupted above parastigma; exserted part of ovipositor nearly as long as gaster. *Male*: Unknown.

Female (holotype): length, including ovipositor, 2.29mm; excluding ovipositor, 1.69mm (AD).

Head generally orange; occiput with hypostomal area bordered brown; frontovertex and upper part of gena slightly dusky orange-brown; temple and gena with a dark brown streak from occipital margin to scrobal margin near torulus; area between occipital margin and posterior ocelli with faint coppery reflections, area between posterior ocelli with purple and green reflections, frontovertex otherwise with weak purple and pale blue reflections, more strongly purple immediately above scrobes; area between eye and scrobe with a coppery, purple and blue-green sheen; temple with a purple sheen, brown streak with a slightly stronger green and coppery sheen, gena generally with a weak purple sheen; top of scrobes with a weak purple sheen, interantennal prominence with a weak brassy sheen; frontovertex with inconspicuous, translucent, pale brown setae along inner eye margins, these continued below eye; gena with scattered setae; interantennal prominence with relatively dense scattered setae, most dense just above mouth margin; maxillary palpus pale orange, terminal segment brown; antenna (Fig. 1170) with radicle orange, apex dark brown; scape largely orange, apical one-quarter white, extreme apex brown, ventral margin narrowly brown for most of its length; pedicel mostly brown, apex and venter partially orange; flagellum dark brown; pronotum orange with weak coppery and brassy reflections, posterior margin translucent; propleuron and prosternum pale orange; mesoscutum with anterior half orange with weak brassy and coppery reflections and with relatively sparse, dark brown setae, posterior half brown with a weak, pale blue, metallic sheen and clothed with relatively dense silvery setae, posterior margin orange-brown with a weak brassy and purple sheen; tegula orange, apex orange-brown; axilla orange with very weak brassy and coppery reflections, with dark brown setae; scutellum orange with weak coppery and brassy reflections, with dark brown to black setae, tuft black, apical setae off-white and translucent; metanotum slightly dusky orange; mesopleuron orange with a weak brassy and purple sheen; mesosternum orange; fore coxa orange; fore femur margined dark brown towards apex, otherwise fore leg orange; mid coxa orange, inner surface brown; mid femur white

to very pale orange, dorsal margin pale brown, tibia orange, white at base, external carina brown, spur and tarsus orange; hind coxa orange; hind femur orange, extreme apex dark brown, tibia dark brown, tarsus white with part of basitarsus and apical segment brown; fore wing (Fig. 1171) mostly infuscate but hyaline towards base and at apex, submarginal vein very pale orange, rest of venation brown; propodeum orange with a weak brassy sheen, a little dusky with a purple and blue sheen around spiracle, about 20 translucent silvery setae around spiracle; gaster dark brown, mainly with a purple and coppery sheen with brassy, blue and green reflections, sides of tergites largely metallic blue and green mixed with some copper; gonostylus pale orange.

Head (Fig. 1174) about 5.3X as wide as frontovertex, in profile about 2.1X as high as deep, anteriorly fairly evenly curved, interantennal prominence weakly protuberant between toruli; occipital margin sharp, weakly carinate; vertex with a short, very indistinct groove behind each posterior ocellus; ocelli forming an angle of about 50°; frontovertex quite shiny, with moderately deep, fairly regular, fine, polygonally reticulate sculpture of mesh size slightly smaller than diameter of facet, area above scrobes mainly with slightly coarser, more irregular, transversely elongate sculpture; narrowest point between eye and scrobe about 0.25X length of scape, with similar, coarse, transversely elongate sculpture that extends on to temple and gena; scrobes deep, very broadly ∩-shaped, meeting, dorsally very smooth, sharply margined, lateral margin carinate; interantennal prominence without median ridge, broadly rounded and largely with weak, regular, polygonally reticulate sculpture but almost completely smooth dorsally; antenna as in Fig. 1170; scape subcylindrical, broadest about middle, about 6.5X as long as broad; F1-F5 slightly longer than broad, F6 slightly transverse, segments larger and broader distad, linear sensilla present only on F3-F6; clava clearly broadened, slightly longer than F3-F6, sutures oblique, sensory area enlarged, extending ventrally about 0.75X length of clava, apex strongly obliquely truncate; eye reaching occipital margin, clothed in inconspicuous short setae that are much shorter than diameter of facet; inner eye margins clearly diverging below anterior ocellus; malar sulcus absent; clypeal margin virtually straight medially; mandible with three teeth; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 87, HH 91.5, FV 16.5, POL 7, OOL 0, OCL 8.5, AOL 10.5, EL 62, EW 43, MS 38, SL 49, SW 7.5.

Thorax (Fig. 1173) with polygonally reticulate sculpture on pronotum and mesoscutum that is a little shallower and finer than that in ocellar area; anterior, paler part of mesoscutum generally with fine, obliquely elongate, striate-reticulate sculpture, darker part with more regular, rounded, polygonally reticulate sculpture; sculpture on axilla and scutellum similar to that in ocellar area, but perhaps very slightly deeper; visible part of mesoscutum about 2.3X as broad as long; scutellum about 1.2X as broad as long, with a distinct subapical tuft, setae about 0.4X as long as scutellum; mid tibia with a conspicuous external carina for about 0.6X its length; hind femur about 4.3X as long as broad; fore wing with venation and setation as in Figs 1171, 1175; costal cell with 1 or 2 seta dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak; propodeum medially about 0.16X as long as scutellum and smooth. Relative measurements: FWL 106.5, FWW 39; HWL 78.5, HWW 22.5.

Gaster with syntergum about 0.5X as long as mid tibia; hypopygium Fig. 1176; ovipositor Fig. 1172, exserted part nearly as long as gaster or mid tibia. Relative measurements: OL 115.5, GL 55 [MT 50].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, PN Corcovado, Los Patos/Sirena, LS 509200 275700, 70m, #65127, 1.viii-20.ix.2001 (J. Azofeifa). Holotype in NHMUK.

***Prochiloneurus armidus* sp.nov.**
(Figs 1177-1180)

DIAGNOSIS. *Female* (length about 2.2mm): head orange, frontovertex slightly dusky, temple and gena with a dark brown streak; antenna (Fig. 1178) with funicle very pale yellow, F1-F3 brown ventrally; clava dark brown; thorax largely orange, posterior half of mesoscutum dark brown with a green and blue-green sheen and clothed with dense silvery setae; anterior half of mesopleuron orange, posterior half orange-brown; fore wing (Fig. 1179) with a group of 2 to 4 finer setae below proximal half of parastigma, without a distinct group of pale setae below distal half of parastigma; hyaline apex of fore wing slightly less than 1.5X as wide as length of marginal vein; fore wing with an inconspicuous subapical band of very slightly paler setae; propodeum orange, laterally orange-brown with a distinct blue-green and purple sheen and about 10-12 silvery setae around spiracle; gaster mostly orange, brown towards base dorsally; head in facial view (Fig. 1180) about as high as broad and about 4.6X as wide as frontovertex; antennal scrobes sharply margined, lateral margin carinate; antenna (Fig. 1178) with scape subcylindrical, about 5.4X as long as broad, broadest in middle; lateral and anterior, paler part of mesoscutum (Fig. 1177) mostly with obliquely elongate, strigose-reticulate sculpture, darker part with more regular, rounded, polygonally reticulate sculpture; apical scutellar tuft about 0.4X as long as scutellum; fore wing (Fig 1179) about 2.8X as long as broad; line of setae on ventral surface of costal cell continuous above parastigma; exserted part of ovipositor about as long as gaster. *Male*: Unknown.

Female (holotype): length, including ovipositor, 2.23mm; excluding ovipositor, 1.61mm (CPD).

Head generally orange; occiput with hypostomal area bordered brown; frontovertex and upper part of gena slightly dusky orange-brown; temple and gena with a dark brown streak from occipital margin to scrobal margin near torulus; area between occipital margin and posterior ocelli with weak purple and blue reflections, area between posterior ocelli with stronger blue, purple and green reflections, frontovertex otherwise with weak coppery, green and blue reflections, more strongly purple immediately above scrobes; area between eye and scrobe with a fairly strong blue, purple, coppery and brassy sheen, more coppery and brassy towards gena; temple with a green, pale blue and coppery sheen, more coppery on dark brown area; gena similar to temple, but less strongly shining; scrobes and interantennal prominence with a weak, metallic pale green sheen; frontovertex with inconspicuous, translucent, pale brown setae along inner eye margins, these continued below eye; gena with scattered setae; interantennal prominence with relatively dense scattered setae; maxillary palpus pale orange, terminal segment pale brown; antenna (Fig. 1178) with radicle orange, apex dark brown; scape largely orange, apical one-third white, extreme apex brown, ventral margin brown in proximal one-third, dorsal margin slightly dusky; pedicel mostly brown, but pale orange dorsally; funicle very pale yellow, F1-F3 largely brown ventrally; clava dark brown; pronotum orange with weak coppery and brassy reflections, posterior margin translucent, neck dark brown; propleuron and prosternum pale orange; mesoscutum with anterior half orange with weak brassy and coppery reflections and with relatively sparse, dark brown setae, posterior half brown with a distinct, metallic blue-green and green sheen and clothed with relatively dense silvery setae, posterior margin orange-brown with a weak brassy and purple sheen; tegula orange, apex orange-brown; axilla orange with very weak brassy and coppery reflections, with dark brown setae; scutellum orange with weak coppery and brassy reflections, with dark brown to black setae, tuft black, apical setae off-white and translucent; metanotum orange; anterior half of mesopleuron orange with a weak brassy and purple sheen, posterior half orange-brown with a weak green and purple sheen; mesosternum orange; fore coxa white; fore femur white proximally, otherwise fore leg pale orange; mid coxa orange, inner surface slightly dusky; mid femur white, extreme apex pale orange, tibia pale orange with an external dark brown streak along most of its length, spur and tarsus pale orange; hind coxa white, leg otherwise pale orange; fore wing (Fig. 1179) mostly infuscate but hyaline towards base and at apex, venation mostly pale orange, marginal vein brown; propodeum mostly orange with a weak brassy and purple sheen, area around spiracle orange-brown with a distinct metallic blue-green and purple sheen, about 9 or 10 translucent silvery setae

anterolateral to spiracle; gaster mostly orange with weak green and purple reflections, Gt1 dark brown dorsally with a distinct green and purple sheen, Gt2-Gt3 orange-brown; gonostylus pale orange.

Head (Fig. 1180) about 4.6X as wide as frontovertex, in profile about 1.8X as high as deep, anteriorly fairly evenly curved from occipital margin to top of scrobes, then slightly angled towards mouth margin and less strongly curved, interantennal prominence weakly protuberant between toruli; occipital margin sharp, weakly carinate; vertex with a pair of small depressions behind each posterior ocellus; ocelli forming an angle of about 50°; frontovertex quite shiny, with moderately deep, fairly regular, fine, polygonally reticulate sculpture of mesh size slightly smaller than diameter of facet, deepest in ocellar area, sculpture immediately above scrobes slightly coarser, more irregular and transversely elongate; narrowest point between eye and scrobe about 0.17X length of scape, with polygonally reticulate sculpture; area immediately below lowest part of eye virtually completely smooth; temple with irregular, transversely elongate, polygonally reticulate sculpture that extends on to gena as more longitudinally elongate cells; scrobes deep, very broadly ∩-shaped, meeting, dorsally very smooth, sharply margined, lateral margin carinate; interantennal prominence without median ridge, broadly rounded and largely with weak, regular, polygonally reticulate sculpture but almost completely smooth dorsally; antenna as in Fig. 1178; scape subcylindrical, broadest about middle, about 5.4X as long as broad; all funicle segments slightly longer than broad, segments larger and broader distad, linear sensilla present only on F4-6; clava relatively slender, only about 1.5X as wide as F6, about as long as F2-F6 combined, sutures oblique, sensory area enlarged, extending ventrally about 0.7X length of clava, apex strongly obliquely truncate; eye reaching occipital margin, clothed in inconspicuous short setae that are much shorter than diameter of facet; inner eye margins clearly diverging below anterior ocellus; malar sulcus absent; clypeal margin slightly convex medially; mandible with three teeth; apical segment of maxillary palpus not enlarged, about as long as radicle. Relative measurements: HW 71, HH 71, FV 15.5, POL 7, OOL 0.5, OCL 7, AOL 9, EL 48, EW 35, MS 30.5, SL 45.5, SW 8.5.

Thorax (Fig. 1177) with polygonally reticulate sculpture on pronotum, mesoscutum, axilla and scutellum that is generally similar to that in ocellar area, but a little shallower along posterior margin of mesoscutum; lateral and anterior, paler part of mesoscutum mostly with obliquely elongate, strigose-reticulate sculpture, darker part with more regular, rounded, polygonally reticulate sculpture; visible part of mesoscutum about 2X as broad as long; scutellum about 1.1X as broad as long, with a distinct subapical tuft, setae about 0.4X as long as scutellum; mid tibia with a short inconspicuous external carina for about 0.3X its length; hind femur about 4.1X as long as broad; fore wing with venation and setation as in Fig. 1179; costal cell with 1 or 2 setae dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak; propodeum (Fig. 1177) medially about 0.12X as long as scutellum and smooth. Relative measurements: FWL 102, FWW 36; HWL 76, HWW 19.

Gaster with syntergum about 0.6X as long as mid tibia; exserted part of ovipositor about as long as gaster or about 1.1X length of mid tibia. Relative measurements: OL 104.5, GL 56.5 [MT 42].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Cacao (ACG), 1100m, 26.i-24.ii.1996 (J.S. Noyes). Holotype in NHMUK.

Prochiloneurus akea **sp.nov.**
(Figs 1181-1183; Hab. ♀ 167)

DIAGNOSIS. *Female* (length about 1.6mm): head dusky orange, temple and gena without a conspicuous dark brown streak; antenna (Fig. 1181) with F1-F3 pale yellow or white, F4 brown mixed orange, F5-F6 and clava dark brown; thorax mostly orange, mesoscutum black, anteriorly with coppery and brassy reflections; mesopleuron uniformly dusky orange; fore wing (Fig. 1182) without any setae below proximal half of parastigma but with a group of about 15 pale setae below distal half; hyaline apex of fore wing very slightly wider than length of marginal vein; fore wing with a distinct subapical band of paler setae; propodeum brown with a blue or purple sheen, with about 8 or 9 silvery setae near spiracle; gaster dark brown to orange with a metallic sheen, at least syntergum pale orange; head (Fig. 1183) in facial view about 1.15X as high as broad and about 5.3X as wide as frontovertex; antennal scrobes sharply margined, carinate laterally; antenna (Fig 1181) with scape about 5.0X as long as broad, widest in proximal half; mesoscutum with sculpture on anterior part and sides generally obliquely strigose, that on posterior and middle part more regular, rounded, polygonally reticulate sculpture; apical scutellar tuft about 0.4X as long as scutellum; fore wing (Fig. 1182) about 3.2X as long as broad; line of setae on ventral surface of costal cell continuous above parastigma; exserted part of ovipositor about 0.6X as long as gaster. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.63mm; excluding ovipositor, 1.34mm (CPD).

Head generally slightly dusky orange; occiput with hypostomal area bordered dark brown from foramen to mandibular base; frontovertex with a weak brassy sheen with weak purple reflections, area above scrobes more strongly metallic; area between eye and scrobe with a fairly strong pale green, brassy and coppery sheen, temple and gena similar, but partly mixed blue and purple; interantennal prominence with a weak purple and brassy sheen, rest of scrobal area mainly pale orange with a very weak brassy sheen; frontovertex with inconspicuous, translucent, pale brown setae along inner eye margins, these continued as slightly more conspicuous scattered setae below eye; gena and interantennal prominence with numerous, scattered setae; maxillary palpus orange-brown, terminal segment dark brown; antenna with radicle mostly dark brown, but proximally orange; antenna (Fig. 1181) with scape orange, ventral margin internally pale brown for about half its length; pedicel brown, apex and ventral surface orange-brown; F1 mostly very pale yellow, marked orange-brown externally, F2-F3 white, F4 brown, ventrally pale orange, F5-F6 and clava dark brown, almost black; pronotum orange with weak purple and brassy reflections, posterior margin translucent, neck brown; propleuron pale orange, brown in front of coxa; prosternum orange; mesoscutum black, anterior two-thirds with distinct coppery and brassy reflections, clothed with relatively sparse, translucent, golden brown setae, posterior one-third similar but more strongly metallic green and brassy and clothed with relatively dense silvery setae, posterior margin purple-brown; tegula orange with apex slightly darker orange-brown; axilla orange with very weak brassy reflections, brownish towards mid line and along posterior margins, with dark brown setae; scutellum orange with weak purple and brassy reflections, anteriorly with translucent pale brown setae, posteriorly with black setae, sub apical tuft black; metanotum dark orange-brown; mesopleuron slightly dusky orange, generally with a weak brassy and purple lustre; mesosternum pale orange, mixed brown; fore coxa white; fore femur pale orange, dorsally margined pale brown in apical half, tibia pale orange, externally mostly orange-brown, tarsus dusky pale orange; mid coxa slightly dirty white; mid femur white, apical one-third pale orange with dorsal margin pale brown; tibia pale orange with outer surface dark brown for about two-thirds of its length, spur and tarsus pale orange; hind coxa white; hind femur orange, tibia dark brown, ventral margin mixed orange, tarsus white, pale orange and brown at apex; fore wing (Fig. 1182) mostly infuscate but hyaline towards base and at apex, venation pale orange; propodeum brown with a purple sheen, slightly bluish submedially, 8 or 9 translucent silvery to pale brown setae near spiracle; gaster orange to dark brown with coppery, purple, green and brassy reflections, dorsum dark brown, Gt1 laterally with a metallic green sheen, syntergum orange, side and venter of gaster mostly orange, sides of tergites brownish; gonostylus orange.

Head (Fig. 1183) about 5.3X as wide as frontovertex, in profile about 2.0X as high as deep,

anteriorly fairly evenly rounded from occipital margin to top of scrobes and from there virtually straight to mouth margin with interantennal prominence slightly protuberant; occipital margin sharp, not carinate; vertex with a short, inconspicuous groove from posterior ocellus along eye margin to about half way to occipital margin; ocelli forming an angle of about 40°; frontovertex quite shiny, with shallow, fairly regular, fine, polygonally reticulate sculpture of mesh size a little smaller than diameter of facet, area immediately above scrobes with coarser, more irregular, transversely elongate sculpture; narrowest point between eye and scrobe about 0.27X length of scape and with obliquely elongate, coarse polygonal sculpture; temple with irregular, transversely elongate, sculpture, gena with similar, but more longitudinally elongate sculpture; scrobes deep, very broadly ∩-shaped, meeting, dorsally very smooth, sharply margined dorsally and laterally, margin carinate laterally; interantennal prominence without median ridge, broadly rounded and completely smooth dorsally, below with shallow, regular, polygonally reticulate sculpture; antenna as in Fig. 1181; scape slightly broadened and flattened, widest in proximal half, about 5X as long as broad; F1 very slightly longer than broad, F2-F6 transverse, segments larger and broader distad, linear sensilla present only on F6; clava clearly broadened, slightly longer than funicle, sutures oblique, sensory area enlarged, extending ventrally about 0.9X length of clava, apex strongly obliquely truncate; eye not reaching occipital margin, separated by slightly more than diameter of facet, clothed in fairly conspicuous setae that are slightly shorter than diameter of facet; inner eye margins clearly diverging in front of anterior ocellus; malar sulcus absent; clypeal margin distinctly concave medially; mandible with three acute teeth; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 68.5, HH 79, FV 13, POL 7, OOL 0, OCL 7.5, AOL 10.5, EL 50, EW 34, MS 31.5, SL 45, SW 9.

Thorax with polygonally reticulate sculpture on pronotum and mesoscutum that is similar to that in ocellar area, axilla and scutellum with similar sculpture but clearly slightly deeper and coarser; mesoscutum in anterior one-third or so and on sides with generally obliquely strigose sculpture, middle and on posterior two-thirds with more regular, rounded, polygonally reticulate sculpture; visible part of mesoscutum about 2.3X as broad as long; scutellum about as broad as long, with a distinct subapical tuft, setae about 0.4X as long as scutellum; mid tibia with a strong external carina for about 0.7X its length; hind femur about 4.7X as long as broad; fore wing with venation and setation as in Fig. 1182; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak; propodeum medially about 0.16X as long as scutellum, virtually smooth but with some shallow irregular sculpture. Relative measurements: FWL 69.5, FWW 21.5; HWL 55, HWW 14.

Gaster with syntergum about 0.6X as long as mid tibia; exserted part of ovipositor about 0.6X length of gaster or about 0.6X mid tibia. Relative measurements: OL 81, GL 33.5 [MT 52].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Valle Miravalles, Est. Cabro Muco, LN 299769 411243, 1100m, #74102, 4.vii.2003 (J.D. Gutierrez). Holotype in NHMUK.

Prochiloneurus abelio **sp.nov.**

(Figs 1184-1190; Hab. ♀ 168)

DIAGNOSIS. *Female* (length about 1.9mm): head orange, frontovertex dusky and slightly metallic with some brown and more strongly metallic areas near ocelli, temple and gena with a distinct brown streak; antenna (Fig. 1185) with flagellum dark brown; thorax largely orange, posterior half or so of mesoscutum dark brown with a moderate violet and coppery sheen and clothed with dense silvery setae; mesopleuron mostly orange, posterior one third dark brown; fore

wing (Fig. 1186) with a group of 3 to 6 pale setae below proximal half of parastigma but without a group of pale setae below distal half; hyaline apex of fore wing slightly less than 1.5X as wide as length of marginal vein; fore wing without a subapical band of paler setae; propodeum dark brown, laterally strongly metallic purple, blue and green, with about 10 silvery setae surrounding spiracle; gaster entirely dark brown with a metallic sheen; head (Fig. 1187) about as broad as high and about 5.6X as wide as frontovertex; antennal scrobes dorsally weakly margined, carinate laterally; antenna (Fig. 1185) with scape slightly broadened and flattened, about 3.9X as long as broad, broadest slightly below middle; paler parts of mesoscutum (Fig. 1190) generally with obliquely elongate, striate-reticulate sculpture, posterior, darker part with more regular, rounded, polygonally reticulate sculpture; apical scutellar tuft about 0.3X as long as scutellum; fore wing (Fig. 1186) about 2.7X as long as broad; line of setae on ventral surface of costal cell continuous above parastigma; exserted part of ovipositor about 0.5X as long as gaster. *Male*: Unknown.

Female (holotype): length, including ovipositor, 1.89mm; excluding ovipositor, 1.58mm (CPD).

Head generally orange; occiput with a dark brown triangular mark above foramen and hypostomal area bordered brown; frontovertex a little dusky between posterior ocelli; temple and gena with a distinct, brown streak from occipital margin to scrobal margin near torulus; mouth margin with brown areas below toruli connected by a faint, curved, brown line; ocellar area and area between occipital margin and posterior ocelli with a distinct purple sheen with some dark blue and green reflections, more strongly metallic dark blue and purple between posterior ocelli, frontovertex in front of ocelli with a weak brassy, coppery and purple sheen, slightly more strongly purple immediately above scrobes; area between eye and scrobe with a weak green, blue, coppery and purple sheen; temple and gena with a stronger metallic green, blue-green and brassy sheen, temple with mixed with a little purple, dark brown areas weakly coppery, lower gena weakly brassy and coppery with weak blue and green reflections; interantennal prominence mostly with a weak brassy sheen with a weak purple lustre dorsally; frontovertex with inconspicuous, translucent, pale brown setae along inner eye margins, these continued below eye; gena and interantennal prominence with numerous, scattered setae, those on interantennal prominence slightly more dense; maxillary palpus white, terminal segment pale orange; antenna (Fig. 1185) with radicle dark brown, proximally orange; scape largely orange, apical one-third white, extreme apex dark brown, ventral margin narrowly dark brown for most of its length, more widely so on internal surface, dorsal margin dusky, outer surface with an incomplete brown band at about two-thirds; pedicel and flagellum dark brown; pronotum pale orange with weak coppery and brassy reflections, posterior margin translucent; propleuron orange, brown anterior to coxa; prosterum orange, anteriorly dusky; anterior half or less of mesoscutum orange with weak brassy and coppery reflections and with relatively sparse dark brown setae, posterior half or so dark brown with a moderately strong violet and slightly coppery sheen and clothed with relatively dense silvery setae, posterior margin of mesoscutum orange-brown with a weak brassy and purple sheen; tegula orange, apex orange-brown; axilla orange with very weak brassy and coppery reflections, with dark brown setae; scutellum orange with weak coppery and brassy reflections, with translucent, golden brown setae, posteriorly with black setae, sub apical tuft black, apical setae off-white and translucent; metanotum dark brown; mesopleuron anteriorly orange with a weak brassy and purple sheen, posterior one-third dark brown with a coppery and green sheen; mesosternum orange; fore coxa white; fore femur white at extreme base, otherwise orange, bordered brown towards apex, tibia orange bordered brown, tarsus slightly dusky orange; mid coxa brown; mid femur mostly white, but apically pale orange with dorsal margin brown, tibia pale orange with a brown streak externally for about two-thirds its length, spur and tarsus orange; hind coxa very pale orange-brown, almost white; hind femur dark brown in proximal half, distal half orange, extreme apex dark brown, tibia mainly dark brown, orange at apex, tarsus orange; fore wing (Fig. 1186) mostly infuscate but hyaline towards base and at apex, submarginal vein pale orange, rest of venation brown; propodeum dark brown, medially with a purple and brassy sheen, laterally with a stronger purple sheen bordered by a strong metallic dark blue and green area towards mid-line, side dark metallic blue, about 10 translucent silvery setae around spiracle; gaster dark purple-brown, mainly with coppery, brassy, blue and green reflections, sides of tergites largely metallic blue and green mixed with some copper; gonostylus pale orange.

Head (Fig. 1187) about 5.6X as wide as frontovertex, in profile about 1.8X as high as deep, anteriorly fairly evenly curved from occipital margin to top of scrobes, virtually straight from top of scrobes to mouth margin, interantennal prominence weakly protuberant between toruli; occipital margin sharp, weakly carinate; vertex with a short groove about midway between posterior ocellus and occipital margin; ocelli forming an angle of about 50°; frontovertex quite shiny, with shallow, fairly regular, fine, polygonally reticulate sculpture of mesh size generally a little smaller than diameter of facet, area above scrobes with coarser, more irregular, transversely elongate sculpture; narrowest point between eye and scrobe about 0.15X length of scape, with very shallow sculpture, almost completely smooth; temple with shallow, irregular, transversely elongate, sculpture, gena with similar, but slightly deeper, more longitudinally elongate sculpture; scrobes deep, very broadly ∩-shaped, meeting, dorsally very smooth and weakly margined, lateral margin carinate; interantennal prominence without median ridge, broadly rounded and largely with weak, regular, polygonally reticulate sculpture but completely smooth dorsally; antenna as in Fig. 1185; scape slightly broadened and flattened, broadest slightly below middle, about 3.9X as long as broad; F1 slightly longer than broad, F2 subquadrate, F3-F6 clearly transverse, segments larger and broader distad, linear sensilla present only on F4-F6; clava clearly broadened, slightly longer than funicle, sutures oblique, sensory area enlarged, extending ventrally about 0.8X length of clava, apex strongly obliquely truncate; eye slightly overreaching occipital margin, clothed in very inconspicuous short setae that are much shorter than diameter of facet; inner eye margins clearly diverging below anterior ocellus; malar sulcus absent; clypeal margin weakly convex medially; mandible with three teeth; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 87, HH 87.5, FV 15.5, POL 6, OOL 0, OCL 10, AOL 9, EL 64, EW 47, MS 32, SL 47, SW 12.

Thorax (Fig. 1190) with polygonally reticulate sculpture on pronotum, mesoscutum axilla and scutellum that is similar to that in ocellar area, but of slightly smaller mesh, sculpture on posterior part of mesoscutum a little shallower; pale parts of mesoscutum with fine, longitudinally oblique, striate-reticulate sculpture, darker parts with more regular, rounded, polygonally reticulate sculpture; axilla and scutellum with sculpture slightly deeper and coarser and of slightly larger mesh; visible part of mesoscutum about 2.3X as broad as long; scutellum about 1.2X as broad as long, with a distinct subapical tuft, setae about 0.3X as long as scutellum; mid tibia with an conspicuous external carina for about half its length; hind femur about 4.2X as long as broad; fore wing with venation and setation as in Figs 1186, 1188; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak; propodeum medially about 0.17X as long as scutellum and smooth. Relative measurements: FWL 99.5, FWW 37; HWL 76.5, HWW 22.

Gaster with syntergum about 0.6X as long as mid tibia; tergites Fig. 1189; ovipositor Fig. 1184, exserted part about 0.5X as long as gaster or mid tibia. Relative measurements: OL 75.5, GL 29 [MT 45].

Variation. Females vary in overall length from 1.89-1.93mm and the head varies from about 5.6-6.0X as wide as the frontovertex. The material from Peru, excluded from the type series, is very similar to the material from Costa Rica, but may be up to 2.30mm in overall length with larger specimens having the head about 6.7X as wide as the frontovertex, the mesopleuron is more extensively dark brown with only a relatively small anterior area orange and the metallic band on the mesoscutum much less shiny.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Limón**, RB Hitoy Cerere, Send. Cascada, LN 643300 184500, 0-100m, #60671, 18-30.xi.2000 (F. Umaña). Paratype: **COSTA RICA**, 1♀, **Alajuela**, 7km N Boca Tapada, Laguna Lagarto Lodge, 10°41'N 84°11'W, 55m, 18-19.ii.2018 (J.S. Noyes). Holotype and paratype

in NHMUK.

Non type material. **PERU**, 1♀, Madre de Dios, Rio Tambopata Res., 12°50'S 69°20'W, 3-16.x.1983 (N.E. Stork); 2♀, Madre de Dios, Rio Tambopata Res., 12°50'S 69°20'W, 17.x-1.xi.1983 (N.E. Stork); 1♀, Madre de Dios, Pto Maldonado, 3.i.1984 (L. Huggert); 1♀, Loreto, Iquitos, Granja Unap, 9.ii.1984 (L. Huggert); 1♀, Loreto, Iquitos, Barillal, 10.ii.1984 (L. Huggert). Material in NHMUK.

COMMENTS. The material identified as *Prochiloneurus abelio* from Peru is very probably this species but is excluded from the type material because of slight colour differences and the disjunct distribution.

Prochiloneurus helleria **sp.nov.**

(Figs 1191-1195; Hab. ♀ 169)

DIAGNOSIS. *Female* (length about 1.7-2.5mm): head orange, temple and gena with a very weak to strong brown streak; antenna (Fig. 1192) with F1-F5 brown mixed pale orange dorsally, F6 and clava dark brown; thorax mostly orange, posterior half of mesoscutum dark brown with a weak blue, purple and violet sheen and clothed with relatively dense silvery setae; mesopleuron orange-brown anteriorly, orange posteriorly; fore wing (Fig. 1193) with a group of 4 or 5 setae below proximal half of parastigma but without a group of pale setae below distal half; hyaline apex of fore wing about as wide as 1.5X length of marginal vein; fore wing with a weak subapical band of very slightly paler setae; propodeum uniform orange-brown to dark brown with a weak metallic sheen, with about 10 silvery setae surrounding spiracle; gaster dark brown with a metallic sheen; head (Fig. 1191) about as 1.0-1.1X as high as broad and about 5.8-7.5X as wide as frontovertex; antennal scrobes sharply margined, carinate laterally; scape about 6.9-7.3X as long as broad, subcylindrical; paler parts of mesoscutum generally with obliquely elongate, striate-reticulate sculpture, posterior, darker part with more regular, rounded, polygonally reticulate sculpture; apical scutellar tuft about 0.4X as long as scutellum; fore wing (Fig. 1193) about 2.8X as long as broad; line of setae on ventral surface of costal cell continuous above parastigma; exserted part of ovipositor about 0.6X as long as gaster. *Male*: unknown.

Female (holotype): length, including ovipositor, 2.06mm; excluding ovipositor, 1.68mm (CPD).

Head generally orange; occiput slightly dusky; mouth margin brown below torulus; temple and gena with a very weak, diffuse brown streak from occipital margin to scrobal margin near torulus; occipital margin with a weak purple sheen, a weak brassy sheen behind posterior ocelli, area between ocelli with a weak purple sheen, frontovertex otherwise with a weak brassy sheen, slightly purple immediately above scrobes; area between eye and scrobe, temple and gena with a weak green, brassy and purple sheen with some coppery areas, gena more weakly metallic; interantennal prominence mostly with a weak brassy sheen, but dorsally with a more distinct purple sheen; frontovertex with inconspicuous, translucent, pale brown setae along inner eye margins, these continued below eye; gena and interantennal prominence with numerous, scattered setae, those on interantennal prominence more dense; maxillary palpus pale orange; antenna (Fig. 1192) with radicle proximally orange, apex dark brown; scape largely orange, apical one-quarter white, extreme apex dark brown, ventral margin narrowly brown for most of its length, dorsal margin slightly dusky; pedicel brown, apex pale orange dorsally; flagellum with F1-F5 mostly brown, each segment partially pale orange dorsally; F6 and clava dark brown; pronotum orange with weak purple, coppery and brassy reflections, posterior margin translucent; propleuron and prosternum orange; anterior half of mesoscutum coloured as pronotum and with relatively sparse dark brown setae, posterior half dark brown with a weak blue, purple and violet sheen and clothed with relatively dense silvery setae, posterior margin of mesoscutum orange-brown with a weak brassy and purple sheen; tegula orange, apex orange-brown; axilla orange with very weak brassy and purple reflections, with golden brown setae; scutellum orange with weak purple and brassy reflections, anteriorly with translucent pale brown setae, posteriorly with black setae, sub apical tuft black; metanotum orange-brown; mesopleuron orange-brown in anterior two-thirds with a weak purple, brassy and green sheen, posterior one-third pale orange with a weak brassy sheen; mesosternum pale, dusky orange; fore coxa white; fore femur white proximally, orange towards

apex and bordered dark brown, tibia orange-brown, apex pale orange, tarsus orange; mid coxa largely pale orange, but brown externally and ventrally near mid-line; mid femur mostly white, but orange at apex and with dorsal margin slightly dusky, tibia orange with a brown streak externally for about two-thirds its length, spur and tarsus orange; hind coxa white; hind femur dark brown, orange-brown towards apex, tibia dark brown, tarsus orange, basitarsus slightly dusky; fore wing (Fig. 1193) mostly infuscate but hyaline towards base and at apex, submarginal vein pale orange, rest of venation brown; propodeum uniform orange-brown with a slight brassy sheen, laterally with a metallic purple sheen, bordered metallic blue and green internally, about 10 translucent silvery setae around spiracle; gaster dark brown, mainly with coppery and brassy reflections, Gt1 with a distinct purple sheen, basal tergites laterally metallic blue and green; gonostylus pale orange.

Head (Fig. 1191) about 6.8X as wide as frontovertex, in profile about 1.9X as high as deep, anteriorly fairly evenly curved, but weakly rounded from occipital margin to just above top of scrobes, and from top of scrobes virtually straight to mouth margin, interantennal prominence weakly protuberant between toruli; occipital margin sharp, carinate; vertex with a conspicuous groove from posterior ocellus along eye margin nearly to occipital margin; ocelli forming an angle of about 45°; frontovertex quite shiny, with shallow, fairly regular, fine, polygonally reticulate sculpture of mesh size generally a little smaller than diameter of facet, area immediately above scrobes with coarser, more irregular, transversely elongate sculpture; narrowest point between eye and scrobe about 0.17X length of scape and with shallow, polygonal sculpture; temple with shallow, irregular, transversely elongate, sculpture, gena with similar, but slightly deeper, more longitudinally elongate sculpture; scrobes deep, very broadly ∩-shaped, meeting, dorsally very smooth, sharply margined dorsally and laterally, margin carinate laterally; interantennal prominence without median ridge, broadly rounded and with weak, regular, polygonally reticulate sculpture throughout; antenna as in Fig. 1192; scape subcylindrical, about 6.9X as long as broad; F1-F2 clearly a little longer than broad, F3-F6 subquadrate, segments larger and broader distad; clava clearly broadened, nearly as long as funicle, sutures oblique, sensory area enlarged, extending ventrally about 0.8X length of clava, apex strongly obliquely truncate; eye slightly overreaching occipital margin, clothed in inconspicuous setae that are a little shorter than diameter of facet; inner eye margins clearly diverging below anterior ocellus; malar sulcus absent; clypeal margin slightly concave medially; mandible with three teeth; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 95.5, HH 96, FV 14, POL 5.5, OOL 0, OCL 10.5, AOL 10.5, EL 71, EW 53, MS 39, SL 55, SW 8.

Thorax with polygonally reticulate sculpture on pronotum and mesoscutum that is similar to that in ocellar area, but of conspicuously smaller mesh, a little deeper on pronotum and anterior part of mesoscutum; anterior half of mesoscutum with obliquely elongate, striate-reticulate sculpture, posterior half with more regular, rounded, polygonally reticulate sculpture; axilla and scutellum with sculpture slightly deeper and coarser and of slightly larger mesh; visible part of mesoscutum about 2.3X as broad as long; scutellum about 1.1X as broad as long, with a distinct subapical tuft, setae about 0.4X as long as scutellum; mid tibia with a strong external carina for about 0.7X its length; hind femur about 4.1X as long as broad; fore wing with venation and setation as in Figs 1193, 1195; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak; propodeum medially about 0.17X as long as scutellum and smooth. Relative measurements: FWL 92, FWW 32.5; HWL 67, HWW 19.5.

Gaster with syntergum about 0.6X as long as mid tibia; exserted part of ovipositor about 0.6X length of gaster or mid tibia.

Paratype. Funicle with linear sensilla present only on F5-F6; gastral tergites Fig. 1194. Relative measurements: OL 121, GL 48.5 [MT 72].

Variation. Females vary in overall length from 1.68-2.52mm, the brown stripe on the temple and gena may be distinct, the hind femur may be mostly orange, the hind tarsus may be completely brown, the propodeum varies from orange-brown to dark brown, the head varies from about as high as broad to about 1.07X as high and about 5.8-7.5X as wide as the frontovertex, larger specimens generally having a longer head and relatively narrower frontovertex, and the scape varies from about 6.9-7.3X as long as broad.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Sta Rosa NP, Bosq. Hum. 9-0, 20.xii.1986-10.i.1987 (Janzen, Gauld). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Sta Elena, Las Nubes, LS 371750 507800, 1210m, 1-15.i.1996 (E. Alfaro); 2♀, **Heredia**, OTS La Selva, 3km S Puerto Viejo, 100m, ii-iii.1993 and iv-v.1993 (P. Hanson); 1♀, **Puntarenas**, Est. Agujas, C. Quebraditos, LN 521400 274300, 782m, #61700, 20.ii-15.iii.2001 (J. Azofeifa). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

COMMENTS. See comments under *aethus* (p. 479)

***Prochiloneurus lenus* sp.nov.**
(Figs 1196-1200; Hab. ♀ 170)

DIAGNOSIS. *Female* (length about 1.6-1.9mm): head generally dark brown, temple and gena without a distinguishable dark brown streak; antenna (Fig. 1197) with flagellum dark brown; thorax mostly orange, mesoscutum (Fig. 1200) with posterior three-quarters dark brown with a weak metallic blue sheen, clothed with dense silvery setae; mesopleuron anterior dusky orange, posteriorly dark brown with a purple, blue and blue-green sheen; fore wing (Fig. 1198) with a group of 3 to 9 setae below proximal half of parastigma but without any pale setae below distal half; hyaline apex of fore wing very slightly wider than length of marginal vein; fore wing without a subapical band of paler setae; propodeum brown with a slight purple, blue and green sheen, with about 10 silvery setae near spiracle; gaster mostly dark brown with metallic reflections, syntergum orange-brown; head (Fig. 1199) in facial view about 1.13X as high as broad and about 6.2X as wide as frontovertex; antennal scrobes sharply margined, carinate laterally; scape (Fig. 1197) about 6.5X as long as broad, subcylindrical; mesoscutum (Fig. 1200) laterally and in anterior one-third or so with obliquely elongate, striate to striate-reticulate sculpture, middle and posterior two-thirds with more regular, rounded, polygonally reticulate sculpture; apical scutellar tuft about 0.4X as long as scutellum; fore wing (Fig. 1198) about 3.0X as long as broad; line of setae on ventral surface of costal cell broadly interrupted above parastigma; exserted part of ovipositor about 0.5X as long as gaster. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.87mm; excluding ovipositor, 1.52mm (CPD).

Head generally dark brown; occiput orange to pale orange-brown with area around foramen brown and hypostomal area bordered dark brown from foramen to mandibular base; mouth margin, area immediately outside torulus and posterior gena orange; area between eye and scrobe with a fairly strong pale green and brassy sheen, temple and gena similar, but temple conspicuously mixed blue and purple; dorsal part of scrobes metallic green, interantennal prominence with a purple and blue sheen; frontovertex with inconspicuous, translucent, pale brown setae along inner eye margins, these continued below eye; gena and interantennal prominence with numerous, scattered setae, those on interantennal prominence more dense and conspicuous; maxillary palpus pale orange, terminal segment dark brown; antenna with radicle mostly dark brown, but proximally orange-brown; antenna (Fig. 1197) with scape largely orange, apical one-quarter white, extreme apex and base dark brown, ventral margin brown for about three-quarters its length and a brown band at about two-thirds; pedicel and flagellum dark brown, almost black; pronotum orange with weak purple and brassy reflections, posterior margin translucent; propleuron and prosternum orange; anterior one-quarter or so of mesoscutum (Fig. 1200) coloured as pronotum and with relatively sparse golden brown setae, posterior three-quarters dark brown with a weak metallic blue sheen and clothed with relatively dense silvery setae, anterior margin of darker area subparallel to posterior margin of pronotum, posterior margin of mesoscutum purple-brown;

tegula orange with apex brown with a slight coppery sheen; axilla orange with very weak brassy and purple reflections, with golden brown setae; scutellum orange with weak purple and brassy reflections, anteriorly with translucent pale brown setae, posteriorly with black setae, sub apical tuft black; metanotum dark brown; mesopleuron anteriorly slightly dusky orange with a weak brassy and purple lustre, posteriorly dark brown with a distinct purple, blue and blue-green lustre; mesosternum pale orange; fore coxa white; fore femur white, orange towards apex, dorsally margined brown, tibia and tarsus dark brown; mid coxa slightly dirty white, dark brown ventrally; mid femur white, a pale brown band at two-thirds, dorsal margin brown towards apex, extreme apex dark brown, tibia dark brown, orange-brown towards apex, spur orange, basitarsus brown proximally, orange distally, rest of tarsus pale orange; hind coxa orange; hind femur orange margined dark brown, tibia dark brown, tarsus orange, brown at apex; fore wing (Fig. 1198) mostly infuscate but hyaline towards base and at apex, submarginal vein pale orange, rest of venation brown; propodeum brown with a purple sheen, slightly bluish and greenish near spiracle, about 10 translucent silvery setae around spiracle; gaster mainly dark brown with coppery, purple, green and brassy reflections, Gt1 laterally with a metallic green sheen, syntergum orange-brown; gonostylus pale orange.

Head (Fig. 1199) about 6.2X as wide as frontovertex, in profile about 2.0X as high as deep, anteriorly fairly evenly rounded from occipital margin to just above top of scrobes, and from top of scrobes virtually straight to mouth margin, interantennal prominence conspicuously protuberant between toruli; occipital margin sharp, carinate; vertex with an inconspicuous groove from posterior ocellus along eye margin nearly to occipital margin; ocelli forming an angle of about 40°; frontovertex quite shiny, with shallow, slightly irregular, fine, polygonally reticulate sculpture of mesh size generally subequal to diameter of facet, area immediately above scrobes with coarser, more irregular, transversely elongate sculpture; narrowest point between eye and scrobe about 0.23X length of scape and with obliquely elongate, coarse polygonal sculpture; temple fairly smooth, with shallow, irregular, transversely elongate, sculpture, gena with similar, but more longitudinally elongate sculpture; scrobes deep, very broadly ∩-shaped, meeting, dorsally very smooth, sharply margined dorsally and laterally, margin carinate laterally; interantennal prominence without median ridge, broadly rounded and completely smooth dorsally, below with shallow, regular, polygonally reticulate sculpture; antenna as in Fig. 1197; scape subcylindrical, about 6.5X as long as broad; F1 a little longer than broad, F2-F6 subquadrate, segments larger and broader distad; clava clearly broadened, about as long as funicle, sutures oblique, sensory area enlarged, extending ventrally about 0.8X length of clava, apex strongly obliquely truncate; eye reaching occipital margin, clothed in fairly conspicuous setae that are about as long as diameter of facet; inner eye margins clearly diverging in front of anterior ocellus; malar sulcus absent; clypeal margin virtually straight medially; mandible with three teeth; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 80, HH 90, FV 13, POL 4.5, OOL 0, OCL 10.5, AOL 10.5, EL 62, EW 43, MS 35.5, SL 53, SW 8.

Thorax (Fig. 1200) with polygonally reticulate sculpture on pronotum and mesoscutum that is similar to that in ocellar area, but clearly deeper and finer on pronotum and anterior part of mesoscutum; mesoscutum laterally and in anterior one-third or so and laterally with obliquely elongate, striate to striate-reticulate sculpture, middle and posterior two-thirds with more regular, rounded, polygonally reticulate sculpture; axilla and scutellum with similar sculpture but slightly deeper and coarser than that on pronotum; visible part of mesoscutum about 2.2X as broad as long; scutellum hardly broader than long, with a distinct subapical tuft, setae about 0.4X as long as scutellum; mid tibia with a strong external carina for about 0.7X its length; hind femur about 4.5X as long as broad; fore wing with venation and setation as in Figs 1196, 1198; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak; propodeum (Fig. 1200) medially about 0.18X as long as scutellum and smooth. Relative measurements: FWL 80.5, FWW 27; HWL 64, HWW 17.

Gaster with syntergum about 0.6X as long as mid tibia; exserted part of ovipositor about 0.5X length of gaster or about 0.6X mid tibia.

Paratype. Funicle with linear sensilla present only on F5-F6. Relative measurements: OL 69, GL28.5 [MT 40].

Variation. Females vary in overall length from 1.55-1.87mm, otherwise very little in material

available, although the exposed part of the mesoscutum may be almost entirely dark brown, the posterior part of the mesoscutum may have some purple reflections, the scutellum may be medially dark brown, the mid basitarsus may be completely orange and the hind femur may be almost totally orange.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown, but part of the type series was collected from *Virola* Aubl. (Magnoliales: Myristicaceae) and *Eugenia* L. (Myrtales: Myrtaceae).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, La Selva BS, 10°26'N 84°01'W, Fog *Virola*, FVK/01, 50-150m, i.1993 (INBio-OET). Paratypes: **COSTA RICA**, 1♀, **Heredia**, Est. Biol. La Selva, 10°26'N 84°01'W, canopy fog *Eugenia* sp., FOT/76/1-40, 50-150m, 5.i.2000 (INBio/OET); 1♀, Heredia, Estacion Biológica La Selva, 10°26'N 84°01'W, 75m, 1-2.iii.2007 (J.S. Noyes). Holotype in MZUCR, paratypes in NHMUK.

Prochiloneurus aethus **sp.nov.**

(Figs 1201-1203)

DIAGNOSIS. *Female* (length about 2.1mm): head orange, temple and gena with a distinct brown streak; antenna (Fig. 1201) with F1-F4 brown mixed pale orange dorsally, F5 dark orange-brown, F6 and clava dark brown; thorax mostly orange, posterior half of mesoscutum dark brown with a moderate dark blue sheen and clothed with dense silvery setae; mesopleuron orange-brown anteriorly, orange on posterior margin; fore wing (Fig. 1202) with a group of 4 or 5 setae below proximal half of parastigma but without a group of pale setae below distal half; hyaline apex of fore wing about as wide as 1.5X length of marginal vein; fore wing with a weak subapical band of very slightly paler setae; propodeum orange, laterally brown with a metallic sheen, with about 10 silvery setae surrounding spiracle; gaster dark brown with a metallic sheen, syntergum orange; head (Fig. 1203) about 1.1X as high as broad and about 7X as wide as frontovertex; antennal scrobes sharply margined, carinate laterally; scape (Fig. 1201) slightly broadened and flattened, about 4.3X as long as broad; paler parts of mesoscutum generally with fine, obliquely elongate, striate-reticulate sculpture, posterior, darker part with more regular, rounded, polygonally reticulate sculpture; apical scutellar tuft about 0.3X as long as scutellum; fore wing (Fig. 1202) about 2.7X as long as broad; line of setae on ventral surface of costal cell interrupted above parastigma; exserted part of ovipositor about 0.5X as long as gaster. *Male*: unknown.

Female (holotype): length, including ovipositor, 2.06mm; excluding ovipositor, 1.74mm (CPD).

Head generally orange; occiput slightly dusky around foramen and bordering hypostomal area; temple and gena with a distinct, dark brown streak from occipital margin to scrobal margin near torulus; area between ocelli brown; occipital margin with a weak purple sheen, area behind posterior ocelli with a weak brassy and purple sheen, area between ocelli with distinct metallic purple and blue reflections, frontovertex otherwise with a weak purple, blue and brassy sheen, more strongly blue immediately above scrobes; temple and area between eye and scrobe with a green and purple sheen and some blue reflections, lower eye margin slightly coppery; gena with a weaker green, coppery and purple sheen; interantennal prominence mostly with a weak coppery, purple and brassy reflections, but dorsally with a more distinct purple sheen; frontovertex with inconspicuous, translucent, pale brown setae along inner eye margins, these continued below eye; gena and interantennal prominence with numerous, scattered setae, those on interantennal prominence more dense; maxillary palpus pale yellow, terminal segment orange; antenna (Fig. 1201) with radicle proximally orange, but mostly dark brown; scape largely orange, apical one-quarter white, extreme apex dark brown, ventral margin narrowly dark brown for most of its length, more widely so on internal surface, dorsal margin dark brown for about two-thirds its

length; pedicel dorsally mostly orange, otherwise brown; flagellum with F1-F4 largely very pale, slightly dusky orange dorsally, ventrally brown, more widely brown on proximal segments, F5 dark orange-brown, slightly paler dorsally, F6 and clava dark brown; pronotum orange with weak purple, coppery and brassy reflections, posterior margin translucent; propleuron and prosternum orange; anterior half of mesoscutum coloured as pronotum and with relatively sparse dark brown setae, posterior half dark brown with a moderately strong, dark blue sheen with some violet reflections and clothed with relatively dense silvery setae, posterior margin of mesoscutum orange-brown with a weak brassy and purple sheen; tegula orange, apex orange-brown; axilla orange with very weak brassy and coppery reflections, with dark brown setae; scutellum orange with weak coppery and brassy reflections, with dark brown setae, posteriorly with black setae, sub apical tuft black, apical setae pale and translucent; metanotum dusky orange; mesopleuron orange-brown with a weak purple, brassy and green sheen, posterior margin pale orange with a weak brassy sheen; mesosternum pale orange; fore coxa white; fore femur white, bordered brown towards apex, tibia orange, slightly dusky dorsally, tarsus orange; mid coxa largely pale orange, but brown ventrally towards mid-line; mid femur mostly white, but with dorsal margin brown apically, tibia orange with a brown streak externally for about two-thirds its length, spur and tarsus orange; hind coxa pale orange; hind femur orange, margined brown ventrally towards apex, tibia orange with an interrupted dark brown streak externally, tarsus orange; fore wing (Fig. 1202) mostly infuscate but hyaline towards base and at apex, submarginal vein pale orange, rest of venation brown; propodeum orange with a slight brassy sheen, laterally brown with a metallic blue, green and purple sheen, bordered metallic blue, purple and brassy internally, about 10 translucent silvery setae around spiracle; gaster dark brown, mainly with coppery, brassy, blue and green reflections, Gt1 with a distinct coppery, purple and green sheen, basal tergites laterally coppery and metallic green, syntergum orange, bordered dark brown; gonostylus pale orange.

Head (Fig. 1203) about 7X as wide as frontovertex, in profile about 2.1X as high as deep, anteriorly fairly evenly curved, although a little less so from top of scrobes to mouth margin, interantennal prominence weakly protuberant between toruli; occipital margin sharp, carinate; vertex with a conspicuous groove from posterior ocellus along eye margin nearly to occipital margin; ocelli forming an angle of about 40°; frontovertex quite shiny, with shallow, fairly regular, fine, polygonally reticulate sculpture of mesh size generally a little smaller than diameter of facet, area above scrobes with coarser, more irregular, transversely elongate sculpture; narrowest point between eye and scrobe about 0.25X length of scape and with shallow, obliquely to transversely elongate imbricate to substriate sculpture of relatively large mesh that continues on to anterior part of gena; temple with shallow, irregular, transversely elongate, sculpture, gena with similar, but slightly deeper, more longitudinally elongate sculpture; scrobes deep, very broadly ∩-shaped, meeting, dorsally very smooth, sharply margined dorsally and laterally, margin carinate laterally; interantennal prominence without median ridge, broadly rounded and with weak, regular, polygonally reticulate sculpture throughout; antenna as in Fig. 1201; scape slightly broadened and flattened, broadest below middle, about 4.3X as long as broad; F1 clearly a little longer than broad, F2 quadrate, F3-F6 transverse, segments larger and broader distad, linear sensilla present only on F5-F6; clava clearly broadened, slightly longer than funicle, sutures oblique, sensory area enlarged, extending ventrally nearly 0.9X length of clava, apex strongly obliquely truncate; eye reaching occipital margin, clothed in conspicuous setae that are about as long as diameter of facet; inner eye margins clearly diverging below anterior ocellus; malar sulcus absent; clypeal margin slightly concave medially; mandible with three teeth; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 91, HH 98, FV 13, POL 5, OOL 0, OCL 9.5, AOL 12.5, EL 66, EW 48, MS 41, SL 56, SW 13.

Thorax with polygonally reticulate sculpture on pronotum and mesoscutum that is similar to that in ocellar area, but of conspicuously smaller mesh, a little deeper on pronotum and anterior part of mesoscutum; anterior three-fifths of mesoscutum generally with fine, obliquely elongate, striate-reticulate sculpture, posterior two-fifths with more regular, rounded, polygonally reticulate sculpture; axilla and scutellum with sculpture slightly deeper and coarser and of slightly larger mesh; visible part of mesoscutum about 2.4X as broad as long; scutellum about 1.1X as broad as long, with a distinct subapical tuft, setae about 0.3X as long as scutellum; mid tibia with a strong external carina for about 0.7X its length; hind femur about 4.2X as long as broad; fore wing with

venation and setation as in Fig. 1202; costal cell with 2 or 3 setae dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak; propodeum medially about 0.15X as long as scutellum and smooth. Relative measurements: FWL 89, FWW 32.5; HWL 68.5, HWW 20.

Gaster with syntergum about 0.6X as long as mid tibia; exserted part of ovipositor about 0.5X length of gaster or mid tibia. Relative measurements: OL 74, GL 30.5 [MT 49].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Santa Cruz, Vista del Mar, LN 235350 357500, Torre Cocesna, 972m, #71769, 10.x.2002 (W. Porras). Holotype in NHMUK.

COMMENTS. *Prochiloneurus aethus* is somewhat similar to *helleria* in general appearance, especially in the colour of the mesopleuron and very similar sculpture on the lower frontovertex and between the eye and scrobe. Apart from the characters given in the key the two species can be separated on the relative width of the scape and the arrangement of setae on the ventral surface of the coastal cell (see respective diagnoses). Other than this, in *aethus* the posterior ocellus is closer to the occipital margin than to the anterior ocellus (equidistant in *helleria*), the narrowest point between the eye and scrobe is about 0.25X the length of the scape (less than 0.2X in *helleria*) and the hind femur is orange, mixed brown towards apex (entirely dark brown in *helleria*).

Prochiloneurus modestus (Timberlake) **stat.rev.**
(Figs 1204-1206; Hab. ♀ 171)

Achrysopophagus modestus Timberlake, 1924:240-243. Holotype ♀, USA (California), USNM, examined. Synonymy with *dactylopii* by Noyes & Triapitsyn (2017:30,33).
Prochiloneurus modestus (Timberlake); Gordh, 1979:936.

DIAGNOSIS. *Female* (length about 1.00-1.92mm): head orange, without a dark brown longitudinal stripe on temple and gena; antenna (Fig 1204) with F1-F4 relatively pale, dorsally slightly dusky white, ventrally brown, F5 brown, F6 and clava dark brown, occasionally flagellum almost entirely dark brown; thorax mostly orange, exposed part of mesoscutum entirely dark brown, anteriorly with a mixed brassy and coppery sheen and posteriorly with a blue-green sheen, evenly clothed with translucent silvery setae; mesopleuron uniform orange; fore wing without a line of setae below proximal half of parastigma but with a group of about 3-15 pale setae below distal half; hyaline apex of fore wing about as wide, or slightly wider, than length of marginal vein; fore wing with a distinct subapical band of paler setae; propodeum medially orange, laterally dark brown and strongly metallic around spiracle with about 30-40 dense silvery setae that extend medially and posteriorly from the spiracle; gaster mostly dark brown with a metallic sheen, but at least syntergum pale orange; head about 1.08-1.26X as long as broad and about 3.8-6.1X as wide as frontovertex, head relatively longer and frontovertex narrower in larger individuals; antennal scrobes sharply margined, carinate laterally; scape (Fig. 1204) about 5.5-6.8X as long as broad, widest at about 0.3X along its length, relatively more slender in larger specimens, mesoscutum with fairly uniform, polygonally reticulate sculpture; apical scutellar tuft about 0.5X as long as scutellum; fore wing (Fig. 1206) about 2.78-3.2X as long as broad; line of setae on ventral surface of costal cell of fore wing interrupted above parastigma, sometimes quite narrowly; hypopygium Fig. 1205; exserted part of ovipositor about 0.6X as long as gaster. *Male* (length 0.92mm): face metallic blue or blue-green with some green areas; scape completely pale yellow; mesoscutum with a dull coppery and brassy sheen in anterior two-thirds or so, posterior one-third metallic blue

green, anterior part clothed in dark brown setae, posterior part clothed in translucent silvery setae; hind femur brown with apex narrowly white, tibia mainly brown with apices dirty white; head in profile about 1.8X as high as deep; malar sulcus present and conspicuous; ocelli forming an angle of about 90°; sculpture on mesoscutum more or less with uniform rounded polygonal cells.

DISTRIBUTION. USA (California, Texas, Florida), Mexico (**new record**), Guatemala (**new record**) and Costa Rica (**new record**),

HOSTS. Recorded as hyperparasitoid of *Anagyrus yuccae* (Coquillett) and *Zarhopalus corvinus* (Girault) (Hymenoptera: Encyrtidae) both primary parasitoids of *Pseudococcus maritimus* (Ehrhorn) on grape (*Vitis vinifera* L.; Vitales: Vitaceae) (Timberlake, 1925; Gordh, 1979). Newly recorded below from *Planococcus citri* (Risso) on *Gardenia "psimonoides"* (Gentianales: Rubiaceae) and guava (*Psidium guajava* L.; Myrtales: Myrtaceae); and *Phenacoccus* Cockerell on *Parthenium hysterophorus* L. (Asterales: Asteraceae). The record from *Pseudaulacaspis cockerelli* (Cooley) (Hemiptera: Diaspididae) is probably an incorrect host association and requires confirmation.

MATERIAL EXAMINED.

Type material. Paratypes of *modestus* Timberlake: 2♀, "Fresno Ca Nov. 1, 1919" "ex grape mealybug" "C.P. Clausen No 1002" "Achrysopophagus modestus Timberlake det Timberlake". Material in NHMUK.

Non type material. **USA**, 1♀, **Texas**, Jeff Davis Co., Davis Mts St, Pk, 5000' (=1527m), 17-18.vii.1982 (G.A.P. Gibson); 3♀, Texas, Brewster Co., Big Bend NP, 23-28.vi.1982 (G.A. P. Gibson); 1♀, Texas, Kent Co., 5 ml. w. Hunt, 1-2.vii.1982 (G.A.P. Gibson); 1♀, Texas, Brewster Co., Big Bend NP, 9-16.vii.1982 (G.A. P. Gibson); 1♀, Texas, Brewster Co., Big Bend NP, 14.vii.1982 (G.A.P. Gibson); 1♀, Texas, Culberson Co., Guadelupe Springs, 5200' (=1588m); 20-22.vii.1982 (G.A.P. Gibson); 3♀, Texas, Hidalgo Co., Bentsen-Rio Grande SP, 2-6.iv.1989 (J.S. Noyes); 1♀, Texas, Zapata Co., Falcon Lake SP, 3.iv.1989 (J.S. Noyes); 1♀, **Florida**, Polk Co., Haines Co., G.C., on Gardenia, 92-079-28, 24.ix.1992 (H.W. Browning); 2♀, Florida, Polk Co., Haines C., G. C., ex *Planococcus citri* on *Gardenia*, 9207912 and 9207915; 24.ix.1992 (H.W. Browning); 3♀, Florida, Polk Auburndale, 132 Lakeview Dr, ex Pseudococcidae on *Gardenia psiminoides*, 03030003, 93030006 and 93030012, 16.vi.1993 (H.W. Browning); 1♀, Florida, Osceola, Kissimmee, *Pseudaulacaspis cockerelli*, 30.v.1992 (G. Buckingham). **BAHAMAS**, 1♀. G. Bahama Is., Freeport, Whit. Farm, *ex Planococcus citri* on guava, 92-560-29, 31.iv.1992 (H.W.B. & J.L.K.). **MEXICO**, 2♀, 1♂, Veracruz, La Tinaja, *Phenacoccus*/*Parthenium hysterophorus*, iv.1979 (F.D. Bennett); 1♀, Nuevo Léon, Cadereyta Jimenez, San Juan, 2.ix.1983 (M.A. Rodriguez). **GUATEMALA**, 2♀, Zacapa, San Lorenzo, 750m, xi.1986 (M. Sharkey). **COSTA RICA**, 1♀, **Guanacaste**, Santa Rosa NP, H10, 26.iv-18.v.1987 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, Santa Rosa NP, Hacienda 3-0, 17-27.iv.1985 (D. Janzen, I.D. Gauld); 2♀, Guanacaste, Santa Rosa NP, H30, 21.ii-14.iii.1987 (D. Janzen, I.D. Gauld); 2♀, Guanacaste, Santa Rosa NP, H30, iii.1987 (D. Janzen, I.D. Gauld); 2♀, Guanacaste, Santa Rosa NP, H30, 4-25.iv.1987 (D. Janzen, I.D. Gauld); 2♀, Guanacaste, Santa Rosa NP, H30, 26.iv-16.v.1987 (D. Janzen, I.D. Gauld); 2♀, Guanacaste, Guanacaste NP (error for Santa Rosa NP), near HQ, MT/YPT, 2-20.iii.1990 (J.S. Noyes); 1♀, Guanacaste, Guanacaste NP (error for Santa Rosa NP), 7km E. of HQ, "small house", 9-10.iii.1990 (J.S. Noyes); 2♀, Guanacaste, PN Santa Rosa, 10°51'N 85°37'W, 300m, 24.ii.2009 (J.S. Noyes); 1♀, Santa Cruz, Vista del Mar, Torre Cocesna, LN 357490 235430, 970m, #61247, xii.2000-i.2001 (Y. Cárdenas); 3♀, Guanacaste, Santa Cruz, PN Marino Las Baulas, LN 258040 332690, 0m, #59488, 16.viii.2000 (Y. Cárdenas). Material in MZUCR NHMUK, UCR, TAMU, USNM, MLP.

COMMENTS. *Achrysopophagus modestus* Timberlake was erroneously synonymised with *Prochiloneurus dactylopii* (Howard) by Noyes & Triapitsyn (2018). The two species are very close but can be separated reliably using the characters given in the key and respective diagnoses.

Prochiloneurus narendrani, known only from Puerto Rico and Dominica (**new record**), is very close to *modestus*. Females differ in the body being generally orange-brown, the subapical tuft of setae being only about 0.2X as long as the scutellum, the fore wing lacking the group of pale setae below the distal half of the parastigma, but a remote group of about 10 pale setae below the proximal half and only about 6 or 7 setae silvery setae in vicinity of propodeal spiracle. Males of *narendrani* differ in having the scape about 4X as long as broad and the flagellum brown.

Prochiloneurus dactylopii (Howard)
(Figs. 1207-1211; Hab. ♀ 172, ♂ 173)

Chiloneurus dactylopii Howard 1885:17. Lectotype ♀ (designated by Noyes,1980:224), USA (Washington DC), USNM, examined.
Achrysopophagus dactylopii (Howard); Girault, 1917b:17.
Prochiloneurus dactylopii (Howard); Gordh, 1979:936.

DIAGNOSIS. *Female* (length about 1.2-2.3mm): head orange, temple and gena with a dark brown streak; antenna (Fig. 1209) with funicle segments brown, partially white, orange, or orange-brown; F6 and clava dark brown, occasionally F6 partially orange; thorax mostly orange, exposed part of mesoscutum with at most anterior one-third orange, remainder dark brown with a strong metallic blue-green or dark blue sheen and evenly clothed with translucent silvery setae; mesopleuron uniform orange; fore wing (Fig. 1210) without a line of setae below proximal half of parastigma but with a group of about 3-15 pale setae below distal half; hyaline apex of fore wing about as wide as 1.5X length of marginal vein; fore wing with a subapical band of slightly paler setae; propodeum medially orange, laterally dark brown and strongly metallic around spiracle and with about 15-20 silvery setae surrounding spiracle; gaster mostly dark brown with a metallic sheen, but at least syntergum pale orange; head (Fig. 1207) about 1.06-1.19X as long as broad and about 5.2-7.3X as wide as frontovertex, head relatively longer and frontovertex narrower in larger individuals; antennal scrobes sharply margined, carinate laterally; scape (Fig. 1209) about 4.7-5.0X as long as broad, widest in proximal half; mesoscutum anteriorly with obliquely elongate striate-reticulate sculpture that contrasts with the more regular polygonally reticulate sculpture posteriorly; apical scutellar tuft about 0.5X as long as scutellum; fore wing (Figs 1210, 1211) about 2.7-2.8X as long as broad; line of setae on ventral surface of costal cell of fore wing virtually absent above parastigma; hypopygium Fig. 1208; exserted part of ovipositor about 0.5-0.6X as long as gaster. *Male* (length 1.10-1.22mm): face metallic blue or blue-green with some green areas; scape white; mesoscutum metallic green with coppery reflections in anterior one-third or so, anterior part clothed in dark brown setae, posterior part clothed in translucent silvery setae, posterior margin slightly coppery hind femur white, distally narrowly margined brown, tibia mainly brown with apices dirty white; head in profile about 2.2X as high as deep and in facial view slightly higher than broad; malar sulcus present but inconspicuous; ocelli forming an angle of about 90°; anterior one-third or so of mesoscutum with obliquely elongate, striate-reticulate sculpture that contrasts with the more regular polygonally reticulate sculpture on the posterior part.

DISTRIBUTION. Recorded below from Costa Rica (**new record**), Trinidad & Tobago and Colombia. Also recorded from USA (Washington D.C.), Records from elsewhere in the USA and from Dominica, Barbados, Mexico, French Guiana, Guyana, Bolivia, Brazil, Paraguay and Chile require confirmation.

HOSTS. Reared, together with *Cheiloneurus nasica* **sp.nov.** (Hymenoptera: Encyrtidae) from *Acerophagus alexte* Noyes (Hymenoptera: Encyrtidae) parasitising *Nipaecoccus nipae* (Maskell) (Hemiptera: Pseudococcidae) on *Psidium guajava* L. (Myrtales: Myrtaceae) (see below and p. 441 and Noyes, 2010). Also recorded below from *Phenacoccus madeirensis (= grenadensis)* Green (Hemiptera: Pseudococcidae) on cassava (*Manihot esculenta* Crantz; Malpighiales: Euphorbiaceae) and *Phenacoccus* Cockerell on tomato (*Solanum lycopersicon* L.; Solanales: Solanaceae).

MATERIAL EXAMINED.

Type material. Lectotype ♀ of *dactylopii*: "1170[04]" "CoType" "*Cheiloneurus dactylopii* How. ♀ Cotype" "♀ *Cheiloneurus dactylopii* Howard det. J.S. Noyes, 1978 LECTOTYPE" "LECTO_TYPE" (USNM)

Non type material**. COSTA RICA**, 1♀, **Guanacaste**, Santa Rosa NP, Est. Murcielago, 10m, 12.ii.1995 (J.S. Noyes); 1♀, Guanacaste, Murcielago, 3m NNW Cerro Guanchipelin, LN 323000 336500, 40m, 28.ii.1996 (M. Araya); 1♀, Guanacaste, Sta. Rosa NP, Hacienda 1-0, 2-28.xii.1985-18.i.1986 (Janzen,

Gauld); 1♀, Guanacaste, Sta. Rosa NP, Hacienda 1-0, 2-23.iii.1986 (Janzen, Gauld); 1♀, Guanacaste, Sta. Rosa NP, Hacienda 1-0, 23.iii-13.iv.1986 (Janzen, Gauld); 1♀, Guanacaste, Santa Rosa NP, H10, 25.iv-16.v.1987 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, Santa Rosa NP, H10, 16.v-6.vi.1987 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, Sta. Rosa NP, Hacienda 3-0, 2-23.iii.1986 (Janzen, Gauld); 1♀, Guanacaste, Sta. Rosa NP, Hacienda 4-C, 31.i-21.ii.1987 (Janzen, Gauld); 1♀, Guanacaste, Sta. Rosa NP, Sn. Emilio 8-C, 8.ii-1.iii.1986 (Janzen, Gauld); 1♀, Guanacaste, Santa Rosa NP, 0-300m, ii.2001 (J.S. Noyes); 2♀, Guanacaste, Santa Cruz, PN Marino las Baulas, LN 258040 332690, 0m, #59489, 20.ix-16.x.2000 (Y. Cárdenas); 1♀, Guanacaste, Santa Cruz, Vista de la Mar, Torre Cocesna, LN 357400 235430, 970m, #61247, xii.2000-i.2001 (Y. Cárdenas); 1♀, Guanacaste, PN Palo Verde, Camino de Alto Viejo, LN 386300 260770, 40m, 9.iv-8.v.2001 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sector Catalina, Ojo de Agua, LN 388500 257300, 20m, #62106, 13.iii-9.iv.2001 (I. Jiménez); 2♀, **Alajuela**, Aguas Zarcas, La Chiles, cafe, iii.1990 (P. Hanson); 1♀, Alajuela, San Pedro de la Tigra, cacao, i-ii.1990 (R. Céspedes); 1♀, **Heredia**, Santo Domingo, 1200m, ii-iii.2016 (P. Hanson); 2♀, Heredia, Santo Domingo, 1200m, MT, vi.2016 (P. Hanson); 6♀, 4♂, Heredia, Santo Domingo, ex *Nipaecoccus nipae* on *Psidium guajava*, i.1987 (P. Hanson); 1♀, Heredia, Sana Rosa de Heredia, INBio, 1100m, #58654, 5.ix-5.x.2000 (R. Zuñiga); 1♀, Heredia, Santo Domingo, INBio Parque, LN 526200 217300, 1100m, #621036, xii.2000-i.2001 (R. Zuñiga); 4♀, Heredia, Santo Domingo, INBio Parque, LN 217300 526200, 1100m, #62082, i-iii.2001 (R. Zuñiga); 1♀, Heredia, Santo Domingo, INBio Parque, 1100m, 19.ii.2001 (J.S. Noyes); 2♀, Heredia, Santo Domingo, INBio Parque, LN 217300 526200, 1100m, #62083, iii-iv.2001 (R. Zuñiga); 2♀, Heredia, Santo Domingo, INBio Parque, LN 217300 526200, 1100m, #62271, v.2001 (R. Zuñiga); 3♀, Heredia, Santo Domingo, INBio Parque, LN 526250 217400, 1100m, iii.2002 (J.A. Azofeifa, J.S. Noyes); 5♀, Heredia, Santo Domingo, INBio Parque, LN 526250 217400, 1100m, 1-12.iv.2002 (D. Rubí, J.S. Noyes); 3♀, Heredia, Santo Domingo, INBio Parque, 9°59'N 84°06'W, 1100m, 11-26.ii.2006 (J.S. Noyes); 1♀, Heredia, Santo Domingo, INBio Parque, 9°59'N 84°06'W, 1100m, 16.ii.2013 (J.S. Noyes); 1♀, **Cartago**, Turrialba, CATIE, YPT, ix.1994 (P. Hanson). **TRINIDAD & TOBAGO**, 2♀, **Trinidad**, Piarco, C.I.E. A5306, 72-6, ex *Phenacoccus* on *Sida*, xii.1971 (F.D. Bennett); 4♀, Trinidad, Curepe, ex *Phenacoccus* sp. on tomato, ix.1983 (F.D. Bennett). **COLOMBIA**, 3♀, 1♂, Cali, CIAT, ex *Phenacoccus grenadensis* on cassava, xi.1977 (F.D. Bennett). Material in MZUCR, NHMUK, USNM, UCR, TAMU and MLP.

COMMENTS. *Prochiloneurus dactylopii* is very similar to *modestus* (see comments under *modestus*, p. 480).

Prochiloneurus thonus **sp.nov.**

(Figs. 1212-1216; Hab. ♀ 174)

DIAGNOSIS. *Female* (length about 1.1-1.8mm): head orange, temple and gena with a dark brown streak; antenna (Fig. 1212) with funicle segments brown, partially pale orange-brown; F6 and clava dark brown, occasionally F5 entirely dark brown; thorax mostly orange, posterior one-third of mesoscutum faintly brown (Fig. 1214) with a strong metallic blue, blue-green and purple sheen and clothed with translucent silvery setae; mesopleuron mostly orange, but posterior one-third brown; fore wing (Fig. 1216) with a line of 4 or 5 setae below proximal half of parastigma but without a group of pale setae below distal half; hyaline apex of fore wing about as wide as 1.7X length of marginal vein; fore wing with a subapical band of slightly paler setae; propodeum medially orange, laterally slightly dusky and with a weak metallic sheen around spiracle and with about 5 or 6 silvery setae surrounding spiracle; gaster largely orange-brown with a metallic sheen, but at least syntergum pale orange; head (Fig. 1213) about 0.95-1.01X as long as broad and about 5.2-7.1X as wide as frontovertex, head relatively longer and frontovertex narrower in larger individuals; antennal scrobes sharply margined, carinate laterally; scape (Fig. 1212) about 4.2-4.8X as long as broad, widest in proximal half, about 0.3X along its length; sculpture on paler parts of mesoscutum (Fig. 1214) generally obliquely elongate striate-reticulate, that on posterior, darker part more regular, rounded, polygonally reticulate sculpture; apical scutellar tuft about 0.3X as long as scutellum; fore wing (Fig. 1216) about 2.7-2.9X as long as broad; line of setae on ventral surface of costal cell continuous above parastigma; exserted part of ovipositor about 0.6X as long as gaster. *Male* (length about 1.02mm): face purple with some coppery reflections a slight brassy and metallic green sheen below torulus; scape brown in proximal two-thirds, remainder pale orange; pronotum and mesoscutum dull with a slight metallic green and coppery sheen;

mesoscutum clothed in uniform brown setae; hind femur white dark brown with apex orange-brown, tibia mainly brown with apices dirty white; head in profile about 1.8X as high as deep and in facial view about as broad as high; malar sulcus absent; ocelli forming an angle of about 80°; sculpture on mesoscutum more or less with uniform rounded polygonal cells, but slightly obliquely elongate in extreme anterior part.

Female (holotype): length, including ovipositor, 1.52mm; excluding ovipositor, 1.24mm (CPD).

Head generally orange; occiput pale orange with hypostomal area hardly dusky from foramen to mandibular base; temple and gena with a strong, dark brown streak from occipital margin to scrobal margin near torulus; anterior margins of posterior ocelli connected by a brown strip with strong metallic blue-green reflections; most of frontovertex with a weak brassy sheen, with eye margins weakly purple; area above scrobes with a weak mixed blue and purple sheen, this continuing laterally to area between eye and scrobe and to temple, darker parts of temple with additional green, coppery and brassy reflections, gena similar but with more blue and purple; interantennal prominence with a weak brassy, coppery and purple sheen, rest of scrobal area mainly pale orange with a very weak brassy sheen; frontovertex with inconspicuous, translucent, pale brown setae along inner eye margins, these continued as a line of slightly more conspicuous setae below eye; gena and interantennal prominence with numerous, scattered setae; maxillary palpus white, terminal segment slightly dusky; antenna (Fig. 1212) with radicle orange proximally, apex narrowly dark brown; scape very pale orange, apex white, proximal 0.75X of ventral and dorsal margins narrowly dark brown, partly interrupted, extreme apex dark brown; pedicel mostly pale orange, dusky externally and with a dark brown streak along its length internally; funicle largely pale orange-brown, F1-F5 ventrally brown, F6 dark brown; clava dark brown; pronotum orange with weak purple and brassy reflections, neck dark brown; propleuron pale orange; prosternum pale orange; anterior 0.7X of mesoscutum (Fig. 1214) matt orange with weak purple, blue and brassy reflections, anterior half of which is clothed with relatively sparse, translucent, brown setae, posterior half with conspicuous, dark brown setae, posterior 0.3X faintly brown but with a strong blue, blue-green and purple sheen clothed in fairly dense, translucent, silvery setae, posterior margin slightly shiny, purple-brown with 3 or 4 longer, dark brown setae; tegula orange with apex translucent orange-brown; axilla orange with very weak purple reflections, with dark brown setae; scutellum orange with weak purple and brassy reflections, anteriorly with translucent pale brown setae, posteriorly with black setae, sub apical tuft black, apical setae translucent and off-white; metanotum orange; mesopleuron orange, generally with a weak brassy and purple lustre, posterior one-third or so brown; mesosternum orange; fore coxa white; femur white, tibia pale orange, tarsus pale orange; mid coxa white, inner surface dark brown; mid femur white, brown at extreme apex, tibia pale orange with an external brown stripe for most of its length, spur and tarsus pale orange; hind coxa white; femur pale orange, tibia pale orange, very slightly dusky towards its base, tarsus pale orange; fore wing (Fig. 1216) mostly infuscate but hyaline towards base and at apex, venation pale orange, no group of pale setae below distal half of parastigma; propodeum orange, very slightly dusky around spiracle, this area with a slight metallic purple and dark blue sheen, only about 5 or 6 inconspicuous setae anteriorly to, and outside, spiracle; gaster generally dusky orange with purple, green and brassy reflections, Gt1 medially dark brown, Gt2-Gt3 pale brown, remainder of dorsum and hypopygium pale orange; gonostylus very pale orange.

Head (Fig. 1213) about 6.9X as wide as frontovertex, in profile about 1.6X as high as deep, anteriorly fairly evenly rounded from occipital margin to mouth margin with interantennal prominence fairly protuberant; occipital margin sharp, weakly carinate; vertex with an inconspicuous, narrow, shiny bottomed groove along eye margin from posterior ocellus almost to occipital margin; ocelli forming an angle of about 35°; frontovertex quite shiny, with shallow, fairly regular, fine, polygonally reticulate sculpture of mesh size a little smaller than diameter of facet, area immediately above scrobes with coarser, more irregular, transversely elongate sculpture; narrowest point between eye and scrobe about 0.15X length of scape and with obliquely elongate, polygonal sculpture; temple with irregular, transversely elongate, sculpture, gena with similar, but more longitudinally elongate sculpture; scrobes deep, very broadly ∩-shaped, meeting, dorsally very smooth, sharply margined dorsally and laterally, margin carinate laterally; interantennal prominence without median ridge, broadly rounded dorsally, virtually smooth, but with shallow,

regular, polygonally reticulate sculpture; antenna as in Fig. 1212; scape slightly broadened and flattened, widest in proximal half at about 0.3X along its length, about 4.2X as long as broad; F1 slightly longer than broad, F2-F6 transverse, segments larger and broader distad; clava clearly broadened, slightly longer than funicle, sutures oblique, sensory area enlarged, extending ventrally about 0.8X length of clava, apex strongly obliquely truncate; eye virtually reaching occipital margin, separated by much less than diameter of facet, clothed with inconspicuous setae that are slightly shorter than diameter of facet; inner eye margins clearly diverging in front of anterior ocellus; malar sulcus absent; clypeal margin weakly concave medially; mandible with three acute teeth; apical segment of maxillary palpus not enlarged, not longer than radicle. Relative measurements: HW 90, HH 86, FV 13, POL 4, OOL 0, OCL 9, AOL 10.5, EL 64, EW 50, MS 35, SL 55, SW 13.

Thorax (Fig. 1214) with polygonally reticulate sculpture on pronotum, mesoscutum, axilla and scutellum that is similar to that in ocellar area, but sculpture on paler parts of mesoscutum generally obliquely elongate striate-reticulate, that on posterior, darker part of mesoscutum perhaps a little shallower and sculpture on axilla and scutellum a little deeper; visible part of mesoscutum about 2X as broad as long; scutellum about 1.2X as broad as long, with a distinct subapical tuft, setae about 0.3X as long as scutellum; mid tibia with a strong external carina for about 0.7X its length; hind femur about 4.4X as long as broad; fore wing with venation and setation as in Figs 1212, 1215; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak; propodeum (Fig. 1214) medially about 0.14X as long as scutellum, virtually smooth but with some shallow irregular sculpture. Relative measurements: FWL 87.5, FWW 30.5; HWL 65, HWW 16.5

Gaster with syntergum about 0.6X as long as mid tibia; exserted part of ovipositor about 0.6X length of gaster or about 0.6X mid tibia.

Paratype. Funicle with linear sensilla present only on F5-F6. Relative measurements: OL 61, GL 25 [MT 39].

Variation. Females vary in overall length from 1.05-1.82mm, F5 may be entirely dark brown; the mid coxa varies from completely white to very pale orange and may have the inner surface dark brown; the head varies from about 5.2-7.1X as wide as the frontovertex, from 0.95-1.01X as long as wide in facial view and from 1.5-1.7X as long as deep with smaller specimens generally having a relatively broader frontovertex and deeper head, the scape varies from about 4.2-4.8X as long as wide and the fore wing varies from about 2.7-2.9X as long as broad.

Male: length 1.02mm.

Head metallic dark green with some coppery reflections. face purple with some coppery reflections a slight brassy and metallic green sheen below torulus; scape brown in proximal two-thirds, remainder pale orange, pedicel dark brown, flagellum pale testaceous-yellow; pronotum and mesoscutum dull with a slight metallic green and coppery sheen; mesoscutum clothed in uniform brown setae; axilla and scutellum similar to mesoscutum but virtually completely matt; propleuron and prosternum dark brown; tegula dark brown, metanotum dark brown, mesopleuron dark brown with weak coppery purple sheen; fore coxa white; fore femur white; tibia white; tarsus pale orange; mid coxa dark brown; mid leg otherwise white; hind coxa dark brown; hind femur white dark brown with apex orange-brown, tibia mainly brown with apices dirty white, tarsus pale yellow; wings hyaline, venation pale brown; gaster dark brown with blue, purple and brassy reflections.

Head about 2.3X as wide as frontovertex, in profile about 1.8X as high as deep, anteriorly fairly evenly rounded from occipital margin to top of scrobes then straight to mouth margin with interantennal prominence hardly protuberant; occipital margin sharp, carinate; vertex with a short, shiny bottomed groove along eye margin just behind posterior ocellus; ocelli forming an angle of about 80°; frontovertex with a weak sheen, with deep, fairly regular, fine, polygonally reticulate sculpture of mesh size subequal to diameter of facet; area between eye and scrobe with obliquely elongate, polygonally reticulate sculpture; temple and gena with irregular, longitudinally elongate sculpture; scrobes shallow, ∩-shaped, meeting, smooth, not sharply margined; torulus at least 1.5X its own length from mouth margin; scape slightly broadened and flattened, widest in middle, about 3X as long as broad; all funicle segments at last 2.5X as long as broad and clothed with

whorls of long setae that are generally about 2-4X as long as diameter of segments; clava slender, entire and with apex rounded; eye reaching occipital margin, clothed in very inconspicuous setae that are much shorter than diameter of facet; malar sulcus absent; clypeal margin weakly concave medially. Relative measurements: HW 86, HH 86, FV 38, POL 16, OOL 4, OCL 5, AOL 10, EL 56, EW 36, MS 32, SL 33, SW 11.

Thorax with polygonally reticulate sculpture on pronotum, mesoscutum, axilla and scutellum that is similar to, but generally slightly shallower than that on frontovertex, sculpture on mesoscutum more or less with uniform rounded polygonal cells, but slightly obliquely elongate in anterior fifth or so, sculpture on scutellum about as deep as that on mesoscutum, but finer; visible part of mesoscutum about 2.2X as broad as long; scutellum about 1.1X as broad as long, without a subapical tuft; mid tibia without an external carina; costal cell with a line of setae dorsally in its apical one-third; apices of postmarginal and stigmal veins not connected by a naked streak.

Gaster with a short apical hook on digitus, aedeagus very slender, apex truncate.

DISTRIBUTION. Costa Rica, Colombia.

HOSTS. Unknown.

MATERIAL EXAMINED.

Holotype ♀: **COSTA RICA**, **Puntarenas**, PN Corcovado, Los Patos/Sirena, La Casona, LS 514200 276500, 100m, #61695, 13.ii-18.iii.2001 (J. Azofeifa). Paratypes: **COSTA RICA**, 1♀, **Heredia**, La Selva BS, 50m, 22.i-3.ii.1991 (J.S. Noyes); 1♀, Heredia, La Selva, 10°26'N 84°01'W, ii.2001 (J.S. Noyes); 1♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, ii.2003 (J.S. Noyes); 2♀, Heredia. Estación Biologica La Selva, (OTS), 10°26'N 84°01'W, 75m, 22-24.ii.2012 (J.S. Noyes); 1♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, 25.ii.2016 (J.S. Noyes); 1♀, **Puntarenas**, 1♀, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 19-20.ii.2009 (J.S. Noyes); Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 12-24.ii.2013 (J.S. Noyes); 1♀, Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 19-20.ii.2016 (J.S. Noyes); 4♀, Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 11-12. ii.2018 (J.S. Noyes); 1♀, Puntarenas, Reserva Absoluta, Cabo Blanco, 9°35'N85°06'W, 30m, 16-17.ii.2009 (J.S. Noyes); 1♀, Puntarenas, PN Piedras Blancas, Est. El Bonito, 100m, 8°43'N 83°13'W, 13-14.ii.2012 (J.S. Noyes); 1♀, Puntarenas, same data as holotype; 1♀, Puntarenas, PN Corcovado, Los Patos/Sirena, La Casona, LS 514200 276500, 100m, #62424, 18.iii-5.v.2001 (J. Azofeifa); 1♀, Puntarenas, PN Corcovado, Est. Los Patos, 200m, 21.ii.2002 (J.S. Noyes); 1♀, Puntarenas, RF Golfo Dulce, Est. Agujas, LS 276750 526550, 300m, YPT, #53490, 15.ix-15.x.1999 (J.A. Azofeifa); 1♀, Puntarenas, Est. Agujas, C. Quebraditos, LS 521400 274300, 782m, #62408, iii-iv.2001 (J. Azofeifa). **COLOMBIA**, 1♀, 1♂, nr Palmira, ex coccid, A427 and A428, COM. INST. ENT. COLL. NO. 13110, i.1953 (D.J. Taylor). Holotype in MZUCR, paratypes in MZUCR, NHMUK, MLP, UCR, TAMU and USNM.

COMMENTS. Apart from the characters given in the key the females of *thonus* can additionally be distinguished from those of *zunigai* by having a slightly broader scape. In *thonus* the scape varies from about 4.2-4.8X as long as broad, whereas in *zunigai* the scape varies from about 5.0-6.6X as long as broad.

Prochiloneurus seini (Dozier), known only from Puerto Rico, may run to *thonus* in the above key but differs in having the scape hardly more than 3X as long as broad and lacks the dark brown band on the temple and gena (see also comments under *lucetia*, p. 487)

***Prochiloneurus lucetia* sp.nov.**

(Figs 1217-1220; Hab. ♀ 175)

DIAGNOSIS. *Female* (length about 1.4-1.6mm): head orange, temple and gena with a dark brown streak; antenna (Fig. 1218) with F1-F5 largely pale dusky yellow, ventrally brown, F6 brown, clava dark brown; thorax (Fig. 1220) orange, anterior two-fifths or so of mesoscutum orange, posterior three-fifths dark brown with a moderately strong dark blue sheen with purple reflections and clothed with relatively dense silvery setae; mesopleuron orange; fore wing (Fig. 1219) with a group of 3 or 4 setae below proximal half of parastigma but without a group of pale setae below

distal half; hyaline apex of fore wing about as wide as 1.5X length of marginal vein; fore wing with a subapical band of slightly paler setae; propodeum medially orange, laterally slightly dusky and with a weak metallic sheen around spiracle and with about 10 silvery setae surrounding spiracle; gaster largely orange-brown with a metallic sheen, but at least syntergum orange; head about 1.10X as high as broad and about 7.1X as wide as frontovertex; antennal scrobes sharply margined, carinate laterally; scape (Fig. 1218) 3.0-3.8X as long as broad, widest slightly below middle; paler parts of mesoscutum (Fig. 1220) generally with obliquely elongate, strigose sculpture, posterior, darker part with more regular, rounded, polygonally reticulate sculpture; apical scutellar tuft about 0.3X as long as scutellum; fore wing (Fig. 1217) about 2.8-2.9X as long as broad; line of setae on ventral surface of costal cell broadly interrupted above parastigma; exserted part of ovipositor about 0.4-0.5X as long as gaster. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.50mm; excluding ovipositor, 1.29mm (CPD).

Head generally orange; temple and gena with a dark brown streak from occipital margin to scrobal margin near torulus; area between posterior ocelli brown with a fairly strong blue-green sheen, ocellar area otherwise with a similar, but weaker sheen with some weak purple reflections; vertex, near occipital margin with a weak brassy sheen and some very weak purple reflections, anterior parts of frontovertex with weak blue, green, purple and brassy reflections, more distinctly purple immediately above scrobes; area between eye and scrobe more distinctly brassy and purple; temple and gena with a weak to moderate, blue, green, brassy and purple sheen, brown streak with a metallic green and coppery sheen; interantennal prominence with a weak brassy and purple sheen; frontovertex with inconspicuous, translucent, pale brown setae along inner eye margins, these continued below eye; gena and interantennal prominence with numerous, scattered setae, those on interantennal prominence more dense; maxillary palpus pale orange, terminal segment slightly darker; antenna (Fig. 1218) with radicle proximally orange, apex dark brown; scape largely orange, apical one-third white, extreme apex dark brown, ventral margin brown for about three-quarters its length, more broadly so internally in basal one-third; pedicel slightly dusky pale yellow with a dark brown streak along internal surface; funicle with F1-F5 largely pale dusky yellow, ventrally brown, proximal segments more so; F6 brown; clava dark brown; pronotum orange with weak purple and brassy reflections, posterior margin translucent; propleuron and prosternum orange; anterior two-fifths or so of mesoscutum coloured as pronotum and with relatively sparse golden brown setae, posterior three-fifths dark brown with a moderately strong dark blue sheen with purple reflections and clothed with relatively dense silvery setae, anterior and posterior margins of darker area subparallel, posterior margin of mesoscutum orange-brown with a weak purple sheen; tegula orange; axilla orange with very weak brassy and purple reflections, with golden brown setae; scutellum orange with weak purple and brassy reflections, anteriorly with translucent pale brown setae, posteriorly with black setae, sub apical tuft black; metanotum orange; mesopleuron orange with a weak brassy lustre; mesosternum pale orange; fore coxa white; fore femur white, orange towards apex, tibia pale orange, slightly brownish proximally, tarsus orange; mid coxa pale orange; mid femur white, tibia pale orange with a brown streak externally for most of its length, spur and tarsus pale orange; hind coxa white; hind femur pale orange, faintly margined brown distally, tibia pale orange with a brown streak externally for much of its length, tarsus pale orange; fore wing (Fig. 1219) mostly infuscate but hyaline towards base and at apex, submarginal vein pale orange, rest of venation brown; propodeum orange with a slight brassy sheen, laterally a little dusky with a slight blue and purple sheen, about 10 translucent silvery setae around spiracle; gaster mainly orange-brown with coppery, purple, green and brassy reflections, basal tergites medially darker with a stronger metallic sheen, Gt1 with a fairly strong coppery, green and blue sheen, laterally metallic blue and green, syntergum orange; gonostylus very pale orange, almost white.

Head about 7.1X as wide as frontovertex, in profile about 1.9X as high as deep, anteriorly fairly evenly rounded from occipital margin to just above top of scrobes, and from top of scrobes virtually straight to mouth margin, interantennal prominence conspicuously protuberant between toruli; occipital margin sharp, not carinate; vertex with an inconspicuous groove from posterior ocellus along eye margin nearly to occipital margin; ocelli forming an angle of about 30°; frontovertex quite shiny, with shallow, fairly regular, fine, polygonally reticulate sculpture of

mesh size generally a little smaller than diameter of facet, area immediately above scrobes with coarser, more irregular, transversely elongate sculpture; narrowest point between eye and scrobe about 0.2X length of scape and virtually smooth, with very shallow, obliquely elongate, polygonal sculpture; temple with shallow, irregular, transversely elongate, sculpture, gena with similar, but more longitudinally elongate sculpture; scrobes deep, very broadly ∩-shaped, meeting, dorsally very smooth, sharply margined dorsally and laterally, margin carinate laterally; interantennal prominence without median ridge, broadly rounded and completely smooth dorsally, below with shallow, regular, polygonally reticulate sculpture; antenna as in Fig. 1218; scape broadened and flattened, broadest slightly below middle, about 3.8X as long as broad; F1 a little longer than broad, F2-F6 transverse, segments larger and broader distad; clava clearly broadened, very nearly as long as funicle and pedicel combined, sutures oblique, sensory area enlarged, extending ventrally about 0.8X length of clava, apex strongly obliquely truncate; eye reaching occipital margin, clothed in inconspicuous setae that are a little shorter than diameter of facet; inner eye margins clearly diverging below anterior ocellus; malar sulcus absent; clypeal margin slightly concave medially; mandible with three teeth; apical segment of maxillary palpus not enlarged, hardly longer than radicle. Relative measurements: HW 60, HH 65.5, FV 8.5, POL 3, OOL 0, OCL 7, AOL 9.5, EL 46, EW 33, MS 27, SL 38, SW 10.

Thorax (Fig. 1220) with polygonally reticulate sculpture on pronotum and mesoscutum similar to that in ocellar area, but a little finer on pronotum and anterior part of mesoscutum; sculpture on anterior half of mesoscutum generally obliquely elongate, strigose, that on posterior, darker part more regular, rounded, polygonally reticulate sculpture; axilla and scutellum with similar sculpture but slightly deeper and coarser than that on pronotum; visible part of mesoscutum about 2X as broad as long; scutellum about 1.1X as broad as long, with a distinct subapical tuft, setae about 0.3X as long as scutellum; mid tibia with a strong external carina for about 0.7X its length; hind femur about 4.5X as long as broad; fore wing with venation and setation as in Figs 1217, 1219; costal cell with 1 or 2 setae dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak; propodeum (Fig. 1220; medially about 0.12X as long as scutellum and smooth. Relative measurements: FWL 82, FWW 29; HWL 72, HWW 19.

Gaster with syntergum about 0.7X as long as mid tibia; exserted part of ovipositor about 0.5X length of gaster or about 0.6X mid tibia.

Paratype. Funicle with linear sensilla present only on F5-F6. Relative measurements: OL 77.5, GL 31 [MT 46].

Variation. Females vary in overall length from 1.35-1.55mm, otherwise very little in material available, although one paratype (Puerto Jimenez) has F1-F5 are mostly brown, the scape only about 3.0X as long as broad and the exserted part of the ovipositor about 0.4X as long as the gaster or 0.5X as long as the mid tibia.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Guanacaste NP, 1000m, Est. Mengo Vc Cacao, v.1988 (Gauld, Janzen). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Macizo Miravalles, Est. Cabro Muco, LN 299769 411243, 1100m, #73633, 18-24.iii.2003 (J. Azofeifa); 1♀, **Puntarenas**, Pen. Osa, Puerto Jimenez, 10m, vi.1991 (P. Hanson). Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. *Prochiloneurus lucetia* is possibly close to *seini* (Dozier) known only from Puerto Rico, both species being quite similar to *dactylopii* but having the scape less than 4X as long as broad. *Prochiloneurus seini* could run to *lucetia* in the above key but differs in having the scape more evenly rounded ventrally and broadest about half-way along its length and the funicle segments relatively broad (see Noyes & Triapitsyn 2018). There are also differences in colouration with *seini* lacking a brown stripe on the temple and gena, having F1-F4 pale orange and F5-F6

virtually completely white, the posterior one-third of the mesopleuron with quite a strong coppery purple sheen and the posterior tibia more or less completely pale orange. In *lucetia* the scape is not evenly rounded ventrally with the broadest part less than two-fifths along its length, the temple and gena have a distinct dark brown stripe, the funicle segments are largely brown, the posterior one-third of the mesopleuron lacks a coppery sheen and the posterior tibia is mostly dark brown.

***Prochiloneurus zunigai* sp.nov.**
(Figs. 1221-1227; Hab. ♀ 176)

DIAGNOSIS. *Female* (length about 0.9-2.1mm): head orange, temple and gena with a dark brown streak; antenna (Figs 1221, 1222) with flagellum dark brown, occasionally F1-F5 partially pale orange or orange-brown; thorax mostly orange, posterior two-fifths of mesoscutum (Fig. 1223) dark brown with a strong metallic blue and purple sheen and clothed with translucent silvery setae; mesopleuron uniform orange; fore wing (Fig. 1226) with a line or group of 3 to 5 setae below proximal half of parastigma but without a group of pale setae below distal half; hyaline apex of fore wing nearly 2X as wide as length of marginal vein; fore wing with a subapical band of slightly paler setae; propodeum medially orange, laterally slightly dusky and with a weak metallic sheen around spiracle and with about 9 or 10 silvery setae surrounding spiracle; gaster largely dusky orange with a metallic sheen, at least syntergum pale orange; head about 0.96-1.10X as long as broad and about 4.1-7.9X as wide as frontovertex, head relatively longer and frontovertex narrower in larger individuals; antennal scrobes sharply margined, carinate dorsally and laterally; scape (Figs 1221, 1222) about 5.0-6.6X as long as broad, virtually parallel-sided; sculpture on paler parts of mesoscutum (Fig. 1223) generally obliquely elongate striate-reticulate, that on posterior, darker part of mesoscutum more regular, rounded, polygonally reticulate sculpture; apical scutellar tuft about 0.3X as long as scutellum; fore wing (Fig. 1226) about 2.8-3.1X as long as broad; line of setae on ventral surface of costal cell interrupted above parastigma; exserted part of ovipositor about 0.6X as long as gaster. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.82mm; excluding ovipositor, 1.50mm (CPD).

Head generally orange; occiput pale orange with hypostomal area bordered dark brown from foramen to mandibular base; temple and gena with a strong, dark brown streak from occipital margin to scrobal margin near torulus; ocellar area orange; most of frontovertex with a weak brassy sheen, with eye margins weakly purple; area above scrobes with a weak mixed blue and purple sheen, this continuing laterally to area between eye and scrobe and to temple, darker parts of temple with additional green, coppery and brassy reflections, gena similar but with more blue and purple; interantennal prominence with a weak brassy, coppery and purple sheen, rest of scrobal area mainly pale orange with a very weak brassy sheen; frontovertex with inconspicuous, translucent, pale brown setae along inner eye margins, these continued as a line of slightly more conspicuous setae below eye; gena and interantennal prominence with numerous, scattered setae; maxillary palpus white, terminal segment slightly dusky; antenna (Fig. 1221) with radicle orange proximally, apex narrowly dark brown; scape very pale orange, apex white, proximal 0.75X of ventral margins narrowly dark brown, partly interrupted, extreme apex dark brown; pedicel mostly pale orange, dusky externally and with a dark brown streak along its length internally; funicle brown, F6 dark brown; clava dark brown; pronotum orange with weak purple and brassy reflections, neck dark brown; propleuron pale orange; prosternum pale orange; anterior 0.6X of mesoscutum (Fig. 1223) matt orange with weak purple, blue and brassy reflections, anterior half of which is clothed with relatively sparse, translucent, brown setae, posterior half with conspicuous, dark brown setae, posterior 0.4X dark brown but with a strong blue, and purple sheen clothed in dense, translucent, silvery setae, posterior margin slightly shiny, purple-brown with 4 or 5 longer, dark brown setae; tegula orange with apex translucent orange-brown; axilla orange with very weak purple reflections, with dark brown setae; scutellum orange with weak purple and brassy reflections, anteriorly with translucent pale brown setae, posteriorly with black setae, sub apical tuft black, apical setae translucent and off-white; metanotum orange-brown; mesopleuron uniform orange, generally with a weak brassy and purple lustre; mesosternum orange; fore coxa white; femur white, tibia pale orange, margined dorsally and ventrally dark brown, tarsus pale orange;

mid coxa white, inner surface dark brown; mid femur white, brown at extreme apex, tibia pale orange with an external brown stripe for most of its length, spur and tarsus pale orange; hind coxa white; femur pale orange, tibia largely dusky orange with a dark brown stripe externally and internally, tarsus pale orange; fore wing (Fig. 1226) mostly infuscate but hyaline towards base and at apex, venation pale orange, no group of pale setae below distal half of parastigma; propodeum orange, very slightly dusky around spiracle, this area with a slight metallic purple and dark blue sheen, only about 9 or 10 inconspicuous setae anteriorly to, and outside, spiracle; gaster generally dusky orange with purple, green and brassy reflections, Gt1 dorsally largely dark brown; apex of outer plate of ovipositor dark brown; gonostylus very pale orange.

Head about 7.9X as wide as frontovertex, in profile about 2.0X as high as deep, anteriorly fairly evenly rounded from occipital margin to mouth margin with interantennal prominence fairly protuberant; occipital margin sharp, weakly carinate; vertex with a conspicuous, narrow, shiny bottomed groove along eye margin from posterior ocellus almost to occipital margin; ocelli forming an angle of about 35°; frontovertex quite shiny, with shallow, fairly regular, fine, polygonally reticulate sculpture of mesh size a little smaller than diameter of facet, area immediately above scrobes with coarser, more irregular, transversely elongate sculpture; narrowest point between eye and scrobe about 0.17X length of scape and with obliquely elongate, polygonal sculpture; temple with irregular, transversely elongate, sculpture, gena with similar, but more longitudinally elongate sculpture; scrobes deep, very broadly ∩-shaped, meeting, dorsally very smooth, carinately margined dorsally and laterally; interantennal prominence without median ridge, broadly rounded dorsally, virtually smooth, but with shallow, regular, polygonally reticulate sculpture; antenna as in Fig. 1221; scape slightly broadened and flattened, slightly widest in proximal half at about 0.3X along its length, although virtually parallel-sided, about 6.0X as long as broad; F1 slightly longer than broad, F2-F3 quadrate, F4-F6 transverse, segments larger and broader distad; clava clearly broadened, slightly longer than funicle, sutures oblique, sensory area enlarged, extending ventrally about 0.8X length of clava, apex strongly obliquely truncate; eye virtually reaching occipital margin, separated by much less than diameter of facet, clothed with inconspicuous setae that are slightly shorter than diameter of facet; inner eye margins clearly diverging in front of anterior ocellus; malar sulcus absent; clypeal margin weakly concave medially; mandible with three acute teeth; apical segment of maxillary palpus not enlarged, not longer than radicle. Relative measurements: HW 110, HH 117, FV 14, POL 5.5, OOL 0, OCL 10, AOL 15, EL 83, EW 60, MS 45, SL 66, SW 11.

Thorax (Fig. 1223) with polygonally reticulate sculpture on pronotum, mesoscutum, axilla and scutellum that is similar to that in ocellar area, but sculpture on paler parts of mesoscutum generally obliquely elongate striate-reticulate, that on posterior, darker part of mesoscutum perhaps a little shallower and sculpture on axilla and scutellum a little deeper; visible part of mesoscutum about 2X as broad as long; scutellum about 1.2X as broad as long, with a distinct subapical tuft, setae about 0.3X as long as scutellum; mid tibia with a strong external carina for about 0.7X its length; hind femur about 4.2X as long as broad; fore wing with venation and setation as in Figs 1226, 1227; costal cell naked dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak; propodeum (Fig. 1223) medially about 0.14X as long as scutellum, virtually smooth but with some shallow irregular sculpture. Relative measurements: FWL 106, FWW 34; HWL 82, HWW 22

Gaster with syntergum about 0.6X as long as mid tibia; exserted part of ovipositor about 0.6X length of gaster or about 0.6X mid tibia.

Paratype. Funicle with linear sensilla present only on F5-F6; hypopygium Fig. 1225; ovipositor Fig 1224. Relative measurements: OL 57, GL 23 [MT 35.5].

Variation. Females vary in overall length from 0.93-2.05mm, F1-F5 may be mixed pale orange or orange-brown (Fig. 1222), the mid coxa varies from completely white to very pale orange and may be pale brown basally; the head varies from about 4.1-7.9X as wide as the frontovertex, from 0.96-1.10X as high as wide in facial view and from 1.5-2.1X as high as deep with smaller specimens generally having a relatively broader frontovertex and deeper head, the scape varies from about 5.0-6.6X as long as broad, in larger specimens linear sensilla may be present on F4-F6 and the fore wing varies from about 2.8-3.1X as long as broad.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Holotype ♀: **COSTA RICA**, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 14-15.ii.2005 (J.S. Noyes); Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Santa Rosa NP, BH110, 4-25.iv.1987 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, Maritza (ACG), 700m, MT/YPT, 20.i-24.ii.1995 (J.S. Noyes); 1♀, Guanacaste, Santa Cruz, Vista del Mar, Torre Cocesna, LN 357490 235430, 970m, xii.2000-i.2001 (Y. Cárdenas); 1♀, **Alajuela**, San Pedro de la Tigra, cacao, i-ii.1990 (R. Céspedes); 1♀, **Heredia**, Santo Domingo, ex mealybugs on palm, vi.2015 (P. Hanson); 4♀, Heredia, Santo Domingo, 1200m, ii-iii.2016 (P. Hanson); 1♀, Heredia, Santo Domingo, INBio Parque, LN526250 217400, 1100m, #60665, 6.xi.-6.xii.2000 (R. Zuñiga); 2♀, Heredia, Santo Domingo, INBio Parque, LN526250 217400, 1100m, iii. 2002 (J.A. Azofeifa, J.S. Noyes); 2♀, Heredia, Santo Domingo, INBio Parque, 9°59'N 84°06'W, 1100m, 14.ii.2015 (J.S. Noyes); 1♀, **San José**, San Antonio de Escazu, creek bed, 1300m, 4-5.iii.1996 (L. Masner); 1♀, San José, Zurqui de Moravia, 1600m, ii-iv.1993 (P. Hanson); 1♀, **Cartago**, Dulce Nombre, Vivero Linda Vista, 1300m, viii-x.1993 (P. Hanson); 2♀, **Puntarenas**, same data as holotype; 4♀, Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 19-20.ii.2009 (J.S. Noyes); 1♀, Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 23-24.ii.2013 (J.S. Noyes); 2♀, Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 11-12.ii.2018 (J.S. Noyes). Holotype in MZUCR, paratypes in MZUCR, NHMUK, MLP, UCR, TAMU and USNM.

COMMENTS. Of the Costa Rican species of *Prochiloneurus*, *zunigai* is probably most similar to *argentinensis* (see Noyes & Triapitsyn, 2018) in general habitus. *Prochiloneurus zunigai* differs from *argentinensis* in having the funicle largely dark brown, the metallic band on the mesoscutum medially less than half as long as the exposed part of the mesoscutum (much less if the pronotum is flexed forwards) and the gaster orange-brown with the syntergum pale orange. In *argentinensis* the funicle has at least F4 and F5 completely pale yellow, the metallic band on the mesoscutum medially about two-thirds as long as the mesocutum and the gaster uniformly dark brown. In the above key to Costa Rica species *argentinensis* would fail at couplet 6 because the gaster is completely dark brown, but the propodeum is mostly orange. See also comments under *thonus* (p. 485).

This species is named in honour of my friend Ronald Zúñiga who collected some of the type material.

Genus *DIVERSINERVUS* Silvestri

Diversinervus Silvestri, 1915:301-304. Type species: *Diversinervus elegans* Silvestri, by original designation and monotypy.

Cheiloneuroides Girault, 1915a:96. Type species: *Cheiloneuroides bicristatus* Giraulr, by original designation and monotypy. Synonymy with *Diversinervus* by Girault (1917a:37).

Female. Length about 1.0-2.1mm.

Body largely brownish yellow to orange, with some distinctly metallic or dusky areas, sometimes mostly dark brown and metallic; gaster dark brown, syntergum often orange; mesoscutum in posterior 0.25X or so with a dark, metallic band that contrasts with the orange anterior part; legs mostly white to pale orange with some dark brown areas; fore wing mainly infuscate from level of proximal part of parastigma to apex, infuscation slightly stronger in middle of wing.

Head at least about 4X as wide as frontovertex, in profile dorsally hardly convex from occipital margin to transfacial ridge, usually sharply bent at about 70° at transfacial carina and from there virtually straight to mouth margin; occipital margin sharp, weakly carinate; area adjacent to eye margin between posterior ocellus and occipital margin with an oval, shiny bottomed depression;

eye clothed with conspicuous setae, each about as long as diameter of facet; facial depression usually dorsally sharply delimited by a strong, curved transfacial ridge, in some species facial depression delimited by a more rounded ledge; malar sulcus absent; antenna with scape broadened and flattened, about 2-3.5X as long as broad, pedicel and flagellum subcylindrical, funicle segments subequal in length but distinctly broader distally, club clearly broader than F1, with a slight, oblique apical truncation; mandible with three acute teeth, upper tooth sometimes rounded; palp formula 4-3.

Mesoscutum usually with a distinct tuft of setae in middle (Fig. 1233); notaular lines absent; scutellum with a distinct subapical tuft of setae; sculpture on mesoscutum and scutellum similar, finely striate to longitudinally elongate reticulate arranged in more or less concentric whorls around an imbricate reticulate area in middle, posterior part of scutellum generally with some shallower imbricate-reticulate sculpture; mid tibia with a subbasal external carina in proximal half; fore wing fully developed or strongly reduced and hardly reaching second gastral tergite; fully developed fore wing about 2.7-3.0X as long as broad with apices of postmarginal and stigmal veins connected by a naked, hyaline streak, submarginal vein with parastigma (Fig. 1232) strongly downcurved and clearly expanded towards proximal end of parastigma, marginal vein about 4-8X as long as broad, up to 2X as long as stigmal vein and up to 3X as long as postmarginal vein, basal cell and costal cell often more or less naked, filum spinosum present, composed of about 5 modified setae; axillae moderately raised above level of scutellum.

Gaster with hypopygium reaching about half way along gaster; ovipositor longer than mid tibia, slightly exserted; gonostylus free.

Male. length about 0.8-1.3mm.

Body generally dark brown with a slight metallic sheen, head occasionally completely or partially yellow; fore wing hyaline; legs mostly white to pale yellow; head about 2X as wide as frontovertex and without a transfacial carina; antenna with 6 funicle segments, all longer than broad and clothed with whorls of long setae, the longest of which are about as 5-6X as long as diameter of segments; clava entire and slightly shorter than F5 and F6 combined; sculpture of mesoscutum mainly imbricate-reticulate but very slightly longitudinally elongate anteriorly, scutellum with similar sculpture to that of female; fore wing with marginal vein about 2.5X as long as broad, subequal to stigmal vein which is clearly shorter than postmarginal vein; phallobase with parameres short, digiti each about 2X as long as broad and with a single apical tooth; aedeagus about 0.4X as long as mid tibia, slender but very slightly broadened subapically with apex rounded.

DISTRIBUTION. Mainly Afrotropics and southern Asia to Australia, although a species which may be *cervantesi* (Girault) was recently found in a greenhouse in Canada (S. Marshall, pers. comm.) and *D. elegans* Silvestri has been introduced into North America and Europe and is newly recorded from Costa Rica (see below).

HOSTS. Recorded as primary parasitoids of soft scales (Hemiptera: Coccidae) (for a comprehensive list see Rosen & Alon, 1983).

BIOCONTROL. Three or four species of *Diversinervus* species have been introduced into various countries for the control of soft scale pests with varying degrees of success. In 1937, *Diversinervus smithi* Compere, 1940 was imported into California (USA) from South Africa for the control of *Parasaissetia nigra* (Nietner) but did not become established (Bartlett in Clausen, 1978). In 1976-1977, *Diversinervus cervantesi* (Girault, 1933) was imported into Israel from South Africa for the control of *Saissetiae oleae* (Olivier) and became established. At about the same time an unidentified species of *Diversinervus* was imported for use against *Ceroplastes* sp. but not released (Argov & Rössler, 1988). *Diversinervus* nr *stramineus* Compere was released in Australia (Queensland and New South Wales) from Kenya in 1999 for the control of *Coccus viridis* (Green) and quickly became established and contributed towards the successful control of the pest (Smith et al., 2004). The most frequently used species, *D. elegans*, has been used in several different European countries, the USA and Australia for the control of several soft scale

pests with little success (see below).

COMMENTS. *Diversinervus* is probably most easily confused with *Cheiloneurus* Westwood and *Anisophleps* Fidalgo, species of all three genera having a subcylindrical flagellum, a generally largely infuscate fore wing with the apices of the postmarginal vein and stigmal vein connected by a naked, hyaline streak, tuft of setae at the apex of the scutellum and hypopygium not reaching the apex of the gaster. It is important to be able to separate *Diversinervus* and *Anisophleps* from *Cheiloneurus* reliably because it is likely that all species of *Cheiloneurus* are hyperparasitoids of scale insects whilst those of *Diversinervus* and *Anisophleps* are primary parasitoids. This would have important implications for any use in biological control introductions. The most reliable character by which to separate *Diversinervus* and *Anisophleps* from *Cheiloneurus* is the fore wing venation. In fully winged species of *Cheiloneurus* the postmarginal and stigmal veins are very short in relation to the marginal vein, in most cases the marginal vein is more than 1.5X as long as the stigmal vein and at least 3X as long as the postmarginal vein whilst in fully winged species of *Diversinervus* and in *Anisophleps* the marginal vein is usually not longer than the either the stigmal vein or the postmarginal vein. Separation of brachypterous specimens is more difficult, but in all *Diversinervus* and *Anisophleps* the sculpture of the mesoscutum always has a tendency to form whorls around a central imbricate reticulate area. These whorls may be in the form of striate sculpture through lineolate-reticulate to imbricate sculpture but always in the posterior part of the mesoscutum the direction of the sculpture merges rather than diverges as in *Cheiloneurus*. Unfortunately, this difference may be difficult to appreciate where the sculpture of the mesoscutum is shallow or not well-defined. In addition *Cheiloneurus* never has a tuft of setae on the mesoscutum or clearly differentiated, scattered scale like setae anteriorly on the mesoscutum whereas in most species of *Diversinervus* there is a clear tuft of setae in the middle of the mesoscutum or scattered scale-like setae on the anterior part of the mesoscutum. In addition, in *Diversinervus*, the infuscation of the fore wing always extends to the apex of the wing, whereas in the majority of species of *Cheiloneurus* the apex frequently has a distinct hyaline area. Females of *Diversinervus* can be distinguished from those *Anisophleps* by the presence, in the latter, of a darker, curved, subapical band delimiting the distal part of the infuscate area of the fore wing with the apex of the wing being hyaline and by the shape of the anterior margin of the transfacial carina in dorsal view. In *Diversinervus* the transfacial carina is roundly convex in dorsal view, whereas in *Anisophleps* it is strongly medially invaginate.

See also comments under *Ludesia* (p. 179).

IDENTIFICATION. 12 species known: Prinsloo, 1985 (key to 7 southern African species); Hayat, 2006 (key and review of 4 Indian species); Rosen & Alon, 1983 (catalogue of 10 species).

Diversinervus elegans **Silvestri**

(Figs 1228-1233; Hab. ♀ 177, ♂ 178)

Diversinervus elegans Silvestri, 1915:304-305. Lectotype♀ (here designated), Eritrea, DEZP, examined.

Cheiloneurus bicristatus Girault, 1915a:96. Holotype ♀, Australia (Queensland), QMB, examined. Synonymy with *elegans* by Girault (1917a:37).

Diversinervus meridionalis Compere, 1931:237-239. Holotype ♀, South Africa (Natal), USNM, not examined. Synonymy with *elegans* by Compere (1937:43).

Diversinervus intermedius Hayat, Alam & Agarwal, 1975:43. Holotype ♀, India (Puducherry), NHMUK, examined. Synonymy with *elegans* by Hayat (1989:279)

DIAGNOSIS. *Female* (overall length about 1.2-2.1mm): head orange; frontovertex and temple with a weak green and purple sheen; antenna (Fig. 1228) with scape orange, ventral margin dark brown; pedicel pale orange with a complete, dark brown, dorso-lateral stripe internally; F1-F4 slightly dusky, each with a complete, dark brown, dorso-lateral stripe internally; F5 slightly dusky pale orange, F6 pale orange; clava with basal segment pale orange, otherwise dark brown; thorax

orange with posterior margin of pronotum white and translucent, propleuron ventrally brown, posterior one-third of mesoscutum metallic dark blue, mixed green and brassy and anterior margin of mesopleuron brown and posterior two-thirds slightly dusky; all coxae white, legs otherwise mainly white to pale orange but fore and mid tibiae each with a narrow, subbasal brown fascia, hind tibia with a broad, median orange-brown band and hind basitarsus apically dark brown; fore wing (Fig. 1232) mostly infuscate but hyaline towards base and at apex of venation; propodeum orange with a weak brassy lustre, side posteriorly with a metallic green and purple sheen; gaster generally slightly dusky orange, dorsally and laterally towards base with a conspicuous coppery purple, green and brassy sheen; gonostylus pale orange; head about 4-7X as wide as frontovertex, relatively wider in smaller specimens; ocelli forming an angle of about 45-55°; scrobes moderately deep and broadly ∩-shaped; antenna as in Fig. 1228, scape broadened and flattened, slightly more than 2X as long as broad, F1-F4 subequal, quadrate or slightly longer than broad, F5-F6 conspicuously larger and subquadrate, linear sensilla present only on F5-F6; clava slightly enlarged, about 1.5X as wide as F6 and nearly as long as F3-F6 combined, sutures slightly oblique, sensory area slightly enlarged extending about 0.3X along ventral margin of clava, apex slightly obliquely truncate; eye reaching occipital margin; inner eye margins weakly converging anteriorly; thorax (Fig. 1233) with pronotum clearly exposed behind head, in dorsal view about 0.8X as long as mesoscutum with a distinct median notch in posterior margin; sculpture of pronotum fairly shallow; mesoscutum with a distinct, median, anterior tuft of long black setae, scutellum with similar, subapical tuft; sculpture on mesoscutum mostly longitudinally elongate, polygonally reticulate and deeper than that on pronotum, but posterior metallic area with shallower, more rounded sculpture; axilla matt, with similar but slightly deeper sculpture than that on posterior part of mesoscutum, scutellum matt with elongate polygonally reticulate sculpture that is virtually arranged in whorls; fore wing about 2.7X as long as broad, with venation and setation as in Figs 1231, 1232; gaster with hypopygium (Fig. 1229) reaching about half way to apex; ovipositor (Fig. 1230) 1.3X as long as mid tibia, or 4.3X as long as gonostylus, slightly exserted, with the exserted part about 0.2X as long as mid tibial spur or less than 0.1X mid tibia. *Male* (length about 0.8-1.3mm): head generally metallic green often with a distinct purple sheen on occiput, lower face and gena; scape pale yellow to pale orange; pedicel pale orange, slightly dusky dorsally; flagellum dusky pale orange; pronotum and mesoscutum metallic green; scutellum metallic green with a slight purple sheen; prepectus pale yellow; mesopleuron metallic green with a strong purple sheen; legs pale yellow to very pale orange, hind tibia with a very faint, brown, subbasal ring; fore wing venation pale orange; propodeum dark purple-brown, side metallic green; gaster dark purple brown, basal tergite dull metallic green; head a little more than 2X as wide as frontovertex; ocelli forming an angle of about 90°; frontovertex with deep, fine, punctate-reticulate sculpture of mesh size slightly smaller than eye facet; scape slightly broadened, about 2.5X as broad as long; all funicle segments at least about 2X as long as broad and clothed with whorls of long setae that are about 3X as long as diameter of segments; mesoscutum and scutellum without any distinct tufts of setae; anterior one-third of mesoscutum with longitudinally elongate, polygonally reticulate sculpture, posterior two-thirds with polygonally reticulate sculpture forming rounded cells, these finer posteriorly; scutellum with slightly elongate, polygonally reticulate to striate sculpture, more or less arranged in whorls.

DISTRIBUTION. Virtually Cosmopolitan (tropical, subtropical and Mediterranean) (Noyes, 2019). Newly recorded below also from Honduras, Costa Rica, Guadeloupe, Peru, Zimbabwe, Madagascar, Philippines, Papua New Guinea and Fiji (**new records**).

HOSTS. Recorded as a primary parasitoid of species of several genera of soft scales (Hemiptera: Coccidae) including *Ceroplastes* Gray, *Coccus* Linnaeus, *Eulecanium* Cockerell, *Parasaissetia* Takahashi, *Pulvinaria* Targioni Tozzetti and *Saissetia* Deplanche (Noyes, 2022). Newly recorded below as a parasitoid of *Ceroplastes rubens* Maskell, *Coccus alpinus* De Lotto, *Pulvinaria psidii* Maskell and *Saissetia miranda* (Cockerell & Parrott) (Hemiptera: Coccidae) (**new records**). Also recorded below from *Ferrisia virgata* (Cockerell) (Hemiptera: Pseudococcidae) (**new record**) but this record is probably erroneous and requires confirmation.

BIOCONTROL. This species has been used in several biological control programmes where the target species are soft scale pests. During about 1935-1958 and again in 1971 it was introduced into New South Wales (Australia) for the control of *Ceroplastes destructor* Newstead but did not become established upon that pest (Wilson, 1960; Greathead, 1971; Sands et al., 1986). It was introduced into California (USA) in 1951, 1953 and 1964-1967 from Eritrea and Lebanon for the control of *Coccus pseudomagnoliarum* (Kuwana) and *Parasaissetia nigra* (Nietner) and eventually became established on *P. nigra* and contributed to partial control of that pest (Bartlett, 1966, Bartlett in Clausen, 1978; Lampson & Morse, 1992), *Diversinervus elegans* was also introduced into Israel from South Africa and from there into Spain, France, Italy, former Yugoslavia, Greece, Morocco and Argentina at various times in the 1970s for the control of *P. nigra*, and sometimes also *Pulvinaria urbicola* Cockerell, but without much success although it frequently became established (Panis & Maro, 1977; Paraskakis et al., 1980; Panis, 1981; Jourheuil, 1986; Argov & Rössler; 1988; Viggiani, 1988).

MATERIAL EXAMINED.

Type material. LECTOTYPE ♀ (here designated): "Nefasit Saissetia oleae Sett 1914" "Diversinervus elegans Silv.", card-mounted. Paralectotypes: 1♀, "Diversinervus elegans Silv. ♀ Nefasit 13 Saisset", slide-mounted; 1♂ "Diversinervus elegans Silv. ♂ Nefasit", slide-mounted. Type material in DEZP.

Non type material. **EGYPT**, 2♀, Alexandria, Antonia, ex *Ceroplastes rusci* ?*Lepidosaphes pomorum Conoteryx* on mandarines, 10.vii.1929 (H. Priesner); 2♀, Mahalla-El-Kubra, *Coccus hesperidum,* 16.x.1930 (H. Priesner); 1♀, 1♂, *Lecanium longulum* on *Ficus altida,* 22.ix.1969 (M. Hafez); 1♀, 1♂, Qalyubiya, Tukh, Site 1, ex *Chloropulvinaria* on *Ficus sycamorus*, 27.x.1990 (H.W. Browning); 1♀, Qalyubiya, Banha Univ., ex *Protopulvinaria psidii* on *Mangifera indica*, 27.x.1990 (H.W. Browning). **ERITREA**, 1♀, Asmara Plateau, ex *Saissetia oleae*, 5.viii.1930 (H. Compere). **KENYA**, 2♀, Kiambu, ex *Saissetia hemisphaerica*, 23.iv.1930 (R.H. Le Pelley); 3♀, 1♂, Kiambu, ex *Saissetia nigra* Nietn., 26.viii.1929 and 27.ii.1931 (R.H. Le Pelley); 3♀, Kiambu, ex *Saissetia oleae*, 26.ii.1931 (R.H. Le Pelley); 4♀, Forest, Kiambu, ex white waxy scale on coffee, 29.i.1985; 2♀, Limuru, ex *Ceroplastes destructor*, 3.xii.1935 (H. Wilkinson); 1♀, Limuru, ex *C. destructor* on coffee, ix.1935; 1♀, Limuru, ex *C. destructor*, x-xii.1935; 1♀, N. Kitito, *Coccus alpinus* on ?coffee, 24.iv.1984 (C.I.E. 18015). **ZIMBABWE**, 1♀, Salisbury, ix.1974 (A. Watsham) "Compared with Lectotype of *D. elegans* S.". **SOUTH AFRICA**, 1♀, Cape Prov., Mossel Bay, xii.1921 (R.E. Turner); 6♀, 2♂, Pretoria, Fountains, ex *Coccus proteae* on *Protea caffra*, viii.1961 (D.P. Annecke). **MADAGASCAR**, 1♀, Betafo area SW Antantarivo, ex *Parasaissetia nigra* on *Coffea*, 11.iv.1989 (J.B.D. Robinson). **INDIA**, 2♀, **Karnataka**, Hessaraghatta, ex *Ferrisia virgata*, iii.1989 (C.I.E. A20858). **PHILIPPINES**, 2♀, 2♂, Luzon, Ilagan, ex scale 86.80 on neem tree, 9.xii.1985 (M.J.W. Cock). **FIJI**, 4♀, 1♂, Suva, ex *Lecanium* on *Colcus*, xii.1931 (H.W. Simmonds); 2♀, Suva, L296 and H296, ex *Ceroplastes rubens Hibiscus*, 23.xi.1938 (R.A. Lever). **PAPUA NEW GUINEA**, 1♀, 1♂, Central Province, Laloki A.R.S., on stem of *Abelmoschus manihot*, 11.ix.1996 (F.M. Dori). **AUSTRALIA**, 1♀, **Queensland**, Sunnybank, ex olive scale on custard apple, 29.ix.1964 (J.H. Barrett); 1♀, Queensland, 15km SE Nambour, 6.xi.1976 (Z. Boucek) "Compared with Lectotype of *Cheil. bicristatus* Gir.". **USA**, 3♀, **Florida**, Fort de Soto, Pinellas, ex *Saissetia miranda* on *Ficus aurea*, 25.viii.1988 (F.D. Bennett); 4♀, 2♂, Florida, Miami, ex *Saissetia* on *Ficus aurea*, 30.iv.1987 (F.D. Bennett). **GUADELUPE**, 4♀, 3♂, Petit-Bourg, ex Coccidae, 5.ii.1990 (J. Etienne). **HONDURAS**, 2♀, Paraiso, Jacaleapa. El Arenal, ex Coccidae, *Salix humboldtiana* vegetativo, 29.vii.1988 (J. Maresco). **COSTA RICA**, 1♀, **Heredia**, Santo Domingo, INBio Parque, 1200m (error for 1100m), 19.ii.2001 (J.S. Noyes); 1♀, Heredia, Santo Domingo, Parque Ecológico, 9°59'N 84°06'W, 1100m, 9.ii.2018 (J.S. Noyes); 1♀, **Puntarenas**, PN Corcovado, Est. Agujas, Cerro Mueller, LS 521500 273200, xii.2001-ii.2002 (J. Azofeifa). **PERU**, 2♀, 1♂, Lima, ex *Saissetia hemisphaerica* on *Nerium oleander*, ?1978 (O. Beingolea); 3♀, 1♂, Vitarte, CICIU, ex *Saissetia nigra* on *Hibiscus rosa-sinensis*, 21.ii.1978 (F. Nuñez). Material in NHMUK and MZUCR.

COMMENTS. I am designating a lectotype for *elegans* in order to ensure the current usage of the name. The specimen designated as lectotype of *Diversinervus elegans* has been labelled as such and is card-mounted and in good condition.

Genus *ICEROMYIA* Noyes

Iceromyia Noyes, 1980:204-205. Type species: *Iceromyia flavifrons* Noyes, by original designation and monotypy.

Female. Overall length about 1.6-2.7mm.

Body not dorsoventrally flattened; head and scutellum orange, rest of body dark brown with a metallic sheen; mouth margin dark brown; legs largely pale orange; antenna inserted near mouth, separated by less than length of torulus; malar sulcus absent; fore wing proximally hyaline with a small infuscate area below proximal part of parastigma, the remainder infuscate from level of marginal vein but becoming gradually paler distally; apex of postmarginal vein and stigmal vein connected by a hyaline streak.

Frontovertex less than 0.17X head width, with a few shallow, inconspicuous piliferous punctures; occipital margin sharp, weakly carinate; a distinct, elongate, oval, shiny bottomed depression adjacent to eye margin between posterior ocellus and occipital margin; eye reaching occipital margin, naked; scrobal area delimited dorsally by a weak ridge which is sharper laterally below eye margin; ocellar area with very shallow polygonally reticulate sculpture, frontovertex elsewhere with shallow sculpture, but not shiny; each scrobal depression delimited dorsally by frontofacial ridge; interantennal prominence dorsally rounded; mandible tridentate with two lower acute teeth and a slightly rounded upper tooth; palp formula 4-3; scape (Fig. 1237) broadened and flattened, dorsal margin slightly convex, lamina not extended past insertion of pedicel; pedicel slightly wider than F1, subconical, dorsal margin rounded; flagellum subcylindrical, subcylindrical, funicle 6-segmented, segments clearly transverse, gradually increasing in width, F6 largest; linear sensilla absent from proximal funicle segments; clava 3-segmented, longer than pedicel and funicle combined, sutures oblique and entire, sensory area very enlarged giving apex a strong obliquely truncate appearance.

Mesoscutum without notaular lines; scutellum with longitudinally elongate sculpture that is conspicuously deeper than that of mesoscutum, apex with a very sparse tuft of setae; mid tibia without a subbasal external carina; fore wing (Fig. 1238) about 2.5X as long as broad, marginal vein about 4X as long as broad, slightly longer than stigmal vein, about 2X as long as postmarginal vein; submarginal vein with parastigma hardly widened and hardly downcurved; basal cell largely naked and with a smaller naked area below parastigma which is closed ventrally; linea calva entire; filum spinosum present, represented by about 5 modified setae; mesopleuron slightly expanded posteriorly, its posterior margin not quite reaching posterior margin of propodeum, falling short by a little more than diameter of spiracle; propodeum with about 12 silvery setae outside spiracle.

Gaster with hypopygium reaching about 0.6X along gaster, W-shaped (Fig. 1236) and about 1.5X as broad as long with a short posterior, median projection (mucro); last tergite about as long as mid tibia; ovipositor about 2X as long as mid tibia and quite strongly exserted; gonostylus free; paratergites absent.

Male. Length about 1.5-1.6mm.

Body generally dark brown with metallic areas; antenna mostly pale orange; legs with all coxae brown, otherwise pale orange with fore and hind femora marked brownish; wings completely hyaline; head about 2.5X as wide as frontovertex; antennal torulus separated from mouth margin by more than its own length; malar sulcus present; ocelli forming an angle of about 85°; frontovertex with moderately deep, punctate reticulate sculpture; antenna relatively high on head with torulus about level with lower eye margin; scape slightly broadened and flattened; funicle segments subequal and each at least about 2X as long as broad and clothed with whorls of long setae, the longest of which is slightly longer than diameter of segments; scutellum with elongate, polygonally reticulate sculpture that is arranged in whorls and conspicuously deeper than sculpture on mesoscutum; phallobase with digiti slender, each about 5X as long as broad, with a single apical hook, aedeagus slender, about half as long as mid tibia with apex rounded.

DISTRIBUTION. Southern Caribbean and Costa Rica.

HOSTS. Parasitoids of *Crypticerya* Cockerell (Hemiptera: Monophlebidae).

COMMENTS. *Iceromyia* is probably very close to *Homosemion* Annecke, both genera having the facial depression distinctly margined dorsally and laterally, similar antennal structure and contrast between sculpture of mesoscutum and scutellum, a weakly downcurved parastigma and similar wing venation with a naked, hyaline streak connecting postmarginal and stigmal veins. They also share the same host. Females of *Iceromyia* differ from those of *Homosemion* by lacking the distinct transfacial carina, above which is a shallow, smooth and shiny transverse depression containing a transverse band of silvery setae; the scape is not subtrapezoidal in shape as in *Homosemion*; the funicle segments are subcylindrical and not broadened and flattened, the hyaline area below the parastigma is completely enclosed ventrally and not open, and the apex of the fore wing is infuscate, without a subtriangular hyaline area, the subapical setae on the scutellum form a sparse tuft which is not present in *Homosemion* and the ovipositor is much more strongly exserted, the exserted part more than half as long as the mid tibia in *Iceromyia* whereas it is much less than half as long in *Homosemion*.

IDENTIFICATION. See Noyes, 1980.

Iceromyia flavifrons **Noyes**
(Figs 1234-1239; Hab. ♀ 179, ♂ 180)

Iceromyia flavifrons Noyes, 1980:205. Holotype ♀, Trinidad (WI), NHMUK, examined.

DIAGNOSIS. *Female* (overall length about 1.6-2.6mm): head generally pale yellow to pale orange with very weak brassy, blue and purple sheen; ocellar area often with a brown triangular mark from occipital margin to anterior ocellus and occasionally a short, brown band across top of scrobes; mouth margin dark brown, this darker area usually extending at least a little way up gena; antenna (Fig. 1237) with scape, pedicel and funicle pale orange, scape with ventral margin narrowly brown; clava dark brown; thorax mostly dark brown, but scutellum pale orange; mesoscutum with anterior half or so metallic blue laterally and purple medially and posteriorly, narrower posterior part metallic green; legs varying from completely pale orange to all coxae dark brown with brownish areas on all femora and tibiae; fore wing (Fig. 1238) infuscate; propodeum dark brown, side metallic green; gaster dark purple brown, basal tergites quite strongly coppery and metallic blue and green; gonostylus pale orange, apex brownish; head (Fig. 1234) about 6-7X as wide as frontovertex; ocelli forming an angle of about 40°; frontovertex slightly shiny with fine, shallow, polygonally-reticulate sculpture of cell diameter about 0.5X diameter of eye facet; interantennal prominence clearly separated from transfacial carina; antenna as in Fig. 1237; scape broadened and flattened, hardly more than 2X as long as broad; funicle segments strongly transverse, gradually increasing in width so that F6 is about 2X as wide as F1, linear sensilla only on F4-F6, sometimes absent from F4; clava clearly longer than pedicel and funicle combined, sutures oblique, sensory area extending about 0.7X along ventral surface of clava, apex strongly obliquely truncate; thorax with polygonally reticulate to imbricate-reticulate sculpture on pronotum, mesoscutum and axilla that is of similar depth and mesh size to sculpture in ocellar area; scutellum with similar sculpture to axilla, but conspicuously deeper; fore wing with venation and setation as in Figs 1238, 1239; hypopygium Fig. 1236; ovipositor (Fig. 1235) strongly exserted, the exserted part about 2X as long as mid tibial spur or more than 0.5X length mid tibia; gonostylus about 2.6X as long as mid tibia spur. *Male* (length about 1.4-1.6mm): head with ocellar area dark purple-brown with a slight coppery purple sheen; rest of head with a metallic green sheen; clava brownish; mesoscutum with a brassy sheen, weakly mixed green and purple; scutellum mostly with a weak coppery sheen, side and apex metallic green; side of propodeum metallic blue-green; antenna relatively high on head with torulus about level with lower eye margin; scape hardly more than 3X as long as broad.

DISTRIBUTION. Trinidad (WI), Honduras (**new record**), Costa Rica (**new record**).

HOSTS. Reared from *Crypticerya montserratensis* (Riley & Howard) (Hemiptera: Monophlebidae) on *Delonix regia* (Bojer) Raf. (Fabales: Fabaceae) (Noyes, 1980, see also below).

MATERIAL EXAMINED.

Type material. Holotype ♀: **TRINIDAD & TOBAGO**, **Trinidad**, ex *Icerya montserratensis*, C.I.E. 18981, iv.1963 (C.I.B.C.) "*Iceromyia flavifrons* gen et sp.n. det. J.S. Noyes 1979 Holotype" (NHMUK). Paratypes: 1♂, same data as holotype (NHMUK).

Non type material. **HONDURAS**, 13♀, 6♂, El Zamorano, ex *Icerya montserratensis* on *Delonix regia*, 28.vi.1988 (F.D. Bennett); **COSTA RICA**, 1♀, **Alajuela**, PN Arenal, Sendero Pilón, LN 453800 271500, 600m, T. Malaise, #58461, 6.viii-5.ix.2000 (G. Carballo); 1♀, **Heredia**, OTS La Selva, 3km S Puerto Viejo, iv-v.1993 (P. Hanson); 1♀, Heredia, OTS-La Selva, 10°26'N 84°01'W, ii.1994 (ALAS); 1♀, **Puntarenas**, Golfito, Est. Agujas, LS 526650 276750, 300m, canopy fog, #61183, 13.iii.2000 (J. Azofeifa). Material in MZUCR and NHMUK.

COMMENTS. The material from Costa Rica and Honduras differs from holotype of *flavifrons* in having the head orange with the ocellar area dark brown, all coxae dark brown and the femora and tibiae with distinct dark markings. In the holotype the head is very pale orange with only the mouth margin dark brown and the legs, including the coxae, are almost completely pale orange with only a weak subapical brown mark dorsally on the mid femur and a very faint subbasal brown band on the mid tibia.

Genus *HOMOSEMION* Annecke

Homosemion Annecke 1967:156-157. Type species: *Homosemion bennetti* Annecke, by original designation and monotypy.

Female. Overall length about 1.0-1.9mm.

Body not dorsoventrally flattened; fore wing generally infuscate with base, a small area below parastigma, area at apex of venation and apex hyaline, area near anal angle usually partially hyaline, main infuscate area not apically enclosed by a curved darker band; apex of postmarginal vein and stigmal vein connected by a hyaline streak.

Frontovertex less than 0.15X head width, with shallow, inconspicuous piliferous punctures; scrobal area delimited dorsally by a continuous frontofacial ridge above which is a shallow, smooth and shiny transverse depression that contains a transverse band of silvery setae that are more dense below eye; ocellar area with very shallow, indistinct polygonally reticulate sculpture, frontovertex elsewhere smooth but not shiny; each scrobal depression delimited dorsally by frontofacial ridge; mandible tridentate with two lower teeth acute and a slightly rounded truncate upper tooth; palp formula 4-3; antenna inserted near mouth; scape strongly broadened and flattened, subtrapezoidal, lamina apically rounded; upper margin of scape broadened but not overhanging the basal part of the flagellum; apically quite smooth not very shiny and not flattened; pedicel very nearly as wide as F1, subtriangular in profile, dorsal margin rounded; flagellum flattened from side to side, F1-F3 gradually increasing in width, F3-F6 hardly increasing in width, subequal in width, produced subequally dorsally and ventrally, much wider than long; clava 3-segmented, sutures entire, oblique, sensory area very enlarged giving apex a strong obliquely truncate appearance;

Mesoscutum with notaular lines sometimes visible anteriorly; fore wing with marginal vein about 4X as long as broad, about 2X as long as stigmal vein; postmarginal vein a little less than half as long as stigmal; submarginal vein with parastigma slightly widened and slightly downcurved; basal cell largely naked and with a smaller naked area below parastigma which is open ventrally; linea calva entire; filum spinosum present, represented by about 5 modified setae.

Gaster with hypopygium transverse, about 2.5X as broad as long, anteriorly bilaterally concave, posteriorly with a shallow to moderate median invagination; ovipositor at least 1.4X as long as mid tibia and quite strongly exserted; gonostylus free; paratergites absent.

Male. Unknown.

DISTRIBUTION. Southern Caribbean and Costa Rica.

HOSTS. Primary parasitoids of *Crypticerya* Cockerell (Hemiptera: Monophlebidae).

BIOCONTROL. *Homosemion bennetti* has been introduced into Barbados (see below).

COMMENTS. See comments under *Ammonoencyrtus* (p. 519) and *Iceromyia* (p. 496).

IDENTIFICATION. Only one species known, see Annecke (1967).

***Homosemion bennetti* Annecke**
(Figs 1240-1248; Hab. ♀ 181)

Homosemion bennetti Annecke, 1967:157-159. Holotype ♀, Trinidad (WI), USNM, not examined.

DIAGNOSIS. *Female* (length about 1.0-1.9mm): head generally orange with a weak metallic sheen; antenna (Figs 1240, 1244) with scape orange, ventral margin greyish brown, pedicel orange, funicle orange, sometimes brown dorsally or entirely dark brown, clava dark brown or basal segment of clava orange; thorax generally orange with a weak metallic sheen; legs mainly pale orange with small brown areas; fore wing (Figs 1245, 1247) mostly infuscate but hyaline towards base and at apex, venation pale orange, proximal part of parastigma and marginal vein brownish; hind wing hyaline; propodeum pale orange; gaster sometimes completely dark brown and distinctly metallic, but usually largely orange with a weak brassy sheen with weak purple and green reflections, Gt1-Gt3 dorsally dark brown with a mixed purple, coppery and brassy sheen. apex of syntergum and outer plate brown; gonostylus very pale orange, apex usually dark brown; head with interantennal prominence clearly separated from transfacial carina although sometimes virtually connected by a slender, carinate ridge; head (Fig. 1246) about 5.2-7.7X as wide as frontovertex; frontovertex about 3.8-5.4X as long as broad; ocelli forming an angle of about 40-50°; antenna as in Figs 1240, 1244; scape about 1.5X as long as broad; funicle segments gradually increasing in width, but F4-F6 subequal; linear sensilla on F5-F6, occasionally on F4; clava dorsally varying from slightly shorter than pedicel and funicle combined to sometimes slightly longer; thorax Fig. 1248; fore wing about 2.3X as long as broad, with venation and setation as in Figs 1241, 1245, 1247; costal cell with 1 to 4 setae dorsally at apex; mid tibial spur about as long as basitarsus; gaster with hypopygium (Fig. 1242) reaching about 0.33X towards apex; syntergum about 0.8-0.9X as long as mid tibia, with apex truncate or broadly rounded; ovipositor (Fig. 1243) clearly exserted, the exserted part varying from about 0.7X as long as mid tibial spur to a little longer, or about 0.25X length mid tibia; ovipositor varying from 1.4-1.8X as long as mid tibia or 2.8-3.3X as long as gonostylus; gonostylus about 1.3-1.8X as long as mid tibial spur. *Male*: unknown.

DISTRIBUTION. Trinidad (WI), Costa Rica (**new record**).

HOSTS. Reared in Trinidad from *Crypticerya montserratensis* (Riley & Howard) (Hemiptera: Monophlebidae) on *Tamarix* Linnaeus (Caryophyllales: Tamaricaceae) (Annecke, 1967, see also below).

BIOCONTROL. *Homosemion bennetti* was introduced into Barbados in 1961 for the control of *Icerya purchasi* Maskell (Hemiptera: Monophlebidae) (as *Anicetus* sp.) but the results of introduction are unknown (see Cock, 1985; Trjapitzin et al. 2004).

MATERIAL EXAMINED.

Type material. Paratypes: TRINIDAD & TOBAGO, 2♀, Trinidad, ex *Icerya montserratensis*, C.I.E. 18981, iv.1963 (C.I.B.C.). Material in BMNH.

Non type material. **TRINIDAD & TOBAGO**, 3♀, **Trinidad**, Balandra, ex *Icerya montserratensis*, x.1955 (F.D. Bennett); 18♀, Balandra, ex *Icerya montserratensis* on *Tamarix*, x.1979 (F.D. Bennett); 23♀, Balandra, ex *Icerya montserratensis*, vii.1981 (F.D. Bennett); **COSTA RICA**, 9♀, **Guanacaste**, Santa Rosa NP, various localities and dates, 1.vi.1985-6.vi.1987 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, Est. Pitilla (ACG) 700m, 10°59'N 85°25'W, 4-7.i.2001 (C. Moraga, P.N. Thomas); 1♀, **Puntarenas**, San Vito, Las Cruces, Wilson Bot. Gdns, 1500m, 18-22.iii.1990 (J.S. Noyes); 1♀, Puntarenas, Pen. Osa, Puerto Jimenez,

8°32'N 83°19'W, 10m, xi,1991 (P. Hanson); 1♀, Puntarenas, Est. Agujas, C. Quebraditos, LS 521400 274300, 782m, #61700, 20.ii-15.iii.2001 (J. Azofeifa); 1♀, **Limón**, RB Hitoy Cerere, Valle de la Estrella, Send. Toma de Agua, LN 184300 643500, 140m, #54234, 8.v.1999 (F. Umaña); 1♀, Limón, RB Hitoy-Cerere, Est. Hitoy-Cerere, Send. Toma de Agua, LN 184600 643400, 140m, #53497, 17.ix-10.x.1999 (F. Umaña). Material in MZUCR and BMNH.

COMMENTS. The material included above may represent more than one species. The majority of specimens from Costa Rica (Guanacaste) agree well with topotypical material from Trinidad, but specimens from Puntarenas and Limón Provinces are generally darker and have a relatively slightly longer antennal clava, ovipositor and mid tibial spur. These differences are very minor and not entirely consistent and therefore I am treating all specimens as a single, variable species pending reassessment based on more material.

Genus *EUSEMION* Dahlbom

Eusemion Dahlbom 1857:293. Type species: *Encyrtus corniger* Walker, by subsequent monotypy (Thomson, 1876:154).

Female. Length about 0.9-2.0mm.

Body orange-brown to dark brown and metallic; mesoscutum and scutellum usually dark blue or purple; head variously dark metallic blue, purple, and green; forewing (Figs 1253, 1255) infuscate with apex hyaline, apices of postmarginal vein and stigmal vein connected by a naked, hyaline streak or sometimes only a paler streak.

Head with setigerous punctures on frontovertex shallow and inconspicuous or well-defined and about the diameter of an ocellus; facial depression delimited dorsally by a curved, non-carinate, sometimes weak, frontofacial ridge (Fig. 1260); antennal scrobes semicircular, sharply margined by a carina dorsally; torulus about equidistant from mouth margin and lower margin of eye; scape very broad and flattened, subtrapezoidal in shape; pedicel subtriangular in profile at least about as wide as F1, dorsally convexly rounded; funicle segments, very transverse, relatively broad and slightly flattened, hence very broadly oval in cross-section; club 3-segmented, a little longer than funicle, sensory area extending about half way along ventral surface forming an oblique apical truncation; malar suture absent; mandible tridentate, the upper tooth apically less acute than the 2 ventral teeth; palp formula 4-3.

Fore wing with parastigma at least slightly swollen, sometimes distinctly expanded and triangular, marginal vein about 4X as long as broad, about 2X as long as stigmal vein and 3X as long as postmarginal vein; filum spinosum present; composed of about 2-4 modified setae; thorax in profile with propodeum narrowly in contact with hind coxa, dorsally with mesoscutum and scutellum quite flat; mesoscutum without notaular lines; mesopleuron not quite reaching level with posterior margin of propodeum, falling short by about diameter of propodeal spiracle.

Gaster a little longer than thorax; syntergum about as long as middle tibia; hypopygium reaching about halfway along gaster, slightly more than 2X as wide as long; paratergites absent; ovipositor hardly exserted; gonostylus free.

Male. Length about 1mm.

Generally very similar to female apart from structure of head, antenna and genitalia; fore wing infuscate as in female and with similar setation; head about 2X as wide as frontovertex; sculpture of frontovertex rather coarse polygonally reticulate; piliferous punctures relatively few, shallow and indistinct; scape hardly broadened, about 3X as long as broad; funicle segments subcylindrical, each at least 2X as long as broad, clothed with whorls of long setae, the longest of which is about 3X as long as diameter of segment; clava entire, slightly shorter than F5-F6 combined.

DISTRIBUTION. Holarctic, central America.

HOSTS. Secondary parasitoids of various scale insects, mainly soft scales (Hemiptera: Coccidae),

but also mealybugs, kermesids, eriococcids and armoured scales (Hemiptera: Pseudococcidae, Kermesidae, Eriococcidae, Diaspididae) via encyrtid (Hymenoptera: Encyrtidae) primary parasitoids (e.g. *Blastothrix* Mayr, *Trichomasthus* Thomson, *Metaphycus* Mercet) (see Peck, 1963; Trjapitzin, 1989).

COMMENTS. The diagnostic features of *Eusemion* have been expanded a little to accommodate *Eusemion monos* **sp.nov.** which may be a little out of place in the genus. This species has a very distinct triangular expansion of the parastigma and lacks deep setigerous punctures on the frontovertex and the proximal funicle segments are much less transverse than in *cornigerum*, *longipennis* and *themisto*. The three other named species certainly belong to *Eusemion* but lack a triangular expansion of the parastigma and have deep, distinct setigerous punctures on the frontovertex. At this time, these differences are probably not enough to warrant separate generic status without a full phylogenetic analysis of the group.

IDENTIFICATION. Previously, only two species known which may be synonymous: *Eusemion cornigerum* (Walker, 1838) (see Annecke, 1967; Trjapitzin, 1989) from the Palaearctic and *Eusemion longipennis* (Ashmead, 1888) (see Peck, 1963) from the Nearctic.

Key to Costa Rican species of *Eusemion*
(Females)

1. Body generally dull metallic green; frontovertex about one-third head width with piliferous punctures shallow, relatively indistinct and generally separated by more than their own diameters; ocelli forming an angle of about 90°; fore wing (Fig. 1253) with parastigma clearly downcurved and swollen, triangular ..... *monos* **sp.nov.** (p. 500)
- Body largely orange-brown with a slight metallic sheen, frontovertex usually with a relatively strong metallic green and purple sheen; frontovertex (Fig. 1260) less than one-quarter head width with piliferous punctures conspicuous, generally separated by less than their own diameters giving it an appearance like the surface of a thimble; ocelli forming an angle of less than 60°; fore wing (Fig. 1255) with parastigma not downcurved and hardly swollen ..... *themisto* **sp.nov.** (p. 502)

***Eusemion monos* sp.nov.**
(Figs 1249-1254; Hab. ♀ 182)

DIAGNOSIS. *Female* (length about 1.4-2.0mm): body generally dull metallic green; legs generally dark brown; frontovertex about one-third head width; piliferous punctures shallow and separated by more than their own diameters; ocelli forming an angle of about 90°; scrobes not sharply margined below eyes; antenna (Fig. 1252) with funicle segments gradually increasing in width distad; linear sensilla present only on F6; fore wing (Fig. 1253) with basal cell largely hyaline, parastigma downcurved and swollen, with a triangular expansion; mid tibial spur very slightly shorter than basitarsus. *Male*: Unknown.

Female (holotype): length, including ovipositor, 1.56mm; excluding ovipositor, 1.50mm (CPD).

Head dark brown to black with a distinct metallic sheen; occipital margin with a purple sheen, frontovertex otherwise with a metallic dark blue sheen with some purple reflections, anterior part immediately above scrobes and between eye and scrobes with a distinct violet sheen; temple and upper gena with a mixed metallic purple, green and blue sheen; lower gena with a weaker brassy and coppery purple sheen; scrobes with a metallic green and slightly coppery sheen, interantennal prominence and mouth margin similar but duller and more conspicuously mixed coppery; frontovertex with moderately conspicuous, scattered brown setae, also a line along inner eye margin, anterior setae slightly translucent; setae on gena and interantennal prominence brown; maxillary palpus very pale orange; antenna (Fig. 1252) dark brown with a weak brassy and purple sheen; thorax dark brown to black; pronotum mainly with a relatively dull, dark green, brassy

and coppery sheen, posterior margin coppery purple; mesoscutum with a moderate, mixed, olive-green and blue-green sheen; axilla with a weak, mixed, dark blue and coppery purple sheen; scutellum mostly with a dark blue sheen, mixed with some olive-green and coppery reflections; mesopleuron with a weak coppery purple and brassy sheen, weakly mixed blue dorsally; fore leg mostly dark brown, with tarsus orange-brown, apical tarsomere brown; mid leg dark brown with spur and tarsus orange, apical tarsomere brown; hind leg dark brown with tarsus orange, apical tarsomere brown; fore wing (Fig. 1253) mostly infuscate, paler proximally and hyaline at apex, widest part of apical hyaline area about 0.3X as wide as maximum wing width, venation mainly pale dusky orange, marginal vein dark brown; propodeum dark brown with a weak brassy and purple sheen, side mostly brassy and metallic green mixed with some copper; gaster dark brown, dorsally mostly with a weak sheen, sides and venter with a moderate, mixed brassy, copper and green sheen; gonostylus dark brown, extreme apex pale orange.

Head about 2.9X as wide as frontovertex, in profile about 1.4X as high as deep with frontovertex evenly, slightly convex between occipital margin and top of scrobes, abruptly bent at about 90° at top of scrobes and virtually straight from there to mouth margin with interantennal prominence hardly protuberant; occipital margin sharp, weakly carinate; a very slender, elongately oval depression alongside eye margin slightly behind posterior ocellus; ocelli forming an angle of about 90°; frontovertex slightly shiny, with moderately deep, imbricate reticulate to polygonally reticulate sculpture of mesh size subequal to eye facet, sculpture more transversely elongate between posterior ocelli and occipital margin; frontovertex virtually smooth immediately above scrobes and below eye; temple and gena with relatively shallow, coarse, longitudinally elongate imbricate-reticulate sculpture; scrobes with shallow, polygonally reticulate sculpture; interantennal prominence with similar sculpture to scrobes but slightly deeper; narrowest point between eye and transfacial ridge hardly wider than diameter of anterior ocellus; scrobes moderately deep, broadly ∩-shaped, not sharply margined below eyes; interantennal prominence dorsally rounded; antenna as in Fig. 1252; scape about 2X as long as broad, dorsal margin weakly convex; clava enlarged, about 1.3X as wide as F6 and slightly longer than pedicel and funicle combined, sutures oblique, sensory area enlarged about 0.6X as long as clava, apex obliquely truncate; eye reaching occipital margin, clothed in conspicuous setae, each about as long as diameter of facet; clypeal margin slightly concave medially; mandible with 3 acute teeth. Relative measurements: HW 70.5, HH 56, FVL 41, FV 24, POL 11, OOL 3.5, OCL 5, AOL 7, EL 38.5, EW 30.5, MS 30, SL 38.5, SW 19.

Thorax (Fig. 1254) with pronotum hardly exposed behind head, about 0.5X as long as mesoscutum; pronotum, mesoscutum, axilla and scutellum with polygonally reticulate sculpture that is generally slightly deeper and of larger mesh than that on frontovertex; visible part of mesoscutum about 2.1X as broad as long; scutellum about 1.1X as broad as long; mid tibial spur slightly shorter than basitarsus; hind femur about 4.5X as long as broad; fore wing with venation and setation as in Figs 1250, 1253; costal cell with a line of about 8 or 9 setae dorsally in apical one-third; parastigma downcurved and slightly widened and broadly triangular proximally; propodeum (Fig. 1254) medially about 0.15X as long as scutellum and with some longitudinal carinae medially, otherwise with shallow, irregular, polygonally reticulate sculpture, about 13 fairly conspicuous setae outside spiracle. Relative measurements: FWL 80, FWW 35; HWL 59.5, HWW 17.5.

Gaster with hypopygium reaching about 0.4X to apex; last tergite about 1.1X as long as mid tibia, with apex acute; ovipositor slightly exserted, the exserted part about 0.25X length of mid tibial spur or about 0.1X mid tibia.

Paratype. Funicle with linear sensilla present only on F6; hypopygium Fig. 1249; ovipositor Fig. 1251. Relative measurements: OL 117.5, GL 33 [MT 67].

Variation. Females vary in length from 1.35-1.97mm, otherwise very little variation noted in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica, higher elevations.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Cerro de la Muerte, Est. Biol. Cuerici, 2600m, xi.1999 (P. Hanson). Paratypes: **COSTA RICA**, 8♀, **San José**, Cerro de la Muerte, 20km S. Empalme, 2800m, ii-iii.1989, ii-iv.1989, iii-iv.1989 and vi-vii.1989 (P. Hanson); 1♀, San José, Cerro de la Muerte, 19km S, 3km W. Empalme, 2600m, 9°39'N 83°52'W, iv-vii.1992 (P. Hanson, C. Godoy); 3♀, San José, Cerro de la Muerte, 6km N San Gerardo, 2800m, ix.1993 and x.1993 (P. Hanson); 5♀, San José, Cerro de la Muerte, Est. Biol. Cuerici, 9°32'N 83°42'W, 2600m, xi.1999, xii.1999 and i.2000 (P. Hanson); 4♀, **Cartago**, 20km S. El Empalme, ix-x.1989 and x-xi.1989 (P. Hanson). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

COMMENTS. This species may be out of place in *Eusemion* (see comments above).

Eusemion themisto **sp.nov.**

(Figs 1255-1261; Hab. ♀ 183)

DIAGNOSIS. *Female* (length about 1.0-1.7mm): body orange-brown with a slight metallic sheen; frontovertex metallic green and purple; legs generally pale orange; frontovertex (Fig. 1260) one-quarter to one-fifth head width; piliferous punctures conspicuous and separated by less than their own diameters; ocelli forming an angle of about 60°; scrobes sharply margined below eyes; funicle segments (Fig. 1261) subequal in width from F2-F6; linear sensilla present on F5 and F6; fore wing (Fig. 1255) with basal cell uniformly infuscate, parastigma not downcurved and not swollen; mid tibial spur slightly longer than basitarsus. *Male*: Unknown.

Female (holotype): length, including ovipositor, 1.52mm; excluding ovipositor, 1.46mm (CPD).

Body generally pale orange-brown; frontovertex with a distinct purple sheen along occipital margin, in ocellar area and above scrobes, otherwise metallic green to blue-green; area between eye and scrobe weakly coppery, purple and brassy; temple with a slight coppery, brassy and bluish sheen; gena with a very weak brassy sheen; scrobes and interantennal prominence with a weak brassy sheen; a brown band between lower margins of toruli; pronotum with a weak coppery, purple and brassy lustre; mesoscutum and scutellum with weak purple and dark blue lustre; axilla with a weak purple and brassy lustre; mesopleuron with a weak brassy and purple lustre; legs, including coxae, generally pale orange, hind tibia with an orange-brown band in middle two-thirds; fore wing (Fig. 1255) mostly infuscate, hyaline at apex, widest part of apical hyaline area a little less than 0.2X as wide as maximum wing width, venation mainly pale dusky orange, marginal vein orange-brown; propodeum with a weak brassy and purple sheen; gaster dorsally with a slight brassy sheen, basal tergites mixed brown and with purple and green reflections, syntergum pale orange, slightly dusky along margins, side and venter of gaster with brassy, green, coppery and purple reflections; gonostylus pale orange.

Head (Fig. 1260) about 4.7X as wide as frontovertex, in profile about 1.5X as high as deep with frontovertex evenly, slightly convex between occipital margin and top of scrobes, abruptly bent at about 90° at top of scrobes and virtually straight from there to mouth margin with interantennal prominence hardly protuberant; occipital margin sharp, weakly carinate; a broadly oval, elongate, shiny-bottomed, depression adjacent to eye margin alongside, and slightly behind, posterior ocellus; ocelli forming an angle of about 50°; frontovertex quite shiny, with moderately deep, polygonally reticulate sculpture of mesh size smaller to eye facet, this obscured by deep, shiny-bottomed piliferous punctures that are mostly separated by less than their own diameters giving the surface of the frontovertex the appearance of a thimble or golf ball; frontovertex virtually smooth immediately above scrobes and between eye and scrobe; temple and gena with moderately deep, conspicuous, longitudinally elongate imbricate-reticulate to striate-reticulate sculpture; scrobes with shallow, polygonally reticulate sculpture; interantennal prominence with similar sculpture to scrobes but slightly deeper; narrowest point between eye and transfacial ridge slightly narrower than diameter of anterior ocellus; scrobes moderately deep, sharply margined below eyes, broadly ∩-shaped; interantennal prominence dorsally rounded; antenna as in Fig. 1261; scape about 1.8X as long as broad, subtrapezoidal in appearance with dorsal margin angular a little below middle; clava enlarged, only slightly wider than F6, but only very slightly shorter than pedicel and funicle

combined, sutures oblique, sensory area enlarged about 0.7X as long as clava, apex obliquely truncate; eye reaching occipital margin, clothed in fairly conspicuous setae, each slightly shorter than diameter of facet; clypeal margin slightly concave medially; mandible with 3 acute teeth. Relative measurements: HW 68, HH 60, FVL 47, FV 14.5, POL 6.5, OOL 1.5, OCL 5, AOL 9, EL 46.5, EW 36, MS 28, SL 43, SW 24.

Thorax (Fig. 1258) with pronotum hardly exposed behind head, about 0.5X as long as mesoscutum; pronotum, mesoscutum, axilla and scutellum with polygonally reticulate sculpture that is generally shallower, but of larger mesh than that on frontovertex; visible part of mesoscutum about 2.3X as broad as long; scutellum about as broad as long; hind femur about 4X as long as broad; fore wing with venation and setation as in Figs 1255, 1257; costal cell with a line of 5 setae dorsally in apical one-third; parastigma without a triangular expansion; propodeum medially about 0.15X as long as scutellum and with a few longitudinal carinae medially, otherwise virtually smooth, about 5 fairly conspicuous setae outside spiracle. Relative measurements: FWL 60.5, FWW 26.5; HWL 48, HWW 13.

Gaster with hypopygium reaching about 0.6X to apex; last tergite about as long as mid tibia, with apex acute; ovipositor slightly exserted, the exserted part about 0.4X length of mid tibial spur or about 0.15X mid tibia.

Paratype. Funicle with linear sensilla present only on F5-F6; hypopygium Fig. 1259; ovipositor Fig. 1256. Relative measurements: OL 103, GL 29 [MT 73.5].

Variation. Females vary in length from 1.00-1.68mm, the head varies from about 4.1-4.8X as wide as the frontovertex, otherwise very little variation noted in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica, middle elevations.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Macizo Miravalles, Est. Cabro Muco, LN 299769 411243, 1100m, #73635, iii.2003 (J. Azofeifa). Paratypes: **COSTA RICA**, 2♀, **Guanacaste**, Macizo Miravalles, Est. Cabro Muco, LN 299769 411243, 1100m, 18-24.iii.2003 and iii.2003 (J. Azofeifa); 3♀, **Alajuela**, PN Arenal, Sect. La Peninsula, LN 453800 271500, 600m, T. Amarilla, #56556, 17.vi.2000 (G. Carballo); 1♀, **Heredia**, Santo Domingo, INBio, cafetal, 6-7.iii.1996 (Masner); 1♀, Heredia, Santo Domingo, INBio, 1100m, YPT (compost), 6-7.iii.1996 (L. Masner); 1♀, **Puntarenas**, Monteverde, St. Luis Valley, 1400m, 17.viii.1986 (L. Masner). Holotype in MZUCR, paratypes in MZUCR, NHMUK and CNC.

COMMENTS. *Eusemion themisto* is very similar to *cornigerum* (Walker) but differs in having the apical hyaline area of the fore wing narrower, at its widest point about 0.17X (one-sixth) maximum wing width and the body, including the legs, generally orange-brown. In *cornigerum* the apical hyaline area about 0.33X (one-third) as wide as the maximum wing width and the body, is dark brown with a distinct metallic sheen with the legs mostly dark brown.

I have examined the remains of the holotype of *Mira longipennis* (USNM: "Jacksonville Fla" "Type No 4764 U.S.N.M." (red label) "Eusemion (Mira) longipennis ♀ Type Ashm."), but unfortunately most is missing. It is represented only by the basal two-thirds of left fore wing, flagellum with clava partially eaten by psocids (Psocoptera), fore tibia and tarsus, mid femur and tibia, hind femur and tibia and the hind tibia. In his original description of *longipennis*, Ashmead (1888) stated that the body was dark blue, the gena red and the legs mostly black with the tarsi brown. He also noted that the distal apex of the scape projected as a sharp point to one side, a condition that is often seen in European specimens of *cornigerum*. The parts of the holotype that remain agree with *cornigerum* and, together with the original description, strongly suggest that *longipennis* and *cornigerum* are the same species. *Eusemion cornigerum* certainly occurs in North America but it would be necessary to compare freshly collected material from Jacksonville, Florida with the remains of the holotype to be sure of the synonymy.

Genus *ANICETUS* Howard

Anicetus Howard in Howard & Ashmead, 1896:639. Type species: *Anicetus ceylonensis* Howard, by monotypy.

Asteropaeus Howard, 1898:231.Type species*: Asteropaeus primus* Howard, by monotypy. Synonymy with *Anicetus* by Peck (1951:500).

Habrolepopterygis Girault, 1915a:86. Type species: *Habrolepopterygis felix* Girault, by monotypy. Synonymy with *Anicetus* by Girault (1916b:302).

Paraceraptrocerus Girault, 1920b:184. Type species: *Paraceraptrocerus africanus* Girault, by original designation. Synonymy with *Anicetus* by Trjapitzin (1989:302).

Krishneriella Mani, 1935:421. Type species: *Krishneriella ceroplastodis* Mani, by monotypy. Synonymy with *Anicetus* by Hayat (1976:49).

Female. Overall length about 0.8-1.90mm (up to 2.7mm in extralimital species).

Body not dorsoventrally flattened; generally pale orange to dark brown, sometimes metallic in darker species; fore wing infuscate, hyaline at apex and usually also at base, infuscate area enclosed subapically by a characteristic curved, more strongly infuscate band.

Head without conspicuous, setigerous punctures on frontovertex; scrobal area delimited dorsally by a strong, slightly curved, transfacial carina; dorsal surface of transfacial carina without a band of dense setae; scrobes relatively broad and shallow, meeting dorsally; mandible, in Costa Rica species, with three teeth, upper tooth apically rounded or transversely truncate, extralimital species may have the middle tooth broadly rounded or truncate or only one tooth and a broad truncation; palp formula 4-3; antenna inserted near mouth; antennal scape strongly broadened and flattened, subrhomboidal or subtriangular in profile; upper margin of scape angular about half way along its length, its distal margin often dorsally flattened and shiny; upper margin of pedicel often flattened and shiny, sometimes polished; pedicel mostly strongly ventrally produced, enclosing F1; pedicel and flagellum strongly flattened; funicle 6-segmented, segments transverse, mostly strongly so, at least some segments with a strong ventral projection; clava 3-segmented, in Costa Rica species at least as long as pedicel and funicle combined, but in many extralimital species clava much shorter than funicle, sutures sometimes only partial, sensory area greatly enlarged, so that clava has a strong, oblique apical truncation.

Mesoscutum, in many species with a line of scattered pore-like structures along the mid-line (Fig. 1292); fore wing about 2.3-2.7X as long broad, postmarginal and stigmal veins more or less connected by a naked, hyaline streak; marginal vein at least 1.5X as long as broad, mostly at least 3X as long broad, postmarginal and stigmal veins well developed; apex of postmarginal vein delimited by a single relatively long setae; basal cell usually with a large area devoid of setae with area below parastigma and marginal vein naked, extralimital species may have basal cell entirely setose; filum spinosum present.

Gaster about as long as thorax, apex of syntergum rounded; hypopygium at least about 2X as broad as long, often strap-like; paratergites absent; ovipositor varying from hidden to strongly exserted, gonostylus free, varying from about as long as mid tibial spur to more than 4X as long in some extralimital species.

Male. Length about 0.6-1.5mm.

Head subtriangular in profile with vertex flat; frontovertex with polygonally reticulate sculpture; antenna inserted high on head, a little above lowest eye margin; scape slightly broadened and flattened, all funicle segments longer than broad, subcylindrical and clothed with whorls of long setae, the longest of which are at least 2-3X as long as diameter of segments; clava entire, but sometimes appearing two-segmented because of a median constriction; fore wing about 2.3-2.5X as long as broad, hyaline; venation similar to female but marginal vein often less than 2X as long as wide; phallobase with a single apical hook on each digitus, aedeagus slender, apically acute.

DISTRIBUTION. Cosmopolitan except higher latitudes.

HOSTS. Species of the genus have been recorded as primary parasitoids of soft scales (Hemiptera:

Coccidae), especially of the genera *Ceroplastes* Gray**,** *Pulvinaria* Targioni Tozzetti and *Saissetia* Deplanche (Noyes, 2019). Records from Diaspididae (Hemiptera) require confirmation.

BIOCONTROL. To date, eight named species of *Anicetus* have been utilised in classical biocontrol programmes aimed at various soft scale insects (Hemiptera: Coccidae) in different parts of the world. Most of these introductions were unsuccessful because the parasitoid was not released or did not become established. *Anicetus ceroplastis* Ishii and *beneficus* Ishii & Yasumatsu were introduced into Israel from Japan in about 1960 for the control of *Ceroplastes floridensis* Comstock but did not establish (Rivnay, 1968) and in about 1980 *Anicetus dodonia* Ferrière was imported into Israel for the control of the same scale, but was not released (Argov & Rössler, 1988). *Anicetus beneficus* and *ohgushii* Tachikawa were imported into the former USSR for the control of *Ceroplastes sinensis* Del Guercio sometime prior to 1988 but were not released (Izhevsky, 1988). *Anicetus annulatus* Timberlake was released in California (USA) from Japan for the control of *Eucalymnatus tessellatus* (Signoret) (Smith, 1923), and again in about 1951 and 1981 for the control of *Coccus pseudomagnoliarum* (Kuwana) and *Saissetia oleae* (Olivier), but these control attempts failed (Bartlett in Clausen, 1978; Kennett, 1988). *Anicetus parvus* Compere was imported into Australia in 1935 from Africa for the control of *Gascardia destructor* Newstead, but was not released (Wilson, 1960). However, *Anicetus communis* Annecke and *nyassicus* (Compere) from South Africa were released in Australia between 1968 and 1974 for the control of the same scale and have been attributed with at least partial control of the pest (Sands et al., 1986). The most important species of the genus to be used in biocontrol programmes has been *Anicetus beneficus*. This species has been used successfully for the control of *Ceroplastes rubens* Maskell since 1946 in Japan (Yasumatsu, 1958; Takagi, 2002) and was introduced from there to Australia in 1955 and 1977 (Smith, 1986) and South Korea in 1975 (Choi & Lee, 1989) where it successfully controls the pest. More recently, it was released in Papua New Guinea from Japan in 2002 and has become successfully established (Krull & Basedow, 2005).

COMMENTS. *Anicetus* belongs to group of largely unrelated genera where the females are structurally similar, all having a strongly flattened scape, strongly broadened or flattened flagellum and strongly infuscate fore wings. The majority of these genera have been delimited and defined by Annecke (1967) in his excellent study of the group. *Anicetus* can be distinguished from these and other similar genera by having the unique combination of a strong transfacial carina clearly separating the interantennal prominence from the frontovertex, a strongly flattened scape and flagellum and the main infuscate area of the fore wing delimited distally by a curved, darker band followed by a hyaline area. See also comments under *Ammonoencyrtus* (p. 519).

IDENTIFICATION. Worldwide about 60 species known. See Annecke, 1967 (World species of *Anicetus* and *Paraceraptrocerus*), Trjapitzin & Ruiz Cancino, 2009 (New World) and Trjapitzin, 2010a (New World, Hawaii, Australia); also Prinsloo & Mynhardt, 1981 (Afrotropical species), Hayat, 2006 (India), Sugonjaev, 2005 (Vietnam), Sharkov, 1988 (Palaearctic), Xu & Li, 1991 (China) and Xu & He, 1997 (China).

Key to Costa Rican species of *Anicetus*
(Females)

1. Pedicel (Fig. 1262) almost symmetrical in profile, subtriangular without a conspicuous, elongate ventral projection; hind tibia pale yellow with a pair of conspicuous dark brown rings ..... *annulatus* Timberlake (p. 506)
- Pedicel (Figs 1268, 1274-1279, 1295, 1300) strongly asymmetric in profile with dorsal margin straight and ventral margin conspicuously elongate; hind tibia orange to dark brown, occasionally orange with a pair of broad dark brown rings 2

2 (1) Frontovertex (Fig. 1269) throughout with distinct punctate-reticulate sculpture of cell size slightly smaller than diameter of eye facet; funicle (Fig. 1268) not longer than first segment of clava (measured dorsally) 3

- Frontovertex mostly smooth and shiny, with very shallow sculpture only in ocellar area; funicle (Figs 1274-1279, 1295, 1300) longer than first segment of clava 4

3 (2) Ovipositor clearly exserted (Hab. 186), exserted part about 1.3X as long as mid tibial spur ..... *arche* **sp.nov.** (p. 508)
- Ovipositor hardly exserted, the exserted part not more than half as long as mid tibial spur ..... *oroso* **sp.nov.** (p. 510)

4 (2) Ovipositor not exserted or hardly so with exserted part not more than 0.7X as long as mid tibial spur (Hab. 187, 188)..... *lysithea* **sp.nov.** (p. 511)
- Ovipositor strongly exserted (Hab. 189), the exserted part at least as long as mid tibial spur 5

5 (3) Scape (Fig. 1295) relatively broad, at most 1.4X as long as broad [length measured from base to distal margin of ventral lamina; width from dorsal margin in distal half of scape to ventral margin of lamina]; clava less than 2X as long as broad .... *cheras* **sp.nov.** (p. 515)
- Scape narrow, at least about 1.6X as long as broad; clava more than 2X as long as broad ..... *apatos* **sp.nov.** (p. 517)

***Anicetus annulatus* Timberlake**
(Figs 1262-1266; Hab. ♀ 184, ♂ 185)

Anicetus annulatus Timberlake, 1919:227-231. Holotype ♀, Hawaii, BPBM, not examined.
Anicetus eous Trjapitzin, 1965:901-902. Holotype ♀, USSR (Primorsky Kray), ZISP, not examined. Synonymy with *annulatus* by Japoshvili, et al. (2016:354).
Anicetus annulipes; Bouček, 1977:68. Lapsus for *annulatus* Timberlake.

DIAGNOSIS. *Female* (length about 0.7-1.4mm): head generally pale orange with a weak brassy sheen; a transverse, brown band level with toruli, this distinctly Λ-shaped between toruli; antenna (Fig. 1262) with scape pale orange with lower margin dark narrowly brown; pedicel and flagellum generally pale orange, middle segment of clava dusky; thorax orange, mesoscutum with a very weak pale blue and purple sheen; legs mainly pale yellow, but hind tibia with a pair of dark brown rings and hind tarsus with distal part of basitarsus and apical tarsomere brown; fore wing (Fig. 2365) mostly infuscate but hyaline towards base and at apex; gaster mostly pale orange but dorsally with Gt1 dark brown with a slight purple, coppery and green sheen, and Gt2-Gt4 dusky; gonostylus pale orange; head about 2.6-3.9X as wide as frontovertex, relatively much narrower in larger specimens, in profile about as high as deep; ocelli forming an angle of about 50°; frontovertex mostly completely smooth and shiny; eye clothed with fairly conspicuous translucent setae; antenna as in Fig. 1262; scape subtrapezoidal, about 1.5X as long as broad, with proximal part of dorsal margin about 2.3X as long as distal part, proximal part of ventral margin about 1.7X as long as distal part, dorsal margin of scape distally weakly convex, with very shallow sculpture; pedicel symmetrical in profile, without an elongate ventral process, dorsally weakly convex, with very shallow sculpture; funicle segments gradually increasing in width distally; clava about 1.2X as long as pedicel and funicle combined, sutures strongly oblique, sensory area about 2.2-2.5X as long as ventral margin, apex strongly obliquely truncate; mandible with two acute teeth and an upper truncate tooth; mesoscutum without scattered pores along midline or near posterolateral margin; fore wing about 2.7X as long as broad, with venation and setation as in Figs 1263, 1265; ovipositor not exserted and about 0.9-1.0X as long as mid tibia; anterolateral projections on hypopygium (Fig. 1266) about one-third its overall length. *Male* (length about 0.6-1.0mm): head mainly orange but scrobal area brown; scape and pedicel brown, flagellum slightly dusky pale orange; thorax dark brown, dorsally almost black; legs mostly pale orange, but hind femur distally dark brown and hind tibia with a pair of brown rings, these often joined, hind basitarsus and terminal segment mostly brown; wings hyaline (Fig. 1264); gaster dark brown; head subtriangular in profile with vertex flat; antenna inserted high on head, a little above lowest eye margin; scape

slightly broadened and flattened, about 3X as long as broad; all funicle segments a little more than 2X as long as broad and clothed with whorls of long setae, the longest of which are at least about 3X as long as diameter of segments; clava entire, but appearing two-segmented because of a median constriction; fore wing about 2.3X as long as broad, venation and setation as in Fig. 1265; phallobase with a single apical hook on each digitus, aedeagus slender, apically acute and about 0.7X as long as mid tibia.

DISTRIBUTION. Virtually cosmopolitan except for higher latitudes (see Noyes, 2019); recorded below from USA (Hawaii, Florida **new record**), St Vincent (**new record**), Trinidad & Tobago (**new record**), Costa Rica (**new record**), India, China, Japan and Australia.

HOSTS. Recorded as a primary parasitoid of a variety of soft scale insects (Homoptera: Coccidae) belonging to the following genera: *Ceroplastes* Gray, *Coccus* Linnaeus, *Eucalymnatus* Cockerell, *Lecanium* Burmeister, *Pulvinaria* Targioni Tozzetti and *Saissetia* Deplanche (see Noyes, 2019). It has also been recorded as a parasitoid of *Aonidiella citrina* (Coquillett), *Lopholeucaspis japonica* (Cockerell) and *Unaspis yanonensis* (Kuwana) (Homoptera: Diaspididae) but these records require confirmation (see Noyes, 2019). Recorded below from *Coccus viridis* (Green) on *Citrus sinensis* L. (Sapindales: Rutaceae) and *Psidium guajava* L. (Myrtales: Myrtaceae), and from *Eucalymnatus tessellatus* (Signoret) on *Ilex cassine* L. (Aquifoliales: Aquifoliaceae).

BIOCONTROL. This species was introduced into California (USA) from Japan in about 1923 for the control of *Eucalymnatus tessellatus* (Signoret) (Hemiptera: Coccidae) (Smith, 1923), but the result of the introduction is unknown. It was imported again into California from Japan in about 1951 and 1981 for the control of *Coccus pseudomagnoliarum* (Kuwana) and *Saissetia oleae* (Olivier) (Hemiptera: Coccidae), but these control attempts failed (Bartlett in Clausen, 1978; Kennett, 1988).

MATERIAL EXAMINED.

Non type material. **USA**, 1♀, **Hawaii**, Saddle Road, 16 ml W Hilo, 4400ft (=1344m); reared ex *Eucalymnatus tessellatus*, 17.vii.1975 (J.W. Beardsley), "Anicetus annulatus Timb. det. J.W. Beardsley"; 1♀, **Florida**, Polk Co., 132 Lkview Dr. Aub, ex *Coccus viridis* on guava, 2.vi.1992 (H.W. Browning); 1♀, Florida, Polk Co., Lake Alfred, NTN Pot.Gr., ex *Coccus viridis* on *Citrus sinensis*, i.vii.1992 (H.W. Browning); 2♀, Florida, Lake Co., Lk. Louise St Prk, ex *Eucalymnatus tessellatus* on *Ilex cassine*, 26.iv.1993 (H.W. Browning). **ST VINCENT**, 1♂, Charlotte, Mt Pleasant, edge of rainforest, 6.vii.1976 (J.S. Noyes); 2♀, 1♂, Charlotte, Montreal, edge of rainforest, 8.vii.1976 (J.S. Noyes); 1♂, Charlotte, Mesopotamia, waste ground, 8.v..1976 (J.S. Noyes); 1♀, 1♂, St Andrew, Lowrt, edge of rainforest, 7.vii.1976 (J.S. Noyes); 1♂, St Andrew, Maloney, 12.vii.1976 (J.S. Noyes); 3♂, St Patrick, Symons Bow, wasteground, 10.vii.1976 (J.S. Noyes). **TRINIDAD & TOBAGO**, 6♀, **Trinidad**, St Augustine, ex scale on *Xanthorrhoea*, 1956 (F.D. Bennett); 2♀, Trinidad, Valsayn, Springfield Ave., Moericke trap, 29.i-11.ii.1974 and 8-20.v.1974 (M. Yaseen); 4♀, Trinidad, Curepe, Sta Margarita Circ. Rd, 10-24.iii.1974 and 25.iii-13.iv.1974 (F.D. Bennett); 3♀, Trinidad, CIBC Lab. grounds, Moericke trap, 14-29.iii.1974 and 13-27.vi.1974 (M.N. Beg); 1♂, St George, El Tucuche, s. slope, rainforest, 25.vii.1976 (J.S. Noyes); 1♀, Trinidad, St George, Guanapo Valley, rainforest, 29.vii.1976 (J.S. Noyes); 1♂, Trinidad, Arena Reserve, rainforest, 31.vii.1976 (J.S. Noyes); 1♀, Trinidad, Arena Reserve, rainforest. 6.viii.1976 (J.S. Noyes); 1♀, 3♂, Trinidad, Tumpuna Reserve, Caribbean pine plantation, 9.viii.1976 (J.S. Noyes); 1♀, Trinidad, St Patrick, Cedros Forest, 12.viii.1976 (J.S. Noyes); 2♀, 2♂, Trinidad, Curepe, ex *Coccus hesperidum* on *Carica papaya*, i.1977 (F.D. Bennett); 1♂, **Tobago**, St. John, Cambleton, secondary forest, 22.vii.1976 (J.S. Noyes); 1♂, Tobago, St Paul, Delaford, secondary forest, 22.vii.1976 (J.S. Noyes). **COSTA RICA**, 2♀, **Guanacaste**, Santa Rosa NP, Hacienda, 24.viii-14. ix.1985 and 18.i-8.ii.1986 (Janzen, Gauld); 1♀, Guanacaste, Murcielago, (ACG), 75m, MT, 24.i-4.ii.1996 (J. Ugalde); 2♀, Guanacaste, PN Palo Verde, Campo Aterrizaje, LN 385020 260952, 10m, 10.viii-9.ix.2000 and ix-x.2000 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Est. Palo Verde, LN 259050 388400, 10m, #60220, x-xi.2000 (I. Jiménez); 2♂, **Alajuela**, Reserva Rincon Forestal, Est. Caribe, 19-20.ii.2003 (J.S. Noyes); 1♀, Alajuela, Aguas Zarcas, La Chiles, cafe, iii.1990 (P. Hanson); 3♀, Alajuela, San Carlos, RF Arenal, Sect. Peninsula, LN 271500 453800, 600m, #52783, 16-18.vi.1999 (G. Carballo); 3♀, Alajuela, PN Arenal, Sect. La Peninsula, 600m, T. Amarilla, #56556, 17.vi.2000 (G. Carballo); 3♂, Alajuela, PN Arenal, La Peninsula,

10°27'N 84°40'W, 600m, 25.ii.2003 (J.S. Noyes); 2♀, 1♂, **Heredia**, 3km S Puerto Viejo, OTS-La Selva, 100m, ix.1992, x.1992 and xii,1992 (P. Hanson); 1♀, Heredia, La Selva BS, 50m, MT/YPT, ii.1991 (J.S. Noyes); 1♀, 1♂, Heredia, Puerto Viejo, Est. Biol. La Selva, LN 364463 532850, 100-200m, #67193, 20-31. iii.2002 (J. Azofeifa); 1♀, Heredia, Santo Domingo, INBio Parque, 1200m, 19.ii.2001 (J.S. Noyes); 2♀, **San José**, Zurqui de Moravia, 1600m, ii-iv.1993 and vi.1993 (P. Hanson); 2♀, San José, San Pedro, Tigra Cacao, ii-iv.1990 (P. Hanson); 1♀, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 14-15. ii.2005 (J.S. Noyes); 1♀, Puntarenas, Manuel Antonio, 26.viii.1986 (L. Masner); 5♀, Puntarenas, Manuel Antonio, 23-28.viii.1986 (L. Masner); 2♀, Puntarenas, Est. Altamira, 1450m, 9°03'N 83°00'W, ii.2002 (C. Hansson, D. Rubí); 2♀, Puntarenas, Est. Altamira, Send a Casa Coca, LN 331750 574400, 1700m, ii.2002 (C. Hansson, D. Rubí, J. Azofeifa); 1♀, Puntarenas, RF Golfo Dulce, 5km W Piedras Blancas, 8°46'N 83°17'W, 100m, viii-ix.1991 (P. Hanson, C. Godoy); 2♀, Puntarenas, RF Golfo Dulce, 24km W Piedras Blancas, 200m, 8°46'N 83°24'W, ii.1992 and iii.1992 (P. Hanson); 1♀, Puntarenas, RF Golfo Dulce, 3km SW Rincon, 10m, x.1991 (P. Hanson); 4♀, Puntarenas, Puerto Jimenez, 8°32'N 83°19'W, 10m, various dates vi.1991-iv.1993 (P. Hanson); 7♀, 1♂, Puntarenas, PN Corcovado, Est. La Leona, 10m, 18.ii.2002 (J.S. Noyes); 1♀, Puntarenas, PN Corcovado, Sirena, LS 507750 270000, 10m, 19.ii.2002 (J. Azofeifa); 1♀, Puntarenas, PN Corcovado, Rio Rincon 3km NE Los Patos, 50m, 1-9.iii.2000 (J.A. Azofeifa); 9♀, Puntarenas, Isla del Coco, Wafer-Chathan, 5°32'N 87°03'W, 0-100m, #69553, 2-31.v.2002 (J. Azofeifa); 5♀, 43♂, Puntarenas, PN Isla de Coco, Cerro Yglesias, 5°32'N, 87°03'W, 200-500m, #70719, no date (J. Azofeifa); 8♀, 9♂, Puntarenas, PN Isla de Coco, Bahia Wafer, 5°32'N, 87°03'W, 4-10m, 2-31.iii.2002 (J. Azofeifa); 1♀, **Limón**, RB Hitoy Cerere, 9°40'N 83°02'W, 100m, ii.2004 (J.S. Noyes). **INDIA**, 2♀, **Bihar**, Muzaffarpur, ex *Pulvinaria*, No 6, CIE A.11233, 27.iii.1979 (N.K. Sharma); 2♀, **Karnataka**, Chethalli, ex green scale, No 36, CIA A.10667, 1978 (S.P. Singh); 1♀, **Karnataka**, Chikmagalur, sp. 55, ex *Coccus viridis* on coffee, CIE A19557, 16.v.1987 (C. Prakasan). **CHINA**, 1♀, **Sichuan**, Chongging, Yuzou G. house, ex *Coccus* sp. on *Citrus sinensis*, 7.xi.1992 (H.W. Browning); 1♀, **Hunan**, Changsha, H.R.I., on *Citrus*, 16.vii.1992 (H.W. Browning). **JAPAN**, 1♀, Yokohama, ex *Lecanium* on orange tree, 28.vi.1920. **AUSTRALIA**, 2♀, **NSW**, Sydney, *Eucalymnatus tessellatus*, 31.xii.1927 (H. Compere). Material in MZUCR, CNC and NHMUK.

COMMENTS. Females of *Anicetus annulatus* are relatively easy to separate from other species of the genus by the combination of the pale orange colouration, pale yellow hind tibia with two brown bands, scape with dorsal margin convex and not shiny, symmetrical pedicel with dorsal margin convex and not shiny, and relatively narrow fore wing.

Anicetus arche sp.nov.

(Hab. ♀ 186)

DIAGNOSIS. *Female* (overall length about 1.8mm): hind tibia pale orange with a faint pale brown, subbasal ring; hind tarsus with base and apex dark brown, contrasting with pale orange remainder; frontovertex, except for a narrow strip dorsally along transfacial carina, with distinct punctate-reticulate sculpture of cell size slightly smaller than diameter of eye facet; scape about 1.5X as long as broad with apex of dorsal margin flattened and conspicuously shiny; pedicel dorsally flat and shiny, asymmetrical, with an elongate ventral process; funicle about as long as first segment of clava (measured dorsally); clava, in profile, about 2X as long as broad; ovipositor clearly exserted, the exserted part about 1.3X as long as mid tibial spur. *Male*: Unknown.

Female (holotype): length, including ovipositor, 1.83mm; excluding ovipositor, 1.61mm (CPD).

Head generally orange with very weak brassy lustre and a transverse brown band across face level with torulus; transfacial carina dorsally with a coppery purple sheen; setae on frontovertex, temple and upper gena dark brown, those across transfacial carina, on interantennal prominence and on lower gena translucent, and slightly silvery; radicle pale orange-brown, apically dark brown; scape orange with ventral margin dark brown and apical half of dorsal margin dark brown with a metallic green sheen; pedicel orange with apical part of ventral process dark brown and dorsal margin dark brown with a metallic green sheen; funicle similarly coloured to pedicel; clava orange with ventral margin dark brown and dorsal margin dark brown with a metallic green sheen, coppery purple towards apex; darker markings on antenna stronger on internal surfaces; thorax generally orange with mesosternum dark brown; mesoscutum with a weak brassy sheen and some

pale coppery reflections; scutellum and axilla similar to mesoscutum, but less shiny with coppery reflections a little more conspicuous; mesopleuron with a weak brassy sheen; fore leg almost completely pale orange with posterior part of coxa dark brown and apical tarsomere orange-brown; mid leg pale orange with spur dark orange-brown; hind leg pale orange with extreme apex of femur dark brown, tibia with extreme base dark brown, subbasal area white followed by a faint, pale brown subbasal ring, tarsus with basitarsus proximally pale orange, distal half mainly dark brown, apical tarsomere dark brown, remainder of tarsus white; fore wing mostly infuscate but hyaline towards base and at apex, venation orange-brown; hind wing mainly hyaline, but weakly infuscate anteriorly below distal part of venation and slightly beyond; propodeum orange with a weak brassy lustre, setae outside spiracle translucent, pale brown and moderately conspicuous; gaster mostly orange with Gt1-Gt6 dorsally dark brown with a mixed purple, coppery and brassy sheen, side of Gt2-Gt5 with a metallic green and blue-green sheen; gonostylus pale orange.

Head about 6.4X as wide as frontovertex; ocelli forming an angle of about 40°; narrowest point of frontovertex slightly behind anterior ocellus; frontovertex about 3.3X as long as broad with very fine, punctate-reticulate sculpture on frontovertex of cell diameter much less than diameter of facet, dorsal part of transfacial carina almost smooth but with some very shallow reticulate sculpture; a shallow, shiny bottomed depression present adjacent to eye margin between posterior ocellus and occipital margin; eye overreaching occipital margin and clothed with fairly conspicuous translucent setae that are each about as long as diameter of facet; face below transverse brown band clothed with conspicuous, very dense setae; clypeal margin medially very weakly convex; occipital margin carinate; narrowest point between eye and transfacial carina less than half diameter of facet; interantennal prominence with a median carinate ridge that extends almost to transfacial carina; antenna similar to that of *oroso* (Fig. 1268); scape about 1.5X as long as broad, subtrapezoidal, with proximal part of dorsal margin subequal in length to distal part and with proximal part of ventral margin about 1.6X as long as distal part; distal part of dorsal margin of scape completely flat, smooth and shiny; dorsal part of pedicel completely smooth and shiny; pedicel and all funicle segments subequal in width, dorsal and ventral margins subparallel; clava relatively very long, about 1.8X as long as pedicel and funicle combined, sutures strongly oblique, sensory area about 7X as long as ventral margin, apex strongly obliquely truncate; malar sulcus absent; mandible with two acute teeth and a truncation. Relative measurements: HW c.106 (head slightly collapsed), FVL 54; FV 16.5, POL 7, OOL 1, OCL 5.5, AOL 13, EL c.51, EW c.53, MS c.46, SL 55, SW 37.

Thorax with polygonally reticulate to imbricate reticulate sculpture on pronotum and mesoscutum that is slightly shallower than, but of similar mesh size to, sculpture on frontovertex; mesoscutum, along mid-line, with an irregular series of pores; axilla with similar sculpture to that on frontovertex; scutellum with longitudinally elongate, polygonally reticulate sculpture that is slightly coarser and deeper than on frontovertex; visible part of mesoscutum about 2X as broad as long; scutellum about as broad as long; mid tibia with a strong external carina for about half its length; hind femur about 3.6X as long as broad; fore wing with venation and setation similar to that of *oroso* (Figs 1270, 1272) but area below submarginal vein with a more or less complete line of setae; cubital vein track with about 8 or 9 setae that nearly reach base of wing; costal cell with 2 setae dorsally at apex; apices of postmarginal and stigmal veins more or less connected by a naked, hyaline streak; propodeum medially about 0.15X as long as scutellum, with some shallow, irregular reticulate sculpture and also several irregular carinae medially, a transverse carina running from anterior margin submedially towards spiracle, this connected to anterior margin of propodeum by three conspicuous carinae, 8 setae anterior to and outside spiracle. Relative measurements: FWL 104, FWW 44; HWL 83, HWW 24.5.

Gaster with hypopygium reaching about 0.4X to apex; syntergum about 0.6X as long as mid tibia, with apex broadly rounded; ovipositor strongly exserted, the exserted part about as long as mid tibial spur or 0.3X length mid tibia. Relative measurements: GL 54 [MT 29].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, 16km SSE La Virgen, 10°16'N 85°05'W, 1050-1150m, 11/M/TN, 10.ii-21.iv.2001 (INBio/OET-ALAS). Holotype in NHMUK.

COMMENTS. *Anicetus arche* is close to *oroso* and also to the extra-limital species, *primus* (Howard) (from Mexico) and *quintanai,* De Santis (Argentina, Peru), all four species having the funicle not longer than the first clava segment (measured dorsally) and the frontovertex with conspicuous, deep, regular, polygonally reticulate sculpture throughout. It differs from all three species in having the exserted part of the ovipositor much longer than the mid tibial spur, whereas in the other species the exserted part of the ovipositor is not more than about two-thirds as long as the mid tibial spur. It is probably most similar to *oroso*, but, in addition to the relative length of the ovipositor, differs from this species in having a distinct, median, carinate ridge on the interantennal prominence that nearly connects with the transfacial carina, a virtually complete line of setae below the submarginal vein and 7 or 8 setae along cubital vein track. In *oroso* the interantennal prominence apparently lacks a median carina and the setae below the submarginal vein and along the cubital vein track are much less numerous than in *arche*. Of the other two species it is probably closest to *primus* since the funicle is about as long as the first clava segment, whereas in *quintanai* the funicle is not more than 0.75X as long as the first segment. It differs also from both *primus* and *quintanai* in having the head more than 6X as wide as the frontovertex with the ocelli forming an angle of not more than 40° whereas in *primus* and quintanai the head is less than 6X as wide as the frontovertex and the ocelli form an angle of at least 60°.

Anicetus oroso **sp.nov.**

(Figs 1267-1273)

DIAGNOSIS. *Female* (length about 1.6mm): hind tibia pale orange with a faint pale brown, subbasal spot; hind tarsus with basitarsus and apex dark brown, contrasting with pale orange remainder; frontovertex, (Fig. 1269) except for a narrow strip dorsally along transfacial carina, with distinct punctate-reticulate sculpture of cell size slightly smaller than diameter of eye facet; scape (Fig. 1268) 1.5X as long as broad with apex of dorsal margin flattened and conspicuously shiny; pedicel dorsally flat and shiny, asymmetrical, with an elongate ventral process; funicle about as long as first segment of clava (measured dorsally); clava, in profile, about 2X as long as broad; ovipositor (Fig. 1267) weakly exserted, the exserted part about 0.5X as long as mid tibial spur; anterolateral projections of hypopygium (Fig 1273) less than one-fifth its overall length. *Male*: Unknown.

Female (holotype): length, including ovipositor, 1.56mm; excluding ovipositor, 1.48mm (CPD).

Body generally dark orange, mesoscutum with a weak purple sheen; transfacial carina dorsally with a coppery purple sheen; a transverse brown band across face level with torulus (Fig. 1269); lower parts of interantennal prominence and lower gena with dense slightly silvery setae; antenna (Fig. 1268) with scape orange, bordered dark brown; pedicel orange with apical part of ventral process dark brown and dorsal margin dark brown with a metallic green sheen; funicle similarly coloured to pedicel; clava orange with ventral margin dark brown and dorsal margin dark brown with a metallic green sheen, coppery purple towards apex; darker markings on antenna stronger on internal surfaces; legs almost completely pale orange, fore coxa posteriorly very pale brown, the mid tibial spur pale orange, hind tibia with extreme base dark brown, subbasal area white followed by a faint, pale brown subbasal spot; fore wing (Fig. 1272) mostly infuscate but hyaline towards base and at apex, venation orange-brown; metanotum dark brown; gaster mostly orange with Gt1-Gt6 dorsally dark brown with a mixed purple, coppery and brassy sheen, side of Gt2-Gt5 with a metallic green and blue-green sheen; gonostylus pale orange.

Head (Fig. 1269) about 8X as wide as frontovertex, with very fine, punctate-reticulate sculpture on frontovertex of cell diameter much less than diameter of facet, dorsal part of transfacial carina almost smooth but with some very shallow reticulate sculpture; a shallow, shiny bottomed

depression present adjacent to eye margin between posterior ocellus and occipital margin; ocelli forming a very acute angle of about 35°; eye overreaching occipital margin, appearing naked, but with sparse, very short setae that are less than half as long as diameter of facet; face below transverse brown band clothed with conspicuous, very dense setae; interantennal prominence without a median carinate ridge; antenna as in Fig. 1268; scape about 1.5X as long as broad, subtrapezoidal, with proximal part of dorsal margin subequal in length to distal part and with proximal part of ventral margin about 1.6X as long as distal part; distal part of dorsal margin of scape completely flat, smooth and shiny; dorsal part of pedicel completely smooth and shiny; pedicel and all funicle segments subequal in width, dorsal and ventral margins subparallel; funicle, measured dorsally about as long as first segment of clava; clava relatively very long, about 1.8X as long as pedicel and funicle combined, sutures strongly oblique, sensory area about 7X as long as ventral margin, apex strongly obliquely truncate; mandible with two acute teeth and a truncation;

Thorax (Fig. 1271) with polygonally reticulate to imbricate reticulate sculpture on pronotum and mesoscutum that is slightly shallower than, but of similar mesh size to, sculpture on frontovertex; mesoscutum with a line of sparse, fine pores along midline and one or two similar pores near posterolateral margin; axilla with similar sculpture to that on frontovertex; scutellum with longitudinally elongate, polygonally reticulate sculpture that is slightly coarser and deeper than on frontovertex; fore wing about 2.4X as long as broad with venation and setation as in Figs 1270, 1272; area below submarginal vein without a line of setae, with only two or three setae near base and cubital vein with at most only 3 setae distally; apices of postmarginal and stigmal veins connected by a naked, hyaline streak; propodeum (Fig. 1271) with 5 or 6 short carinae connecting transverse, submedian carina to anterior margin of the propodeum; 6 or 7 setae anterior to and outside spiracle. Relative measurements: FWL 103, FWW 43; HWL 80.5, HWW 24.

Gaster with hypopygium (Fig. 1273) reaching about 0.4X to apex; syntergum about 0.6X as long as mid tibia with apex broadly rounded; ovipositor (Fig. 1267) hardly exserted, the exserted part not more than about half as long as mid tibial spur. Relative measurements: OL 50.5, GS 14 [MT 41.5].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown

MATERIAL EXAMINED.

Type material. Holotype: ♀: **COSTA RICA**, **Alajuela**, RB San Ramon, 900m, xi-xii.1999 (P. Hanson). Holotype in NHMUK.

COMMENTS. *Anicetus oroso* is close to *arche*, *primus* and *quintanai* (see comments under *arche*, p. 510). It is probably closest to *primus* because both species have the funicle about as long as the first segment of the clava (measured dorsally) and the ovipositor relatively weakly exserted. It differs from *primus* in being much larger, having a very narrow frontovertex with the ocelli forming an angle of only about 35°. The female of *primus* is about 0.9mm in length and has a moderately broad frontovertex with the ocelli forming only a slightly acute angle (probably of at least about 60°).

***Anicetus lysithea* sp.nov.**

(Figs 1274-1293; Hab. ♀187, 188)

DIAGNOSIS. *Female* (length about 0.9-1.9mm): exceptionally variable species; hind tibia completely pale orange to pale orange with a pair of pale brown dark bands or even completely dark brown; hind tarsus mostly with base and apex dark brown, contrasting with pale orange remainder; frontovertex, excluding ocellar area, completely smooth and shiny, ocellar area with shallow, polygonally reticulate sculpture; scape (Figs 1274-1279) 1.3-1.8X as long as broad with

apex of dorsal margin almost always weakly convex and not shiny, very rarely slightly shiny; pedicel dorsally flat or hardly convex and hardly shiny, asymmetrical, with an elongate ventral process; funicle clearly longer than first segment of clava (measured dorsally); clava, in profile, about 1.5-2.3X as long as broad and at least nearly as long as pedicel and funicle combined; ovipositor hidden to slightly exserted, the exserted part at most 0.7X as long as mid tibial spur; hypopygium (Figs 1286, 1287) with anterolateral projections about one-third to half its overall length. *Male*: Unknown.

Female (holotype): length, including ovipositor, 1.29mm; excluding ovipositor, 1.20mm (CPD).

Head generally orange; vertex between occipital margin and anterior ocellus quite dull with a very weak brassy and purple sheen, between anterior ocellus and top of scrobes with a slightly stronger purple sheen, between eye and scrobe with coppery purple and blue sheen; temple gena and scrobal area mainly with weak brassy sheen; a transverse brown band across top of scrobes below transfacial carina and a further complete, transverse brown band across face level with toruli; setae on frontovertex, temple and upper gena dark brown, those immediately above transfacial carina, on interantennal prominence and on lower gena translucent, pale brown; antenna (Fig. 1274) with radicle orange, apex and side dark brown; scape orange, ventrally and apically margined dark brown; pedicel orange with apical part of ventral process brown and dorsal margin externally brown; funicle mainly similarly coloured to pedicel; clava dark brown, orange-brown proximally; thorax generally orange with prosternum and mesosternum dark brown; mesoscutum with a weak dark blue and purple sheen; tegula orange-brown with a weak brassy and purple sheen; axilla with a weak brassy and purple sheen; scutellum virtually matt but with some weak coppery and brassy reflections; mesopleuron with a weak brassy, purple and blue sheen; legs mainly pale orange to orange, but apical tarsomere on fore and hind leg dark brown, basitarsus on hind leg dark brown in distal half; fore wing (Fig. 1280) mostly infuscate but hyaline towards base and at apex, venation orange-brown; hind wing (Fig. 1281) hyaline; propodeum orange with a weak brassy lustre; gaster dorsally pale orange with Gt1 dark brown with a mixed purple, coppery and brassy sheen, Gt2-Gt4 slightly dusky, side and venter orange, sides of Gt1-Gt5 with a metallic green, blue-green and brassy sheen; gonostylus orange.

Head about 5.1X as wide as frontovertex, about 1.5X as long as deep, with very shallow, fine, reticulate sculpture on vertex between occipital margin and anterior ocellus, frontovertex otherwise completely smooth and shiny and about 2.9X as long as broad; an oval, shiny bottomed depression adjacent to eye margin very slightly behind posterior ocellus; ocelli forming an angle of about 50°; eye hardly overreaching occipital margin and clothed with fairly conspicuous translucent setae that are each about as long as diameter of facet; face below transverse brown band clothed with fairly conspicuous, moderately dense setae; clypeal margin medially more or less straight; occipital margin carinate; narrowest point between eye and transfacial carina about equal to diameter of facet; interantennal prominence dorsally slightly acute with very weak median ridge; antenna as in Fig. 1274; scape about 1.5X as long as broad, subtrapezoidal with proximal part of dorsal margin about 1.4X as long as distal part and with proximal part of ventral margin about 1.7X as long as distal part, distal part of dorsal margin weakly convex, with very shallow sculpture and slightly shiny; dorsal part of pedicel flat and very slightly shiny; pedicel and all funicle segments subequal in width, dorsal and ventral margins subparallel; clava about as long as pedicel and funicle combined, sutures strongly oblique, sensory area about 3.6X as long as ventral margin, apex strongly obliquely truncate; narrowest point of frontovertex slightly in front of anterior ocellus; malar sulcus absent; mandible with two acute teeth and an upper truncate tooth. Relative measurements: HW 72, HH 54, FVL 41, FV 14, POL 6, OOL 2, OCL 4, AOL 8.5, EL 42, EW 35, MS 30, SL 36.5, SW 24.

Thorax (Fig. 1291) with polygonally reticulate to imbricate-reticulate sculpture on pronotum and mesoscutum that is of similar depth to that between posterior ocelli; mesoscutum with scattered pores along midline (as in Figs 1291, 1292); axilla with similar sculpture to that on vertex between occipital margin and posterior ocelli; scutellum with longitudinally elongate, polygonally reticulate sculpture that is slightly coarser and deeper than on axilla; visible part of mesoscutum about 2.2X as broad as long; scutellum about 1.1X as broad as long; mid tibia with a weak external carina for much of its length; hind femur about 3.7X as long as broad; fore wing

with venation and setation as in Figs 1280, 1288; costal cell with 1 seta dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak; propodeum medially about 0.22X as long as scutellum, with some extremely shallow, reticulate sculpture medially and several weak carinae, no distinct carina running from anterior margin submedially towards spiracle. Relative measurements: FWL 65.5, FWW 27; HWL 48, HWW 13.0

Gaster with hypopygium reaching about 0.6X to apex; last tergite about 0.8X as long as mid tibia, with apex broadly rounded; ovipositor slightly exserted, the exserted part about 0.7X as long as mid tibial spur or about 0.2X length mid tibia.

Paratype. Funicle with linear sensilla present only on F5-F6; mesoscutum with scattered pores along midline and one near posterolateral margin; anterolateral projections of hypopygium (Fig. 1286) not more than about one-third its length; ovipositor Fig. 1293. Relative measurements: OL 39.5, GL 10.5 [MT 34].

Variation. Females vary in overall length 0.90-1.87mm, an unusually variable species, especially in colouration, the dark brown band between the toruli and on the gena may be absent, the body varies from almost completely orange with hardly a metallic sheen to virtually completely dark brown, including the gaster, the frontovertex and mesoscutum may have a relatively strong metallic blue or purple lustre, the antenna may be largely orange with the scape margined dark brown and flagellum with dorsal and ventral margins broadly brown (Figs 1274-1278) or it may be completely dark brown (Fig. 1279), the coxae and legs vary from almost completely pale orange to almost completely dark brown with the brown bands on the hind tibia or the hind tibia almost completely dark brown, the fore wing may be completely infuscate except for the apical hyaline band, the hind wing may be weakly infuscate anteriorly; the head varies from about as long as deep to about 1.5X as long as deep and from 3.6-6.1X as wide as the frontovertex, the frontovertex may be 2.1-4.2X as long as broad, the ocelli may form an angle of about 50-80°, the narrowest point between the eye and transfacial carina varies from about as wide as the diameter of an eye facet to about 1.5X as wide, the scape may be about 1.3-1.8X as long as broad, the funicle may have linear sensilla absent from F5, the clava varies from nearly as long as the pedicel and funicle combined to about 1.3X as long, it may be broadly heart-shaped and about 1.5X as long as broad to distinctly elongate, nearly 2.3X as long as broad and subrhomboidal, the sensory area of the clava may be 2.0-4.4X as long as the ventral margin, the mesoscutum rarely lacks pores along the midline and may have one or two near the posterolateral margin; the mid tibia may lack an external carina or may have a distinct carina for most of its length, the fore wing is about 2.2-2.5X as long as broad, the hind wing varies from 3.1-4.2X as long as broad, there may be up to 4 setae dorsally at apex of costal cell, the ovipositor varies from slightly shorter than mid tibia to slightly longer and about 3.3-3.8X as long as the gonostylus and may be hidden or slightly exserted with the exserted part about 0.7X as long as the mid tibial spur, the anterolateral projections on the hypopygium may be about one-third to half its length.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown, but one specimen below was reared from galls which may have been coccid (Hemiptera: Coccidae) galls.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, Santo Domingo, INBio Parque, LN 526250 217400, 1100m, iii.2002 (J.A. Azofeifa, J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Santa Rosa NP, Hacienda 3-0, 18.x-8.xi.1986 (Janzen, Gauld); 1♀, Guanacaste, Guanacaste NP, 1300m, Derumbé Vn Cacao, iv-v.1988 (Gauld, Janzen); 2♀, Guanacaste NP, below Pitilla, 500m, 7-8.iii.1990 (J.S. Noyes); 1♀, Guanacaste, PN Palo Verde, Camino de Alto Viejo, LN 386300 260770, 40m, #61363, 11.i-10.ii.2001 (I. Jiménez); 1♀, Guanacaste, ZP Nosara, Fila Maravilla, LN 221350 381700, 800m, #66663, xi-xii.2001 (I. Jiménez); 1♀, Guanacaste, ZP Nosara, RF Monte Alto, Send. La Ceiba, LN 221100 382950, 600m, #66655, 19.xii.2001 (I. Jiménez); 1♀, Guanacaste, Santa Cruz, BN Diría, Finca Navarrete, LN 238220 361060, 160m, #66652, 17-22. i.2002 (Y. Cardeñas); 1♀, **Alajuela**, Reserva Rincón Forestal, Est. Caribe, 10°53'N

85°18'W, 400m, 19-20.ii.2003 (J.S. Noyes); 1♀, Alajuela, Est. Cabro Muco, 10°43'N 85°09'W, 1100m, 13.ii.2004 (C. Hansson, J. Azofeifa); 1♀, Alajuela, PN Arenal, Sect. La Peninsula, LN 453800 271500, 600m, T. Amarilla, #56556, 17.vi.2000 (G. Carballo); 2♀, Alajuela, PN Arenal, La Peninsula, 10°27'N 84°40'W, 600m, 25.ii.2003 (J.S. Noyes); 1♀, Alajuela, RF Arenal, PN Volcan Arenal, Sector Colada, LN 269900 456750, 600m, #54371, 1-26.x.1999 (G. Carballo); 1♀, Alajuela, Peñas Blancas, 9.v.1987 (E.C. Cruz); 1♀, Alajuela, RB San Ramon, 900m, ii-iii.2000 (P. Hanson); 2♀, **Heredia**, 16km SSE La Virgen, 10°16'N 85°05'W, 1050-1150m, 11/M/NOTN, 9.ii-21.iv.2001 (INBio /OET - ALAS); 2♀, Heredia, 11km SSE La Virgen, 10°20'N 84°04'W, 450-550m, 05/M/NOTN, 22.ii-20.iv.2003 (INBio - OET - ALAS); 1♀, Heredia, 6km ENE Vara Blanca, 10°11'N 84°07'W, 200m, 10/M/TN, ii.2002 (INBio-OET-ALAS); 3♀, Heredia, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/TN, iii.2002 (INBio-OET-ALAS); 1♀, Heredia, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/TN, iv.2002 (INBio-OET-ALAS); 1♀, Heredia, Vara Blanca, vii-viii.1990 (P. Hanson); 1♀, Heredia, F. La Selva 3km S Puerto Viejo, 10°26'N 84°01'W, 5.iv.1985 (H.A. Hespenheide); 4♀, Heredia, La Selva BS, 50m, 22.i-3.ii.1991 (J.S. Noyes); 1♀, Heredia, La Selva BS, 10°26'N 84°01'W, 50-150m, fog *Carapa guianensis*, FOT/02, 5.iii.1993 (INBio-OET); 1♀, Heredia, OTS La Selva, 10°26'N 84°01'W, 50-150m, M/05/260, 15-30.xi.1993; 1♀, Heredia, OTS La Selva, 10°26'N 84°01'W, 50-150m, M/09/227, 15-30.xi.1993; 1♀, Heredia, La Selva BS, 10°26'N 84°01'W, FVK 32, 3.xi.1994; 1♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, ii.2002 (J.S. Noyes); 1♀, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, 75m, ii.2003 (J.S. Noyes); 1♀, Heredia, Est. La Esperanza, 2500m, 24.iii.2002 (M. Gates); 3♀, **San José**, Zurqui de Moravia, 1600m, iii.1991. ii-iv.1993 and v.1994 (P. Hanson); 1♀, San José, Braulio Carrillo NP, 1000m, 18.ii.2001 (J.S. Noyes); 1♀, San José, San Antonio de Escazu, 1300m, ii.1999 (W. Eberhard); 1♀, San José, Zurqui de Moravia, 1600m, v.1994 (P. Hanson); 2♀, San José, Est. Biol. Cerro de la Muerte, 9°33'N 83°44'W, 3100m, v-vi.2000 and vii.2000 (P. Hanson); 1♀, San José, Cerro de la Muerte, 16km S Empalme, 2600m, ii-iv.1989 (P. Hanson); 3♀, San José, 19 km S Empalme, Mirador Quetzal, 9°39'N 83°52'W, 2600m, i.2000, ii.2000 and iv.2000 (P. Hanson); 1♀, San José, Hwy 2, km 66, 2400m, 4.iv.1985 (H. Goulet, L. Masner); 1♀, **Cartago**, 4km NE Cañon, Genesis II, 2350m, iv.1985 (P. Hanson); 3♀, Cartago, PN Tapanti, 9°45'N 83°47'W, 1200-1500m, 20.iii-10.iv.2000 (C. Hansson, D. Rubí); 1♀, Cartago, PN Tapanti, Torre ICE #32, LN 561600 187400, 1700m, #61073, viii-ix.2000 (D. Rubí); 1♀, Cartago, Turrialba, CATIE, JC #96 from coccid infested *Bixa orellana*, 15.iii.1990 (J.S. Noyes); 5♀, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 14-15.ii.2005 (J.S. Noyes); 1♀, Manuel Antonio NP, iii.1986 (L. Masner); 2♀, Puntarenas, Hwy 2, km 95, 9°36'N 83°45'W, 3200m, 1-7. iv.1985 (H. Goulet, L. Masner); 1♀, Puntarenas, Hwy 2, km 95, 9°36'N 83°44'W, 3200m, 3-13.iv.1986 (H. Goulet, L. Masner); 1♀, Puntarenas, Res. Biol. Carara, 9°46'N 84°57'W, 40m, 1-7.iii.2005 (C. Hansson); 5♀, Puntarenas, Est. Altamira, Send. los Gigantes, LS 331800 572100, 1460m, 10.i-10.ii.2002 (D. Rubí); 3♀, Puntarenas, Est. Altamira, Send. los Gigantes, LS 351800 572100, 1400m, ii.2002 (C. Hansson, D. Rubí); 2♀, Puntarenas, Est. Altamira, Send. a Casa Coca, LS 331750 57440, 1700m, ii.2002 (C. Hansson, D. Rubí, J. Azofeifa); 1♀, Puntarenas, Est. Altamira, Cerro Biolley, LS 332400572200, 1760m, #63980, 10.vii-10. viii.2001 (D. Rubí); 1♀, Puntarenas, Est. Altamira, Valle de Silencio, Jardin Natural, LS 572200 342300, 2450m, #64111, vi-vii.2001 ((D. Rubí); 1♀, Puntarenas, Portero Grande, Cerro Kasir, 2959m, LS 349700 566850, #59113, 20.viii.2000 (M. Alfaro); 1♀, Puntarenas, Portero Grande, Sendero a Cerro Kasir, 2959m, LS 349700 566850, #60380, 19.ix-9.x.2000 (M. Alfaro); 1♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 1300m, 24.ii.2002 (J.S. Noyes); 1♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 8°46'N 82°57'W, 1300m, 15-16.ii.2006 (J.S. Noyes); 1♀, Puntarenas, RF Golfo Dulce, 3km SW Rincon, i.1992 (P. Hanson); 1♀, Puntarenas, RF Golfito, Est. Agujas, LS 526550 276750, 300m, #591257, 1-14.x.2000 (J. Azofeifa); 1♀, Puntarenas, PN Corcovado, Est. Agujas, LS 526550 276750, 300m, 11.ii.2002 (J. Azofeifa); 1♀, Puntarenas, PN Corcovado, Los Patos, 8°33'N 83°30'W, 200m, ii.2000 (J.S. Noyes, J.A. Azofeifa); 1♀, **Limón**, PN Barbilla, Sect. Colonia Puriscaleña, Sendero Cerro Azul, ex galls, 4-24.iii.2000 (E. Mora); 4♀, Limón, RB Hitoy-Cerere, 100m, MT/YPT, 14-19.i.1991 (J.S. Noyes); 1♀, Limón, AC Amistad, RB Hitoy Cerere, LN 643400 184600, 150m, iii.1994 (G. Carballo); 1♀, Limón, AC Amistad, RB Hitoy Cerere, LS 398100 572800, 100m, vi-viii.1994 (G. Carballo); 1♀, Limón, RB Hitoy Cerere, Valle de la Estrella, Send. Toma de Agua, LS 643400 184600, 100m, #57947, viii-ix.2000 (F. Umaña); 1♀, Limón, RB Hitoy Cerere, Valle de la Estrella, Send. Bobocara, LN 184300 642500, 180m, #55290, iii.2000 (F. Umaña); 1♀, Limón, RB Hitoy Cerere, Send. Espavel, LS 570460 401558, 220m, #54815, 10-19.ii.2000 (F. Umaña); 1♀, Limón, Talamanca, Valle de Silencio, Sendero al Jardin Natural, 2400m, LS342300 577200, #62338, iv-v.2001 (D. Rubí); 1♀, Limón, P.I.L.A., Valle del Silencio, Alred. d.Refugio, LS 340258 577465, 2480m, #75066, 20-26. ix.2003 (D. Rubí); 1♀, Limón, P.I.L.A., Valle de Silencio, Sendero Andarivel, 2472m, 17024.iii.2003 (R.

González, et al.); 1♀, Limón, RB Hitoy Cerere, Send Espavel, LN 401200 569800, 560m, 21.vi-8.vii.2003 (R. Gamboa, et al.); 3♀, Limón, RB Hitoy Cerere, 9°40'N 83°02'W, 100m, ii.2004 (J.S. Noyes). Holotype in MZUCR, paratypes in NHMUK, MZUCR, UCR, USNM and CNC.

COMMENTS. The unusual amount of variability exhibited by the above material suggests that it probably represents a species complex. At present I am unable to resolve the taxonomy based only on morphology. If a more satisfactory solution becomes necessary (e.g., for biocontrol purposes), it will almost certainly require a comprehensive in-depth analysis of large amount of combined morphological and molecular data.

Anicetus lysithea is very close to *toumeyellae* Milliron from North America, both species belonging to the *ceylonensis* group (see Annecke, 1967) and having the apex of the scape dorsally at least slightly convex and not shiny and the pedicel dorsally with shallow sculpture and not completely smooth and shiny. Smaller females of *lysithea* can be extremely similar to those of *toumeyellae*, but they can be separated by the sculpture of the frontovertex. In *lysithea* the frontovertex between the anterior ocellus and transfacial carina is completely devoid of sculpture and smooth and shiny, whilst in *toumeyellae* this area has shallow, but distinct, polygonally reticulate sculpture. *Anicetus lysithea* also appears to be somewhat similar to *anneckei* Prinsloo, described from South Africa. However, *anneckei* has the dorsal surface of the pedicel slightly concave and polished which places it in the *abyssynicus* group (Annecke, 1967). In *lysithea*, the pedicel is never concave and usually very slightly convex and not polished

***Anicetus cheras* sp.nov.**
(Figs 1294-1297)

DIAGNOSIS. *Female* (length about 1.2mm): legs pale orange, hind tarsus with base and apex dark brown; frontovertex, excluding ocellar area, completely smooth and shiny, ocellar area with shallow, polygonally reticulate sculpture; scape (Fig. 1295) 1.4X as long as broad with apex of dorsal margin weakly convex and not shiny; pedicel dorsally flat and shiny, asymmetrical, with an elongate ventral process; funicle clearly longer than first segment of clava (measured dorsally); clava, in profile, very nearly 2X as long as broad and at least as long as pedicel and funicle combined; ovipositor strongly exserted, the exserted part at least as long as mid tibial spur; anterolateral projections of hypopygium (Fig. 1297) hardly more than one-third its overall length. *Male*: Unknown.

Female (holotype): length, including ovipositor, 1.21mm; excluding ovipositor, 1.04mm (AD).

Head generally orange; occiput pale orange; vertex between occipital margin and anterior ocellus quite dull with a weak brassy and purple sheen, between anterior ocellus and top of scrobes with a relatively strong blue and purple sheen, between eye and scrobe with coppery purple and blue sheen; temple, gena and scrobal area mainly with a weak brassy sheen; a faint, transverse brown band across face level with torulus; setae on frontovertex, temple and upper gena dark brown, those above transfacial carina, on interantennal prominence and on lower gena translucent, pale brown; antenna (Fig. 1295) with radicle orange, apex and side dark brown; scape orange with ventral margin dark brown and apical part of dorsal margin slightly dusky; pedicel orange with apical part of ventral process brown and dorsal margin dark orange-brown with a weak brassy lustre; funicle mainly similarly coloured to pedicel; clava dark brown, mixed orange-brown towards base ventrally; thorax generally orange with prosternum and mesosternum dark brown; mesoscutum with a very weak brassy and purple sheen; tegula orange-brown with a weak brassy and purple sheen; axilla with a weak brassy and purple sheen; scutellum virtually matt but with some weak coppery and brassy reflections; mesopleuron with a weak brassy, blue and purple sheen; legs, including coxae, pale orange to orange, with apex of hind basitarsus pale brown and apical tarsomere brown; fore wing (Fig. 1294) mostly infuscate but hyaline towards base and at apex, venation orange-brown; hind wing hyaline; propodeum orange with a weak brassy lustre, setae outside spiracle translucent pale brown and inconspicuous; gaster mostly dusky orange with Gt1-Gt3 dorsally dark brown with a mixed purple, coppery and brassy sheen, side of Gt1-Gt5 with a metallic green, blue-green and brassy sheen; gonostylus orange.

Head about 3.8X as wide as frontovertex, about 1.3X as long as deep, with very shallow, fine, reticulate sculpture on vertex between occipital margin and anterior ocellus, frontovertex otherwise completely smooth and shiny and about 2.0X as long as broad; a small, circular, shallow, shiny bottomed depression adjacent to eye margin very slightly behind posterior ocellus; ocelli forming an angle of about 80°; eye hardly overreaching occipital margin and clothed with fairly conspicuous translucent setae that are each about as long as diameter of facet; face below transverse brown band clothed with fairly conspicuous, moderately dense setae; clypeal margin medially very weakly convex; occipital margin carinate; narrowest point between eye and transfacial carina about equal to diameter of facet; interantennal prominence dorsally acute without a weak median ridge; antenna as in Fig. 1295; scape about 1.4X as long broad, subtrapezoidal with proximal part of dorsal margin about 1.4X as long as distal part and with proximal part of ventral margin about 1.7X as long as distal part of dorsal margin which is distally convex, with shallow sculpture and hardly shiny; dorsal part of pedicel flat and relatively shiny; pedicel and all funicle segments subequal in width, dorsal and ventral margins subparallel, linear sensilla present only on F6; clava very slightly less than 2X as long as broad, hardly more than 1.1X as long as pedicel and funicle combined, sutures strongly oblique, sensory area about 3.6X as long as ventral margin, apex strongly obliquely truncate; narrowest point of frontovertex slightly in front of anterior ocellus; malar sulcus virtually absent, but weakly indicated immediately below eye; mandible with two acute teeth and a truncate upper tooth. Relative measurements: HW 72, HH 50, FVL 38, FV 19, POL 7.5, OOL 2, OCL 3.5, AOL 5.5, EL 37, EW 33, MS 29.5, SL 33, SW 23.5.

Thorax with polygonally reticulate to imbricate-reticulate sculpture on pronotum and mesoscutum that is of similar depth to that between posterior ocelli; mesoscutum with scattered pores along midline only; axilla with similar sculpture to that on vertex between occipital margin and posterior ocelli; scutellum with longitudinally elongate, polygonally reticulate sculpture that is slightly coarser and deeper than on axilla; visible part of mesoscutum about 1.8X as broad as long; scutellum about 1.1X as broad as long; mid tibia with a weak external carina for much of its length; hind femur about 3.5X as long as broad; fore wing with venation and setation as in Figs 1294, 1296; costal cell without setae dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak; propodeum medially about 0.17X as long as scutellum, with some shallow, reticulate sculpture medially a weak transverse carina running from anterior margin submedially towards spiracle, 3 setae anterior to and outside spiracle. Relative measurements: FWL 66, FWW 28; HWL 49, HWW 12.

Gaster with hypopygium (Fig. 1297) reaching about 0.8X to apex, anterolateral projections hardly more than one-third its overall length; last tergite about 0.7X as long as mid tibia with apex broadly rounded; ovipositor strongly exserted, the exserted part about 1.2X as long as mid tibial spur or 0.4X length mid tibia. Relative measurements: OL 42, GL 16.5 [MT 27.5].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, San Vito, Las Cruces, Wilson Bot. Gdns, 1300m, 24.ii.2002 (J.S. Noyes). Holotype in NHMUK.

COMMENTS. *Anicetus cheras* can be placed in the *abyssinicus* group as defined by Annecke (1967) (see comments under *apatos*, p. 518). As with *apatos*, it can be distinguished from other species placed in the group by the well exserted ovipositor with the gonostylus more than 0.5X as long as the mid tibia (less than 0.4X as long as the mid tibia in other included species). Apart from the characters given in the key, females of the species can be separated from those of *apatos* using the shape of the hypopygium. In *cheras* the anterolateral projections of the hypopygium are hardly more than one-third the length of the middle part of the hypopygium whereas in *apatos* the anterolateral projections are about half the length of the middle part.

***Anicetus apatos* sp.nov.**
(Figs 1298-1302; Hab. ♀ 189)

DIAGNOSIS. *Female* (length about 1.5-1.8mm): legs pale orange, hind tarsus with base and apex dark brown; frontovertex, excluding ocellar area, completely smooth and shiny, ocellar area with shallow, polygonally reticulate sculpture; antenna (Fig. 1300) with scape 1.7X as long as broad with apex of dorsal margin weakly convex and not shiny; pedicel dorsally flat and shiny, asymmetrical, with an elongate ventral process; funicle clearly longer than first segment of clava (measured dorsally); clava, in profile, very nearly 2.5X as long as broad and at least as long as pedicel and funicle combined; ovipositor strongly exserted, the exserted part at least as long as mid tibial spur; anterolateral projections of hypopygium (Fig. 1299) about half its overall length. *Male*: Unknown.

Female (holotype): length, including ovipositor, 1.50mm; excluding ovipositor, 1.27mm (CPD).

Head generally orange; vertex between occipital margin and anterior ocellus quite dull with a weak brassy and purple sheen, between anterior ocellus and top of scrobes with a relatively strong blue and purple sheen, between eye and scrobe with coppery purple and blue sheen; temple, gena and scrobal area mainly with weak brassy sheen; a transverse brown band across face level with torulus; setae on frontovertex, temple and upper gena dark brown, those across transfacial carina, on interantennal prominence and on lower gena translucent, pale brown; antenna (Fig. 1300) with radicle pale orange-brown, apically dark brown; scape orange with ventral margin dark brown and apical part of dorsal margin slightly dusky with a very weak brassy and purple sheen; pedicel orange with apical part of ventral process brown and dorsal margin dark orange-brown with a weak blue, brassy and purple lustre; funicle mainly similarly coloured to pedicel, but F6 dorsally pale orange; clava dark brown, mixed orange-brown towards base ventrally; thorax generally orange with propleuron, prosternum and mesosternum dark brown; mesoscutum with a weak blue and purple sheen; tegula orange-brown with a weak brassy and purple sheen; axilla with a weak brassy and purple sheen; scutellum virtually matt but with some weak coppery and brassy reflections; mesopleuron with a weak brassy sheen; legs, including coxae, pale orange to orange, with hind basitarsus almost completely, and apical tarsomere completely, dark brown; fore wing (Fig. 1298) mostly infuscate but hyaline towards base and at apex, venation orange-brown; hind wing (Fig. 1302) very weakly infumate brown; propodeum orange with a weak brassy lustre, setae outside spiracle brown and inconspicuous; gaster mostly dusky orange with Gt1-Gt3 dorsally dark brown with a mixed purple, coppery and brassy sheen, side of Gt1-Gt5 with a metallic green, blue-green and brassy sheen; gonostylus dusky pale orange.

Head about 3.6X as wide as frontovertex, about 1.3X as long as deep, with very shallow, fine, reticulate sculpture on vertex between occipital margin and anterior ocellus, frontovertex otherwise completely smooth and shiny and about 2.0X as long as broad; a small, circular, shallow, shiny bottomed depression adjacent to eye margin between posterior ocellus and occipital margin; ocelli forming an angle of about 70°; eye hardly overreaching occipital margin and clothed with fairly conspicuous translucent setae that are each about as long as diameter of facet; face below transverse brown band clothed with fairly conspicuous, moderately dense setae; clypeal margin medially very weakly convex; occipital margin carinate; narrowest point between eye and transfacial carina about 2X diameter of facet; interantennal prominence dorsally acute with a weak median ridge; antenna as in Fig. 1300; scape about 1.7X as long as broad, subtrapezoidal, proximal part of dorsal margin about 1.7X as long as distal part and with proximal part of ventral margin about 2X as long as distal part, distal part of dorsal margin convex, with shallow sculpture and hardly shiny; dorsal part of pedicel flat and relatively shiny; pedicel and all funicle segments subequal in width, dorsal and ventral margins subparallel; clava hardly more than 1.1X as long as pedicel and funicle combined, nearly 2.5X as long as broad, sutures strongly oblique, sensory area about 2.9X as long a ventral margin, apex strongly obliquely truncate; narrowest point of frontovertex slightly in front of anterior ocellus; malar sulcus absent; mandible with two acute teeth and a truncate upper tooth. Relative measurements: HW 75, HH 52, FVL 43, FV 21, POL 7.5, OOL 3, OCL 3, AOL 6.5, EL 40, EW 32, MS 30, SL 38, SW 23.

Thorax with polygonally reticulate to imbricate-reticulate sculpture on pronotum and mesoscutum that is of similar depth to that between posterior ocelli; mesoscutum, along mid-line, with an irregular series of pores; axilla with similar sculpture to that on vertex between occipital margin and posterior ocelli; scutellum with longitudinally elongate, polygonally reticulate sculpture that is slightly coarser and deeper than on axilla; visible part of mesoscutum about 2X as broad as long; scutellum about 1.2X as broad as long; mid tibia with an external carina for most of its length; hind femur about 3.3X as long as broad; fore wing with venation and setation as in Figs 1298, 1301; costal cell with 1 or 2 setae dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak; propodeum medially about 0.15X as long as scutellum, with some shallow, reticulate sculpture medially a weak transverse carina running from anterior margin submedially towards spiracle, 6 or 7 setae anterior to and outside spiracle. Relative measurements: FWL 72.5, FWW 31; HWL 57, HWW 16.

Gaster with hypopygium reaching about 0.8X to apex; last tergite about 0.8X as long as mid tibia, with apex broadly rounded; ovipositor strongly exserted, the exserted part about 1.6X as long as mid tibial spur or 0.5X length mid tibia. Relative measurements: GL 46 [MT 65].

Paratype. Funicle with linear sensilla present only on F6. Mesoscutum with scattered pores along midline and a group of 4 or 5 near posterolateral margin; anterolateral projections of hypopygium (Fig. 1299) about half its overall length. Relative measurements: OL 58.5, GL 23 [MT 32].

Variation. Females vary in overall length from 1.50-1.77mm, otherwise very little variation noted in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Zurqui de Moravia, 1600m, i-ii.1992 (P. Hanson). Paratypes: **COSTA RICA**, **Puntarenas**, Monteverde, 15-16.vii.1986 (L. Masner). Holotype and paratype in NHMUK.

COMMENTS. *Anicetus apatos* has the funicle clearly longer than the basal clava segment (measured dorsally), the apex of the scape dorsally rounded and the pedicel flattened dorsally, which places it in the *abyssinicus* group as defined by Annecke (1967). It can be distinguished from other species placed in the group by the well exserted ovipositor with the gonostylus more than 0.5X as long as the mid tibia (less than 0.4X as long as the mid tibia in other included species). See also comments under *cheras* (p. 516).

Genus *AMMONOENCYRTUS* De Santis

Ammonoencyrtus De Santis, 1964:376-378. Type species: *Cerapterocerus bonariensis* Brèthes, by original designation and monotypy.

Female. Overall length about 0.9-2.3mm.

Body not dorsoventrally flattened; fore wing generally infuscate with base, a small area below parastigma, area at apex of venation and apex hyaline, area near anal angle usually partially hyaline, main infuscate area not apically enclosed by a curved darker band; apex of postmarginal vein and stigmal vein more or less connected by a hyaline streak.

Head with shallow, inconspicuous piliferous punctures on frontovertex; scrobal area delimited dorsally by a weak transfacial ridge above which is a shallow, smooth and shiny transverse depression that contains a transverse band of silvery setae that are more dense below eye; transfacial ridge interrupted medially by interantennal prominence where it meets frontovertex;

ocellar area with shallow, but distinct polygonally reticulate sculpture that fades gradually towards transverse depression above the transfacial ridge; each scrobal depression delimited dorsally by transfacial ridge; malar sulcus absent; antenna inserted near mouth; scape strongly broadened and flattened, subtrapezoidal, lamina apically rounded; upper margin of scape broadened and slightly overhanging the basal part of the flagellum; apically quite smooth and shiny but not flattened; pedicel about half as wide as F1, subtriangular in profile, often very asymmetric being dorsally produced towards apex, dorsal margin always flat or concave and very shiny, usually flat surface tilted outwards; flagellum strongly flattened from side to side, segments subequal in width, produced ventrally and much wider than long, F1 largest, segments becoming progressively shorter dorsally and longer ventrally; clava 3-segmented, sutures entire, oblique, sensory area very enlarged giving apex a strong obliquely truncate appearance; mandible tridentate with two lower teeth acute and a rounded or obliquely truncate upper tooth; palp formula 4-3.

Mesoscutum with notaular lines sometimes visible anteriorly; fore wing with marginal vein longer than stigmal vein; postmarginal vein about half as long as stigmal; submarginal vein with parastigma slightly widened and usually slightly downcurved; basal cell largely naked and with a smaller naked area below parastigma; filum spinosum present;

Gaster with hypopygium transverse, anteriorly bilaterally concave, posteriorly with a shallow to moderate median invagination; ovipositor at least 1.5X as long as mid tibia and slightly to strongly exserted; gonostylus free; paratergites absent.

Male. Length about 0.9-1.5mm.

Head and body very dark brown with a moderate metallic sheen on head and a weaker metallic sheen on thoracic dorsum and gaster; antenna mostly brown; wings hyaline; frontovertex about half head width, with polygonally reticulate sculpture, gena and scrobal area with similar, but shallower sculpture; scape hardly broadened and not flattened; funicle with all segments longer than broad, clothed with setae, the longest about 1.5-4X as long as diameter of segment; phallobase with a single apical hook on each digitus.

DISTRIBUTION. New World.

HOSTS. Primary, or possibly secondary, parasitoids of soft scales (Hemiptera: Coccidae) (Compere, 1925; De Santis, 1964; Annecke, 1967; Meyer et al., 2001) and of lac insects (Hemiptera Kerriidae) (Schauff, 2005).

COMMENTS. *Ammonoencyrtus* is very similar to *Anicetus* Howard and *Homosemion* Annecke and can be distinguished using the key provided by Annecke (1967). Females of *Ammonoencyrtus* can be separated from those of *Anicetus* by lacking a strong, entire transfacial carina or ridge and not having the infuscate area of the fore wing delimited by a darker curved band. In addition, the pedicel is never more than half as wide as F1and is always dorsally flattened or concave and very shiny and the funicle segments are broadest proximally so that F6 is broader than F1. In *Anicetus* the pedicel is at least as wide as F1 and partially encloses it and it is often convexly rounded and not shiny, F1 is always narrower than F6. Females of *Ammonoencyrtus* can be separated from those of *Homosemion* by having the transfacial ridge interrupted medially, the dorsal surface of the pedicel flattened or concave and very shiny, F1 being slightly broader than F6 and the hyaline area below the parastigma being completely enclosed. In *Homosemion* the transfacial ridge is continuous, the dorsal surface of the pedicel is convexly rounded and dull and the hyaline area below the parastigma is open posteriorly.

IDENTIFICATION. Three species have been described previously. There is no single treatment available for identifying all three, but two have been treated by Annecke (1967) and a third by Schauff (2005).

Key to Costa Rican species of *Ammonoencyrtus* (Females)

1. Hind basitarsus yellow, concolorous with following tarsomeres; pedicel (Figs 1303, 1312, 1317, 1318) with a dorsal margin distinctly produced in lateral view [best seen on slide-mounted specimen]; frontovertex, above transfacial carina, with more than 20 conspicuous setae, excluding those along eye margin 2
- Hind basitarsus dark brown, contrasting with following tarsomeres that are yellow or pale orange; pedicel (Fig 1323, 1331, 1336) with dorsal margin not distinctly produced in lateral view [best seen on slide-mounted specimen]; frontovertex above transfacial carina with fewer than 15 setae, excluding those along eye margin 4

2 (1) Both mesoscutum and scutellum with a strong metallic dark green and blue-green sheen; sculpture on lateral one-third or so of scutellum very shallow and superficial, quite smooth and very shiny, contrasting strongly with much deeper sculpture on mesoscutum ..... *hyperion* **sp.nov.** (p. 520)
- Dorsum of thorax at most with a strong metallic sheen only on mesoscutum, scutellum orange; scutellum conspicuously sculptured, except on extreme side and apex, hardly shiny, with sculpture clearly deeper than that on mesoscutum 3

3 (2) Exserted part of ovipositor at least 1.5X as long as mid tibial spur, ovipositor about 2X as long as mid tibia; area above mouth margin pale orange .... *prosymnos* **sp.nov.** (p. 522)
- Exserted part of ovipositor not longer than mid tibial spur, ovipositor usually not more than about 1.7X as long as mid tibia; area above mouth margin dark brown (Fig. 1319) ..... *carolinensis* (Meyer) (p. 524)

4 (1) Antenna (Fig. 1323) with sensory area on clava shorter than ventral surface of clava ....*keira* **sp.nov.** (p. 526)
- Antenna (Figs 1331, 1336) with sensory area on clava at least about 1.5X as long as ventral surface of clava..... 5

5 (4) All coxae dark brown, legs otherwise mostly dark brown; mesoscutum and scutellum dark brown, mesoscutum with a strong, metallic dark blue and purple sheen, scutellum somewhat duller, but with a strong metallic sheen on side and at apex . ..... *galas* **sp.nov.** (p. 527)
- At least mid coxa orange, legs otherwise orange with dusky areas; mesoscutum orange or dusky orange with a weak to moderate dark blue and purple sheen, scutellum orange, sometimes with side and apex slightly metallic 6

6 (5) Mesoscutum dusky orange, but with a distinct metallic purple and green, blue or blue-green sheen and contrasting quite strongly with the orange scutellum; sensory area of clava (Fig. 1336) not more than about 2.3X as long as ventral margin (measured along straight ventral part) of clava; head less than 6X as wide as frontovertex .... *xanthos* **sp.nov.** (p. 529)
- Mesoscutum concolourous with scutellum, orange and with a weak coppery purple sheen; sensory area of clava about 3X as long as ventral margin; head at least about 7X as wide as frontovertex ..... *autone* **sp.nov.** (p. 531)

***Ammonoencyrtus hyperion* sp.nov.**
(Figs 1303-1307; Hab. ♀ 190)

DIAGNOSIS. *Female* (length about 1.7-2.0mm): mouth margin orange brown to dark brown; mesoscutum and scutellum both dark brown with a strong metallic sheen; fore and mid coxae

pale orange, hind coxa orange-brown; legs mostly orange, hind femur orange or largely dark brown; hind basitarsus yellow; head (Fig. 1305) about 6.5-10X as wide as frontovertex; antenna (Fig. 1303) with dorsal margin of pedicel produced in lateral view; sensory part of clava about 4X as long as straight part of ventral margin; frontovertex with more than 20 setae, excluding those along eye margin; scutellum mostly with very shallow, superficial sculpture that is clearly shallower than sculpture of mesoscutum; exserted part of ovipositor at least a little shorter than mid tibial spur. *Male*: Unknown.

Female (holotype): length, including ovipositor, 1.97mm; excluding ovipositor, 1.87mm (CPD).

Head generally orange with a very weak purple and brassy sheen; area delimited by ocelli with a metallic purple and blue-green sheen; area above transfacial carina metallic violet and dark blue, this continuing laterally, mixed purple and green, between eye and scrobal margin onto upper gena; temple brown with a moderate blue-green and green sheen; mouth margin mainly dark brown; setae on frontovertex, temple, gena and interantennal prominence dark brown; radicle dark brown; antenna (Fig. 1202) with scape, dark brown with a brassy and purple sheen, dorsal part of scape with a strong dark green sheen; pedicel and flagellum dark brown with a brassy and purple sheen; pronotum orange, posterior margin translucent, neck largely dark brown; propleuron mostly dark brown; prosternum orange-brown; mesoscutum metallic dark blue, narrowly margined posteriorly and laterally shining purple-brown, reticulate cells narrowly margined purple; tegula orange-brown with a weak brassy and purple sheen, apical margin dark brown; axilla dark brown with a weak brassy and purple sheen; scutellum metallic blue-green laterally and posteriorly, median one third or so coppery purple mixed blue-green and green; metanotum medially orange to dark orange-brown laterally; mesopleuron pale orange-brown with a mixed brassy, purple and dark blue sheen; fore coxa pale orange with a dark brown basal area posteriorly; fore femur pale orange, dorsally margined brownish, tibia and tarsus pale orange with apical tarsomere dark brown; mid coxa pale orange; mid femur pale yellow at extreme base, otherwise dusky pale orange, tibia proximally pale orange-brown, but mostly pale orange, spur and tarsus pale orange, apical tarsomere brown; hind coxa mostly dark brown, but pale orange in part externally and apically; hind femur brown, pale orange at extremities; tibia dark brown at extreme base, otherwise dusky pale orange, tarsus orange with apical tarsomere dark brown; fore wing (Fig. 1304) mostly infuscate but hyaline towards base and at apex, area proximad of anal angle clearly hyaline; venation brown, marginal vein dark brown, apices of postmarginal and stigmal veins connected by a fairly straight hyaline streak; hind wing hyaline; propodeum slightly dusky orange with a weak purple and brassy lustre, side with a purple and dark blue-green sheen, setae outside spiracle brown and moderately conspicuous; gaster dark brown, dorsally with a distinct purple, coppery and brassy sheen, side and venter more conspicuously mixed metallic green and blue; gonostylus apex pale orange.

; head

Head (Fig. 1305) about 6.5X as wide as frontovertex, in profile about 1.7X as long as deep, frontovertex evenly convex from occiput to top of scrobes then weakly curved to mouth margin with interantennal prominence slightly protuberant; vertex with a distinct, elongate, oval, shiny bottomed depression adjacent to eye margin between posterior ocellus and occipital margin; ocelli forming an angle of about 40°, anterior ocellus relatively large, its diameter about 0.6X minimum width of frontovertex; frontovertex slightly shiny with very shallow, fine, polygonally-reticulate sculpture of cell diameter about 0.5X diameter of eye facet, completely smooth above transfacial carina; temple and gena with longitudinally elongate, imbricate-reticulate sculpture that is clearly shallower than that on frontovertex; eye reaching occipital margin, naked; occipital margin sharp, carinate; narrowest point between eye and transfacial carina about 3X diameter of facet; narrowest point of the connection of the interantennal prominence to the frontovertex flat and about 1.5X diameter of anterior ocellus; area immediately above transfacial carina with about 23 setae; narrowest point of frontovertex hardly in front of anterior ocellus; frontovertex about 4.1X as long as broad; antenna as in Fig. 1303; scape subtrapezoidal with proximal part of dorsal margin about 0.85X length of distal part and with the proximal part of the ventral margin about 1.3X as long as the distal part; distal part of dorsal margin of scape and dorsal margin of pedicel

slightly concave and completely smooth and shiny; pedicel distinctly produced dorsally, about 0.4X as wide as F1, setae uniform; F1 about 1.3X as long as F2 and subequal in width, remaining segments progressively slightly narrower, clava about 0.9X as wide as F1; clava dorsally about as long as F2-F6 combined, sutures oblique, apex strongly obliquely truncate, sensory area about 4X as long as ventral margin; mandible with three teeth, lower teeth acute, upper tooth apically rounded tooth. Relative measurements: HW 97, HH 83, FVL 61; FV 15, POL 7, OOL 0, OCL 6.5, AOL 13.5, EL 55, EW 53, MS 45, SL (dorsal margin) 57.5, SL (lamina) 63, SW 45.

Thorax with polygonally reticulate to imbricate-reticulate sculpture on pronotum, mesoscutum and axilla that is slightly shallower than sculpture in ocellar area, but of similar mesh size; scutellum, in middle third with sculpture that is not deeper than that on mesoscutum, or hardly so, and laterally conspicuously shallower; visible part of mesoscutum about 1.5X as broad as long; scutellum about as broad as long; mid tibia with a weak external carina in proximal half; hind femur about 4.0X as long as broad; fore wing with venation and setation as in Figs 1304, 1306; costal cell with 9 or 10 setae dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak; propodeum medially about 0.13X as long as scutellum and with some shallow, irregular sculpture, about 6 setae anterior to and outside spiracle. Relative measurements: FWL 97, FWW 46; HWL 69, HWW 22.

Gaster with hypopygium reaching about 0.4X to apex, without a median, posterior projection (mucro); last tergite about 0.9X as long as mid tibia, with apex broad and weakly angular; ovipositor slightly exserted, the exserted part about 0.5X as long as mid tibial spur or about 0.1.5X length mid tibia.

Paratype. Funicle with linear sensilla on F3-F6; hypopygium Fig. 1307. Relative measurements: OL 64.5, GL 19 [MT 44.5].

Variation. Females vary in overall length from 1.74-1.97mm, the head is 6.5-10X as wide as the frontovertex, the pronotum may be similarly coloured to the mesoscutum and the hind femur may be orange or largely dark brown.

Male. Unknown.

DISTRIBUTION. Costa Rica, Trinidad & Tobago,

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Est. Cacao (ACG), 1100m, ii.2000 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Heredia**, La Selva BS, 50m, MT/YPT, ii.1991 (J.S. Noyes). **TRINIDAD & TOBAGO**, 1♀, **Trinidad**, St George, St Augustine, Malaise trap, 15.vii-13.viii.1976 (J.S. Noyes). Holotype in NHMUK, paratypes in MZUCR and NHMUK.

COMMENTS. *Ammonoencyrtus hyperion* can be distinguished from other species of the genus by the strongly metallic mesoscutum and scutellum and relatively shallow sculpture of the scutellum.

Ammonoencyrtus prosymnos **sp.nov.**

(Figs 1308-1312)

DIAGNOSIS. *Female* (length about 2.1-2.3mm): area above mouth margin orange; mesoscutum and scutellum orange with a weak metallic sheen; fore and mid coxae white, hind coxa pale orange; legs otherwise orange; hind basitarsus orange; head about 6.5-7.7X as wide as frontovertex; pedicel with dorsal margin produced in lateral view; sensory part of clava about 2.5X as long as straight part of ventral margin of clava; frontovertex with more than 20 setae, excluding those along eye margin; scutellum mostly with uniform conspicuous, polygonally reticulate sculpture that is clearly deeper than shallower imbricate-reticulate sculpture of mesoscutum, only extreme side and apex smooth and shiny; exserted part of ovipositor about as long as mid tibial spur to about 2X as long. *Male*: Unknown.

Female (holotype): length, including ovipositor, 2.08mm; excluding ovipositor, 1.89mm (CPD).

Head generally orange with a very weak brassy sheen; a narrow area above transfacial carina with a purple sheen mixed blue and violet; setae on frontovertex, temple and upper gena dark brown, those across face above transfacial carina conspicuous and silvery, those on interantennal prominence and on lower gena pale brown, translucent, and slightly silvery; antenna (Fig. 1312) with radicle orange, apex dark brown; scape slightly dusky orange, ventral margin translucent, proximally brown on internal surface, dorsal margin dark brown with a strong metallic green and blue-green sheen, very widely so towards apex; pedicel dark orange-brown, dark brown dorsally with a strong metallic green and blue-green sheen; funicle dark orange-brown, clava dark brown, flagellum with a brassy sheen; thorax generally orange with prosternum dark brown; pronotum with neck partially dark orange-brown; mesoscutum with a weak brassy and purple sheen; axilla and scutellum more or less matt, but with weak coppery and brassy reflections; mesopleuron with a weak brassy and purple sheen; fore coxa white; fore femur proximally white, remainder of fore leg mainly orange, but apical tarsomere dark brown; mid coxa white; mid femur proximally white, remainder of fore leg mainly orange, but apical tarsomere partly brown; hind coxa pale orange; remainder of hind leg mostly orange, but apical tarsomere dark brown; fore wing (Fig. 1311) mostly infuscate but hyaline towards base and at apex, venation pale orange, proximal part of parastigma and marginal vein brownish, apices of postmarginal and stigmal veins connected by an elongate, slightly curved hyaline streak; hind wing hyaline; propodeum pale orange with a weak brassy lustre, side dusky with a metallic blue and purple sheen, setae outside spiracle brown and inconspicuous; gaster largely orange with Gt1-Gt6 dorsally dark brown with a mixed purple, coppery and brassy sheen, side of Gt2-Gt5 with a metallic green and purple sheen, sternites brown, apex of outer plate of ovipositor and apex of syntergum pale brown; gonostylus pale orange, apex very pale orange.

Head about 6.5X as wide as frontovertex, in profile about 1.5X as long as deep, evenly convex from occiput to top of scrobes then virtually straight to mouth margin with interantennal prominence only slightly protuberant; vertex with a distinct, oval, shiny bottomed depression adjacent to eye margin between posterior ocellus and occipital margin; ocelli forming an angle of about 45°; frontovertex about 4.3X as long as broad, slightly shiny with fine, polygonally-reticulate sculpture of cell diameter about 0.5X diameter of eye facet, completely smooth above transfacial carina; temple and gena with longitudinally elongate, imbricate-reticulate sculpture of similar depth to that on frontovertex; eye reaching occipital margin, clothed with inconspicuous, very short translucent setae that are each much shorter than diameter of facet; occipital margin sharp, not carinate; narrowest point between eye and transfacial carina about 3.5X diameter of facet; width of interantennal prominence where it meets frontovertex about equal to minimum width of frontovertex; area immediately above transfacial carina with about 25 setae; narrowest point of frontovertex slightly in front of anterior ocellus; antenna as in Fig. 1312; scape subtrapezoidal with proximal part of dorsal margin 0.7X length of distal part and with the proximal part of the ventral margin about 1.25X as long as the distal part; distal part of dorsal margin of scape and dorsal margin of pedicel virtually flat but slightly concave and completely smooth and shiny; pedicel distinctly expanded dorsally, about 0.4X as wide as F1, setae uniform; F1 about 2X as long as F2 and subequal in width, remaining segments progressively narrower so that clava is about 0.7X as wide as F1; funicle with linear sensilla on F4-F6; clava dorsally a little shorter than F4-F6, apex strongly obliquely truncate, sutures oblique, sensory area about 2.4X as long as ventral margin; mandible with three teeth, upper tooth short appearing truncate. Relative measurements: HW 90, HH 77, FVL 57, FV 14, POL 7.5, OOL 0, OCL 7.5, AOL 11, EL 55, EW 49, MS 33, SL (dorsal margin) 58, SL (lamina) 62, SW 42.

Thorax with polygonally reticulate to imbricate-reticulate sculpture on pronotum and mesoscutum that is of similar depth and mesh size to sculpture on frontovertex; axilla with slightly deeper, slightly transversely elongate, polygonally reticulate sculpture; scutellum with similar sculpture to axilla, but conspicuously deeper and more rounded; visible part of mesoscutum about 1.5X as broad as long; scutellum about as broad as long; mid tibia without an external carina; hind femur about 4.1X as long as broad; fore wing venation and setation as in Figs 1310, 1311; area proximad of anal angle clearly hyaline; costal cell with 6 or 7 setae dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak; propodeum medially about

0.13X as long as scutellum, virtually smooth, 4 setae anterior to and outside spiracle. Relative measurements: FWL 95, FWW 41; HWL 72, HWW 19.5.

Gaster with hypopygium (Fig. 1309) reaching about 0.6X to apex, with a short, posterior, median projection (mucro); last tergite about as long as mid tibia, with apex strongly acute; ovipositor (Fig. 1308) strongly exserted, the exserted part about as long as mid tibial spur or 0.3X length mid tibia. Relative measurements: OL 96.5, GL 34 [MT 49.5].

Variation. Females vary in overall length from 2.09-2.25mm, the head is about 6.5-7.7X as wide as the frontovertex with the frontovertex about 4.3-5.0X as long as wide, the occipital margin may be weakly carinate, linear sensilla may also be present on F3 and the ovipositor varies from about 1.9-2.2X as long as the mid tibia so that the exserted part varies from about as long as the mid tibial spur to about 2X as long or 0.3-0.7X as long as mid tibia.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, 16km SSE La Virgen, 10°16'N 85°05'W, 1050-1150m, 11/M/TN, 10.ii-21.iv.2001 (INBio/OET-ALAS). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, PN Volcán Tenorio, Est. El Pilón, LN 298212 427913, 700m, #69218, 15-22.v.2002 (G. Carballo). Holotype and paratype in NHMUK.

COMMENTS. *Ammonoencyrtus prosymnos* is generally very similar to *carolinensis* and *bonariensis* (Brèthes) but can be separated from these species by the relatively more strongly exserted ovipositor (see key).

***Ammonoencyrtus carolinensis* (Meyer)**

(Figs 1313-1322; Hab. ♀ 191)

Anicetus carolinensis Meyer, in Meyer et al., 2001:687-689. Holotype ♀, USA (North Carolina), NSCU, not examined.
Ammonoencyrtus carolinensis (Meyer); Schauff, 2005: 115-118.
Homosemion carolinensis (Meyer); Trjapitzin, 2010a:440, 453.

DIAGNOSIS. *Female* (overall length 0.9-2.0mm): head generally orange with a very weak purple and brassy sheen; area above transfacial carina with a distinctly stronger purple sheen, a curved brown line between mouth margin and toruli (Fig. 1319), sometimes faint; antenna (Figs 1317, 1318) with scape orange, broadly margined brown ventrally, dorsal margin brown with a strong metallic green sheen; flagellum may be almost completely dark brown with a brassy and purple sheen, or it may be partly orange-brown; mesoscutum usually very slightly dusky orange with a distinct purple lustre (rarely dark brown and contrasting strongly with scutellum); axilla orange; scutellum orange with a slight brassy and coppery sheen, side and apex with a distinct purple and blue sheen; legs white to pale orange; fore wing (Figs 1320, 1321) infuscate with base and apex hyaline; gaster mostly orange with Gt1-Gt5 dorsally, distal margin of Gt6 and apex of syntergum brown, gonostylus pale orange; head (Fig. 1319) 5.8-9.6X as wide as frontovertex, the frontovertex relatively wider in smaller specimens with frontovertex slightly shiny with very shallow, fine, polygonally-reticulate sculpture, completely smooth above transfacial carina; ocelli forming an acute angle; narrowest point of connection of interantennal prominence to frontovertex flat and about 2X diameter of anterior ocellus; area immediately above transfacial carina with about 20 setae; antenna as in Figs 1317, 1318; F1 about 1.5X as long as F2 and subequal in width, remaining segments progressively slightly narrower; clava about 0.9X as wide as F1 and dorsally about as long as F3-F6 combined, sensory area about 2.2-4X as long as ventral margin, relatively longer in larger specimens (Fig. 1318); linear sensilla mostly only on F4-F6, rarely on all funicle segments;

mandible with three teeth; scutellum (Fig. 1313) with polygonally reticulate sculpture that is clearly deeper than imbricate-reticulate sculpture on mesoscutum, side and apex virtually smooth; fore wing about 2.4X as long as broad, venation and setation as in Figs 1314, 1317, 1318; area proximad of anal angle clearly hyaline; gaster with hypopygium (Figs 1315, 1316) reaching about 0.4X to apex, without a distinct, short, posterior, median projection (mucro); last tergite about as long as mid tibia or a little shorter, with apex acute or rounded; ovipositor (Fig. 1322) about 1.5X as long as mid tibia, slightly exserted, the exserted part not longer than mid tibial spur. *Male* (about 0.9-1.1mm): head and body very dark brown with a metallic green to blue-green and purple sheen on head, coppery purple in ocellar area; mesoscutum relatively dull dark green and coppery purple, scutellum coppery purple, side and apex metallic dark green; gaster with a metallic green and coppery sheen; antenna with scape yellow, pedicel and flagellum pale brown; legs mostly yellow, hind leg with coxa brown, hind femur partially brown, hind tibia brown in proximal two thirds; wings hyaline; frontovertex about half head width, with polygonally reticulate sculpture, gena and scrobal area with similar, but shallower sculpture; scape about 2.5X as long as broad; funicle with all segments longer than broad, F1 longest, clothed with setae, the longest of which is about 1.5X as long as diameter of segment; each digitus with a single apical hook.

DISTRIBUTION. USA (North Carolina, Florida); Costa Rica (**new record**).

HOSTS. Reared from *Mesolecanium nigrofasciatum* (Pergande) (Homoptera: Coccidae) on *Vaccinium corymbosum* L.) (Ericales: Ericaceae) (Meyer et al., 2001) and *Paratachardia silvestri* (Mahdihassan) (=*lobata* (Chamberlin) (Homoptera: Kerriidae) (Schauff, 2005). Recorded below from *Ceroplastes floridensis* Comstock (Hemiptera: Coccidae) on *Ilex cornuta* Lindl. & Paxton (Aquifoliales: Aquifoliacae) (**new record**).

MATERIAL EXAMINED.

Non type material. **USA**, 1♀, **Florida**, Monroe Co., Big Pine Key, Watson's Hammock, iii-iv.1985 (S. & J. Peck); 2♀, 2♂, Florida, Alachua Co., Gainesville. ex *Ceroplastes floridensis* on *Ilex cornuta*, 21.viii.1988 (F.D. Bennett); 3♂, Florida, Alachua Co., Gainesville. ex *Ceroplastes floridensis* on *Ilex cornuta*, 24.viii.1988 (F.D. Bennett); 8♀, Florida, Alachua Co., Gainesville. ex *Ceroplastes floridensis* on *Ilex cornuta*, 31.viii.1988 (F.D. Bennett); 1♀, Florida, Levy Co., Cedar Key, 23.iv.1989 (J.S. Noyes); 1♀, Florida, Gainesville, oak forest, 15.ix-20.x.1989 (BRC Hym Team). **COSTA RICA**, 14♀, **Guanacaste**, Santa Rosa NP, various localities and dates, 11.v.1985-31.i.1987 (D. Janzen, I.D. Gauld); 1♀, Guanacaste, Guanacaste NP, Est. Cacao (Pedregal), xi-xii.1990 (INBio Team); 2♀, Guanacaste, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Est. Cacao (ACG), 1100m, ii.2000 (J.S. Noyes); 1♀, Guanacaste, BN Diría, Ret. Alr. Torre Control de Incendio, LN 238550 358650, 600-700m, #66659, xii.2001-i.2002 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sector Palo Verde, LN 260952 385020, 0-50m, #54241, 8.xi-9.xii.1999 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sector Palo Verde, Campo Aterrizaje, LN 388400 259050, 10m, 10.i-19.ii.2001 (I. Jiménez); 4♀, **Heredia**, Santo Domingo, INBio Parque, LN 217300 526200, 1100m, TM, vi-vii.2000, vii.2001 and viii.2001 (R. Zuñiga); 1♀, Heredia, Santo Domingo, INBio Parque, LN 217300 526200, 1100m, iii.2002 (J.S. Azofeifa, J.S. Noyes); 3♀, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 14-15.ii.2005 (J.S. Noyes); 1♀, Puntarenas, Monteverde, 15-16.vii.1986 (L. Masner); 1♀, Puntarenas, PN Corcovado. Cerro Rincón, La Tigrilla, LS 274500 523600, 600m, #66466, 16.xi-20.xii.2001 (J. Azofeifa); 1♀, **Limón**, 5km SE Puerto Viejo, MT/YPT, 26.ii-1.iii.1991 (J.S. Noyes). Material in NHMUK, MZUCR, USNM and CNC.

COMMENTS. Costa Rica specimens agree well with the original description of *carolinensis* in Meyer et al. (2001), as well as with the diagnostic notes provided by Schauff (2005) and with material identified as this species listed above from Florida. I therefore have no hesitation in treating the Costa Rica material as *carolinensis*. It should be noted that the infuscation of the fore wing is generally not as strong as that figured by Schauff (2005, Fig. 5). In many specimens the diagonal band connecting the main infuscate area to the anal angle of the wing may be quite faint and difficult to see. I am unable to distinguish *carolinensis* from *californicus* using morphological characters, but the two can be separated instantly on colour. In *californicus* the thorax and legs are generally dark brown whereas in *carolinensis* the thorax and legs are pale orange with a

weak metallic sheen on the mesoscutum. Annecke (1967) noted a similar difference between *bonariensis* and *californicus*. It is possible that all three are forms of a single species. However, *bonariensis* appears to differ from both *californicus* and *carolinensis* in having a slightly wider frontovertex. In *bonariensis* it appears to be at least about 0.2X as wide as the head (De Santis, 1964, Fig. 200) whereas it is 0.10- 0.18X as wide as the head in *californicus* and *carolinensis*,

Ammonoencyrtus keira sp.nov.
(Figs 1323-1328)

DIAGNOSIS. *Female* (length about 1.1mm): area above mouth margin dark brown; mesoscutum dark orange-brown with a moderate metallic sheen, contrasting with orange scutellum; fore and hind coxa dusky orange, mid coxa orange; legs mostly orange; hind basitarsus dark brown; head about 4X as wide as frontovertex; antenna (Fig. 1323) with dorsal margin of pedicel not produced in lateral view; sensory part of clava shorter than straight part of ventral margin; frontovertex with about 10 setae above transfacial carina, excluding those along eye margin; scutellum (Fig. 1325) mostly with uniform conspicuous, polygonally reticulate sculpture that is clearly deeper than shallower imbricate-reticulate sculpture of mesoscutum, only extreme side and apex smooth and shiny; exserted part of ovipositor not longer than mid tibial spur. *Male*: Unknown.

Female (holotype): length, including ovipositor, 1.08mm; excluding ovipositor, 1.02mm (CPD).

Head generally slightly dusky pale orange with a very weak green, purple and brassy sheen; area above transfacial carina with a similar purple and violet sheen, this continuing more strongly laterally mixed with metallic blue between eye, and scrobal margin onto upper gena; temple with a moderate purple sheen; a curved, dark brown band between toruli and mouth margin; setae on frontovertex, temple, gena and interantennal prominence dark brown; antenna (Fig. 1323) with radicle orange-brown, apex dark brown; scape dusky orange, broadly bordered dark brown ventrally and apically and with dorsal margin dark brown with a slight purple and brassy sheen, remainder of antenna dark brown with a purple and brassy sheen; thorax with pronotum orange, neck marked dark brown; propleuron and prosternum orange-brown; mesoscutum dark orange-brown with a distinct green and blue-green lustre, mixed dark blue posteriorly and purple along posterior margin; tegula orange-brown with a weak brassy and purple sheen; axilla dusky orange with a weak purple and brassy sheen; scutellum orange with a weak brassy and coppery sheen, side and extreme apex with a purple and blue sheen; mesopleuron orange-brown with a mixed brassy, coppery, purple and blue sheen; fore coxa slightly dusky pale orange; fore femur proximally pale orange, slightly dusky orange towards apex, tibia dusky orange proximally, pale orange apically, tarsus orange with terminal segment dark brown; mid coxa orange; mid leg generally coloured as fore leg; hind coxa orange-brown; hind femur slightly dusky orange, tibia mostly dusky orange, but with apical one-quarter pale orange, basitarsus and apical tarsomere dark brown, remaining tarsomeres pale orange; fore wing (Fig. 1327) mostly infuscate but hyaline towards base and at apex, venation dusky orange, marginal vein dark brown, apices of postmarginal and stigmal veins connected by a fairly straight hyaline streak (Fig. 1326); hind wing hyaline; propodeum dusky orange with a weak brassy lustre, side with a relatively strong coppery purple and green lustre, setae outside spiracle dark brown and moderately conspicuous; gaster dark brown with a mixed purple, coppery and brassy sheen, with some metallic green and blue reflections on side and ventrally; gonostylus brown.

Head about 4.3X as wide as frontovertex, in profile about 1.5X as long as deep, frontovertex evenly convex from occiput to top of scrobes then virtually straight to mouth margin with interantennal prominence only slightly protuberant; vertex with an indistinct, elongate, oval, shiny bottomed depression adjacent to eye margin between posterior ocellus and occipital margin; ocelli forming an angle of about 80°; frontovertex about 2.7X as long as broad, clearly narrowing anteriorly, narrowest slightly above transfacial carina, slightly shiny with shallow, fine, polygonally-reticulate sculpture of cell diameter a little less than diameter of eye facet, completely smooth above transfacial carina; temple and gena with longitudinally elongate, imbricate-reticulate sculpture, slightly shallower than sculpture on frontovertex; eye reaching occipital margin, naked; occipital margin sharp, weakly carinate; narrowest point between eye and transfacial carina about

3X diameter of facet; narrowest point of the connection of the interantennal prominence to the frontovertex not carinate, about 0.5X as wide as diameter of anterior ocellus; area immediately above transfacial carina with about 9 setae; antenna as in Fig. 1323; scape subtrapezoidal with proximal part of dorsal margin 0.6X length of distal part and with the proximal part of the ventral margin about 1.3X as long as the distal part; distal part of dorsal margin of scape and dorsal margin of pedicel flat and completely smooth and shiny; pedicel not produced dorsally, about half as wide as F1, setae uniform; F1 about 1.6X as long as F2 and subequal in width, remaining segments progressively slightly narrower; linear sensilla present on F4-F6 or absent from F4; clava about 0.8X as wide as F1 and dorsally about as long as funicle, sutures oblique, apex strongly obliquely truncate, sensory area about 0.8X as long as ventral margin; mandible with two teeth and a weak truncation. Relative measurements: HW 52, HH 44.5, FVL 32; FV 12, POL 6.5, OOL 0, OCL 4, AOL 6, EL 29, EW 24.5, MS 24.5, SL (dorsal margin), 28, SL (lamina) 30.5, SW 21.

Thorax (Fig. 1325) with polygonally reticulate to imbricate-reticulate sculpture on pronotum and mesoscutum that is of slightly larger mesh size and slightly shallower than sculpture on frontovertex; axilla with clearly deeper, slightly transversely elongate, polygonally reticulate sculpture; scutellum with similar sculpture to axilla, but conspicuously deeper and more rounded; visible part of mesoscutum about 1.8X as broad as long; scutellum about 1.1X as broad as long; mid tibia with a weak external carina proximally; hind femur about 3.5X as long as broad; fore wing venation and setation as in Figs 1326, 1327; area proximad of anal angle weakly hyaline; costal cell with 6 or 7 setae dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak (Fig. 1326); propodeum (Fig. 1325) medially about 0.13X as long as scutellum, quite smooth, about 4 setae anterior to and outside spiracle. Relative measurements: FWL 53, FWW 24.5; HWL 39.5, HWW 10.

Gaster with hypopygium (Fig. 1324) reaching about 0.6X to apex, without a distinct, posterior, median projection (mucro); last tergite about 0.8X as long as mid tibia, with apex very weakly acute appearing rounded; ovipositor (Fig. 1328) slightly exserted, the exserted part about 0.7X as long as mid tibial spur or less than 0.2X length mid tibia. Relative measurements: OL 54.5, GL 14.5 [MT 41].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Est. Altamira, Send. a Casa Coca, LS 331750 574400, 1700m, ii.2002 (C. Hansson, D. Rubí, J. Azofeifa). Holotype in NHMUK.

Ammonoencyrtus galas **sp.nov.**

(Figs 1329-1333; Hab. ♀ 192)

DIAGNOSIS. *Female* (length about 1.4-2.1mm): area above mouth margin dark brown (Fig. 1332); mesoscutum and scutellum dark brown with a metallic sheen; all coxae dark brown; legs largely dark brown; hind basitarsus orange-brown; head (Fig. 1332) about 5X as wide as frontovertex; antenna (Fig. 1331) with dorsal margin of pedicel not produced in lateral view; sensory part of clava nearly 2X as long as straight part of ventral margin; frontovertex (Fig. 1332) with fewer than 15 setae, excluding those along eye margin; scutellum mostly with uniform conspicuous, polygonally reticulate sculpture that is clearly deeper than shallower imbricate-reticulate sculpture of mesoscutum, only extreme side and apex smooth and shiny; exserted part of ovipositor much shorter than mid tibial spur. *Male*: Unknown.

Female (holotype): length, including ovipositor, 2.08mm; excluding ovipositor, 2.02mm (CPD).

Head generally slightly dusky orange with a very weak purple and brassy sheen; area above

transfacial carina with a relatively strong purple sheen mixed blue and violet, this continuing laterally between eye and scrobal margin onto upper gena; temple with a moderate purple and violet sheen; area above mouth margin (Fig. 1332) dark brown; setae on frontovertex, temple, gena and interantennal prominence dark brown; radicle orange-brown, apex dark brown; antenna (Fig. 1331) mostly dark brown with a brassy sheen, but middle of scape externally with an elongate orange stripe; thorax with pronotum orange, neck largely dark brown; propleuron and prosternum dark brown; mesoscutum dark brown with a strong purple and blue sheen and an underlying, slightly weaker metallic green sheen; tegula dark brown with a weak brassy and purple sheen; axilla dark brown with a weak brassy sheen; scutellum dark brown with a slight brassy and coppery sheen, more purplish proximally, side and apex with a strong purple sheen; mesopleuron dark brown with a mixed purple and dark blue sheen; fore coxa dark brown; fore femur dark brown, mixed orange towards apex, tibia proximally brown, distally pale orange, tarsus largely pale dusky orange, but basitarsus orange-brown and apical tarsomere dark brown; mid coxa dark brown; mid femur dark brown, extreme base pale orange, proximal half of tibia dark brown, apex pale orange, spur and tarsus dusky pale orange, apical tarsomere dark brown; hind coxa dark brown; hind femur dark brown, tibia mainly very dark brown, almost black, with apex very pale orange, tarsus largely dusky pale orange with basitarsus and two apical tarsomeres dark brown; fore wing (Fig. 1334) mostly infuscate but hyaline towards base and at apex, venation dusky pale orange, marginal vein dark brown, apices of postmarginal and stigmal veins connected by a fairly straight hyaline streak (Fig. 1329); hind wing hyaline; propodeum dark brown with a weak brassy lustre, side with a relatively strong purple and brassy lustre, setae outside spiracle dark brown and moderately conspicuous; gaster dark brown with a mixed purple, coppery and brassy sheen, with some metallic green and blue reflections on side and ventrally; gonostylus slightly dusky pale orange.

Head (Fig. 1332) about 5.0X as wide as frontovertex, in profile about 1.5X as long as deep, frontovertex evenly convex from occiput to top of scrobes then virtually straight to mouth margin with interantennal prominence only slightly protuberant; vertex with a distinct, elongate, oval, shiny bottomed depression adjacent to eye margin between posterior ocellus and occipital margin; ocelli forming an angle of about 65°; frontovertex about 3.2X as long as broad, narrowest slightly in front of anterior ocellus, slightly shiny with very shallow, fine, polygonally-reticulate sculpture of cell diameter about 0.5X diameter of eye facet, completely smooth above transfacial carina; temple and gena with longitudinally elongate, imbricate-reticulate sculpture of similar depth to that on frontovertex; eye reaching occipital margin, naked; occipital margin sharp, carinate; narrowest point between eye and transfacial carina about 3X diameter of facet; narrowest point of connection of interantennal prominence to frontovertex carinate and much less than 0.2X diameter of anterior ocellus; area immediately above transfacial carina with about 17 setae; antenna as in Fig. 1331; scape subtrapezoidal with proximal part of dorsal margin 0.6X length of distal part and with the proximal part of the ventral margin about 1.6X as long as the distal part; distal part of dorsal margin of scape and dorsal margin of pedicel virtually flat but slightly concave and completely smooth and shiny; pedicel not produced dorsally, about 0.4X as wide as F1, setae uniform; F1 about 1.3X as long as F2 and subequal in width, remaining segments progressively narrower so that clava is about 085X as wide as F1; clava dorsally about as long as F3-F6 combined, sutures oblique, apex strongly obliquely truncate, sensory area about 1.8X as long as ventral margin; mandible with two teeth and a broad truncation. Relative measurements: HW 88, HH 74, FVL 56; FV 17.5, POL 8.5, OOL 0, OCL 7.5, AOL 10, EL 48, EW 44, MS 39, SL (dorsal margin) 60, SL (lamina) 66, SW 38.

Thorax with polygonally reticulate to imbricate-reticulate sculpture on pronotum and mesoscutum of similar depth and mesh size to sculpture on frontovertex; axilla with slightly deeper, slightly transversely elongate, polygonally reticulate sculpture; scutellum with similar sculpture to axilla, but conspicuously deeper and more rounded; visible part of mesoscutum about 1.5X as broad as long; scutellum about as broad as long; mid tibia with a weak external carina in proximal half; hind femur about 4.1X as long as broad; fore wing venation and setation as in Figs 1329, 1331; area proximad of anal angle weakly hyaline; costal cell with 11 or 12 setae dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak (Fig. 1329); propodeum medially about 0.15X as long as scutellum, quite smooth but with a

few shallow, longitudinal carinae posteriorly near middle, about 10 setae anterior to and outside spiracle. Relative measurements: FWL 109, FWW 49; HWL 82, HWW 27.

Gaster with hypopygium reaching about half way to apex, without a distinct, posterior, median projection (mucro); last tergite about 0.7X as long as mid tibia, with apex weakly acute; ovipositor hardly exserted, the exserted part about 0.2X as long as mid tibial spur or less than 0.1X length mid tibia.

Paratype. Funicle with linear sensilla present only on F3-F6; hypopygium Fig. 1330. Relative measurements: OL 61.5, GL 19 [MT 45].

Variation. Females vary in overall length from 1.42-2.08mm, the mesoscutum may be lacking an underlying metallic green sheen, the anterior part of the side of the scutellum may be strongly shining green and blue-green, the mid femur may be orange-brown; the gonostylus may be proximally orange-brown and the narrowest point of the connection of the interantennal prominence to the frontovertex may be subcarinate and about 0.3X as wide as the anterior ocellus.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Cartago**, Madreselva, Los Lagos, LN 184450 550050, 2600m, 7.xi-5.xii.1994 (M.M. Chavarria). Paratypes: **COSTA RICA**, 1♀, **Cartago**, Hwy 2, km 95, 14.iv.1985 (L. Masner); 1♀, Cartago, Hwy 2, km 96, 9°36'N 83°44'W, 3200m, 3-13.iv.1986 (H. Goulet, L. Masner); 1♀, Cartago, PN Tapanti-Macizo de la Muerte, Send. a Rio Humo, LN 188100 560500, 1400-1500m, #56624. xii.1999-i.2000 (M. Alfaro). Holotype in MZUCR, paratypes in NHMUK.

Ammonoencyrtus xanthos **sp.nov.**

(Figs 1334-1338; Hab. ♀ 193)

DIAGNOSIS. *Female* (length about 1.1-1.3mm): area above mouth margin dark brown; mesoscutum orange-brown with a moderate metallic sheen, contrasting a little with slightly dusky orange scutellum; fore and hind coxa dusky orange to orange-brown, mid coxa orange; legs mostly orange; hind basitarsus dark brown; head about 4.5-5.2X as wide as frontovertex; antenna (Fig. 1336) with dorsal margin of pedicel not produced in lateral view; sensory part of clava slightly more than 2X as long as straight part of ventral margin; frontovertex with about 15 setae, excluding those along eye margin; scutellum (Fig. 1338) mostly with uniform conspicuous, polygonally reticulate sculpture that is clearly deeper than shallower imbricate-reticulate sculpture of mesoscutum, only extreme side and apex smooth and shiny; exserted part of ovipositor much shorter than mid tibial spur. *Male*: Unknown.

Female (holotype): length, including ovipositor, 1.31mm; excluding ovipositor, 1.27mm (CPD).

Head generally slightly dusky orange with very weak purple and brassy sheen; area above transfacial carina with a relatively strong purple and violet sheen, this continuing laterally mixed with metallic blue-green between eye, and scrobal margin onto upper gena; temple with a moderate purple and violet sheen; mouth margin dark brown between mandibular bases; setae on frontovertex, temple, gena and interantennal prominence dark brown; antenna (Fig. 1336) with radicle orange-brown, apex dark brown; scape dusky orange, broadly bordered dark brown ventrally and with dorsal margin dark brown with a slight brassy sheen, remainder of antenna dark brown with a brassy sheen; thorax with pronotum orange, neck marked dark brown; propleuron and prosternum orange-brown; mesoscutum orange-brown with a moderate purple and blue sheen; tegula orange-brown with a weak brassy and purple sheen; axilla orange with a weak brassy sheen; scutellum slightly dusky orange with a weak brassy and coppery sheen, side and extreme apex with a purple and blue sheen; mesopleuron dusky orange with a mixed brassy, coppery and purple sheen; fore coxa slightly dusky pale orange; fore femur proximally pale orange, slightly

dusky orange towards apex, tibia dusky orange proximally, pale orange apically, tarsus orange with terminal segment dark brown; mid coxa orange; mid leg generally coloured as fore leg; hind coxa orange-brown; hind femur slightly dusky orange, tibia mostly dusky orange, but with apical one-quarter pale orange, basitarsus and two apical tarsomeres dark brown, remaining tarsomeres pale orange; fore wing mostly infuscate but hyaline towards base and at apex, venation dusky orange, marginal vein dark brown, apices of postmarginal and stigmal veins connected by a fairly straight hyaline streak; hind wing hyaline; propodeum dusky orange with a weak brassy lustre, side with a relatively strong coppery purple and green lustre, setae outside spiracle dark brown and moderately conspicuous; gaster dark brown with a mixed purple, coppery and brassy sheen, with some metallic green and blue reflections on side and ventrally, syntergum dusky pale orange; gonostylus dark brown with apex pale orange.

Head about 5.2X as wide as frontovertex, in profile about 1.5X as long as deep, frontovertex evenly convex from occiput to top of scrobes then virtually straight to mouth margin with interantennal prominence only slightly protuberant; vertex with a distinct, elongate, oval, shiny bottomed depression adjacent to eye margin between posterior ocellus and occipital margin; ocelli forming an angle of about 50°; frontovertex about 3.8X as long as broad, narrowest slightly in front of anterior ocellus, slightly shiny with very shallow, fine, polygonally-reticulate sculpture of cell diameter about 0.5X diameter of eye facet, completely smooth above transfacial carina; temple and gena with longitudinally elongate, imbricate-reticulate sculpture of similar depth to that on frontovertex; eye reaching occipital margin, naked; occipital margin sharp, weakly carinate; narrowest point between eye and transfacial carina about 3X diameter of facet; narrowest point of the connection of the interantennal prominence to the frontovertex not carinate, and only slightly narrower than diameter of anterior ocellus; area immediately above transfacial carina with about 9 setae; antenna as in Fig. 1336; scape subtrapezoidal with proximal part of dorsal margin 0.6X length of distal part and with the proximal part of the ventral margin about 1.45X as long as the distal part; distal part of dorsal margin of scape and dorsal margin of pedicel flat and completely smooth and shiny; pedicel not produced dorsally, about 0.4X as wide as F1, setae uniform; F1 about 1.1X as long as F2 and subequal in width, remaining segments progressively slightly narrower; clava about 0.9X as wide as F1, dorsally about as long as funicle, sutures oblique, apex strongly obliquely truncate, sensory area about 2.2X as long as ventral margin; mandible with two teeth and a moderately broad truncation. Relative measurements: HW c62, HH c52, FVL 46; FV 12, POL 5, OOL 0, OCL 5.5, AOL 7, EL 38, EW 34, MS c27.5, SL (dorsal margin) 38.5, SL (lamina) 43, SW 26.

Thorax (Fig. 1338) with polygonally reticulate to imbricate-reticulate sculpture on pronotum and mesoscutum that is of similar depth and mesh size to sculpture on frontovertex; axilla with slightly deeper, slightly transversely elongate, polygonally reticulate sculpture; scutellum with similar sculpture to axilla, but conspicuously deeper and more rounded; visible part of mesoscutum about 1.6X as broad as long; scutellum about as broad as long; mid tibia without an external carina; hind femur about 3.9X as long as broad; fore wing venation and setation as in Figs 1334, 1337; area proximad of anal angle more or less completely infuscate with only a slight hint of a hyaline area; costal cell with 8 or 9 setae dorsally at apex; apices of postmarginal and stigmal veins (Fig. 1337) connected by a naked, hyaline streak; propodeum (Fig. 1338) about 0.13X as long as scutellum, quite smooth but with a few shallow, very short, longitudinal carinae posteriorly near middle, about 4 setae anterior to and outside spiracle. Relative measurements: FWL 73.5, FWW 33.5; HWL 54, HWW 16.5.

Gaster with hypopygium reaching about half way to apex, without a distinct, posterior, median projection (mucro); last tergite about 0.8X as long as mid tibia, with apex weakly acute; ovipositor hardly exserted, the exserted part about 0.2X as long as mid tibial spur or less than 0.1X length mid tibia.

Paratype. Funicle with linear sensilla present only on F4-F6; hypopygium Fig. 1335. Relative measurements: OL 70, GL 22 [MT 54].

Variation. Females vary in overall length from 1.14-1.31mm, the mesoscutum may have an additional metallic green sheen, the head may be only about 4.5X as wide as the frontovertex, there may be only 5 or 6 setae dorsally at apex of costal cell of fore wing and there may be 5 or 6 setae outside spiracle on propodeum.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, 6km NE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/NOTN, iv.2002 (INBio-OET-ALAS). Paratypes: **COSTA RICA**, 1♀, **Heredia**, Vara Blanca, Finca la Georgina, 2200m, ix.1989 (P. Hanson); 1♀, **San José**, Zurqui de Moravia, 1600m, iii.1992 (P. Hanson). Holotype in MZUCR, paratypes in NHMUK.

***Ammonoencyrtus autone* sp.nov.**
(Hab. ♀ 194)

DIAGNOSIS. *Female* (length about 2.3mm): area above mouth margin dark brown; mesoscutum and scutellum orange with a weak metallic sheen; all coxae pale orange; legs otherwise pale orange except dark orange-brown hind basitarsus; head about 7.2X as wide as frontovertex; pedicel with dorsal margin not produced in lateral view; sensory part of clava about 2X as long as straight part of ventral margin; frontovertex with about 15 setae, excluding those along eye margin; scutellum mostly with uniform conspicuous, polygonally reticulate sculpture that is clearly deeper than shallower imbricate-reticulate sculpture of mesoscutum, only extreme side and apex smooth and shiny; exserted part of ovipositor shorter than mid tibial spur. *Male*: Unknown.

Female (holotype): length, including ovipositor, 2.27mm; excluding ovipositor, 2.14mm (CPD).

Head generally orange with a very weak purple and brassy sheen; a narrow area above transfacial carina with a moderately strong purple sheen mixed blue and violet, this continuing laterally between eye and scrobal margin onto upper gena; temple with a weak purple and violet sheen; lower face with a curved, transverse, brown band between toruli and mouth margin; setae on frontovertex, temple, gena and interantennal prominence dark brown; radicle orange, apex dark brown; scape orange, ventral margin dark brown, dorsal margin dark brown, distally with a strong metallic purple sheen mixed metallic green and dark blue; pedicel dark brown, dorsally metallic green and purple sheen; funicle dark orange-brown, dorsally dark brown with a slight brassy sheen, clava dark brown; thorax generally orange; pronotum with neck partially dark orange-brown; mesoscutum with a weak brassy and purple sheen; axilla and scutellum more or less matt, but with weak coppery and brassy reflections; mesopleuron with a weak brassy, blue and purple sheen; legs, including coxae, generally pale orange, but apical tarsomeres dark brown and hind basitarsus dark orange-brown in distal two-thirds; fore wing mostly infuscate but hyaline towards base and at apex, venation pale orange, proximal part of parastigma and marginal vein brownish, apices of postmarginal and stigmal veins connected by a fairly straight hyaline streak; hind wing hyaline; propodeum pale orange with a weak brassy lustre, side slightly dusky with a metallic green and purple sheen, setae outside spiracle translucent pale brown and moderately conspicuous; gaster largely orange with Gt1-Gt6 dorsally dark brown with a mixed purple, coppery and brassy sheen, side of Gt2-Gt5 with a metallic green and purple sheen, sternites brown, apex of outer plate of ovipositor and apex of syntergum pale brown; gonostylus pale orange-brown, apex very pale orange.

Head about 7.2X as wide as frontovertex, in profile about 1.5X as long as deep, frontovertex evenly convex from occiput to top of scrobes then virtually straight to mouth margin with interantennal prominence only slightly protuberant; vertex with a distinct, elongate, oval, shiny bottomed depression adjacent to eye margin between posterior ocellus and occipital margin; ocelli forming an angle of about 45°; frontovertex about 4.5X as long as broad, narrowest slightly in front of anterior ocellus, slightly shiny with fine, polygonally-reticulate sculpture of cell diameter about 0.5X diameter of eye facet, completely smooth above transfacial carina; temple and gena with longitudinally elongate, imbricate-reticulate sculpture of similar depth to that on frontovertex; eye reaching occipital margin, virtually naked, but clothed with very inconspicuous,

very short, translucent setae that are each much shorter than diameter of facet; occipital margin sharp, carinate; narrowest point between eye and transfacial carina about 3X diameter of facet; width of interantennal prominence meeting frontovertex about 0.5X diameter of anterior ocellus; area immediately above transfacial carina with about 13 setae; antenna with scape subtrapezoidal with proximal part of dorsal margin 0.5X length of distal part and with the proximal part of the ventral margin about 1.6X as long as the distal part; distal part of dorsal margin of scape and dorsal margin of pedicel virtually flat but slightly concave and completely smooth and shiny; pedicel not expanded dorsally, nearly 0.5X as wide as F1, setae uniform; F1 about 1.1X as long as F2 and subequal in width, remaining segments progressively narrower so that clava is about 0.85X as wide as F1; clava dorsally about as long as F2-F6 combined, sutures oblique, apex strongly obliquely truncate with sensory area about 2X as long as ventral margin; mandible tridentate, upper tooth rounded. Relative measurements: HW 93, HH 79, FVL 59; FV 13, POL 9.5, OOL 0, OCL 7, AOL 11, EL 52, EW 48, MS 36, SL (dorsal margin) 61, SL (lamina) 67, SW 40.

Thorax with polygonally reticulate to imbricate-reticulate sculpture on pronotum and mesoscutum that is of similar depth and mesh size to sculpture on frontovertex; axilla with slightly deeper, slightly transversely elongate, polygonally reticulate sculpture; scutellum with similar sculpture to axilla, but conspicuously deeper and more rounded; visible part of mesoscutum about 1.5X as broad as long; scutellum about as broad as long; mid tibia with a weak external carina in proximal half; hind femur about 4.1X as long as broad; fore wing with area proximad of anal angle hyaline; costal cell with 11 or 12 setae dorsally at apex; apices of postmarginal and stigmal veins connected by a naked, hyaline streak; propodeum medially about 0.13X as long as scutellum, quite smooth but with a few shallow, longitudinal carinae posteriorly near middle, about 15 setae anterior to and outside spiracle. Relative measurements: FWL 106, FWW 48; HWL 80, HWW 23.

Gaster with hypopygium reaching about 0.6X to apex, with an inconspicuous, posterior, median projection (mucro); last tergite about 0.7X as long as mid tibia, with apex acute; ovipositor slightly exserted, the exserted part about 0.5X as long as mid tibial spur or 0.15X length mid tibia; gonostylus about 1.2X as long as mid tibial spur.

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Monteverde, 1780m, Est. Biol. Monteverde, 3.ix.1996 (S. Seaton). Holotype in NHMUK.

Genus *POLASZEKIUS* gen.nov.

Type species: *Polaszekius nemesis* sp.nov. Gender masculine.

Female. Length about 1.5-1.7mm.

Body robust, generally dark with a weak to moderate metallic sheen; funicle with unicolourous pale segments; dorsum of thorax with dark setae; legs generally dark with pale areas; wings hyaline with a small infuscate area below marginal and stigmal veins; propodeum dark with a weak metallic sheen, side more strongly metallic, some silvery setae near spiracle; gaster dark with a metallic sheen.

Head in profile about 1.7X as high as deep, anteriorly fairly evenly curved from occipital margin to top of scrobes, more strongly curved at top of scrobes and virtually straight to mouth margin, interantennal prominence hardly protuberant; occipital margin carinate; frontovertex about half head width and with irregular, polygonally reticulate sculpture and sparse, shallow piliferous punctures; ocelli forming a strongly obtuse angle; temple and gena with shallow, longitudinally elongate, polygonally reticulate sculpture; eye nearly reaching occipital margin,

with fairly conspicuous setae; scrobes shallow, ∩ -shaped; antenna attached slightly below lower eye margin; scape slightly broadened and flattened, a little more than 2X as long as broad, about 0.4X as long as head width; funicle segments subquadrate, mostly transverse, linear sensilla only on distal segments; clava shorter than funicle, 3-segmented, sutures subparallel, sensory area slightly enlarged and extending a little way along ventral surface, giving apex of clava a slight, obliquely truncate appearance; malar sulcus absent; mouth about 0.4X head width, clypeal margin very slightly produced medially; mandible with a long lower tooth a short median tooth and a broad truncation; palp formula 3-3.

Thorax with pronotum short; mesoscutum without notaular lines; scutellum convex, but dorsally quite flat, with deeper sculpture than mesoscutum, extreme apex and side completely smooth and shiny; mid tibia with a minute elongate invagination on its external surface about mid-way along its length (see below), spur about as long as basitarsus; fore wing fully developed; about 2.3X as long as broad; costal cell with only 1 line of setae ventrally and a line of setae dorsally in apical half or so; submarginal vein with an apical hyaline break; marginal vein about 2.5X as long as broad, slightly shorter than stigmal vein and about 2X as long as postmarginal vein; linea calva open; filum spinosum present, consisting of a line of about 5 slightly stouter setae; posterior margin of mesopleuron not reaching level with posterior margin of propodeum, falling short by distance equivalent to about half diameter of propodeal spiracle; propodeum short, with some shallow, irregular sculpture posteriorly, side sharp above hind coxa, with a minute posterolateral tooth behind spiracle; about 20 setae near spiracle, not extending part way towards hind coxa.

Gaster with hypopygium reaching slightly past apex; paratergites absent; syntergum shorter than mid tibia, apex rounded; ovipositor (Fig. 1342) strongly exserted, slender, longer than mid tibia, outer plates narrow, ribbon-like; second valvifer without a subapical seta, proximally with posterior, outer margin of semicircular sheet (see below) hardly concave, almost straight; hypopygium (Fig. 1343) subtriangular, longer than broad and with posterior margin somewhat trident-shaped.

Male. Unknown.

DISTRIBUTION. Known only from Costa Rica, but possibly more widespread in the Neotropics.

HOSTS. Unknown.

COMMENTS. The minute, elongate invagination about mid-way along the mid tibia appears to be unique to this genus, unfortunately this character seems to be visible only on slide-mounted material and even then with some difficulty.

Polaszekius may be close to *Dalek* and other genera (e.g. *Hebynthus*, *Alkonia*, *Raquanus*, *Mendisa*, *Caldencyrtus*, etc., see comments under *Alkonia*, p. 708). However, it can be separated from these genera and others by the unique structure of the hypopygium and ovipositor. The hypopygium (Fig. 1343) is subtriangular, much longer than broad, with a trident-shaped posterior margin. The (Fig. 1342) is slender, strongly exserted and it has outer plates that are slender and ribbon-like and the outer margin of the proximal part of the second valvifer (semi-circular sheet; see Copland & King, 1972) is hardly concave. In the vast majority of encyrtids the semicircular sheet has the posterior, outer part of the semicircular sheet broadly C-shaped. The connection between the distal part of the second valvifer with the third valvula also appears to be unique.

The genus is named in honour of Andrew Polaszek, a colleague and friend, who facilitated this study during the Covid-19 lockdown and who is also an authority on Aphelinidae.

***Polaszekius nemesis* sp.nov.**
(Figs 1339-1345; Hab. ♀ 195)

Female (holotype): length, including ovipositor, 1.60mm; excluding ovipositor, 1.37mm (CPD).

Head generally black with a coppery purple sheen; ocellar area with a metallic dark blue sheen; temple metallic green and brassy near eye; lower part of interantennal prominence and middle

of mouth margin with a slight metallic, dark green sheen; frontovertex, gena and interantennal prominence with inconspicuous, brown setae; antenna (Fig. 1339) with radicle dark brown; scape mostly dark brown, only extreme apex yellow; pedicel dark brown; funicle yellow; clava pale brown; maxillary palpus white; thorax generally dark brown to black; pronotum mostly metallic dark blue with some blue-green, posterior margin narrowly coppery purple; mesoscutum mostly metallic dark blue with some purple reflections, posterior margin narrowly coppery purple; tegula dark brown with a coppery purple sheen; axilla dark brown with a coppery purple and brassy sheen; scutellum dorsally relatively dull purple-brown medially, margined metallic blue-green, vertical sides and apex bright metallic dark blue, green and brassy; mesoscutum clothed with slightly translucent, brown setae, scutellum with dark brown setae; metanotum dark purple-brown; mesopleuron very dark brown, with a brassy sheen mixed with some coppery purple; mesosternum dark brown; all coxae dark brown; fore femur and tibia dark brown, each with extreme apices very pale orange, tarsus pale orange, apical tarsomere pale brown; mid femur white in proximal 0.5X, apical 0.5X dark brown, tibia dark brown at extreme base, a white subbasal ring, followed by a dark brown ring to about 0.5X, apex yellow, spur and tarsus white to very pale yellow, apical tarsomere pale orange-brown; hind femur dark brown, tibia almost completely dark brown with a very narrow, pale orange subbasal ring, hind tarsus brown; wings mostly hyaline, but fore wing (Fig. 1340, 1345) with a small, weakly infuscate area immediately below marginal and stigmal veins; propodeum dark brown, with a weak purple and brassy sheen, side with a metallic green, dark blue and coppery sheen with about 20 conspicuous, translucent, silvery setae outside spiracle, extending towards posterior margin and part way towards hind coxa; gaster dark brown, with a distinct coppery purple sheen, dorsal anterior part of Gt1 with a distinct, dark blue, green, brassy and coppery sheen, side of gaster with a mixed metallic green, brassy and coppery sheen; gonostylus dark brown.

Head (Fig. 1341) about 1.9X as wide as frontovertex, without a depression adjacent to eye margin behind posterior ocellus; ocelli forming an angle of about 115°; frontovertex with irregular, fairly deep, polygonal sculpture, in ocellar area of mesh size smaller than eye facet, slightly transversely elongate and partly imbricate-reticulate in front of anterior ocellus with relatively large mesh, subequal to that of eye facet or conspicuously larger; frontovertex with piliferous punctures shallow and indistinct, about 2 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin on to gena; interantennal prominence with a few inconspicuous setae; temple and gena with relatively shallow, longitudinally elongate, polygonally reticulate sculpture of relatively small mesh, area immediately below eye completely smooth; eye nearly reaching occipital margin, separated by very slightly less than diameter of facet, clothed with fairly conspicuous setae, each slightly shorter than diameter of facet, separated from scrobal margin by about diameter of ocellus, area between eye and scrobe partly with shallow, transversely elongate, polygonally reticulate sculpture; scrobes meeting dorsally, very weakly margined dorsally and laterally; interantennal prominence shallow, dorsally rounded; antenna as in Fig. 1339; scape broadened and flattened, only about 2.3X as long as broad, dorsal margin very slightly convex; F1 and F6 subquadrate, F2-F5 clearly transverse, segments becoming progressively broader distad; clava slightly enlarged, about 1.25X as wide as F6, about as long as F2-F6 combined, outer suture strongly oblique, sensory area enlarged, extending about 0.25X along ventral surface of clava giving it a slight, obliquely truncate appearance; clypeal margin (Fig. 1341) with a short, distinct, truncate, bilobed projection. Relative measurements: HW 69, HH 63, FV 36, POL 17, OOL 6, OCL 4, AOL 9, EL 37, EW 26, MS 25, SL 29, SW 12.5.

Thorax (Fig. 1344) in dorsal view with pronotum clearly visible behind head, its posterior margin concave, with polygonally reticulate sculpture that is generally similar to that on frontovertex; mesoscutum with fairly regular, polygonally reticulate sculpture that is a little deeper and coarser than that on pronotum, slightly longitudinally elongate laterally; axilla with shallow, fine, transversely elongate, polygonally reticulate sculpture; scutellum with similar sculpture to that on posterior part of mesoscutum, but clearly coarser and deeper, slightly longitudinally elongate and more or less arranged in whorls, sides and apical one-third more or less vertical and completely smooth and shiny; visible part of mesoscutum about 1.7X as broad as long; scutellum nearly 1.1X as long as broad, extreme apex slightly flange-like; fore wing with venation and distribution of setae as in Figs 1340, 1345; propodeum (Fig. 1344) medially about 0.16X as long as

scutellum, virtually smooth but with some shallow, polygonally reticulate sculpture posteriorly, side posteriorly sharp above hind coxa, but not carinate, with a minute, triangular tooth a little above half way towards spiracle. Relative measurements: FWL 85.5, FWW 37; HWL 59, HWW 15.

Gaster with syntergum about 0.75X as long as mid tibia, with apex rounded (Fig. 1342); ovipositor strongly exserted, the exserted part about 1.25X as long as mid tibial spur or about 0.4X as long as mid tibia.

Paratype. Funicle with linear sensilla only on F4-F6; hypopygium Fig. 1343; ovipositor Fig. 1342. Relative measurements: OL 101.5, GL 59 [MT 85, MTS 28].

Variation. Females vary in overall length from 1.48-1.66mm, the frontovertex or pronotum may be metallic dark blue, dark green or blue-green and may have a slight coppery sheen, the mesoscutum or scutellum may have a distinct violet sheen, the head varies from 1.6-1.7X as high as deep and from 1.9-2.2X as wide as the frontovertex, the reticulate sculpture on the frontovertex may be of mesh size slightly larger than an eye facet, there may be from 4-10 setae in middle of frontovertex in front of anterior ocellus and the fore wing varies from about 2.3-2.4X as long as wide.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/TN, iv.2002 (INBio-OET-ALAS). Paratypes: **COSTA RICA**, 5♀, **Heredia**, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/NOTN, iv.2002 (INBio-OET-ALAS); 8♀, Heredia, 9km ENE Vara Blanca, 10°14'N 84°06'W, 1450-1550m, 15/M/TN, iii-iv.2005 (INBio-OET-ALAS). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

Genus *PROTYNDARICHOIDES* Noyes

Protyndarichoides Noyes 1980:136,224. Type species: *Protyndarichoides nigriceps* Noyes, by original designation and monotypy.

DIAGNOSIS. *Female*. Overall length about 0.8-1.3mm.

Body orange to dark brown with a weak to moderate metallic sheen; wings hyaline, fore wing sometimes weakly infuscate below marginal vein. or uniformly weakly infused pale brown.

Head about 1.9-3.1X as wide as frontovertex, in profile anteriorly quite evenly curved from occipital margin to mouth margin; occipital margin sharp; eye with pale setae that are at least nearly as long as diameter of facet; scrobes very shallow, narrowly ∩-shaped; antenna inserted at about level of lower eye margin or slightly below; scape about 4.4-5.9X as long as wide; funicle 6-segmented, segments at least slightly longer than broad but becoming broader distad; clava 2- or 3-segmented with apex pointed or slightly obliquely truncate; malar sulcus present; clypeal margin medially concave; mandible with three equal, acute teeth; palp formula 4-3.

Thorax with notaular lines present at extreme anterolateral parts of mesoscutum, visible only in paler species; scutellum slightly convex, about as long as broad; mid tibial spur at least slightly shorter than basitarsus; fore wing about 2.4-2.8X as long as broad; parastigma slightly swollen; costal cell dorsally with a single line of setae in at least apical half; marginal vein about 3X as long as broad, at least 1.5X as long as stigmal vein and about 3X as long as postmarginal vein, although postmarginal vein sometimes as long as stigmal vein; stigmal vein subsessile with 3 apical campaniform sensilla; linea calva entire; filum spinosum present; propodeum about 0.2-0.3X as long as scutellum.

Gaster with hypopygium nearly reaching apex, varying from about 2X as broad as long to nearly 1.5X as long as broad; posterior margin medially broadly invaginate; apex of syntergum

truncate or broadly rounded; ovipositor not exserted or hardly exserted, at most about 0.5X as long as mid tibia; second valvifer curved upwards towards apex, semicircular sheet reduced, only slightly broadened proximally, its outer margin hardly curved; gonostylus short, less than 0.25X length of ovipositor; outer plate broadly triangular, about 1.5X as long as broad.

Male. Overall length about 1.0-1.3mm.

Similar to female apart from antennal structure and genitalia. Head about 2-2.3X frontovertex width, scape about 4X as long as wide; all funicle segments clearly longer than broad and clothed with long setae, the longest of which is about 6X as long as diameter of segments, ventral setae shorter; genitalia with phallobase about 2-3.5X as long as broad paramere developed with a subapical seta, cuspis seta absent or present, digitus about 2.5-5X as long as broad with 1 or 2 apical teeth, aedeagus about 4.0-7.0X as long as broad and about one-third to half length of mid tibia with apex acute.

DISTRIBUTION. Cosmopolitan.

HOSTS. Unknown.

COMMENTS. *Protyndarichoides* is a distinctive genus. It can be recognised by the unique combination of the sharply tridentate mandible; subsessile stigmal vein and the relatively short ovipositor with upwardly curved second valvifers, short gonostyli and broad, triangular outer plates.

IDENTIFICATION. 12 World species, including 6 species described below as new. Singh & Agarwal, 1993 (key to four species); Zhang & Huang, 2006 (key to five species); single species description Hayat & Veenakumari, 2017 (India).

Key to Costa Rican species of *Protyndarichoides*
(Females)

1. Mesoscutum (Figs 1349, 1352, 1358, 1359) with cellular sculpture that is sometimes slightly obliquely elongate, but not deeper than sculpture on at least basal half of scutellum and usually conspicuously shallower; clava 3-segmented (Figs 1346, 1350, 1356, 1361) 2
- Mesoscutum (Figs 1370, 1374, 1379, 1388) with longitudinally elongate striate-reticulate to coarsely striate sculpture that is conspicuously deeper than sculpture on scutellum; clava 2-segmented (Figs 1366, 1372, 1380, 1386) 4

2 (1) Scutellum (Fig. 1349) completely smooth in apical one-third or so; head very slightly higher than broad in facial view; antenna (Fig. 1346) with F1 subequal in size to F3; linear sensilla on all funicle segments ..... *hermippe* **sp.nov.** (p. 537)
- Scutellum (Fig. 1352, 1358, 1359) with distinct sculpture to apex; head (Fig. 1351) broader than high in facial view; F1 clearly much smaller than F3; antenna (Fig. 1350, 1356, 1361) with F1 smaller than other segments and without linear sensilla 3

3 (2) Dorsum of thorax completely brown (Fig. 1352); antenna (Fig. 1350) with F6 orange, concolourous with rest of funicle and paler than brown clava; F1 and F2 subequal and clearly smaller than F3, F2 without linear sensilla .... *isonus* **sp.nov.** (p. 538)
- Dorsum of thorax at least partially orange (Figs 1358, 1359); antenna (Figs 1356, 1360) with F6 brown, concolourous with clava and darker than rest of funicle, or at least proximal funicle segments; F1 clearly smaller than F2, F2 usually with linear sensilla .....*nigriceps* Noyes (p. 540)

4 (1) Hind coxa dark brown 5
- Hind coxa white 6

5 (4) Fore coxa dark brown; funicle with linear sensilla present on all segments, funicle (Fig. 1366) with F1 slightly smaller than F2, but F2 equal to F3; propodeum with a group of dense, conspicuous, silvery setae outside spiracle .... *elathes* **sp.nov.** (p. 541)

- Fore coxa pale orange-brown; funicle with linear sensilla absent from F1-F2, funicle (Fig. 1372) with F1-F2 subequal and both conspicuously smaller than F3; propodeum with only about 3 to 6 inconspicuous, pale setae outside spiracle .... *euanthos* **sp.nov.** (p. 543)

6 (4) Clava and funicle unicolourous (Fig. 1380), dusky pale orange; funicle with linear sensilla present on F1-F2 (sometimes absent from F1), funicle with F2 slightly longer than broad and clearly larger than F1 ..... *damocles* **sp.nov.** (p. 545)

- Clava brown contrasting with pale orange funicle (Fig. 1386); funicle with linear sensilla absent from F1-F2, funicle with F2 slightly transverse and about as long as F1 ... . *hephaestus* **sp.nov.** (p. 546)

***Protyndarichoides hermippe* sp.nov.**
(Figs 1346-1349)

DIAGNOSIS. *Female* (length about 0.9mm): flagellum pale orange-brown; thorax dark brown to black with a weak to moderate metallic sheen; fore coxa pale brown, mid coxa dark brown, hind coxa pale orange; gaster dorsally brown, sides and venter pale orange; gonostylus brown; antenna (Fig. 1346) with clava 3-segmented; head slightly higher than broad; F1 subequal to F3; linear sensilla on F1-F6; mesoscutum (Fig. 1349) with slightly obliquely elongate, polygonally reticulate sculpture that is a little shallower than sculpture on scutellum; scutellum with polygonally reticulate sculpture, apical one-third and side smooth; propodeum with 2 or 3 brown setae outside spiracle. *Male*: unknown.

Female (holotype): length 0.87mm (CPD).

Head mainly dark brown; area between occipital margin and posterior ocelli with a coppery-purple sheen, area between posterior ocelli and top of scrobes generally with a weak blue and purple sheen, scrobal area with a weak purple sheen, temple and gena with a coppery sheen; frontovertex, gena and interantennal prominence with moderately conspicuous, long brown setae; radicle pale orange with side dark brown; scape pale orange; pedicel pale orange, slightly dusky dorsally; flagellum pale orange-brown; maxillary palpus very pale orange; pronotum black, mainly with a weak purple sheen, but with some mixed coppery and blue; propleuron and prosternum dark brown; mesoscutum black with a weak coppery purple and dark blue sheen; tegula dark brown with a slight brassy and coppery sheen; axilla black with a weak purple sheen; scutellum black with a weak coppery purple sheen, posterior one-third and side with a slightly stronger coppery, blue-green and brassy sheen; dorsum of thorax clothed with dark brown setae; metanotum dark purple-brown with a weak brassy sheen; mesopleuron dark brown with a weak brassy and purple sheen; mesosternum dark brown; fore coxa pale brown, fore leg otherwise very pale orange; mid coxa dark brown; mid femur off-white proximally, apically slightly dusky pale orange, mid tibia pale orange with a faint, external, dark brown, subbasal streak in proximal half, otherwise mid leg pale orange; hind coxa very pale orange; hind femur proximally off-white, medially pale orange and apex mixed brown, hind tibia pale orange, mixed pale brown in proximal half; tarsus pale orange; wings hyaline; propodeum dark brown with a weak brassy and purple sheen, 2 or 3 inconspicuous brown setae outside spiracle; gaster dorsally brown with brassy, purple and blue-green reflections, sides and venter pale orange; gonostylus brown.

Head about 2X as wide as frontovertex, in profile about 1.9X as high as deep, anteriorly largely quite evenly curved from occipital margin to mouth margin with interantennal prominence clearly protuberant; occipital weakly carinate; ocelli forming an angle of about 110°; frontovertex shiny, with very shallow, transversely elongate imbricate-reticulate to strigose sculpture; frontovertex with piliferous punctures shallow and indistinct, 2 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena about

as shiny as frontovertex, with very shallow longitudinally elongate, strigose to striate-reticulate sculpture; eye not quite reaching occipital margin, separated by a little less than diameter of facet, with inconspicuous pale setae that are a little shorter than diameter of facet, eye separated from scrobal margin by slightly less than diameter of ocellus, area between eye and scrobe with shallow, transversely elongate, imbricate-reticulate sculpture; scrobes meeting, virtually smooth, well delimited, but weakly margined dorsally and laterally; interantennal prominence moderate and distinct, dorsally rounded, sculpture on interantennal prominence polygonally reticulate and about as deep as that on frontovertex; antenna as in Fig. 1346; scape hardly broadened, about 5.2X as long as broad; funicle segments subequal in length and all a little longer than broad, segments broader distad, linear sensilla present F1-F6; clava 3-segmented, slender, not wider than F6, slightly longer than F4-F6 combined, sutures not oblique, sensory area slightly enlarged, extending ventrally about 0.2X length of clava, apex weakly obliquely truncate, appearing almost pointed; clypeal margin medially strongly concave. Relative measurements: HW 46, HH 47.5, FV 23.5, POL 10, OOL 4, OCL 1, AOL 5.5, EL 27.5, EW 20, MS 16, SL 26, SW 5.

Thorax (Fig. 1349) with imbricate-reticulate to polygonally reticulate sculpture on pronotum that is slightly deeper than that on frontovertex; mesoscutum with polygonally reticulate sculpture that is very slightly coarser and perhaps a little deeper than that on frontovertex; axilla with polygonally reticulate sculpture that is about as deep as that on mesoscutum; scutellum slightly convex, anterior median half with polygonally reticulate to longitudinally elongate reticulate sculpture that is a little deeper than that on mesoscutum, apical one-third and side completely smooth and shiny; visible part of mesoscutum about 1.7X as broad as long; scutellum about as long as broad; fore wing with venation and distribution of setae as in Figs 1347, 1348; propodeum (Fig. 1349) medially about 0.2X as long as scutellum and with some very shallow, irregular sculpture medially. Relative measurements: FWL 67, FWW 28.5; HWL 47, HWW 10.

Gaster with hypopygium reaching about 0.9X towards apex; syntergum about 0.7X as long as broad and about 0.7X as long as mid tibia, with apex broadly rounded, virtually truncate; ovipositor hardly exserted; hypopygium subrectangular, about 1.2X as broad as long with anterior margin virtually straight. Relative measurements: OL 28, GS 6 [MT 50].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Limón**, RB Hitoy Cerere, 9°40'N 83°02'W, 100m, ii.2004 (J.S. Noyes). Holotype in NHMUK.

COMMENTS. This species is very close to *aligarhensis* (Fatma & Shafee) known from India and Europe. Both species having generally similar colouration, linear sensilla on all funicle segments, cellular sculpture on the mesoscutum and longitudinally elongate, almost striate sculpture on the scutellum, and a subquadrate hypopygium with an almost straight anterior margin. *Protyndarichoides hermippe* can be distinguished from *aligarhensis* by the head in facial view being conspicuously longer than broad and the antenna inserted below the level of the lower eye margin, whilst in *aligarhensis* the head is broader than long and the antenna is inserted level with the lower eye margin eye.

Protyndarichoides isonus **sp.nov.**

(Figs 1350-1355; Hab. ♀ 196)

DIAGNOSIS. *Female* (length about 0.8-0.9mm): funicle with F1-F5 pale orange, F6 dark brown, clava dark brown; thorax dark brown to black with a weak to moderate metallic sheen; coxae white to pale orange; gaster dark brown with Gt1 and Gt2 pale orange, proximal sternites sometimes

pale orange; gonostylus pale orange; head (Fig. 1351) slightly broader than high; antenna (Fig. 1350) with F1 smaller than F3; linear sensilla on F3-F6; clava 3-segmented; mesoscutum (Fig. 1352) with shallow polygonally reticulate sculpture that is clearly shallower than deep polygonally reticulate sculpture on scutellum; only extreme apex and side of scutellum completely smooth; propodeum with 3 inconspicuous, pale setae outside spiracle. *Male*: unknown.

Female (holotype): length 0.87 mm (CPD).

Head mainly dark brown; frontovertex generally with a weak brassy sheen with some coppery purple reflections; temple, gena and scrobal area coppery purple, slightly brassy on temple; frontovertex, gena and interantennal prominence with moderately conspicuous, long brown setae; antenna (Fig. 1350) with radicle, scape and F1-F5 pale orange, F6 and clava brown; maxillary palpus pale orange; pronotum dark brown with a weak brassy sheen mixed with weak purple reflections; propleuron dark brown, prosternum dark orange-brown; mesoscutum (Fig. 1352) dark brown with a slight brassy sheen and some coppery purple reflections, especially along posterior margin; tegula dark purple brown with a slight brassy sheen; axilla dark brown with a weak brassy sheen; scutellum mostly black with a weak brassy sheen, dark brown and slightly brassy on side and at apex; dorsum of thorax clothed with dark brown setae; metanotum dark orange-brown with a weak brassy sheen; mesopleuron dark orange-brown, mesosternum pale orange; legs, including coxae, almost completely pale orange, but fore coxa and fore femur proximally white and hind tibia pale orange brown, with dorsal margin brown; wings virtually hyaline, but very weakly infuscate immediately below marginal vein (Fig, 153); propodeum orange anteriorly orange-brown and with a weak brassy sheen and a few coppery reflections, 3 inconspicuous pale setae outside spiracle; gaster mostly dark brown with mixed brassy, purple, coppery and green reflections, Gt1 and Gt2 pale orange, sternites dark orange-brown, paler proximally; gonostylus pale orange.

Head (Fig. 1351) about 2.6X as wide as frontovertex. in profile about 1.6X as high as deep, anteriorly largely quite evenly curved from occipital margin to mouth margin, but more strongly so level with top of scrobes with interantennal prominence slightly protuberant; occipital margin not carinate; ocelli forming an angle of about 85°; frontovertex shiny, with conspicuous, moderately deep, irregular, polygonally reticulate sculpture of mesh size generally subequal to diameter eye facet or less; frontovertex with piliferous punctures shallow, but distinct, 3 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena about as shiny as frontovertex, with slightly shallower, longitudinally elongate, strigose to striate-reticulate sculpture; eye not quite reaching occipital margin, separated by about half diameter of facet, with conspicuous pale setae about as long as diameter of facet; eye separated from scrobal margin by about diameter of ocellus, area between eye and scrobe with shallow, transversely elongate, imbricate-reticulate sculpture; scrobes separated dorsally by interantennal prominence, with shallow sculpture, poorly delimited and weakly margined laterally; interantennal prominence moderate and distinct, dorsally reaching frontovertex, sculpture on interantennal prominence polygonally reticulate but much shallower than that on frontovertex; antenna as in Fig. 1350; scape hardly broadened, about 4.9X as long as broad; funicle with F1 hardly longer than broad, F2 slightly larger and F3 slightly larger than F2, F4-F6 subequal in length, becoming wider distad, but conspicuously shorter than F3 which is clearly the longest funicle segment, F6 subquadrate, linear sensilla present only on F3-F6; clava 3-segmented, slightly broadened, about 1.1X as wide as F6, slightly longer than F4-F6 combined, sutures not oblique, sensory area slightly enlarged, extending ventrally about 0.33X length of clava, apex conspicuously obliquely truncate; clypeal margin weakly concave. Relative measurements: HW 48.5, HH 47, FV 19, POL 7.5, OOL 2.5, OCL 2.5, AOL 5.5, EL 29, EW 23, MS 17, SL 27, SW 5.5.

Thorax (Fig. 1352) with imbricate-reticulate to polygonally reticulate sculpture on pronotum that is slightly shallower than that on frontovertex; mesoscutum with polygonally reticulate sculpture that is slightly shallower than that on frontovertex; axilla with polygonally reticulate sculpture that is finer and deeper than that on mesoscutum; scutellum only slightly convex, dorsally with regular, fine, polygonally reticulate sculpture that is much finer and deeper than that on mesoscutum or axillae, apex and side completely smooth and shiny; visible part of mesoscutum about 1.8X as broad as long; scutellum about as long as broad; fore wing with venation and distribution of

setae as in Fig. 1353; propodeum (Fig. 1352) medially about 0.3X as long as scutellum, with a median carina and two submedian carinae, and some polygonally reticulate sculpture medially, a curved transverse carina from anterior margin submedially towards spiracle and shallow, irregular sculpture elsewhere, especially between transverse carina and anterior margin, side of propodeum clearly delimited outside spiracle by a conspicuous, translucent flange extending from anterior margin to posterior margin immediately above hind coxa, about 3 inconspicuous brown setae present outside spiracle. Relative measurements: FWL 57, FWW 20.5; HWL 40, HWW 8.

Gaster conspicuously dorsoventrally flattened, slightly longer than head and thorax combined, with hypopygium reaching about 0.8X along gaster (but slightly retracted towards anterior); syntergum about 0.6X as long as broad and about 0.6X as long as mid tibia, with apex broadly rounded; ovipositor hardly exserted.

Paratype. Hypopygium (Fig. 1354) transverse, about 2.3X as broad as long with anterior margin conspicuously concave; ovipositor Fig. 1355. Relative measurements: OL 30, GS 6.5 [MT 51.5].

Variation. The overall length of the female varies from 0.79-0.87mm, the hind tibia may be almost completely pale orange with only the dorsal margin a little dusky, the base of the gaster may be pale orange ventrally, the fore wing is about 2.6-2.8X as long as broad, otherwise very little variation in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Las Alturas, 8°57'N 82°50'W, 1500m, v.1992 (P. Hanson, C. Godoy). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Santa Rosa NP, Hacienda 1-0, 22.vi-13.vii.1985 (Janzen & Gauld); 1♀, Guanacaste, ZP Nosara, Fila Maravilla, LN 221350 381700, 800m, #63993, vi-vii.2001 (I. Jiménez); 1♀, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 14-15.ii.2005 (J.S. Noyes). Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. This species is quite close to *nigriceps*, females of both species having a distinct translucent flange extending from anterior margin to posterior margin immediately above hind coxa and similarly shaped hypopygium. The two species can be separated using the characters given in the key (see p. 536).

Protyndarichoides nigriceps **Noyes**

(Figs 7,1356-1364; Hab. ♀ 197, ♂ 198)

Protyndarichoides nigriceps Noyes, 1980:224-225. Holotype ♀, Trinidad & Tobago, NHMUK, examined.

DIAGNOSIS. *Female* (length about 1.0-1.3mm): head mainly black with a weak metallic sheen; funicle segments varying from pale orange to dark brown, F6 and clava dark brown; thorax (Figs 1358, 1359) largely orange, pronotum, mesoscutum partially and scutellum usually, largely dark brown with a weak to moderate metallic sheen; coxae orange; gaster mostly orange, but dorsally brown from Gt3 to apex, sometimes only brown from Gt5 to apex; gonostylus brown; head slightly broader than high; antenna (Figs 1356, 1360) with clava 3-segmented; F1 smaller than F3; linear sensilla on F2-F6, sometimes absent from F2; mesoscutum (Figs 1358, 1359) with polygonally reticulate sculpture that is shallower than sculpture on scutellum; scutellum with deep polygonally reticulate sculpture, only extreme sides and apex smooth; side of propodeum clearly delimited outside spiracle by a conspicuous, translucent flange extending from anterior margin to posterior margin immediately above hind coxa, propodeum with about 3 pale setae outside spiracle; fore wing (Fig. 1362) varying from 2.5-2.8X as long as broad; ovipositor (Fig. 1363) about half as long

as mid tibia and about 4.3X as long as gonostylus; hypopygium (Fig. 1361) about 2.2X as broad as long with anterior margin clearly concave. *Male* (length about 1.0-1.3mm): similar to female but body generally dark brown, mesopleuron and propodeum orange-brown; scape and pedicel orange-brown, flagellum brown; legs mostly orange but with mid coxa, hind tibia and hind tarsus dark brown; head about 2-2.3X frontovertex width, antenna with scape (Fig. 1364) about 4X as wide as long; all funicle segments clearly longer than broad and clothed with long setae, the longest of which is about 6X as long as diameter of segments, ventral setae shorter; phallobase (Fig. 7) about 2X as long as broad; cuspis seta present; digitus about 3X as long as broad with 2 unequal apical teeth, aedeagus about one-third as long as mid tibia, 4X as long broad with apex broad and acute.

DISTRIBUTION. Trinidad & Tobago, Costa Rica (**new record**).

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **TRINIDAD & TOBAGO**, **Tobago**, St George, Caura, 2.viii.1976 (J.S. Noyes). Paratypes: TRINIDAD & TOBAGO, 1♀, Tobago, Mt Irvine Bay, 19.vii.1976 (J.S. Noyes). Holotype and paratype in NHMUK.

Non type material: **COSTA RICA**, 1♀, **Guanacaste**, Guanacaste NP, Est. Mengo Vn Cacao, v.1988 (Gauld & Janzen); 1♂, Guanacaste, PN Guanacaste, San Cristobal, #51903, 17.viii-17.ix.1996 (F.A. Quezada); 1♀, **Heredia**, 3 km S Puerto Viejo, OTS-La Selva, 100m, xii.1992 (P. Hanson); 1♀, Heredia, La Selva BS, 6-11.vii.1993 (B. Brown, D. Feener); 3♀, **San José**, Zurqui de Moravia, 1600m, vii.1992, iv.1995 and xi.1996 (P. Hanson); 1♀, 1♂, **Cartago**, Braullio Castillo (error for Braulio Carrillo), NP, 25.iii.1990 (J.S. Noyes); 1♀, Cartago, Turrialba, CATIE, Reventazon, 550m, 4.ix.1986 (L. Masner); 2♂, Cartago, Turrialba, CATIE, 700m, 14-15.iii.1990 (J.S. Noyes); 1♂, Cartago, Turrialba, CATIE, 9°53'N 83°39'W, 600m ii.2002 (J.S. Noyes); 1♀, same data as holotype; 3♀, 1♂, same data as holotype, but vi-viii.1993 and viii-ix.1994; : 1♀, Cartago, Dulce Nombre, Vivero Linda Vista, 1300m, viii-x.1993 (P. Hanson). 1♀, Cartago, 2km NE Cachi, 1200m, vii-ix.1995 (P. Hanson); 1♀, **Puntarenas**, 5km N Puerto Jimenez, iii-iv.1992 (P. Hanson); 1♀, Puntarenas, Buenos Aires, Acia. Pila, Cerro que Mado, LS 336200 573560, 2278m, #52790, v-vi.1999 (R. Villalobos); 2♂, **Limón**, RB Hitoy-Cerere, Sendero Bobocara, LN 184250 640500, 640m, MT, #53498, 8.viii-10.x.1999 (F. Umaña); 1♂, Limón, RB Hitoy-Cerere, Sendero Bobocara, LN 184250 641800, 300m, #52903, 18.v-18.vi.1999 (G. Carballo); 1♀, Limón, RB Hitoy Cerere, Send. Espavel, LS 401200 569800, 560m, #73630, 11.iii-1.iv.2003 (E. Rojas); 1♀, Limón, RB Hitoy-Cerere, Valle del Silencio, LS 570120 400702, #58066, 17.vi-17.vii.2000 (F. Umaña). Material in MZUCR, NHMUK, and CNC.

COMMENTS. See comments under *isonus* (p. 540).

Protyndarichoides elathes **sp.nov.**
(Figs 1365-1370)

DIAGNOSIS. *Female* (length about 1.3mm): flagellum brown; thorax dark brown to black with a weak to moderate metallic sheen; coxae dark brown; gaster dark brown; gonostylus dark brown; head (Fig. 1367) slightly broader than high; antenna (Fig. 1366) with F1 smaller than F3; linear sensilla on F1-F6; clava 2-segmented; mesoscutum (Fig. 1370) with striate-reticulate to striate sculpture that is much deeper than sculpture on scutellum; scutellum virtually completely smooth; propodeum (Fig. 1370) with a group of about 20 conspicuous, silvery setae outside spiracle. *Male*: unknown.

Female (holotype): length 1.29mm (CPD).

Head mainly dark brown to black; frontovertex generally with a weak brassy sheen, mixed faintly with coppery purple along occipital margin and immediately above scrobes; temple, gena and scrobal area metallic coppery purple; frontovertex, gena and interantennal prominence with inconspicuous, short, pale brown setae; radicle and scape slightly dusky, pale orange, dorsal margin of scape more conspicuously dusky; pedicel and flagellum mainly brown, pedicel ventrally

orange and F1 orange-brown; maxillary palpus slightly dusky, pale orange; pronotum black with a weak brassy and purple sheen; propleuron and prosternum dark brown; mesoscutum dark brown to black with a weak brassy sheen with some coppery purple reflections; tegula dark brown with a slight brassy sheen; axilla black with a weak brassy and purple sheen; scutellum black with a moderate brassy and pale blue sheen mixed coppery purple with a few coppery areas; dorsum of thorax clothed with dark brown setae; metanotum dark brown; mesopleuron and mesosternum dark brown; all coxae dark brown; fore femur brown, apices weakly orange-brown, tibia largely pale orange brown with a diffuse, subbasal, pale brown band, tarsus pale orange-brown; mid femur proximally very pale dusky orange, distally brown, tibia brown in proximal half, apex pale orange-brown to pale orange, spur and tarsus pale orange, apex of tarsus brown; hind femur dark brown, hind tibia white at base otherwise dark brown, tarsus dark brown; wings virtually hyaline, but weakly infuscate below marginal vein (Fig. 1365); propodeum dark brown with a very weak brassy and purple sheen, a group of conspicuous silvery setae outside spiracle; gaster dark brown with purple, green, blue and brassy reflections; gonostylus dark brown.

Head (Fig. 1367) about 1.9X as wide as frontovertex, in profile about 1.6X as high as deep, anteriorly fairly evenly curved from occipital margin to mouth margin with interantennal prominence a little protuberant; occipital not carinate; ocelli forming an angle of about 100°; frontovertex shiny, with fairly conspicuous, shallow, fine, irregular, transversely elongate, imbricate-reticulate sculpture; frontovertex with piliferous punctures shallow, indistinct, 4 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena about as shiny as frontovertex, with shallow, longitudinally elongate, strigose to striate-reticulate sculpture; eye not quite reaching occipital margin, separated by about half diameter of facet, with conspicuous pale setae, each clearly longer than diameter of facet; eye separated from scrobal margin by about 2X diameter of ocellus, area between eye and scrobe with shallow, transversely elongate, imbricate-reticulate sculpture; scrobes meeting dorsally with shallow sculpture, poorly delimited and weakly margined dorsally and laterally; interantennal prominence distinct and dorsally rounded, sculpture polygonally reticulate but much shallower that on frontovertex; antenna as in Fig. 1366; scape hardly broadened, about 5.9X as long as broad; funicle with F1 a little longer than broad, clearly smaller than F2, F2-F6 all longer than broad, subequal in length but becoming slightly broader distad, linear sensilla on F1-F6; clava 2-segmented, slightly broadened, about 1.2X as wide as F6, nearly as long as F3-F6 combined, outer suture absent, sensory area slightly enlarged, extending ventrally about 0.2X length of clava, apex conspicuously obliquely truncate; malar sulcus weak and inconspicuous; clypeal margin weakly concave. Relative measurements: HW 55.5, HH 52, FV 28.5, POL 12.5, OOL 5, OCL 1.5, AOL 7.5, EL 30.5, EW 23, MS 20, SL 29.5, SW 6.

Thorax (Fig. 1370) conspicuously dorsoventrally flattened, with imbricate-reticulate to polygonally reticulate sculpture on pronotum that is slightly deeper than that on frontovertex; mesoscutum almost entirely with longitudinally elongate, striate-reticulate to strigose sculpture that is slightly deeper than that on pronotum, and with a small area of polygonally reticulate sculpture anteriorly in middle; axilla virtually smooth, with some very shallow polygonally reticulate reticulate sculpture; scutellum only slightly convex, virtually entirely smooth, but with some very shallow, polygonally reticulate sculpture between axillae; mesopleuron with fairly similar sculpture throughout; visible part of mesoscutum about 1.9X as broad as long; scutellum about 1.1X as broad as long; fore wing with venation and distribution of setae as in Figs 1365, 1368; propodeum (Fig. 1370) medially about 0.27X as long as scutellum, virtually smooth with about 20 conspicuous, silvery setae outside spiracle. Relative measurements: FWL 65, FWW 26.5; HWL 46, HWW 10.5.

Gaster conspicuously dorso-ventrally flattened, slightly longer than head and thorax combined, with hypopygium reaching about 0.9X along gaster; syntergum about as long as broad and 0.9X as long as mid tibia, with apex truncate; ovipositor hardly exserted; hypopygium (Fig. 1369) about 1.5X as long as broad with long anterior apodemes and anterior margin strongly concave. Relative measurements: OL 32.5, GS 6 [MT 56.5].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Macizo Miravalles, Est. Cabro Muco, LN 299769 411243, 1100m, 15.iii-3.iv.2003 (J. Azofeifa). Holotype in NHMUK.

COMMENTS. See comments under *euanthos* (p. 544).

***Protyndarichoides euanthos* sp.nov.**
(Figs 1371-1378; Hab. ♀ 199)

DIAGNOSIS. *Female* (length about 1.0-1.2mm): flagellum orange-brown; thorax dark brown to black with a weak to moderate metallic sheen; coxae orange; gaster dark brown; gonostylus dark brown; head slightly broader than high; antenna (Fig. 1372) with F1 smaller than F3; linear sensilla on F3-F6; clava 2-segmented; mesoscutum (Fig. 1374) with striate-reticulate to striate sculpture that is much deeper than sculpture on scutellum; scutellum with very shallow polygonally reticulate sculpture in basal half between axillae, remainder completely smooth; propodeum with up to 7 brown setae outside spiracle. *Male* (length about 1.2mm): body brown, mesopleuron and propodeum dark brown; phallobase (Fig. 1378) about 3.5X as long as broad; cuspis set absent; aedeagus about 7X as long as broad and about half as long as mid tibia, apex slender and acute.

Female (holotype): length 1.23mm (CPD).

Head mainly black; frontovertex generally with a moderate, metallic dark green and dark blue sheen with some coppery purple reflections; temple, gena and scrobal area metallic coppery purple; frontovertex, gena and interantennal prominence with moderately conspicuous, long brown setae; radicle and scape slightly dusky, pale orange, dorsal margin of scape more conspicuously dusky; pedicel and flagellum orange-brown, pedicel ventrally orange; maxillary palpus slightly dusky, pale orange; pronotum black with a weak brassy and purple sheen; propleuron and prosternum dark brown; mesoscutum dark brown to black with a weak brassy sheen; tegula dark brown with a slight brassy sheen; axilla black with a weak brassy and purple sheen; scutellum black with a distinct dark blue sheen mixed coppery purple anteriorly and dark green posteriorly; dorsum of thorax clothed with dark brown setae; metanotum dark brown; mesopleuron and mesosternum dark orange-brown; fore leg, including coxae, pale orange-brown; mid coxa dark brown; mid femur proximally very pale dusky orange, distally brown, tibia pale orange, brown at extreme base and with a narrow, brown, subbasal ring, spur and tarsus pale orange; hind coxa dark brown; hind femur slightly dusky pale orange becoming brown towards apex, tibia dark orange brown, base narrowly white, tarsus dark brown; wings virtually hyaline, but weakly infuscate below marginal vein (Fig. 1376); propodeum dark brown with a very weak brassy and purple sheen, 3 inconspicuous pale setae outside spiracle; gaster dark brown; gonostylus dark brown.

Head about 2.1X as wide as frontovertex, in profile about 1.4X as high as deep, anteriorly evenly curved from occipital margin to top of scrobes then more strongly curved level with top of scrobes and fairly straight towards mouth margin, with interantennal prominence slightly protuberant; occipital not carinate; ocelli forming an angle of about 100°; frontovertex shiny, with fairly conspicuous, shallow, fine, irregular, transversely elongate, imbricate-reticulate sculpture; frontovertex with piliferous punctures shallow, indistinct, 3 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena about as shiny as frontovertex, with shallow, longitudinally elongate, strigose to striate-reticulate sculpture; eye not quite reaching occipital margin, separated by less than half diameter of facet, with inconspicuous pale setae, each a little longer than diameter of facet; eye separated from scrobal margin by about diameter of ocellus, area between eye and scrobe with shallow, transversely elongate, imbricate-reticulate sculpture; scrobes meeting dorsally with shallow sculpture, poorly delimited and weakly margined dorsally and laterally; interantennal

prominence distinct and dorsally rounded, sculpture polygonally reticulate but much shallower that on frontovertex; antenna as in Fig. 1372; scape hardly broadened, about 5.8X as long as broad; funicle with F1 a little longer than broad, slightly smaller than F2, both clearly smaller than any of the remaining segments which are all longer than broad, subequal in length but becoming broader distad so that F6 is hardly longer than broad, linear sensilla present only on F3-F6; clava 2-segmented, slightly broadened, about 1.4X as wide as F6, slightly longer than F4-F6 combined, sutures not oblique, sensory area slightly enlarged, extending ventrally about 0.3X length of clava, apex conspicuously obliquely truncate; clypeal margin weakly concave. Relative measurements: HW 58, HH 50, FV 28, POL 11.5, OOL 4, OCL 1.5, AOL 7.5, EL 31.5, EW 26.5, MS 22, SL 29, SW 5.

Thorax (Fig. 1374) with imbricate-reticulate to polygonally reticulate sculpture on pronotum that is slightly deeper than that on frontovertex; mesoscutum almost entirely with longitudinally elongate, striate-reticulate to strigose sculpture that is conspicuously deeper than that on pronotum, and with a small area of polygonally reticulate sculpture anteriorly in middle; axilla with shallow polygonally reticulate to imbricate-reticulate sculpture that is similar to that on pronotum; scutellum only slightly convex, virtually entirely smooth, but with some shallow, irregular sculpture between axillae; mesopleuron with relatively rough sculpture of large mesh in anterior two-thirds, posterior part smooth; visible part of mesoscutum about 1.7X as broad as long; scutellum about 1.2X as broad as long; fore wing with venation and distribution of setae as in Figs 1375, 1376; propodeum (Fig. 1374) medially about 0.27X as long as scutellum, virtually smooth with about 6 or 7 inconspicuous, brown setae outside spiracle. Relative measurements: FWL 64, FWW 26.5; HWL 42, HWW 11.

Gaster hardly longer than thorax, with hypopygium reaching about 0.9X along gaster; syntergum about 0.8X as long as broad and about 0.8X as long as mid tibia, with apex broadly rounded; ovipositor hardly exserted.

Paratype. Hypopygium (Fig. 11371) about 1.2X as broad as long with moderate anterior apodemes and anterior margin very concave; ovipositor Fig, 1373. Relative measurements: OL 30.5, GS 4.5 [MT 57].

Variation. Females vary in overall length from 1.04-1.24mm, the propodeum may have up to 7 setae outside the spiracle, otherwise very little variation in material examined.

Male (length 1.15mm): similar to female apart from antennal structure and genitalia. Head about 1.9X frontovertex width, antenna (Fig. 1377) with scape about 4X as wide as long; all funicle segments clearly longer than broad and clothed with long setae, the longest of which is about 6X as long as diameter of segments, ventral setae shorter; phallobase (Fig. 1378) about 3.5X as long as broad; digitus about 3X as long as broad with a single apical tooth, cuspis set absent; aedeagus about 7X as long as broad and about half as long as mid tibia, apex slender and acute.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Arenales, w. side Volcan Cacao, 1988-1989; 3 ♀, 1♂, same data as holotype; 2♀, **Heredia**, Santo Domingo, INBio Parque, LN 217300 526200, 1100m, v.2001 and 27.v-27.vi.2001 (R. Zuñiga). Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. This species is very similar in general habitus and colouration to *elathes*. Apart from the characters given in the key (p. 537), *euanthos* can be separated from *elathes* by having the syntergum about 0.8X as long as the mid tibia and the hypopygium slightly broader than long with the anterior apodemes less than one-third the length of the hypopygium. In *elathes* the syntergum is about 0.9X as long as the mid tibia and the hypopygium is longer than broad with the anterior apodemes half as long as the hypopygium.

***Protyndarichoides damocles* sp.nov.**
(Figs 1379-1385; Hab. ♀ 100)

DIAGNOSIS. *Female* (length about 0.8-1.1mm): flagellum dusky pale orange; thorax dark brown to black with a weak to moderate metallic sheen; fore coxa pale yellow, mid coxa brown, hind coxa white; gaster brown; gonostylus brown; head (Fig. 1381) slightly broader than high; antenna (Fig. 1380) with clava 2-segmented; F1 smaller than F3; linear sensilla on F1-F6, sometimes absent from F1; mesoscutum (Fig. 1379) with longitudinally striate to striate-reticulate sculpture that is conspicuously deeper than sculpture on scutellum; scutellum with shallow reticulate sculpture in anterior half, posterior half completely smooth; propodeum (Fig. 1379) with 4 or 5 brown setae outside spiracle. *Male*: unknown.

Female (holotype): length 1.06mm (CPD).

Head mainly dark brown; area between occipital margin and posterior ocelli with a coppery-purple sheen, area between posterior ocelli and top of scrobes generally with a weak green and coppery-purple sheen, area immediately above scrobes, scrobal area, temple and gena with a distinctly coppery-purple sheen; frontovertex, gena and interantennal prominence with moderately conspicuous, long brown setae; radicle pale orange with side dark brown; scape pale orange; pedicel and flagellum slightly dusky pale orange, pedicel a little more dusky proximally; maxillary palpus off-white; pronotum black, mainly with a coppery-purple sheen, but with some mixed coppery and blue; propleuron and prosternum dark brown; mesoscutum black with a weak brassy sheen; tegula dark brown with a slight brassy and coppery sheen; axilla black with a weak coppery-purple sheen; scutellum black with a weak coppery purple sheen, posterior one-third and side with a slightly stronger blue-green, brassy, and coppery sheen; dorsum of thorax clothed with dark brown setae; metanotum dark purple-brown with a weak brassy sheen; mesopleuron dark brown with a weak brassy and purple sheen; mesosternum dark brown; fore coxa very pale yellow, fore leg otherwise very pale orange; mid coxa brown; mid femur white proximally, apically slightly dusky pale orange, mid tibia with extreme base white and a faint, external, dark brown, subbasal streak in proximal half, otherwise mid leg pale orange; hind coxa white; hind femur proximally white, medially pale orange and apex mixed brown, hind tibia with extreme base white and a narrow, incomplete, subbasal brown band, otherwise hind leg pale orange; wings hyaline; propodeum dark brown with a weak brassy and purple sheen, 4 or 5 inconspicuous brown setae outside spiracle; gaster brown with brassy, purple and blue-green reflections, venter slightly paler brown; gonostylus brown.

Head (Fig. 1381) about 2.1X as wide as frontovertex, in profile about 1.5X as high as deep, anteriorly weakly curved from occipital margin to top of scrobes, slightly angled at top of scrobes and more or less straight to mouth margin, interantennal prominence hardly protuberant; occipital margin not carinate; ocelli forming an angle of about 100°; frontovertex shiny, with very shallow polygonally reticulate to imbricate-reticulate sculpture of mesh size generally subequal to eye facet; frontovertex with piliferous punctures shallow and indistinct, 3 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena a little more shiny than frontovertex, with very shallow longitudinally elongate, strigose to striate-reticulate sculpture; eye reaching occipital margin, with conspicuous pale setae that are a little longer than diameter of facet, eye separated from scrobal margin by slightly less than diameter of ocellus, area between eye and scrobe virtually smooth but with extremely shallow, transversely elongate, polygonally reticulate sculpture; scrobes meeting, virtually smooth, weakly margined dorsally and laterally; interantennal prominence weak, dorsally rounded, sculpture on interantennal prominence much shallower and finer than that on frontovertex; antenna as in Fig. 1380; scape hardly broadened, about 5X as long as broad; F1 subquadrate and conspicuously smaller than F2-F6 which are all at least slightly longer than broad, segments broader distad; clava 2-segmented, hardly broadened, about 1.1X as wide as F6, slightly shorter than F3-F6 combined, sutures slightly oblique, sensory area slightly enlarged, extending ventrally about 0.2X length of clava, apex weakly obliquely truncate; clypeal margin emarginate medially. Relative measurements: HW 53.5, HH 45, FV 25, POL 10.5, OOL 3, OCL 2, AOL 7.5, EL 30, EW 25, MS 18, SL 25, SW 5.

Thorax (Fig, 1379) with imbricate-reticulate to polygonally reticulate sculpture on pronotum that is slightly deeper than that on frontovertex; entire mesoscutum with relatively deep, longitudinally elongate polygonally reticulate to strigose sculpture that is clearly deeper than that on pronotum; axilla with polygonally reticulate sculpture that is about as deep as that on frontovertex; scutellum slightly convex, anterior half with very shallow, polygonally reticulate sculpture that is clearly deeper than that on frontovertex, apex and side completely smooth and shiny; visible part of mesoscutum about 1.7X as broad as long; scutellum about 1.1X as broad as long; fore wing with venation and distribution of setae as in Figs 1382, 1384; propodeum (Fig. 1379) medially about 0.25X as long as scutellum and with some very shallow, irregular sculpture medially. Relative measurements: FWL 52.5, FWW 21.5; HWL 34.5, HWW 8.

Gaster with hypopygium reaching about 0.9X along gaster; syntergum about 0.8X as long as broad and about 0.7X as long as mid tibia, with apex broadly rounded; ovipositor hardly exserted.

Paratype. Funicle with linear sensilla present only on F1-F6, or absent from F1; hypopygium (Fig. 1385) about 1.2X as broad as long with anterior margin clearly concave; ovipositor Fig. 1383. Relative measurements: OL 26, GS 3.5 [MT 46.5].

Variation. Females vary in overall length from 0.84-1.06mm, otherwise very little variation observed in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Limón**, 7km SW Bribri, ix-xi.1989 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **Heredia**, RB La Selva, 10°26'N 84°01'W, xii.1995 (INBio/OET - ALAS); 1♀, Heredia, Puerto Viejo, Est. Biol. La Selva, LN 264463 532850, 100-200m, #67193, 30-31.iii.2002 (J. Azofeifa). Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. Of the Costa Rica species, *Protyndarichoides damocles* is most similar to *hephaestus* but can be separated using the characters given in the key (see p. 537).

***Protyndarichoides hephaestus* sp.nov.**

(Figs 1386-1388; Hab. ♀ 201)

DIAGNOSIS. *Female* (length about 0.8-1.1mm): funicle pale orange, clava brown; thorax brown to dark brown with a weak to moderate metallic sheen; fore and hind coxae white, mid coxa dark brown; gaster brown; gonostylus brown; antenna (Fig. 1386) with clava 2-segmented; head slightly broader than high; F1 smaller than F3; linear sensilla on F3-F6; mesoscutum (Fig. 1388) with longitudinally striate to striate-reticulate sculpture that is conspicuously deeper than sculpture on scutellum; scutellum with shallow reticulate sculpture in anterior half, posterior half completely smooth; propodeum (Fig. 1388) with 3 or 4 brown setae in a line outside spiracle. *Male*: unknown.

Female (holotype): length 1.05mm (CPD).

Head mainly dark brown; area between occipital margin and posterior ocelli with a coppery-purple sheen, area between posterior ocelli and top of scrobes generally with a weak green and coppery-purple sheen, area immediately above scrobes, scrobal area, temple and gena with a distinctly coppery-purple sheen; frontovertex, gena and interantennal prominence with moderately conspicuous, long brown setae; radicle pale orange with side dark brown; scape pale orange; pedicel and funicle pale orange, pedicel slightly dusky proximally; clava brown; maxillary palpus white; pronotum black, mainly with a coppery-purple sheen, but with some mixed coppery and blue; propleuron and prosternum dark brown; anterior part of mesoscutum dark brown with a weak brassy sheen, posterior two-thirds or so virtually completely matt black with a few brassy

reflections along posterior margin; tegula dark brown with a slight brassy and coppery sheen; axilla black with a weak coppery-purple sheen; scutellum dark brown, anterior two-thirds with a weak mixed blue and coppery-purple sheen, posterior one-third and side with a stronger blue-green, brassy, and coppery sheen; dorsum of thorax clothed with dark brown setae; metanotum dark purple-brown with a weak brassy sheen; mesopleuron dark brown with a weak brassy and purple sheen; mesosternum dark brown; fore coxa white, fore leg otherwise very pale orange; mid coxa dark brown; mid femur white proximally, apically pale orange, mid tibia with extreme base white and a narrow, external, dark brown, subbasal streak in proximal half, otherwise mid leg pale orange; hind coxa white; hind femur proximally white, medially pale orange and apex brown, hind tibia with extreme base white and a narrow, subbasal brown band, otherwise hind leg pale orange; wings hyaline; propodeum dark brown with a weak brassy sheen, 3 or 4 inconspicuous brown setae in a line outside spiracle; gaster dark brown with brassy, purple and blue-green reflections; gonostylus brown.

Head about 2.2X as wide as frontovertex, in profile about 1.4X as high as deep, anteriorly weakly curved from occipital margin to top of scrobes, slightly angled at top of scrobes and more or less straight to mouth margin, interantennal prominence hardly protuberant; occipital margin not carinate; ocelli forming an angle of about 105°; frontovertex shiny, with shallow polygonally reticulate to imbricate-reticulate sculpture of mesh size generally subequal to eye facet; frontovertex with piliferous punctures shallow and indistinct, 3 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena a little more shiny than frontovertex, with very shallow longitudinally elongate, strigose to striate-reticulate sculpture; eye slightly overreaching occipital margin, with conspicuous pale setae that are a little longer than diameter of facet, eye separated from scrobal margin by about diameter of ocellus, area between eye and scrobe with very shallow, transversely elongate, polygonally reticulate sculpture; scrobes meeting, virtually smooth, weakly margined dorsally and laterally; interantennal prominence weak, dorsally rounded, sculpture on interantennal prominence much shallower and finer than that on frontovertex; antenna as in Fig. 1386; scape hardly broadened, about 4.4X as long as broad; F1-F5 slightly longer than broad, F6 quadrate, F1 subequal to F2 and slightly smaller than F3-F6, segments broader distad; clava 2-segmented, hardly broadened, about 1.2X as wide as F6, slightly shorter than F3-F6 combined, sutures slightly oblique, sensory area enlarged, extending ventrally about 0.33X length of clava, apex strongly obliquely truncate; clypeal margin emarginate medially. Relative measurements: HW 53, HH 46, FV 24, POL 11.5, OOL 2.5, OCL 2.5, AOL 7, EL 31.5, EW 27, MS 19, SL 24, SW 5.5.

Thorax (Fig. 1388) with imbricate-reticulate to polygonally reticulate sculpture on pronotum that is slightly deeper than that on frontovertex; mesoscutum with anterior median one-third quite shiny, with relatively shallow, polygonally reticulate to imbricate sculpture, slightly longitudinally elongate posteriorly and laterally, posterior two-thirds and side of mesoscutum virtually matt with longitudinally elongate, polygonally reticulate to strigose sculpture that is clearly deeper than that on anterior part and on pronotum; axilla with polygonally reticulate sculpture that is about as deep as that on frontovertex; scutellum slightly convex, anterior median half with very shallow, polygonally reticulate sculpture that is about as deep as that on frontovertex, apex and side completely smooth and shiny; visible part of mesoscutum about 2.3X as broad as long; scutellum about as long as broad; fore wing with venation and distribution of setae as in Fig. 1387; propodeum (Fig. 1388) medially about 0.14X as long as scutellum and with some very shallow, irregular sculpture medially. Relative measurements: FWL 53.5, FWW 22.5; HWL 38, HWW 9.

Gaster with hypopygium reaching about 0.9X along gaster; syntergum about 0.7X as long as broad and about 0.7X as long as mid tibia, with apex broadly rounded, virtually truncate; ovipositor not exserted.

Paratype. Funicle with linear sensilla present only on F3-F6; hypopygium about as long as broad, anterior margin shallowly concave. Relative measurements: OL 23, GS 4 [MT 40.5].

Variation. Females vary in overall length from 0.77-1.05mm, the hind tibia may be largely dark brown with the hind tarsus brown, F1 and F2 may be quadrate, and the mesoscutum may have the shiny, anterior part hidden under the pronotum and thus may appear to be completely matt with elongate sculpture.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, RF Golfo Dulce, 3km SW Rincon, 10m, i.1993 (P. Hanson). Paratypes: **COSTA RICA**, 2♀, **Cartago**, [Turrialba], CATIE, 700m, MT/YPT, 14-15.iii.1990 (J.S. Noyes); 1♀, **Puntarenas**, Golfo Dulce, 24km W Piedras Blancas, vi-viii.1989 (Hanson, Gauld); 1♀, Puntarenas, Golfo Dulce, 3km SW Rincon, vi-viii.1989 (P. Hanson); 1♀, Puntarenas, Pen. Osa, 5km W Puerto Jimenez, 8°33'N 83°21'W, 10m, vi.1992 (P. Hanson); 3♀, Puntarenas, PN Corcovado, Los Patos, 8°33'N 83°30'W, 200m, ii.2000 and 1-9.iii.2000 (J.S. Noyes, J.A. Azofeifa). Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. Of the Costa Rica species, *Protyndarichoides hephaestus* is most similar to *damocles* but can be separated using the characters given in the key (see p. 537).

Genus *GAHANIELLA* Timberlake

Gahaniella Timberlake, 1926:23-26. Type species: *Gahaniella californica* Timberlake, by original designation and monotypy.

Female. Length about 0.9-1.8mm.

Body generally dark metallic green with some coppery or purple areas; fore wing hyaline with pale yellow venation.

Head about 2X frontovertex or only slightly more; occipital margin sharp, carinate; vertex with a shiny bottomed depression along eye margin behind posterior ocellus; frontovertex with conspicuous punctate-reticulate sculpture of cell size about equal to diameter of eye face; scrobes shallow, weakly delimited dorsally and laterally; malar suture absent; antenna inserted about level with lower eye margin or slightly above, torulus separated from mouth margin by at least 1.5X its own length; scape short, about as long a malar space and about 3X as long as broad; funicle segments subequal in size, larger than pedicel, all with very conspicuous longitudinal sensilla which are about as long as segment; clava 3-segmented, sensory area minute, apex rounded; mouth narrow, about one-third head width; mandible with 1 tooth and a broad, slightly concave truncation; palp formula 4.3;

Thorax dorsally slightly convex; pronotum short, hardly visible behind head; mesoscutum with imbricate-reticulate sculpture; notaular lines absent; scutellum with strongly longitudinally elongate sculpture that is at least about as deep as that on mesoscutum; mesopleuron clearly separated from gaster by propodeum and hind coxa; mid tibial spur very slightly shorter than mid basitarsus; fore wing about 2.2X as long as broad; marginal vein about 2X as long as broad, about as long as stigmal vein, slightly longer than postmarginal vein; stigmal vein with only 3 campaniform sensilla at apex; parastigma not swollen; linea calva interrupted, sometimes closed; filum spinosum present, represented by only 2 or 3 modified setae; propodeum short, medially not more than 0.1X as long as scutellum, spiracles nearly touching anterior margin, about 10-15 silvery setae laterally.

Gaster about as long as thorax or a little shorter; paratergites absent; hypopygium not reaching more than half way along gaster and at least about 2.7X as broad as long, subrectangular, posterior margin fairly straight; syntergum slightly shorter than mid tibia to slightly longer, apex rounded or acute; ovipositor hidden or hardly exserted with the exserted part not more than about 0.3X mid tibial spur; gonostylus free, second valvifer with a distinct, short, leaf-like flange that overhangs the proximal part of the gonostylus.

Male. Length about 0.8-1.2mm.

Generally very similar to female; funicle with segments about 1.5-2.0X as long as broad and

clothed with whorls of long setae, the longest of which is about 3-3.5X as long as diameter of segments, setal socket unusually large; linear sensilla absent from 1 or 2 proximal segments and only about 0.5X as long as segment; phallobase slender, parameres present, slender, reaching about 0.7X to apex of digitus, with a single subapical seta and a basal seta; each digitus about 4.5X as long as wide, with an apical tooth and an apical bristle; aedeagus slender, nearly 8X as long as wide, with apex rounded and about 0.5X as long as mid tibia.

DISTRIBUTION. USA (Hawaii, Florida), Caribbean, Central and South America.

HOSTS. Recorded as parasitoids of various genera of Coccidae (Hemiptera) viz: *Ceroplastes* Gray, *Coccus* Linnaeus, *Differococcus* Granara de Willink, *Milviscutulus* Williams & Watson, *Parasaissetia* Takahashi, *Parthenolecanium* Šulc, *Pulvinaria* Targioni Tozzetti, *Saissetia* Deplanche, *Toumeyella* Cockerell (see below). Also recorded from *Orthezia* Bosc d'Antic (Homoptera: Ortheziidae), and *Planococcus* Ferris (Hemiptera: Pseudococcidae) (see below) but these records probably need confirmation. There are also specimens reared from *Crypticerya* Cockerell (Hemiptera: Monophlebidae) in the NHMUK. It is likely that the species are hyperparasitoids (see Kerrich, 1953; Beardsley 1976).

COMMENTS. Females of *Gahaniella* can be recognised by the unique combination of the antenna placed relatively high on the head with a short scape, all funicle segments subquadrate, subequal and with conspicuous longitudinal sensilla, mandibles with one tooth and a broad truncation, pale fore wing venation and the ovipositor having short flat leaf-like extension at the apex of the second valvifer that overhangs the proximal part of the gonostylus.

IDENTIFICATION. Five species known, including one described as new below. For key to five previously described species see Trjapitzin, 2010; see also Timberlake (1926) and Kerrich (1953) for original descriptions of species.

Key to Costa Rican species of *Gahaniella*
(Females)

1. Fore coxa white, fore femur white; reticulate sculpture on mesoscutum very coarse, scutellum (Fig. 1389) with coarse polygonally reticulate to striate-reticulate sculpture ..... *chaldenes* **sp.nov.** (p. 549)
- Fore coxa brown, fore femur mostly brown; reticulate sculpture on mesoscutum shallow, scutellum with polygonally reticulate to striate sculpture 2

2. Costal cell of forewing (Fig. 1397) dorsally with at least two lines of setae in apical half; linea calva more or less closed posteriorly ..... *californica* Timberlake (p. 551)
- Costal cell of fore wing (Fig. 1401) dorsally with only submarginal line of setae in apical half; linea calva open posteriorly ..... *saissetiae* Timberlake (p. 552)

***Gahaniella chaldenes* sp.nov.**
(Figs 1389-1395; Hab. ♀ 202)

DIAGNOSIS. *Female* (length about 1.0-1.3mm): Fore leg, including coxa, white to very pale yellow; mid femur and tibia very pale yellow, tibia with a faint, pale, brown, subbasal band; head (Fig. 1392) about 2.2X as wide as frontovertex; ocelli forming an angle of about 100°; scape (Fig. 1390) about 3X as long as broad; linear sensilla on flagellum slender, generally separated by 2-3X their own widths; reticulate sculpture on mesoscutum (Fig. 1389) very coarse, scutellum with coarse polygonally reticulate to striate-reticulate sculpture; fore wing (Fig. 1391) with scattered setae dorsally in apical half of costal cell in addition to line of submarginal setae; linea calva interrupted and closed posteriorly; syntergum shorter than mid tibia; ovipositor (Fig. 1393) less than 1.5X as long as mid tibia. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.20mm; excluding ovipositor, 1.16mm (CPD).

Head dark brown to black; frontovertex predominantly with a dull, dark green sheen mixed coppery purple; anterior part of frontovertex, scrobal area and gena mainly with a coppery purple sheen; temple with a more distinctly coppery and dark blue sheen; frontovertex with moderately conspicuous, scattered, translucent brown setae; numerous setae forming a line along inner eye margin continuing below eye on to gena; gena and interantennal prominence with scattered, moderately conspicuous, translucent, brown setae; maxillary palpus white; radicle orange-brown; scape brown with extreme base and apex very pale yellow, apex more widely so; pedicel brown with apex pale, dusky yellow; flagellum pale brown, ventrally mixed testaceous-yellow; thorax dark brown to black; pronotum mainly with a dull brassy, and coppery purple sheen; mesoscutum with a dull, dark blue and coppery purple sheen, posterior margin dull coppery purple; scutellum similar to mesoscutum but side and apex dark green and more strongly metallic; mesopleuron with a moderate coppery purple and dull blue sheen; fore coxa white; fore femur white, tibia very pale, slightly dusky, yellow, tarsus dusky pale yellow; mid coxa brown; mid leg otherwise mostly very pale yellow, but tibia with an extremely faint, pale, brown, subbasal band; hind coxa dark brown; femur dark brown; tibia narrowly dusky pale orange at base, with a broad subbasal, brown band to 0.6X, apex white, tarsus white, slightly dusky towards apex; wings hyaline, venation very pale testaceous-yellow; propodeum dark purple-brown with a weak brassy sheen, side dull metallic blue and purple, a group of about 7 or 8 moderately conspicuous, silvery setae outside spiracle not extending down side towards coxa; gaster dark purple-brown, dorsally with a coppery purple sheen, side and venter with a weak brassy, purple and blue sheen; gonostylus dark brown, apex pale orange.

Head (Fig. 1392) about 2.2X as wide as frontovertex, in profile about 1.6X as high as deep, frontovertex evenly, slightly convex from occipital margin to top of scrobes, abruptly bent at about 80° at top of scrobes and then virtually straight to mouth margin with interantennal prominence not protuberant; occipital margin sharp, weakly carinate; a very slender, short oval depression alongside eye margin level with hind margin of posterior ocellus; ocelli forming an angle of about 100°; frontovertex slightly shiny, with deep, punctate-reticulate sculpture of mesh size a little smaller than eye facet; temple and posterior gena with shallow, longitudinally elongate imbricate-reticulate sculpture, anterior gena with more polygonally reticulate sculpture; area between eye and scrobe with longitudinally elongate imbricate-reticulate sculpture; scrobe and interantennal prominence with shallow, polygonally reticulate sculpture; scrobes very shallow, indistinctly margined, narrowly ∩-shaped; interantennal prominence dorsally rounded; antenna as in Fig. 1390; scape about 2.9X as long as broad, widest subapically; linear sensilla on flagellum relatively slender, generally separated by 2-3X their own widths; clava not enlarged, as wide as F6 a little longer than F5-F6 combined, sutures parallel, sensory area small, at apex only, giving it a pointed or slightly rounded appearance; eye slightly overreaching occipital margin, naked; clypeal margin narrowly convex medially. Relative measurements: HW 75, HH 63, FVL 31, FV 34, POL 18, OOL 3.5, OCL 2, AOL 12, EL 40.5, EW 36, MS 24, SL 22, SW 8.

Thorax (Fig. 1389) with pronotum hardly exposed behind head, in dorsal view about 0.25X as long as mesoscutum; pronotum with imbricate-reticulate to polygonally reticulate sculpture that is clearly shallower and generally of larger mesh size than sculpture on frontovertex; mesoscutum with fine, slightly longitudinally elongate, polygonally reticulate sculpture that is a little deeper than that on pronotum, slightly more elongate anterior laterally; axilla with similar sculpture to pronotum but slightly transversely elongate; scutellum with very similar sculpture to mesoscutum, but slightly more longitudinally elongate laterally; visible part of mesoscutum about 1.7X as broad as long; scutellum about as broad as long; hind femur about 3.6X as long as broad; fore wing with venation and setation as in Figs 1391, 1395; costal cell with scattered setae dorsally in apical half in addition to line of submarginal setae; linea calva interrupted and more or less closed posteriorly; propodeum (Fig. 1389) medially about 0.05X as long as scutellum and virtually smooth. Relative measurements: FWL 61, FWW 27; HWL 44, HWW 13.

Gaster with hypopygium reaching about 0.4X to apex; last tergite about 0.9X as long as mid tibia, with apex rounded; ovipositor slightly exserted, the exserted part about 0.3X length of mid tibial spur or about 0.1X mid tibia.

Paratype. Mandible with a short, lower tooth and a broad, slightly concave truncation. Funicle

with linear sensilla present on all segments; hypopygium Fig. 1394; ovipositor Fig, 1393. Relative measurements: OL 76, GL 18 [MT 61].

Variation. Females vary in length from 1.00-1.29mm, otherwise very little variation noted in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, 1♀, **Guanacaste**, Sta. Rosa NP, Sn. Emilio 7-0, 22.vi-13.vii.1985 (Janzen, Gauld). Paratypes: **COSTA RICA**, 6♀, **Guanacaste**, Santa Rosa NP, various localities and dates, 11.v.1985-8.xi.1986 (D. Janzen, I.D. Gauld); 1♀, **Puntarenas**, 13 km NE Dominical, RB Rio Magnolia, 9°20'N 83°47'W, 800m, 22-24.ii.2015 (J.S. Noyes). Holotype in MZUCR, paratypes in NHMUK and MZUCR.

COMMENTS. In the key to species provided by Trjapitzin (2010) *chaldenes* runs easiest to *tertia* Kerrich, 1953, described from Trinidad & Tobago. Both species have completely white to very pale yellow fore and mid legs, except for a brown mid coxa and the scape is broadest subapically. It differs from *tertia* in having scattered setae dorsally in the apical half of costal cell of the fore wing in addition to a line of submarginal setae, the linea calva interrupted and closed posteriorly, scutellum with coarse, distinctly cellular, elongate sculpture, syntergum shorter than mid tibia and ovipositor much less than 1.5X as long as the mid tibia. In *tertia* there is only a single line of submarginal setae dorsally in the fore wing costal cell, the linea calva is interrupted but open posteriorly, the sculpture on the mesoscutum is finely striate, the syntergum is slightly longer than the mid tibia and the ovipositor is about 1.7X as long as the mid tibia. Comparison with *akhatovi* Trjapitzin, 2010 and *brasiliensis* (Gomes, 1941) is more difficult because I have not seen the type material of either species and their original descriptions are superficial and probably erroneous. However, I am confident that *chaldenes* is distinct from *akhatovi* because the flagellar segments of *chaldenes* are much broader with F4-F6 clearly transverse and the flagellum is pale testaceous yellow to pale brown whereas in *akhatovi* the flagellar segments are comparatively more slender with all funicle segments longer than broad and black-brown in clouration. Other character states defining *brasiliensis* in Trjapiztin's key suggest that it is closer to *chaldenes*, i.e. the clava is a little shorter than F4-F6 combined and the distance of the torulus from the mouth is only about 1.6X its distance from the eye margin. However, *chaldenes* differs from *brasiliensis* in being less than 1.5mm in length, having F4-F6 clearly transverse and the hind tibia dark brown with pale apices. In *brasiliensis* the body length is about 1.75mm, all funicle segments are longer than broad and the hind tibia is pale with only the extreme base darkened.

Gahaniella californica Timberlake

(Figs 1396-1398; Hab. ♀ 203)

Gahaniella californica Timberlake, 1926:26-27. Holotype ♀, USA (California), USNM, digital images examined.

DIAGNOSIS. *Female* (length about 1.0-1.4mm): all coxae brown; fore femur brown, tibia pale orange or brown; mid femur and tibia mostly brown; head about 2.1X as wide as frontovertex; ocelli forming an angle of about 100°; scape (Fig. 1396) about 3.3X as long as broad; linear sensilla on flagellum slender, generally separated by 2-3X their own widths; reticulate sculpture on mesoscutum shallow, scutellum with polygonally reticulate to striate sculpture; fore wing (Fig. 1397), in apical half of costal cell, with scattered setae in addition to line of submarginal setae; linea calva interrupted and closed posteriorly; apex of fore wing venation Fig. 1398; syntergum shorter than mid tibia; ovipositor hardly exserted and about 1.3X as long as mid tibia. *Male* (length

about 1.4mm): generally very similar to female; ocelli forming an angle of about 115°; funicle segments about 1.5-2.0X as long as broad and clothed with whorls of long setae, the longest of which is about 3.5X as long as diameter of segments; phallobase slender, each digitus with 1 tooth and aedeagus slender with apex acute.

DISTRIBUTION. USA (California) (Timberlake, 1926), Mexico (Trjapitzin et al., 2008); Costa Rica (**new record**).

HOSTS. Recorded as a parasitoid of *Parthenolecanium* ?*corni* (Bouché) (Hemiptera: Coccidae) on *Quercus californica* J.G. Cooper (Fagales: Fagaceae) and *Parthenolecanium corni* on *Arctostaphylos* Adans (Ericales: Ericaceae) (Timberlake, 1926) and also from *Orthezia* Bosc d'Antic (Hemiptera: Ortheziidae) on *Capsicum annuum* L. (Solanales: Solanaceae) and from *Differococcus argentinus* (Morrison) on *Celtis pallida* Torr. (Rosales: Ulmaceae) (Trjapitzin et al., 2008; Myartseva et al., 2010). Recorded below from a mixed collection of *Saissetia coffeae* (Walker) and *Ceroplastes* Gray (Hemiptera: Coccidae) on a fern.

MATERIAL EXAMINED

Holotype ♀ (Digital images): USA, Idyllwild Cal. Jl. 29 1912" "Ex Lecanium sp." "Timberlake lectopr 14654 ♀" "Holotype" "Type No 28145 U.S.N.M." "Gahaniella californica Types Timb" "USNMENT 01570144" (USNM).

USA, 1♀, 1♂, **California**, San Jacinto Mts, Idyllwild, ex *L. corni* on manzanita, vii.1939 (P De Bach) "Gahaniella californica Timb. ♀ Det. H.C.". **COSTA RICA**, 1♀, **Guanacaste**, PN Palo Verde, 400m E Puenta La Espuela, LN 258 980 396500, 10m, #60219, no date (I. Jiménez); 1♀, **Cartago**, Turrialba, ex collection of *Saissetia coffeae* and *Ceroplastes* on fern, 13.iii.1990 (J.S. Noyes). Material in NHMUK and MZUCR.

Gahaniella saissetiae **Timberlake**

(Figs 1399-1402; Hab. ♀ 204, ♂ 205)

Gahaniella saissetiae Timberlake, 1926:27-28. Holotype ♀, West Indies (US Virgin Islands), USNM, digital images examined.

DIAGNOSIS. *Female* (length about 0.9-1.5mm): all coxae brown; fore femur mostly brown, tibia mostly yellow, occasionally largely dark brown; mid femur and tibia mostly brown; head about 2.1X as wide as frontovertex; ocelli forming an angle of about 100°; scape (Fig. 1401) about 2.9X as long as broad; linear sensilla on flagellum relatively wide, separated by hardly more than their own widths; reticulate sculpture on mesoscutum shallow, scutellum with polygonally reticulate to striate sculpture; fore wing (Fig. 1401), in apical half of costal cell, with only a line of submarginal setae dorsally; linea calva interrupted but open posteriorly; apex of fore wing venation Fig. 1402; syntergum longer than mid tibia; ovipositor (Fig. 1400) more than 1.5X as long as mid tibia. *Male* (length about 1.2mm): similar to female, but funicle segments about 1.5-2.0X as long as broad and clothed with whorls of long setae, the longest of which is about 3.5X as long as diameter of segments.

DISTRIBUTION. USA (Hawaii) (Beardsley, 1976), Cuba (Bruner, 1929), US Virgin Islands (Timberlake, 1926); Brazil (Kerrich, 1953) and newly recorded for USA (Florida), Honduras and Costa Rica (**new records**),

HOSTS. Recorded as a parasitoid of *Parasaissetia nigra* (Nietner) (Timberlake (1926:28), *Saissetia coffeae* (Bruner, 1929), *Milviscutulus* (as *Ceroplastes*) *mangiferae* (Green) (Zayas Muños, 1981), *Toumeyella cubensis* (Heidel & Köhler) (Castellanos et al., 1996), *Coccus viridis* (Green) and *Saissetia oleae* (Olivier) (Kerrich, 1953). Also recorded below from *Ceroplastes floridensis* Comstock, *Pulvinaria urbicola* Cockerell (Hemiptera: Coccidae) (**new records**). The record as a parasitoid of *Planococcus* Ferris (Hemiptera: Pseudococcidae) (**new record**) requires confirmation.

MATERIAL EXAMINED.

Holotype ♀ (digital simages): "Exp. Station St. Croix Virgin Islands" "ex Saissetia nigra (Nient.)" "Reared Apr. 14.22" "C.E. Wilson Collr." "Parts mounted" "Holotype" "Type No 28146" "Gahaniella saissetiae Types Timb." (USNM).

USA, 3♀, **Hawaii**, Oahu., Barbers Point, 29.xii.1965 and 22.iv.1966 (J.W. Beardsley); 1♀, Hawaii, Oahu, U.H. Campus, Honolulu, ex *Saissetia coffeae*, iii.1969 (J.W. Beardsley); 1♀, 1♂, **Florida**, Dade Co., Miami, ex soft scale on *Schefflera*, iv.1987 (F.D. Bennett); 3♀, 1♂, Florida, Monroe Co., Upper Key Largo, ex *Pulvinaria urbicola* on *Coccoloba diversifolia*, 88-75, 22.iii.1988 (F.D. Bennett); 2♀, Florida, Levy Co., Cedar Key, 25.iv.1989 (J.S. Noyes); 1♀, Florida, Broward Co., Pampano Beach, *Ceroplastes floridensis* on *Ixora coccinea*, 24.vii.1990 (F.D. Bennett); 2♀, 1♂, Florida, Polk Co., Lake Parker Park, ex unknown soft scale on *Pinus* sp., 26.i.1991 (H.W. Browning); 1♂, Florida, Best Western of Sarasota, ex *Ceroplastes floridensis*, on Calamondin, 31.iii.1993 (HW. Browning); 1♀, Florida, Polk, W. Haven, Lamplighter Vill., ex *Coccus viridis* on *Ixora*, 7.x.1993 (H.W. Browning); 3♀, 2♂, Florida, Polk Co., W. Haven, Ave. L, NW, (private), ex *Coccus viridis*, *Citrus paradisi*, 14.xi.1991 (H.W. Browning). **CUBA**, 1♀, Santiago de las Vegas/La Habana, ex *Coccus viridis* lab culture on *Coffea arabica* cv *catuai*, iv-viii.1975 (G. Köhler); 3♀, 1♂, ex *Planococcus* sp., café, ii.1991; 8♀, CITRICO, *Coccus viridis*, 18.vi.1988. **HONDURAS**, 1♀, 1♂, El Zamorano, ex soft scale on *Acalypha*, 27.vi.1988 (F.D. Bennett). **COSTA RICA**, 1♀, **Guanacaste**, Maritza (ACG) 700m, MT/YPT, 20.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Santa Rosa NP, Sn. Emilio 6-C, 31.i-21.ii.1987 (D. Janzen, I.D. Gauld); 1♀, **Alajuela**, PN Arenal, Send. Pilón, LN 458050 269200, 650m, #62074, 5.iii-20.iv.2001 (G. Carballo); 1♂, **San José**, Santo Domingo, INBio Parque, 1200m [error for 1100m], 19.ii.2001 (J.S. Noyes). **BRAZIL**, 1♀, Campinas, Fazenda Taquaral, ex *Coccus viridis* on orange, 17.xi.1934 (H. Compere) "Gahaniella saissetiae ♀ Det. H.C."; 1♀, 1♂, ex *S. oleae*, 1934 (H. Compere) "Gahaniella saissetiae ♀ Det. H.C.". Material in NHMUK and MZUCR.

COMMENTS. According to Timberlake (1926) the scape of *saissetiae* should be 4X as long as broad, and the fore tibia brown whereas in the above material the scape is about 3X as long as broad and the fore tibia is mostly yellow. It is very difficult to measure accurately the relative width of the scape in *Gahaniella*, especially if it is held close to the head or if it is measured on slide-mounted specimens. It therefore seems likely that Timberlake's measurements were erroneous. As noted above the fore tibia does vary from largely dark brown to almost completely yellow.

Genus *PRIONOMITUS* Mayr

Prionomitus Mayr, 1876:701. Type species: *Encyrtus chlorinus* Dalman, by monotypy.

Female. Length about 0.9-2.0mm.

Body generally metallic green, often with purplish markings on face.

Antenna with funicle 6-segmented; clava 3-segmented; mandible with one tooth and a broad, slightly concave truncation.

Mesoscutum with a characteristic posterolateral depression or invagination anterior to tegula; fore wing with marginal vein very short, very nearly punctiform, postmarginal vein distinct at least about half as long as stigmal vein.

Gaster with hypopygium extending past apex of last tergite, often enclosing ovipositor to its apex.

Male. Length about 0.9-1.8mm.

Generally similar to female but antenna with segments elongate, but asymmetric, proximal segments subserrate, all segments with whorls of long setae each at least about 3X as long as diameter of segments; phallobase with digiti well-developed and each with from 2 to 4 apical teeth.

HOSTS AND BIOLOGY. Of the described species, hosts are known only for *P. mitratus* (Dalman) and *tiliaris* (Dalman). In the Palaearctic region these species have been recorded from nymphs of *Cacopsylla* Ossiannilsson and *Livilla* Curtis and in the Nearctic region from *Cacopsylla*, *Ceanothia* Heslop-Harrison, *Euglyptoneura* Heslop-Harrison and *Pexopsylla* Jensen (Hemiptera:

Psyllidae). The life history and host preferences in southern France have been described for *P. mitratus* by Delvare, et al. (1981), Nguyen & Delvare (1982) and Delvare (1984). The eggs are normally deposited in the fourth instar of one of five species of *Psylla* Geoffroy and adult parasitoids emerge from the fifth instar. There are normally three generations of the parasitoid per year and the winter is passed in the adult stage with oviposition commencing the following year in May. The deposited egg has a long peduncle which remains protruding through the integument of the host, but there is no aeroscopic plate. Development of the embryo lasts about 2.5 days at 20°C. The eclosed larva lies with its head towards the posterior of the host and has 13 postcephalic segments. The first two larval instars are probably apneustic and remain attached to the integument of the host via the remains of the egg. The third instar is free and has 7 pairs of spriracles located in segments II to VII (Delvare, et al., 1981). The fourth instar has an additional pair of spiracles on segment IX. The fifth instar fills almost the whole body cavity of the host and has spiracles on each of segments II to X and in addition seven pairs of papillary organs on the head. At this point, about 12-13 days after oviposition, the host becomes mummified and after a further 18-20 days the adult parasitoid emerges.

DISTRIBUTION. The genus is found throughout the Holarctic region, Pakistan and central America (Mexico and Costa Rica) (Noyes & Hanson, 1996; Noyes 2019; Trjapitzin, 1989).

BIOCONTROL. See under *Prionomitus mitratus* below.

COMMENTS. Species of *Prionomitus* are frequently mistaken for *Psyllaephagus,* but females can be distinguished by the hypopygium extending to the apex of the gaster and enclosing the ovipositor nearly to its apex and both sexes can be distinguished on the presence of the posterolateral depression on the mesoscutum anterior to each tegula. In *Psyllaephagus* the hypopygium rarely reaches more than three-quarters along the gaster and never encloses the ovipositor to its apex and there are never posterolateral depressions on the mesoscutum.

IDENTIFICATION. Nine World species, 7 of which are Palaearctic, 1 Holaractic and Neotropical and 1 Neotropical. Trjapitzin (1989) provides a key to 6 of the 8 species known from the Palaearctic region, including *mitratus* (below).

***Prionomitus mitratus* (Dalman)**

(Figs 1403-1411; Hab. ♀ 206, ♂ 207)

Encyrtus mitratus Dalman, 1820:352. Holotype ♀, Sweden, NHRM, not examined.
Encyrtus chlorinus Dalman, 1820:364. Syntypes ♂, Sweden, NHRM, not examined. Synonymy with *Encyrtus mitratus* Dalman by Thomson (1876:162).
Encyrtus coniferae Walker, 1837:461. Lectotype ♀ (designated by Graham, 1969:245), Ireland. NMID, not examined. Synonymy with *Prionomitus mitratus* (Dalman) by Graham (1969:245).
Microterys mitratus (Dalman); Thomson, 1876:162.
Prionomitus mitratus (Dalman); Mercet, 1921:257.

DIAGNOSIS. *Female* (length about 1.1-1.9mm): head with a transverse purple band across top of antennal scrobes; fore legs, including coxae, completely yellow; head as in Fig. 1405; antenna as in Fig. 1403; ocelli forming an angle of 90°or more, posterior ocelli equidistant from occipital and eye margins or distinctly closer to eye margins depending on the relative width of frontovertex which varies from about one-third to two-fifths head width; fore wing venation as in Figs 1406, 1407; hypopygium (Fig. 1408) more or less completely enclosing ovipositor which is about as long as mid tibia, gonostylus (Fig. 1404) about two-fifths as long as ovipositor. *Male* (length about 1.0-1.6mm): similar to female but for antenna (Fig. 1411) and genitalia (Fig. 1411); aedeagus slightly more than half as long as mid tibia.

DISTRIBUTION. Holarctic, Costa Rica (Trjapitzin, 1989; Noyes & Hanson, 1996; Noyes, 2019).

HOSTS. Not known for Costa Rica, but elsewhere reared from a variety of psyllid (Hemiptera; Psyllidae) nymphs including Palaearctic records from *Cacopsylla cratraegi* (Schrank), *C. melanoneura* (Förster), *C. peregrina* (Förster), *C. pyri* (Linnaeus), *C. pyricola* (Förster), *C. pyrisuga* (Förster), *Livilla retamae* (Puton) and *L. variegata* (Löw), and Nearctic records from *Cacopsylla americana* (Crawford), *Ceanothia essigi* (Jensen), *C. insolita* (Tuthill), *Euglyptoneura fuscipennis* (Crawford), *E. minuta* (Crawford), *E. robusta* (Crawford) and *Pexopsylla cercocarpi* Jensen (see Trjapitzin, 1989; Noyes & Hanson, 1996; Noyes, 2019),

BIOCONTROL. *Prionomitus mitratus* has been introduced into Canada (British Columbia) and USA (California) in an attempt to control *Cacopsylla pyricola* (Förster), a pest of pears. It has been partially successful in controlling this pest in Canada (McMullen, 1971). In Europe, *P. mitratus* is regarded as being important in the natural regulation of the same pest in southern France and other countries (Delvare, et al. 1981; Delvare, 1984).

MATERIAL EXAMINED

Non type material. **COSTA RICA**, 1♀, **San José**, Cerro de la Muerte, Arroyo Muerte, 3200m, 7-13.iv.1985 (L. Masner); 1♀, Hwy 2, km 93, [Cerro de la Muerte]. 83°45'W 9°36'N. 3200m, 1-7.iv.1985 (H. Goulet, L. Masner). Plus a further 32♀, 24♂, from **CANADA**, **UNITED KINGDOM**, **FRANCE**, **SPAIN**, **ITALY** and **MONTENEGRO** as listed in Noyes & Hanson (1996). Material deposited in NHMUK, INBio, CNC.

Genus *SECTILICLAVA* Hoffer

Sectiliclava Hoffer, 1957a:55. Type species: *Sectiliclava paliuri* Hoffer, by monotypy.
Parapsyllaephagus Robinson, 1961:117. Type species: *Parapsyllaephagus adulticollis* Robinson, by original designation and monotypy. Synonymy with *Sectiliclava* by Robinson (1962:755).

Female. Length about 1.0-1.8mm.

Body generally squat, robust; head and thorax strongly metallic, thorax sometimes mostly yellow or pale orange; wings hyaline.

Head with occipital margin sharp, carinate; funicle 6-segmented; clava 3-segmented; mouth opening about one-third head width; mandibles with 2 close-set teeth and a broad truncation or appearing broadly and slightly obliquely truncate at apex with vestiges of 4 short, teeth.

Thorax with scutellum convex; apical segment of fore tarsus (e.g. Figs 1419, 1426), and sometimes also other tarsi, strongly enlarged, at least as long as rest of tarsus, usually much longer; fore wing about 2.3X as long as broad; marginal vein (e.g. Figs 1436, 1441) absent or very short, stigmal vein usually arising from submarginal vein before the submarginal vein reaches anterior wing margin; postmarginal vein about half as long as stigmal vein; linea calva entire; filum spinosum present; mesopleuron developed so that it posteriorly separates the propodeum and hind coxa and its posterior margin touches the base of the gaster.

Hypopygium reaching apex of gaster, strongly transverse, about 2.5-3X as broad as long, anterior margin straight or weakly emarginate, posteriorly with a distinct mucro (e.g. Figs 1427, 1435); syntergum with apex broadly concave; ovipositor about half as long as mid tibia and with gonostlyus immovably fused to second valvifer.

Male. Length about 1.1-1.6mm.

Generally very similar to female but funicle segments relatively longer and clava entire; genitalia with phallobase 2.5-3X as long as broad, parameres and digiti subequal in length and width, paramere with an apical seta, digitus with two apical hooks, aedeagus slender, at least about 15X as long as broad.

DISTRIBUTION. Holarctic and Central America.

HOSTS. Parasitoids of adult jumping plant lice (Hemiptera: Psyllidae). The life history has been

described by Robinson (1961b).

COMMENTS. *Sectiliclava* is a very distinctive genus which is characterised by the enlarged apical segment of the fore tarsus, fore wing with a very short or absent marginal vein and the hypopygium reaching the apex of the gaster with a distinct mucro. The enlarged apical segment of the fore tarsus is probably used by the female parasitoid to hold on to the adult psyllid during oviposition.

IDENTIFICATION. Worldwide 8 species, including 5 described below as new. See: Robinson, 1961 (single Palaearctic species); Trjapitzin, 1989 (single Palaearctic species) and Noyes & Hanson, 1996 (key to two Caribbean species).

Key to Costa Rican species of *Sectiliclava*
(Females and males)

1. Clava 3-segmented (e.g. Figs 1428, 1437) (females) 2
- Clava unsegmented (e.g. Figs 1433, 1464) (males) 8

FEMALES

2 (1) Thorax largely yellow, dorsally with mesoscutum almost entirely yellow .... *isis* Noyes & Hanson (p. 557)
- Thorax completely dark brown with a moderate to strong metallic sheen 3

3 (2) Frontovertex (Figs 1420, 1429) without contrasting, conspicuous shiny-bottomed piliferous punctures 4
- Frontovertex (Figs 1443, 1447, 1459) with distinct shiny-bottomed piliferous punctures separated by at most half their own diameters and that contrast strongly with different colouration of relatively dull areas between punctures 5

4 (3) Antenna almost completely yellow, only apex of clava slightly dusky; frontovertex and face with conspicuous, very dense, silvery setae, at least 20 between anterior ocellus and top of scrobes ..... *helikes* **sp.nov.** (p. 558)
- Antenna with scape and pedicel mostly brown, funicle and clava orange-brown to pale brown; frontovertex and face with fairly dense, translucent, silvery setae, those on gena and interantennal prominence relatively long and bristle-like, but only 1 or 2 pairs between anterior ocellus and top of scrobes ..... *megleos* **sp.nov.** (p. 559)

5 (3) Mesoscutum (Fig. 1444, 1452) with distinct piliferous punctures (giving appearance like surface of thimble or golf-ball) that are separate by less than half their own diameters 6
- Mesoscutum (Fig. 1462) without distinct piliferous punctures 7

6 (5) Antenna with pale orange funicle contrasting with brown clava; mid tibia generally paler than hind tibia ..... *fusui* **sp.nov.** (p. 561)
- Antenna with funicle and clava unicolourous dark brown; mid tibia generally darker than hind tibia ..... *arion* **sp.nov.** (p.563)

7 (5) Antenna (Fig. 1456) with all funicle segments quadrate or transverse; scutellum, medially at least, with rounded. polygonally reticulate sculpture .... *pulchriceps* Noyes & Hanson (p.564)
- Antenna (Fig. 1460) with all funicle segments longer than broad; scutellum (Fig. 1462) throughout with longitudinally elongate, striate-reticulate sculpture .... *rojasorum* **sp.nov.** (p. 565)

MALES

8 (1) Flagellar (Fig. 1433) segments clothed with very long setae, the longest of which are longer than scape; proximal funicle segments strongly asymmetrical; frontovertex without distinct piliferous punctures ..... *megleos* **sp.nov.** (p. 559)

- Flagellar (Figs 1417, 1463) segments clothed with relatively short setae that are much less than one-fifth length of scape; proximal funicle segments symmetrical; frontovertex with distinct piliferous punctures (giving appearance like surface of thimble or golf-ball) that are separated by about at most half their own diameters 9

9 (7) Thorax and gaster mostly pale yellow to pale orange, scutellum contrasting bright metallic dark green and coppery; pedicel (Fig. 1417) about 1.5X as long as broad; clava with a transverse apical truncation that is about half as wide as clava .... *isis* Noyes & Hanson (p. 557)

- Thorax and gaster entirely dark brown with a weak metallic sheen; pedicel (Fig. 1463) about as long as broad; clava with apex pointed ..... *rojasorum* **sp.nov.** (p. 565)

***Sectiliclava isis* Noyes & Hanson**

(Figs 1412-1419; Hab. ♀ 208, ♂ 209)

Sectiliclava isis Noyes & Hanson, 1996:122,123-124. Holotype ♀, Costa Rica, NHMUK, examined.

DIAGNOSIS. *Female* (length about 1.4-1.8mm): head generally metallic green or blue-green with violet areas especially in scrobal area; piliferous punctures conspicuous (Fig. 1412), but not contrasting, varying from slightly smaller to slightly larger than ocelli; lower face with setae slightly more dense than those on frontovertex and more conspicuous; thorax pale yellow to pale orange with pronotum, anterior part of mesoscutum and scutellum dark and metallic; hind femur pale orange; fore and mid tibiae yellow to pale orange, hind tibia pale orange with apex brown; all funicle segments (Fig. 1414) a little longer than broad, F6 subquadrate; apex of mandible oblique with 4 extremely short teeth (Fig. 1412); mesoscutum relatively dull with piliferous punctures shallow and indistinct, setae dark brown and conspicuous, sculpture shallow, fine, polygonally reticulate; scutellum with relatively deep, polygonally reticulate sculpture; fore leg with apical tarsomere (Fig. 1419) slightly longer than four basal tarsomeres; hind leg with apical tarsomere about as long as three basal tarsomeres; fore wing (Figs 1413, 1415) with postmarginal vein not reaching wing margin; hypopygium Fig, 1418); ovipositor Fig. 1416. *Male* (length about 1.6mm): similar to female but for structure of antenna and genitalia; antenna (Fig. 1417) with flagellum filiform with all segments at least a little longer than broad, parallel-sided and clothed in setae that are shorter than diameter of segments; phallobase about 2.5X as long as broad; cuspis seta absent; aedeagus about 14.5X as long a broad, but very slender towards apex.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, RF Golfo Dulce, 24km W. of Piedras Blancas, 200m, i-iii.1991 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, 2♂, **Puntarenas**, same data as holotype but iv-v.1991, ii.1992 and i-ii.1993. Holotype and paratypes in NHMUK.

Non type material. **COSTA RICA**, 1♀, **Puntarenas**, Est. Altamira, Send a Casa Coca, LS 331750 574400, 1700m, #62096, 14.ii-16.iii.2001 (D. Rubí). Material in MZUCR.

COMMENTS. This is the most distinctive species of *Sectiliclava* since the thorax is mostly yellow or pale orange, in all other species the thorax is mostly dark brown with a metallic sheen.

***Sectiliclava helikes* sp.nov.**
(Figs 1420-1427)

DIAGNOSIS. *Female* (length about 1.4mm): antenna mostly pale yellow; lower face (Fig. 1420), between positions of malar sulci, with conspicuous, dense, silvery setae; thorax dark brown with a moderate to strong metallic sheen; scutellum mostly coppery; mid and hind tibia pale yellow; head with shallow, inconspicuous piliferous punctures on frontovertex; funicle (Fig. 1421) with all segments slightly longer than broad, F6 broadest; mesoscutum with shallow polygonally reticulate sculpture. Male: unknown.

Female (holotype): length 1.35mm (CPD).

Head generally dark metallic green, slightly coppery along occipital and eye margins, frontovertex with some brassy reflections, area immediately above scrobes metallic dark blue, upper part of scrobes metallic purple; lower face with conspicuous, dense, silvery setae extending between positions of malar sulci; antenna, including radicle, pale yellow, some dorsal setae on funicle dark brown and very conspicuous, radicle and apex of clava slightly dusky; maxillary palpus very pale yellow; thorax mostly dark brown to black with a moderate to strong metallic sheen; pronotum with a coppery purple sheen; mesoscutum with a metallic dark green sheen mixed with some blue-green and dark blue, posterior margin narrowly coppery purple; tegula yellow, dark brown at apex; axilla with a weak brassy and purple sheen; scutellum mostly coppery with apical 0.25X and side metallic dark green mixed with some copper; setae on dorsum of thorax dark brown and inconspicuous; metanotum with a weak brassy and coppery sheen; mesopleuron generally with a weak purple and brassy sheen; fore coxa white; fore femur white, tibia and tarsus very pale yellow, pretarsus dark brown; mid coxa dark brown proximally, pale yellow apically; mid femur white, tibia and tarsus very pale yellow, spur white, basitarsus ventrally white, pretarsus dark brown; hind coxa mostly dark brown with extreme apex pale yellow; hind femur white, tibia pale yellow, tarsus white with two apical tarsomeres pale yellow, pretarsus dark brown; wings hyaline (Fig. 1423); propodeum dark brown, with a slight sheen, side with dense silvery setae outside spiracle and a group descending part way to hind coxa; gaster dark brown, generally with a fairly strong coppery and purple sheen, with green and blue reflections, Gt1 and syntergum with a distinct metallic green and blue-green sheen; gonostylus dark brown.

Head (Fig. 1420) about 2.7X as wide as frontovertex, in profile about 1.8X as high as deep, more or less evenly convex from occipital margin to top of scrobes, then virtually straight to mouth margin, with interantennal prominence hardly protuberant; ocelli forming an angle of about 90°; frontovertex shiny, generally with moderately deep, regular, polygonally reticulate sculpture of subequal mesh size to eye facet, piliferous punctures distinct but shallow and only about half the diameter of an ocellus; temple and posterior part of gena with shallower, longitudinally elongate, polygonally reticulate sculpture; anterior part of gena with similar sculpture to frontovertex; eye very nearly reaching occipital margin, with inconspicuous, pale setae that are each much shorter than diameter of facet; scrobes shallow, ∩-shaped, meeting, generally with regular, polygonally reticulate sculpture; interantennal prominence weak, moderately acute dorsally, with regular, polygonally reticulate sculpture; antenna as in Fig. 1421; scape subcylindrical, about 6.5X as long as broad; all funicle segments slightly longer than broad, but becoming slightly broader distally, linear sensilla present only on F2-F6; clava slightly broadened, about 1.4X as wide as F6, slightly shorter than F4-F6 combined, sutures slightly oblique, sensory area enlarged so that apex has a short but distinct, oblique truncation that extends about 0.3X along ventral surface; malar sulcus absent; clypeal margin concave; mandible (Fig. 1420) with apex virtually obliquely truncate but with two extremely short lower teeth and two short, but distinctly longer upper teeth. Relative measurements: HW 99.5, HH 86, FV 36.5, POL 25, OOL 3, OCL 7, AOL 17, EL 57, EW 47, MS 38, SL 45.5, SW 7.

Thorax in dorsal view with pronotum short, largely hidden by head, with posterior margin broadly concave, but slightly more strongly concave medially; pronotum, mesoscutum and axilla generally with similar reticulate sculpture to that in ocellar area, but slightly shallower; scutellum mostly with slightly elongate, polygonally reticulate sculpture that is clearly deeper and of larger mesh size than that on mesoscutum or axilla, apex and side virtually completely smooth and

shiny; visible part of mesoscutum about 1.8X as broad as long; scutellum about 1.1X as broad as long; fore leg with apical tarsomere (Fig. 1426) about as long as four basal tarsomeres; hind leg with apical tarsomere slightly shorter than two basal tarsomeres; fore wing with venation and distribution of setae as in Figs 1422, 1423, postmarginal vein more or less reaching wing margin; propodeum medially about 0.11X as long as scutellum and with shallow, irregular, reticulate sculpture. Relative measurements: FWL 99, FWW 42.5; HWL 65, HWW 21.5.

Gaster with last tergite (Fig. 1425) about 0.5X as long as mid tibia, with apex emarginate; hypopygium (Fig. 1427) with mucro about 0.5X as long as broad; ovipositor Fig. 1424. Relative measurements: OL 24.5 [MT 56].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, San Antonio de Escazu, 1300m, x.1998 (W. Eberhard). Holotype in NHMUK.

COMMENTS. *Sectiliclava helikes* is most similar to *megleos*, both species lacking distinct shiny-bottomed piliferous punctures on the frontovertex, have conspicuous silvery setae on the face and tegula at least partially white or yellow. The two species can be separated on the density and distribution of silvery setae on the frontovertex and face (see key). In addition, *helikes* has linear sensilla on F2, F6 slightly longer than broad and the sensory part of the clava extends only about 0.3X along the ventral surface, whilst in *megleos* linear sensilla are absent from F2, F6 is quadrate and the sensory part of the clava extends very nearly half way along ventral surface.

Sectiliclava megleos **sp.nov.**

(Figs 1428-1436; Hab. ♀ 210)

DIAGNOSIS. *Female* (length about 1.2mm): antenna mostly dark brown; lower face (Fig. 1429), between positions of malar sulci, with sparse, conspicuous, silvery setae; thorax dark brown with a moderate to strong metallic sheen; scutellum mostly coppery; mid tibia pale orange; hind tibia brown mixed pale orange; head (Fig. 1429) with piliferous punctures small, shallow and indistinct; funicle (fig. 1428) with all segments slightly longer than broad, F6 broadest; mesoscutum (Fig. 1430) with shallow, indistinct piliferous punctures. Male (length about 1.1mm): thorax and gaster mostly dark brown; frontovertex without distinct piliferous punctures; antenna (Fig. 1433) with pedicel slightly broader than long; funicle segments clothed in long setae, the longest of which is longer than scape or more than 5X as long as diameter of F6; proximal funicle segments very asymmetrical; clava with apex rounded.

Female (holotype): length 1.19mm (CPD).

Head with occiput black with a weak coppery purple sheen; frontovertex generally metallic blue-green, narrowly coppery along occipital margin, a small violet patch between posterior ocelli, mixed coppery purple, blue and violet immediately above scrobes; scrobal area generally coppery mixed metallic green; temple and posterior part of gena mostly metallic green mixed with some coppery areas; frontovertex with only one pair of setae between anterior ocellus and top of scrobes apart from those along eye margins, setae translucent and silvery, those on gena and interantennal prominence relatively long and bristle-like; antenna with radicle pale orange, mixed brown laterally; scape brown, apical 0.3X pale orange; pedicel dark brown, pale orange at apex and ventrally; funicle pale orange-brown with conspicuous dark brown setae dorsally; clava pale brown; maxillary palpus white; thorax mostly dark brown to black with a metallic sheen dorsally; pronotum with a moderate coppery purple sheen; mesoscutum metallic green with a slight violet

sheen posteriorly and posterior margin coppery purple; tegula dusky white basally, dark brown with a weak coppery purple sheen apically; axilla with a weak coppery sheen; scutellum mostly coppery, apex and side shining, metallic green, blue-green and coppery; setae on mesoscutum translucent, pale brown, silvery in some lights and fairly conspicuous, setae on scutellum dark brown and less conspicuous; metanotum with a slight sheen; mesopleuron generally with a weak coppery purple and brassy sheen; fore coxa orange-brown, mid and hind coxae dark brown; fore femur white to very pale orange, fore tibia pale orange with a broad, diffuse, pale brown subbasal band, tarsus pale orange, apical tarsomere dark brown; mid femur white to very pale orange, mid tibia and tarsus very pale orange, spur white, basitarsus pale yellow; hind femur white to very pale orange, tibia brown mixed pale orange for most of its length, apices dusky pale orange, tarsus very pale orange, apical tarsomere brown; wings hyaline (Fig. 1431); propodeum dark brown, with a slight coppery purple sheen, side with dense silvery setae lateral to spiracle and a group descending part way to hind coxa; gaster dark brown, generally with a fairly strong coppery and purple sheen, with green and blue reflections, Gt1 with a dark blue sheen, syntergum with a dark blue sheen mixed green and purple; gonostylus dark brown.

Head (Fig. 1429) about 2.3X as wide as frontovertex, in profile about 2.1X as high as deep, submenisciform, more or less evenly convex from occipital margin to top of scrobes, then less strongly curved to mouth margin, with interantennal prominence hardly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 105°; frontovertex shiny, generally with moderately deep, regular, polygonally reticulate sculpture of mesh size generally a little larger than eye facet, piliferous punctures small, shallow and indistinct; temple and gena with slightly shallower, longitudinally elongate, polygonally reticulate sculpture; eye very nearly reaching occipital margin, with inconspicuous, pale setae that are each much shorter than diameter of facet; scrobes shallow with similar sculpture to frontovertex; interantennal prominence with similar sculpture to frontovertex but much shallower; antenna as in Fig. 1428; scape subcylindrical, about 5.5X as long as broad; all funicle segments slightly longer than broad, becoming slightly broader distally and clothed with longer, bristle-like setae dorsally; clava broadened, about 1.5X as wide as F6, about as long as F4-F6 combined, sutures slightly oblique, sensory area enlarged so that apex has a distinct oblique truncation; malar sulcus absent; clypeal margin slightly concave. Relative measurements: HW 81, HH 77, FV 36, POL 23, OOL 4, OCL 6, AOL 14, EL 44, EW 34, MS 31, SL 38.5, SW 7.

Thorax (Fig. 1430) in dorsal view with pronotum short, largely hidden by head, with posterior margin shallowly concave, but slightly more strongly concave medially; pronotum with polygonally reticulate to imbricate reticulate sculpture that is clearly shallower and of smaller mesh than sculpture on frontovertex; mesoscutum with sculpture and piliferous punctures very similar to that on frontovertex; axilla with shallow, polygonally reticulate sculpture; scutellum with polygonally reticulate sculpture that is clearly coarser, deeper and more longitudinally elongate than that on mesoscutum, apex and side completely smooth and shiny; visible part of mesoscutum about 1.9X as broad as long; scutellum about 1.1X as broad as long; fore leg with apical tarsomere (Fig. 1432) about as long as four basal tarsomeres; hind leg with apical tarsomere slightly shorter than two basal tarsomeres; fore wing with venation and distribution of setae as in Figs 1431, 1436; propodeum (Fig. 1430) medially about 0.11X as long as scutellum and with shallow, irregular, reticulate sculpture. Relative measurements: FWL 93, FWW 40; HWL 58, HWW 20.

Gaster with last tergite about 0.5X as long as mid tibia.

Paratype. Mandible with 2 short, but distinct, upper teeth and a broad lower truncation. Funicle with linear sensilla present on F3-F6, or absent from F3; hypopygium Fig. 1435. Relative measurements: OL 19, MT 43.5.

Variation. Females vary in overall length from 1.16-1.19mm, there may be no violet colour between the posterior ocelli, the area above the scrobes may be uniformly coppery, the scape may be almost entirely brown, the fore coxa may be almost completely pale yellow, the apical tarsomere of the fore leg may be completely pale orange and the head varies from 2.3-2.5X as wide as the frontovertex with the ocelli forming an angle of about 95-105°.

Male: length 1.11mm (CPD).

Very similar to female but for the structure of the antenna and genitalia. Antenna (Fig. 1433) with scape about 3X as long as broad and a little shorter than malar space, F1-F2 slightly broader than long, F3-F6 slightly longer than broad, all segments clothed with long setae, the longest of which are at least 2X as long as the width of the broadest segments; clava solid and shorter than F5-F6 combined; phallobase (Fig. 1434) broad, parameres nearly as long as digiti, each digitus with a pair of apical teeth, aedeagus about 15X as long as broad, apically extremely slender and narrowly rounded, nearly half as long as mid tibia. Relative measurements: AL 45, MT 100.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Est. Altamira, Cerro Quemado, LS 336200 575560, 2279m, #66667, 13.xi-13.xii.2001 (D. Rubi). Paratypes: **COSTA RICA**, 1♂, **Puntarenas**, Est. Altamira, Cerro Quemado, LS 336200 575560, 2279m, #64572, 16.viii-16. ix.2001 (D. Rubi); 1♀, Puntarenas, Las Alturas BS, 8°57'N 82°50'W, 2000m, i-iii.1995 (P. Hanson). Holotype MZUCR, paratypes in NHMUK.

COMMENTS. See comments under *helikes* (p. 559).

***Sectiliclava fusui* sp.nov.**
(Figs 1437-1444)

DIAGNOSIS. *Female* (length about 1.2mm): antenna mostly pale orange, clava brown; setae arising from piliferous punctures sparse, translucent, silvery and fairly conspicuous; thorax dark brown with a moderate to strong metallic sheen; scutellum metallic green with a coppery band; mid tibia very pale orange, hind tibia brown with apices pale orange; head (Fig. 1443) with conspicuous, completely shiny, piliferous punctures on frontovertex; funicle (Fig. 1437) with F1-F5 all slightly longer than broad, F6 quadrate; mesoscutum (Fig. 1444) with piliferous punctures conspicuous, similar to those on frontovertex.. Male: unknown.

Female (holotype): length 1.23mm (CPD).

Head with occiput generally dark purple; frontovertex, area between eye and scrobe and upper scrobal area with very shiny, metallic dark green or blue-green piliferous punctures, area between punctures relatively dull, contrasting, purple; lower face, temple and posterior gena metallic green mixed purple; setae arising from piliferous punctures translucent, silvery and fairly conspicuous; antenna (Fig. 1437) with radicle orange, mixed brown laterally; scape pale orange; pedicel pale orange, brown dorsally in proximal half; funicle pale orange; clava brown; maxillary palpus dusky white; thorax mostly dark brown to black with a metallic sheen dorsally; pronotum with a moderate metallic green and purple sheen; mesoscutum with a metallic blue-green sheen mixed with some purple, posterior margin narrowly coppery purple; tegula dark brown with weak coppery purple sheen; axilla with a weak coppery purple sheen; scutellum largely metallic green with a broad, transverse, coppery band across middle for about half its length, apex mixed coppery; setae on mesoscutum, translucent and silvery and fairly conspicuous, setae on scutellum dark brown and less conspicuous; metanotum with a weak brassy and coppery purple sheen; mesopleuron generally with a weak purple and brassy sheen, a weak pale blue sheen posteriorly; all coxae dark brown; all femora dark brown, fore and mid femora pale orange at apex; fore and mid tibiae, mid tibial spur and tarsi very pale orange, each pretarsus brown; hind tibia brown with apices pale orange, tarsus white with apical tarsomere orange-brown, pretarsus brown; wings hyaline (Fig. 1440); propodeum dark brown, with a slight sheen, side with dense silvery setae outside spiracle and a group descending part way to hind coxa; gaster dark brown, generally with a fairly strong coppery and purple sheen, with green and blue reflections, Gt1 and syntergum with a distinct metallic green and blue-green sheen; gonostylus dark brown.

Head (Fig. 1443) about 2.3X as wide as frontovertex, in profile about 2.3X as high as deep, menisciform, more or less evenly convex from occipital margin to top of scrobes, then less strongly

curved to mouth margin, with interantennal prominence hardly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 100°; frontovertex shiny, generally with moderately deep, regular, polygonally reticulate sculpture of mesh size subequal to or clearly larger than eye facet, piliferous punctures distinct, completely smooth and shiny and about diameter of an ocellus, sometimes slightly larger; temple and posterior part of gena with shallower, longitudinally elongate, polygonally reticulate sculpture; anterior part of gena with similar sculpture to frontovertex; eye very nearly reaching occipital margin, with inconspicuous, pale setae that are each much shorter than diameter of facet; scrobes virtually absent, very shallow with similar sculpture and piliferous punctures to frontovertex; interantennal prominence indistinguishable, below toruli with shallow, regular, polygonally reticulate sculpture; antenna as in Fig. 1437; scape subcylindrical, about 5.9X as long as broad; F1-F5 slightly longer than broad, F6 quadrate, segments becoming slightly broader distally, linear sensilla present only on F3-F6; clava hardly broadened, about 1.1X as wide as F6, slightly longer than F4-F6 combined, sutures slightly oblique, sensory area enlarged so that apex has a distinct oblique truncation that extends very nearly half way along ventral surface; malar sulcus absent; clypeal margin concave; mandible with apex virtually obliquely truncate but with two very short, upper teeth and a minutely crenulate, lower, truncate margin. Relative measurements: HW 97, HH 91, FV 43, POL 31, OOL 3, OCL 6, AOL 18, EL 55, EW 40, MS 37, SL 41, SW 7.

Thorax (Fig. 1444) in dorsal view with pronotum short, largely hidden by head, with posterior margin shallowly concave, but slightly more strongly concave medially; pronotum with polygonally reticulate to imbricate reticulate sculpture that is about as deep as sculpture on frontovertex; mesoscutum with very similar sculpture and piliferous punctures to those on frontovertex, but punctures not as shiny; axilla with similar sculpture to pronotum; scutellum with sculpture that is clearly deeper than that on mesoscutum, medially with longitudinally elongate striate-reticulate sculpture that contrasts with polygonally reticulate sculpture at base and apex; visible part of mesoscutum about 1.9X as broad as long; scutellum about 1.1X as broad as long; fore leg with apical tarsomere (Fig. 1438) about as long as four basal tarsomeres; hind leg with apical tarsomere slightly shorter than two basal tarsomeres; fore wing with venation and distribution of setae as in Figs 1440, 1441, postmarginal vein not quite reaching wing margin; propodeum (Fig. 1444) medially about 0.11X as long as scutellum and with shallow, irregular, reticulate sculpture. Relative measurements: FWL 94, FWW 41; HWL 55.5, HWW 21.

Gaster with last tergite about 0.6X as long as mid tibia, with apex emarginate; hypopygium (Fig. 1439) with mucro about 0.9X as long as wide; ovipositor Fig. 1442. Relative measurements: OL 44.5 [MT 93].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, 24km W Chacarita, 8°77'N 83°40'W, 200m, Malaise trap, 18-21.ii.2009 (B. Brown, W. Porras). Holotype in NHMUK.

COMMENTS. *Sectiliclava fusui* is most similar to *arion*, both species having distinct, deep, piliferous punctures on the frontovertex and mesoscutum, lack conspicuous dense silvery setae on the face and have the tegula completely dark brown. Apart from characters given in key *fusui* has linear sensilla absent on F1-F2, the sensory part of the clava extends nearly half way along its ventral surface, the mesoscutum is metallic blue-green, the scutellum is metallic green with a broad, transverse, coppery band and apex largely coppery and the ovipositor is about half as long as the mid tibia with the posterior margin of the semicircular sheet, at the base of the second valvifer, distinctly curved. In *arion* linear sensilla are present on all funicle segments, the sensory part of the clava extends only about one-third along its ventral surface, the mesoscutum has purple

interpuncture areas contrasting with shiny metallic green punctures, the scutellum is mostly purple and blue with the apex blue and green and the ovipositor is hardly more than one-third as long as the mid tibia with the posterior margin of the semicircular sheet, of the second valvifer, straight.

The species is named after Lucian Fusu who first drew my attention to this new species.

***Sectiliclava arion* sp.nov.**
(Figs 1445-1452; Hab. ♀ 211)

DIAGNOSIS. *Female* (length about 1.3-1.6mm): antenna (Fig. 1445) mostly dark brown; setae arising from piliferous punctures (Fig. 1447) sparse, translucent, silvery and fairly conspicuous; thorax dark brown with a moderate to strong metallic sheen; scutellum mostly purple and blue; mid tibia brown in proximal half, distal half and hind tibia pale orange; head (Fig. 1445) with conspicuous, completely shiny, piliferous punctures on frontovertex; funicle (Fig. 1445) with F1-F5 all slightly longer than broad, F6 quadrate; mesoscutum (Fig. 1452) with piliferous punctures conspicuous, similar to those on frontovertex. Male: unknown.

Female (holotype): length 1.34mm (CPD).

Head with occiput black with a weak coppery purple sheen; frontovertex, scrobal area, area between eye and scrobe and gena with very shiny, metallic dark blue, piliferous punctures, area between punctures and temple relatively dull, contrasting, coppery purple; setae arising from piliferous punctures translucent, silvery and fairly conspicuous; antenna (Fig. 1445) with radicle pale orange, mixed brown laterally; scape pale orange, mixed brown apically and along dorsal margin; pedicel and flagellum dark brown; maxillary palpus dark brown; thorax mostly dark brown to black with a metallic sheen dorsally; pronotum with a moderate coppery purple sheen; mesoscutum as frontovertex; tegula dark brown with a weak coppery purple sheen; axilla with a weak coppery purple sheen; scutellum mostly with a distinct purple sheen in proximal 0.6X, mixed with a little metallic blue near base, apical 0.4X metallic dark blue mixed with some green; setae on mesoscutum, translucent and silvery and fairly conspicuous, setae on scutellum dark brown and less conspicuous; metanotum with a weak brassy sheen; mesopleuron generally with a weak brassy sheen, a weak purple sheen posteriorly; all coxae dark brown; all femora dark brown; fore tibia and tarsus pale orange, apical tarsomere pale orange-brown, pretarsus brown; mid tibia brown in proximal 0.5X, pale orange distally, spur and tarsus pale orange, pretarsus brown; hind tibia and tarsus pale orange, apical tarsomere dusky, pretarsus brown; wings hyaline (Fig. 1451); propodeum dark brown, with a slight sheen, side with a metallic blue sheen and with dense silvery setae lateral to spiracle and a group descending part way to hind coxa; gaster dark brown, generally with a fairly strong coppery and purple sheen, with green and blue reflections, Gt1 with a dark blue sheen, syntergum with a metallic green and blue-green sheen; gonostylus dark brown.

Head (Fig. 1447) about 2.1X as wide as frontovertex, in profile about 2X as high as deep, menisciform, more or less evenly convex from occipital margin to top of scrobes, then less strongly curved to mouth margin, with interantennal prominence hardly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 120°; frontovertex shiny, generally with moderately deep, regular, polygonally reticulate sculpture of mesh size generally a little larger than eye facet, piliferous punctures distinct, completely smooth and shiny and very slightly smaller than diameter of ocellus; temple with shallower, longitudinally elongate, polygonally reticulate sculpture; gena with sculpture similar to frontovertex; eye very nearly reaching occipital margin, with inconspicuous, pale setae that are each much shorter than diameter of facet; scrobes virtually absent, very shallow with similar sculpture and piliferous punctures to frontovertex; interantennal prominence distinguishable only between toruli, virtually smooth between piliferous punctures; antenna as in Fig. 1445; scape subcylindrical, about 6.3X as long as broad; F1-F5 slightly longer than broad, F6 quadrate, segments becoming slightly broader distally, linear sensilla present on all funicle segments; clava hardly broadened, about 1.1X as wide as F6, about as long as F4-F6 combined, sutures slightly oblique, sensory area enlarged so that apex has a distinct oblique truncation; malar sulcus absent; clypeal margin slightly concave. Relative measurements: HW 97, HH 90, FV 46, POL 30, OOL 3, OCL 5.5, AOL 16, EL 52, EW 38, MS 37, SL 41, SW 6.5.

Thorax (Fig. 1452) in dorsal view with pronotum short, largely hidden by head, with posterior margin shallowly concave, but slightly more strongly concave medially; pronotum with polygonally reticulate to imbricate reticulate sculpture that is clearly shallower than sculpture on frontovertex between piliferous punctures; mesoscutum with very similar sculpture and piliferous punctures to those on frontovertex with punctures similarly shiny; axilla with similar sculpture to pronotum; scutellum with sculpture that is clearly finer and deeper than that on mesoscutum, with longitudinally elongate striate-reticulate sculpture in a whorl-like pattern that contrasts with polygonally reticulate sculpture at extreme apex; visible part of mesoscutum about 1.8X as broad as long; scutellum about 1.1X as broad as long; fore leg with apical tarsomere (Fig. 1450) slightly shorter than four basal tarsomeres; hind leg with apical tarsomere slightly shorter than two basal tarsomeres; fore wing with venation and distribution of setae as in Figs 1446, 1451, postmarginal vein more or less reaching wing margin; propodeum (Fig. 1452) medially about 0.11X as long as scutellum and with shallow, irregular, reticulate sculpture. Relative measurements: FWL 98, FWW 42; HWL 62, HWW 21.

Gaster with last tergite about 0.6X as long as mid tibia.

Paratype. Mandible with a slightly oblique broad truncation with 4 very short vestiges of teeth; hypopygium Fig. 1459; ovipositor Fig. 1448. Relative measurements: OL 23, MT 53.

Variation. Females vary in overall length from 1.34-1.58mm, otherwise very little variation noted in material available.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Zurqui de Moravia, 1600m, vi.1995 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **San José**, Zurqui de Moravia, LN 225700 534800, 1600m, 30.iii-8.iv.2009 (W. Porras). Holotype MZUCR, paratype in NHMUK.

COMMENTS. See comments under *fusui* (p. 562).

***Sectiliclava pulchriceps* Noyes & Hanson**

(Figs 1453-1459; Hab. ♀ 212)

Sectiliclava pulchriceps Noyes & Hanson, 1996:121-122. Holotype ♀, Costa Rica, NHMUK, examined.

DIAGNOSIS. *Female* (length about 1.0-1.3mm): frontovertex coppery with contrasting bright metallic green or blue piliferous punctures that are completely smooth and shiny and generally slightly smaller than diameter of ocellus; lower face (Fig. 1459) with setae about as dense as those on frontovertex; thorax generally dark brown to black with a metallic sheen; hind femur brown; all tibiae yellow to pale orange; funicle segments quadrate or transverse; apex of mandible oblique with 4 short teeth; mesoscutum relatively dull with piliferous punctures shallow and indistinct, setae silvery and fairly conspicuous, sculpture polygonally reticulate and a little shallower and finer than on frontovertex; scutellum with relatively deep, slightly elongate, polygonally reticulate sculpture; fore leg with apical tarsomere (Fig. 1454) about as long as four basal tarsomeres; hind leg with apical tarsomere about as long as three basal tarsomeres; fore wing (Fig. 1458, 1457) with postmarginal vein not reaching wing margin; hypopygium Fig. 1453; ovipositor Fig. 1455. *Male*: unknown.

DISTRIBUTION. Trinidad & Tobago, Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Barra Honda NP, 150m, v.1988 (I.D. Gauld). Paratypes: TRINIDAD & TOBAGO, 1♀, Trinidad, St. George, St. Augustine, wasteground, 16.vi.1976 (J.S. Noyes). Holotype and paratype in NHMUK.

Non type material. **COSTA RICA**, 1♀, **Guanacaste**, PN Palo Verde, Camino a OET, LN 260952 385020, 0-50m, #56550, 7-17.vi.2000 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sect. Catalina, LN 388500 257300, #64148, 9.v-7.vi.2001 (I. Jiménez). Material in MZUCR and NHMUK.

COMMENTS. One recently collected specimen of *pulchriceps* differs from the holotype in having the antenna, fore coxae and fore and mid femora yellow. It otherwise agrees well and is therefore included here.

Sectiliclava rojasorum **sp.nov.**

(Figs 1460-1467; Hab. ♀ 213, ♂ 214)

DIAGNOSIS. *Female* (length about 1.2-1.3mm): antenna mostly brown; setae arising from piliferous punctures sparse, silvery and inconspicuous; thorax dark brown with a moderate to strong metallic sheen; scutellum mostly coppery; mid and hind tibiae pale orange; head with piliferous punctures on frontovertex very distinct, completely smooth and shiny; funicle (Fig. 1460) with all segments clearly longer than broad, F6 broadest; mesoscutum with piliferous punctures shallow and inconspicuous. Male (length about 1.1mm): thorax and gaster mostly dark brown; frontovertex with distinct piliferous punctures; antenna (Fig. 1463) with pedicel about as broad as long; funicle segments clothed with short setae, the longest of which are about 0.5X as long a width of broadest segment; proximal funicle segments symmetrical; clava with apex more or less pointed.

Female (holotype): length 1.29mm (CPD).

Head with occiput generally dull, dark purple; frontovertex coppery with piliferous punctures contrasting shining metallic green; interantennal prominence mostly metallic dark green; mouth margin coppery; temple and gena relatively dull metallic dark blue mixed with purple; setae arising from piliferous punctures translucent, silvery, but mostly inconspicuous; antenna with radicle pale orange, a little dusky dorsally; scape pale orange; pedicel pale orange, brown dorsally; flagellum brown; maxillary palpus pale brown; thorax mostly dark brown to black with a metallic sheen dorsally; pronotum with a moderate coppery purple sheen mixed with dark blue reflections; mesoscutum metallic dark blue, posterior margin narrowly coppery purple; tegula dark brown with weak coppery purple sheen; axilla with a weak coppery purple sheen; scutellum mostly coppery, apical 0.25X metallic dark green, mixed coppery and brassy; setae on mesoscutum and scutellum dark brown; metanotum with a very weak brassy sheen; mesopleuron generally with a weak purple and brassy sheen; all coxae dark brown; all femora dark brown, pale orange at apex; tibiae pale orange, fore tibia with a small, pale brown subbasal area; fore and mid tarsi pale orange, pretarsi brown, hind tarsus proximally white, distally pale orange, pretarsus brown; wings hyaline; propodeum dark brown, with a slight brassy sheen, side with moderately dense silvery setae outside spiracle and a group descending along anterior margin to hind coxa; gaster dark brown, Gt1 and syntergum with a distinct metallic green and blue-green sheen, Gt2-Gt6 mostly coppery, sides and venter with mixed blue, green, coppery purple and brassy reflections; gonostylus dark brown.

Head about 2.5X as wide as frontovertex, in profile about 2.1X as high as deep, menisciform, more or less evenly convex from occipital margin to mouth margin, with interantennal prominence moderately protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 100°; frontovertex shiny, generally with moderately deep, regular, polygonally reticulate sculpture of mesh size slightly larger than eye facet, piliferous punctures very distinct, completely smooth and shiny and of very slightly smaller diameter than ocellus; temple and posterior part of gena with much shallower, longitudinally elongate, polygonally reticulate sculpture; anterior part of gena with similar sculpture to frontovertex; eye very nearly reaching occipital margin, with conspicuous, pale setae that are at least as long as diameter of facet; scrobes virtually absent, very

shallow with similar sculpture and piliferous punctures to frontovertex; interantennal prominence indistinguishable, below toruli with shallow, regular, polygonally reticulate sculpture; antenna as in Fig. 1460; scape subcylindrical, about 6.2X as long as broad; all funicle segments clearly longer than broad, segments becoming slightly broader distally; clava hardly broadened, about 1.1X as wide as F6, slightly shorter than F4-F6 combined, sutures not oblique, sensory area hardly enlarged so that apex appears rounded; malar sulcus absent; clypeal margin concave, but straight medially. Relative measurements: HW 91, HH 86, FV 37, POL 26, OOL 2.5, OCL 6.5, AOL 15, EL 56, EW 41, MS 30, SL 40, SW 6.5.

Thorax in dorsal view with pronotum short, partially hidden by head, with posterior margin weakly concave; pronotum with polygonally reticulate to imbricate reticulate sculpture that is about as deep as sculpture on frontovertex, but generally of much larger mesh; mesoscutum with finer, shallower sculpture than on frontovertex and with piliferous punctures shallow, small and inconspicuous; axilla with very fine, shallow polygonally reticulate sculpture that is much shallower than that on pronotum; scutellum with sculpture that is a little deeper than that on frontovertex, generally longitudinally elongate striate-reticulate sculpture, extreme sides and apex completely smooth and shiny; visible part of mesoscutum about 1.7X as broad as long; scutellum about 1.2X as broad as long; fore leg with apical tarsomere (Fig. 1466) about as long as four basal tarsomeres; hind leg with apical tarsomere slightly shorter than two basal tarsomeres; fore wing with postmarginal vein not reaching wing margin; propodeum medially about 0.11X as long as scutellum and with shallow, fine, irregular, polygonally reticulate sculpture. Relative measurements: FWL 83, FWW 36; HWL 54 HWW 17.

Gaster with last tergite about 0.7X as long as mid tibia; hypopygium Fig. 1465. Relative measurements: OL 45, [MT 97].

Paratype. Linear sensilla present only on F3-F6 or absent from F3; mandible with apex broadly and slightly obliquely truncate with minute vestiges of 4 teeth.

Variation. Females vary in overall length from 1.16-1.29mm, otherwise very little variation noted.

Male: length 1.05-1.15mm (CPD).

Very similar to female but for the structure of the antenna and genitalia. Antenna (Fig. 1463) with scape about 4.4X as long as broad and very slightly longer than malar space, all funicle segments longer than broad; all segments clothed with short setae, the longest of which are about 0.5X as long a width of broadest segment; clava solid and about as long as F5-F6 combined; forewing structure and distribution of setae as in Figs 1461, 1464; phallobase (Fig. 1467) about 3X as long as broad; cuspis seta present; paramere nearly as long as digitus with an apical seta, each digitus with a pair of apical teeth; aedeagus very slender, about 12X as long as broad and weakly angular apically, about one-third as long as mid tibia. Relative measurements: AL 13, MT 40, MTS 12.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 23-24.ii.2007 (J.S. Noyes). Paratypes: **COSTA RICA**, 2♀, 2♂, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 19-20.ii.2016 (J.S. Noyes). Holotype in MZUCR, paratypes in NHMUK..

COMMENTS. Of the Costa Rica species of the genus, *rojasorum* is probably most similar to *fusui* but, apart from lacking conspicuous piliferous punctures on the mesoscutum it can be separated by having a unicolorous brown antenna, pale orange hind tibia; mandible with upper teeth virtually absent, sculpture on scutellum elongate and reticulate (cellular), especially towards apex, and the anterior margin of the hypopygium distinctly emarginate. In *fusui* the funicle is pale orange contrasting with the brown clava, the hind tibia is dark brown, the mandible has two short, but

distinct upper teeth, the scutellum has finely striate-reticulate sculpture and the anterior margin of the hypopygium is more or less straight.

This species is named in honour of Fabio and Carlos Rojas, the two wonderful brothers who run the farm at the main entrance to RP Karen Mogensen.

Genus *TRECHNITES* Thomson

Trechnites Thomson, 1876:118. Type species: *Metallon fuscitarsis* Thomson, by subsequent designation of Erdös (1957:56).

Psylledontus Crawford, 1910:88. Type species: *Psylledontus insidiosus* Crawford by monotypy and original designation. Synonymy with *Trechnites* by Ferrière (1961:39).

Metallonella Girault, 1915:77. Type species: *Metallonella australiensis* Girault, by original designation. Synonymy with *Psylledontus* by Girault (1924:4) and synonymy with *Trechnites* by Ferrière (1961:39).

Female. Overall length about 0.8-1.7mm.

Head and thorax dull, dark brown to largely metallic blue or green.

Head with occipital margin narrowly rounded or sharp, sometimes carinate; eyes distinctly setose, setae about as long a diameter of facet; antenna with scape elongate, subcylindrical to slightly broadened and flattened, pedicel relatively elongate, as long as F1-F2 or sometimes F1-F3 combined; funicle 5-segmented; clava 3-segmented (solid in some extralimital species), usually obliquely truncate at apex with sensory area extending along much of ventral part of apical segment; mandible variable, with three subequal teeth, 2 lower teeth and a truncate upper tooth, 2 teeth and a broad upper truncation, two short teeth and a median truncation or 4 teeth; palp formula 3-3 or 3-2.

Mesoscutum with notaular lines present, partial or complete; fore wing about 2.3-2.4X as long as broad; parastigma not swollen to slightly swollen and weakly triangular; marginal vein punctiform, often not reaching anterior wing margin; postmarginal vein virtually absent; stigmal vein long and forming an angle of about 50° with anterior wing margin; filum spinosum present, composed of 4-8 pegs-like setae; mesopleuron not expanded posteriorly, separated from posterior margin of propodeum by about diameter of spiracle so that propodeum laterally is broadly in contact with hind coxa and clearly separating mesopleuron from base of gaster.

Gaster with apex of syntergum transversely truncate or with a membranous invagination either side of apex; paratergites absent; hypopygium extending at least to level with apex of syntergum, with a short to moderately long mucro (posterior median projection) that encloses ovipositor; gonostylus immovably fused to the relatively broad second valvifer; ovipositor not exserted or hardly exserted.

Male. Length about 0.7-1.3mm.

Similar to female but for solid clava and genitalia; pedicel sometimes strongly swollen; clava solid; genitalia with phallobase about 4X as long as broad; digitus about 3-4.5X as long as broad with 1-3 apical teeth, parameres weakly developed, apical set present; aedeagus 6-9X as long as broad, broadest subapically, about 0.5-0.8X as long as mid tibia.

DISTRIBUTION. Cosmopolitan.

HOSTS. Reliably reported as primary endoparasitoids of nymphs of jumping plant lice (Hemiptera: Psyllidae, Triozidae) (see Noyes, 2019). Records of other hosts (Coccoidea and Aphididae) or as hyperparasitoids require confirmation.

BIOCONTROL. *Trechnites insidiosus* Crawford (as *psyllae* Ruschka) and an unidentified of *Trechnites* species (possibly *sadkai* Guerrieri & Noyes, 2009) were released in the western United States of America from Europe, Iran and Afghanistan from 1966-1990 for the control of *Cacopsylla pyricola* (Förster) (Hemiptera: Psyllidae) a major pest of pear. *Trechnites insidiosus* was already present in North America and therefore data are not available recording the effectiveness of the

introduced parasitoids. The unidentified species from Europe was recovered in Washington state in 1991 and the Afghanistan biotype was recovered a few generations after its release in California in about 1978 (Unruh et al., 1995). *Trechnites insidiosus* is currently being tested for mass release or conservation in order to maximise natural control of pear psylla in the Western USA (Le Goff et al., 2021).

COMMENTS. Species of *Trechnites* can be separated from all other encyrtid parasitoids of Psylloidea by the 5-segmented funicle in both sexes. In all other genera the funicle is either 6-segmented (e.g., *Psyllaephagus*, *Arianus*, *Caldencyrtus*, *Dalek*) or 4-segmented (*Cercobelus*). *Trechnites* is extremely close to *Coccidaphycus* Blanchard (1940) and the two should probably be treated synonymously. However, given some very minor morphological differences, I am retaining *Coccidaphycus* as a valid genus until fresh material can be examined and the true host relationship can be confirmed. The genus differs from *Trechnites* in having a 4-segmented maxillary palp and tridentate mandibles and is reported to be a parasitoid of Coccoidea. All species currently placed in *Trechnites* have a 3-segmented maxillary palp. The mandible of *Trechnites* is variable. Some species, including the type species, have two acute lower teeth and a truncate upper tooth, the majority seem to have short, acute upper and lower teeth and a broadly truncate middle tooth which sometimes is distinctly concave giving the appearance of two middle teeth (i.e., 4-toothed mandible), very few species have 3 fairly even, short or somewhat rounded teeth. However, in *Coccidaphycus nigricans* Blanchard the mandible appears to have 3, fairly long, very acute teeth (Blanchard, 1940, Fig. 2c). Crucially, the structure of the hypopygium of *Coccidaphycus nigricans* Blanchard is not mentioned by Blanchard (1940) or De Santis (1964) and is therefore unknown. This would help determine whether or not to treat the two genera synonymously because the hypopygium of *Trechnites* is very characteristic in its shape (see Guerrieri & Noyes, 2009). Other characters that have been used to separate the two genera, such as colour, extent of sensory area on apical segment of clava, sculpture of mesoscutum and scutellum and variation in the marginal vein (see Noyes & Hayat, 1984; Guerrieri & Noyes, 2009) are too variable to be reliable. The apparent difference in host relationships may be grounds for maintaining the two genera separately. All species of *Trechnites* are parasitoids of nymphs of jumping plant lice (Psylloidea) whereas the type series of *Coccidaphycus nigricans* was reared from a collection of scale insects (Coccoidea). However, there is some doubt that coccid hosts listed by Blanchard (three separate families: Monophlebidae, Kerriidae and Coccidae) are the true hosts. It seems likely that that the type series (4♀ and 1♂) was reared from a collection of soft scales on their host plant that were placed in a container and not from individual scale insects. It is possible that psyllid nymphs were mixed up with these scale insects and it was from these that the parasitoids actually emerged.

IDENTIFICATION. Worldwide, 34 species known, including 4 species described below as new. For aids to identification see Guerrieri & Noyes, 2009 (revision of 5 European species); Trjapitzin, 1989 (key to 7 Palaearctic species); Prinsloo, 1981 (identification of four Afrotropical species); Ayyamperumal & Manickavasagam, 2018 (key to 11 Indian species); Zu & Li, 2016 (identification of three species from China).

Key to Costa Rican species of *Trechnites*
(Females and males)

1. Sculpture of mesoscutum and scutellum (Fig. 1481) contrasting and conspicuously coarser on scutellum; notaular lines (often only visible on slide-mounted material) nearly meeting medially and reaching, or very nearly reaching, posterior margin of mesoscutum 2
- Sculpture of mesoscutum and scutellum (Fig. 1489, 1492, 1508) finely reticulate and of similar depth; notaular lines (often only visible on slide-mounted material) clearly separate, reaching at most a little over half-way across mesoscutum 3

2 (1) Both mesoscutum and scutellum with imbricate-reticulate to polygonally reticulate sculpture, but that on mesoscutum composed of cells that are 2-4 times as large as

those on scutellum, sculpture on scutellum coarser and strongly contrasting with that on mesoscutum; hind tibia and tarsus dark brown .... *merops* Noyes & Hanson (p. 569)

- Mesoscutum (Fig. 1481) with transversely elongate imbricate-reticulate to striate-reticulate sculpture constrasting with longitudinally elongate polygonally reticulate to striate-reticulate sculpture on scutellum; hind tibia dark brown with apical half to one-third pale orange; hind tarsus yellow ..... *thelxines* **sp.nov.** (p. 570)

3 (1) Fore wing (Fig. 1487) strongly infuscate in basal half contrasting with hyaline apical half distad of stigmal vein ..... *thyones* **sp.nov.** (p. 572) [Female unknown, but it is likely that both sexes have distinctly infuscate fore wing]

- Fore wing (Fig. 1496, 1505) completely hyaline, or almost imperceptibly infuscate proximally 4

4 (3) Fore wing (Fig. 1496) with linea calva open or partially closed by not more than a single line of setae; flagellum (Fig. 1497) clothed in less dense setae (fewer than 10 between each pair of linear sensilla), more elongate setae, most of which are at least half length of linear sensilla; mandible (Fig. 1496) with three similar, very short, obtuse teeth ..... *kale* **sp.nov.** (p. 573)

- Fore wing (Fig. 1505) with linea calva completely closed by at least two lines of setae; flagellum (Fig. 1500) clothed with very dense setae (at least 40 between each pair of sensilla), mostly very short setae that are each less than 0.25X as long as linear sensilla; mandible (Fig. 1507) with three short, teeth, outer teeth obtuse, middle tooth broadly truncate ..... *spondes* **sp.nov.** (p. 575)

Trechnites merops **Noyes & Hanson**

(Figs 3,1468-1475; Hab. ♀ 215, ♂ 216)

Trechnites merops Noyes & Hanson, 1996:112-113. Holotype ♀, Costa Rica, NHMUK, examined.

DIAGNOSIS. *Female* (length about 0.9-1.3mm): head metallic green with some copper; mesoscutum shining metallic green, posteriorly coppery; scutellum relatively dull dark blue and purple; hind tarsus brown, contrasting with yellow fore and mid tarsi; hind tibia and tarsus dark brown; fore wing hyaline (Fig. 171); flagellum (Fig. 1468) with fairly dense, moderately short setae, generally about 20-24 setae between pairs of longitudinal sensilla on clava with majority of setae at most about half length of linear sensilla; mandible (Fig. 1470) with two short, obtuse teeth and a broad truncation; palp formula 3-3; notaular lines relatively conspicuous and meeting medially at posterior margin of mesoscutum; mesoscutum with imbricate reticulate sculpture; scutellum with deeper, fine, polygonally reticulate sculpture of cell size from half to one-quarter that on mesoscutum; fore wing (Fig,. 1471) with linea calva open; apex of venation Fig. 1472; apex of syntergum with a pair of apical lateral membranous invaginations; hypopygium (Fig. 1475) with median apical extension reaching past apex of syntergum and completely enclosing ovipositor (Fig. 1474). *Male* (length about 0.8-1.2mm): pedicel (Fig. 1469) not swollen; aedeagus (Fig. 1473) about 9X as long as broad and about 0.65X as long as mid tibia, its apex broad and obtuse; digitus with two apical teeth.

DISTRIBUTION. Costa Rica.

HOSTS. Reared from *Trioza* sp. (Hemiptera: Triozidae) on *Clethra* sp. (Ericales: Clethraceae) (Noyes & Hanson, 1996).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, San Rafael, Uvita, 1700m, ex psyllid on *Clethra*. iii.1992 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Guanacaste NP, 9km S. Santa Cecilia, Est.

Pitilla, 700m, vi.1989 (I.D. Gauld); 1♂, **Puntarenas**, Monteverde, 15.xii.1985-5.i.1986 (A. Forsyth); 1♂, **Puntarenas**, Monteverde, Finca Canada, 1500-1600m, 23-27.ii.1991 (B.J. Sinclair). Holotype and paratypes in NHMUK.

Non type material. **COSTA RICA**, 1♀, **Guanacaste**, Est. Cacao (ACG), 10°55'N, 85°30'W, 22.ii.2003 (J.S. Noyes); 3♀, 3♂, Guanacaste, Macizo Miravalles, Est. Cabro Muco, 1100m, LN 299769 411243, 18-24. iii.2003 and iii.2003 (J. Azofeifa);1♀, Guanacaste, Macizo Miravalles, Est. Cabro Muco, 1100m, LN 299769 411243, #73586, 16.iii-3.iv.2003 (J. Azofeifa, et al.); 1♀, Guanacaste, Valle Miravalles, Est. Cabro Muco, 1100m, LN 299769 411243, #74102, 4.vii.2003 (J.D. Gutierrez, et al.); 2♂, **Alajuela**, PN Volcán Arenal, Sendero Pilón, LN 458050 269200, 650m, 8.iii-20.iv.2000 and 8.xi-7.xii.2000 (G. Carballo); 3♂, Alajuela, RF Arenal, Sect. la Peninsula, LN271500 453800, 600m, 1-14.iii.2000 and 18-23.i.2001 (G. Carballo); 1♀, **Heredia**, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/TN, iv.2002 (INBio-OET-ALAS); 2♀, 1♂, **San José**, Zurqui de Moravia, 1600m, iv.1995 and i.1996 (P. Hanson); 1♀, San José, 26km N. San Isidro, 9°34'N 83°44'W, 2100m, ii-v.1992 (P. Hanson); 10♀, 12♂, **Cartago**, PN Tapanti, 9°45'N 83°47'W, 1200-1500m, 20.iii-10.iv.2000 (C. Hansson, D. Rubi); 1♀, Cartago, PN Tapanti, sendero Arboles Caidos, LN 561400 192500, 1500m, #61070, viii-ix.2000 (D. Rubí); 3♀, Cartago, PN Tapanti-Macizo de la Muerte, Torre ICE #31, LN 561800 188500, 1800m, 9.vii-10.viii.2000 and viii-ix.2000 (D. Rubí); 1♂, Cartago, PN Tapanti-Macizo de la Muerte, Send. a Rio Humo, LN 188100 560500, 1400-1500m, #56624, xii.1999-i.2000 (M. Alfaro); 1♀, **Puntarenas**, Monteverde, 1400m, 26-28.iii.1991 (P. Hanson); 1♀, Puntarenas, Buenos Aires, Est. Altamira, Send. a Casa Coca, LS 332800 575250, 1800m, #62337, iv-v.2005 (D. Rubí); 1♀, 1♂, Puntarenas, Est. Altamira, Cerro Frantzius, LS 334150 574450, 2134m, #62095, 14.ii-16.iii.2001 and 12.i-12.ii.2002 (D. Rubí); 1♀, **Limón**, P.I.L.A., Valle del Silencio, send. circular, 2450m, LS 340258 577465, #75393, 20.ix-5.x.2003 (R. Gonzalez, et al.). Material in MZUCR, NHMUK, TAMU, USNM and CNC.

Trechnites thelxines sp.nov.

(Figs 1476-1484; Hab. ♀ 217, ♂ 218)

DIAGNOSIS. *Female* (length about 0.8-1.2mm): head metallic green with some copper; mesoscutum shining green, anteriorly and posteriorly coppery; scutellum dull dark blue and purple; hind tibia pale yellow with a broad dark brown subbasal band, tarsus pale yellow; fore wing (Fig. 1482) hyaline; flagellum (Fig, 1483) with very dense short setae, generally at least 40 setae between pairs of longitudinal sensilla on clava with majority of setae not more than one-quarter of length of linear sensilla; mandible (Fig. 1476) with very short upper and lower teeth with a broadly truncate middle tooth; palp formula 3-2; mesoscutum (Fig. 1481) with shallow, transversely elongate, imbricate sculpture; scutellum with contrasting, deeper, longitudinally very elongate imbricate to striate-reticulate sculpture; notaular lines complete and nearly meeting at posterior margin of mesoscutum; fore wing (Fig. 1482) with linea calva closed by 3 lines of setae. *Male* (length about 0.7-1.0mm): pedicel not swollen (Fig. 1484); digitus (Fig. 1478) with 2 apical teeth, aedeagus about 6.3X as long as broad and about 0.5X as long as mid tibia with apex broadly rounded.

Female (holotype): length 0.94mm (CPD).

Head black with a moderate metallic sheen; frontovertex metallic green with scattered coppery reflections; scrobal area, temple and gena coppery purple; radicle dark brown; antenna (Fig. 1483) with scape mostly dark brown, apical 0.4X very pale yellow, virtually white; pedicel white, dorsally dark brown towards base; F1-F3 brown, F4 pale brown, pale yellow externally, F5 pale yellow; clava proximally brown, apical segments pale yellow; maxillary palpus very pale yellow; thorax mostly dark brown to black with a weak to moderate metallic sheen; pronotum with a coppery purple sheen; mesoscutum coppery purple in anterior half and broadly along lateral and posterior margins, remainder with a metallic dark green sheen; tegula dark brown with a weak coppery purple sheen; axilla and anterior three-quarters of scutellum with weak coppery purple sheen, posterior part of scutellum with a weak dark blue sheen that becomes slightly more conspicuous metallic dark green and coppery towards apex and side; mesopleuron generally with a purple sheen, anteriorly with some coppery and brassy reflections; mesosternum dark brown; all coxae dark brown, distally mixed pale orange; fore femur mostly dark brown, white at base and apex, tibia pale orange with a broad, subbasal brown ring, tarsus pale orange, apical tarsomere

slightly dusky; mid femur mostly dark brown, white at base, very pale orange at apex, tibia white with a narrow, subbasal brown ring, spur and tarsus very pale orange; hind femur mainly dark brown, white at extreme base and apex, tibia white at base, pale orange at apex with a dark brown subbasal band extending to about 0.5X, tarsus pale yellow, apical tarsomere dusky; wings (Fig. 1482) hyaline; propodeum dark brown, with a slight purple sheen, side with a stronger, green, blue-green and coppery sheen; gaster dark brown, generally with a fairly strong coppery and purple sheen, with green and blue reflections, Gt1 and syntergum laterally more distinctly metallic green and blue; gonostylus dark brown.

Head (Fig. 1476) about 3.2X as wide as frontovertex, in profile about 1.7X as high as deep, quite flat from occipital margin to top of scrobes, then more curved at top of scrobes and only slightly convex to mouth margin, with interantennal prominence hardly protuberant; occipital margin sharp, not carinate; ocelli forming an angle of about 75°; inner eye margins subparallel; frontovertex shiny, in ocellar area with fairly regular, moderately deep, polygonally reticulate sculpture of mesh size slightly smaller than eye facet, in front of anterior ocellus with slightly transversely elongate, polygonally reticulate to imbricate-reticulate sculpture of similar mesh size to that in ocellar area; frontovertex with at least 10 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena quite shiny, with shallower, longitudinally elongate, polygonally reticulate sculpture; eye slightly overreaching occipital margin, with conspicuous, dense, pale setae that are each about as long as diameter of facet; scrobes shallow, narrowly Λ-shaped, meeting, generally with sculpture similar to that on frontovertex, weakly margined dorsally and laterally; interantennal prominence weak, moderately acute dorsally, with shallow, regular, polygonally reticulate sculpture; antenna as in Fig. 1483; scape subcylindrical, about 4.4X as long as broad; F1-F4 transverse, F5 subquadrate, segments slightly larger and broader distad; clava hardly broadened, about 1.2X as wide as F5, very slightly longer than funicle, sutures not oblique, apex rounded; malar sulcus absent; clypeal margin concave. Relative measurements: HW 54.5, HH 49, FV 17, POL 8, OOL 1, OCL 2.5, AOL 6.5, EL 39, EW 28.5, MS 14.5, SL 22, SW 5.

Thorax (Fig. 1481) in dorsal view with pronotum short, largely hidden by head, with posterior margin broadly and shallowly concave; pronotum dorsally with similar sculpture to that in ocellar area; mesoscutum with shallower and more transversely elongate polygonally reticulate to imbricate-reticulate sculpture; axilla and scutellum with relatively coarse, polygonally reticulate sculpture that is conspicuously deeper than that on mesoscutum, extreme apex and side of scutellum completely smooth and shiny; visible part of mesoscutum about 2X as broad as long, notaular lines present, but not visible externally; scutellum about 1.2X as broad as long; fore wing with venation and distribution of setae as in Figs 1480, 1482; propodeum (Fig. 1481) medially about 0.11X as long as scutellum and with shallow, polygonally reticulate sculpture. Relative measurements: FWL 51, FWW 18; HWL 30, HWW 6.

Gaster with syntergum about 0.8X as long as mid tibia, with apex rounded.

Paratype. Funicle with linear sensilla present only on F4-F5; flagellum with very dense short setae, generally at least 40 setae between pairs of longitudinal sensilla on clava with majority of setae not more than one-quarter of length of linear sensilla; mandible with very short upper and lower teeth with a broadly truncate middle tooth; palp formula 3-2; apex of syntergum with a pair of subapical, lateral membranous invaginations; hypopygium Fig. 1477; ovipositor Fig. 1479. Relative measurements: OL 44, GL 19 [MT 64.5].

Variation. The overall length of the female varies from 0.81-1.23mm, the frontovertex may be completely coppery, F3 and F4 vary from pale orange to brown, the clava may be completely white, the mesoscutum may be mostly metallic dark green, the entire scutellum may have an indistinct, weak, dark blue sheen, the coxae may be completely dark brown; the hind tibia may have only the apical one-third pale orange and the head varies from about 2.9-3.3X as wide as the frontovertex with the ocelli forming an angle of about 75-90°.

Male: length 0.74-0.97mm.

Extremely similar to female but for structure of clava and genitalia. Antenna (Fig. 1484) generally unicolorous brown, sometimes with clava partially or completely off-white; clava solid with sensory area enlarged forming a distinct, oblique apical truncation, genitalia (Fig. 1478) with

2 apical teeth on digitus and aedeagus about 0.5X as long as mid tibia, slender with apex obtusely rounded. Relative measurements: AL 44, MT 90.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, PN Corcovado, Send. Los Patos/Sirena, LS 509200 275700, 70m, 20.ii.2002 (J. Azofeifa). Paratypes: **COSTA RICA**, 1♂, **Guanacaste**, Pitilla (ACG), 700m, YPT, 11.ii.1996 (L. Masner); 1♀, Guanacaste, San Lorenzo, Tienes Morenas, LN 287800 427600, iv.1995 (G. Rodriguez); 1♀, **Alajuela**, PN Arenal, Sendero Pilón, 10°27'N 84°43'W, 600m, 26.ii.2003 (J.S. Noyes); 1♀, Alajuela, ACA San Carlos, RF Arenal, Sendero Pilón, LN 269100 457900, 600m, MT, #53363, 17-18.v.1999 (G. Carballo); 1♀, **Heredia**, OTS-La Selva, 10°26'N 84°01'W, canopy fog FVK/11, *Virola koscheyi*, 4.ix.1993 (INBio-OET); 3♂, Heredia, OTS La-Selva, FVK 24, 15.x.1994 (ALAS); 2♀, 3♂, Heredia, OTS-La Selva, FVK 27, 20.x.1994 (ALAS); 1♀, Heredia, Puerto Viejo, Est. Biol. La Selva, LN 264463 532850, 100-200m, #67193, 30-31.iii.2002 (J. Azofeifa); 2♀, Heredia, 11km SE La Virgen, 10°20'N 84°04'W, 450-550m, 05/N/TN, 22.ii-20.iv.2003 (INBio-OET-ALAS); 1♀, **Puntarenas**, Est. Altamira, 9°03'N 83°00'W, 1450m, ii.2002 (C. Hansson, D. Rubí); 1♀, Puntarenas, Est. Altamira, Send. a Casa Coca, LS 331750 574400, 1700m, ii.2002 (C. Hansson, D. Rubí, J. Azofeifa); 2♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 1500m, 18-22.iii.1990 (J.S. Noyes); 1♀, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 8°46'N 82°57'W, 1300m, 15-16.ii.2006 (J.S. Noyes); 2♀, Puntarenas, La Gamba Biol. Sta., 8°42'N 83°12'W, 150m, 13-14.ii.2006 (J.S. Noyes); 1♀, Puntarenas, Pen. Osa, 8km S. R. Rincon, Coopermarti, xii.1990 (P. Hanson); 1♀, 3♂, Puntarenas, PN Corcovado, Los Patos, 8°33'N 83°30'W, 200m, ii.2000 (J.S. Noyes, J.A. Azofeifa); 1♀, Puntarenas, PN Corcovado, Est. Los Patos, 200m, 21.ii.2002 (J.S. Noyes); 2♂, Puntarenas, PN Corcovado, Los Patos, LS 517900 281600, 200m, 21.ii.2002 (J. Azofeifa); 1♀, Puntarenas, Golfito, Est. Agujas, LS 526650 276750, 300m, canopy fog, #61183, 15.iii.2000 (A. Solis); 3♂, Puntarenas, Golfito, Est. Agujas, LS 526550 276750, 300m, 22.xii.2000-9.i.2001 and 9-24.ii.2001 (J. Azofeifa); 1♀, **Limón**, RB Hitoy-Cerere, 100m, 14-19.i.1991 (J.S. Noyes). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

Trechnites thyones sp.nov.

(Figs 1485-1490)

DIAGNOSIS. *Female*: unknown. *Male* (length about 1.2mm): fore wing (Fig. 1487) strongly infuscate in basal half; linea calva closed by a single line of setae; pedicel (Fig. 1485) slightly swollen; digitus (Fig. 1490) with 2 or 3 apical teeth, aedeagus about 6.5X as long as broad and about 0.6X as long as mid tibia with apex acute.

Female. Unknown.

Male (holotype): length 1.15mm (CPD).

Head dark brown to black and moderately shiny; occipital margin, eye margins and interantennal prominence weakly coppery-purple; antenna (Fig. 1485) with radicle brown; scape generally brown, but orange-brown internally; pedicel brown, dark brown proximally; flagellum brown; maxillary palpus brown; thorax dorsally black and only slightly shiny, less so than frontovertex, but with a slight coppery purple sheen, side and venter dark brown, mesopleuron generally with a stronger brassy and weak purple sheen; coxae dark brown; all femora dark brown; all tibiae dark brown, pale orange at apex, mid tibia more broadly pale orange; all tarsi pale orange, apical tarsomere on each slightly dusky; fore wing (Fig. 1487) infuscate to apex of stigmal vein, apex hyaline; hind wing weakly infuscate in proximal half, apex hyaline; propodeum black and slightly shiny; gaster dark brown, generally with a dull coppery purple sheen mixed with some brassy, green, blue and purple reflections.

Head (Fig. 1488) about 2.5X as wide as frontovertex, in profile about 2.2X as high as deep, submenisciform, in profile clearly more or less evenly curved from occipital margin to mouth

margin, interantennal prominence slightly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 95°; inner eye margins clearly diverging in front of posterior ocelli; frontovertex shiny, generally with, moderately deep, sometimes touching, piliferous punctures interspersed with regular, polygonally reticulate sculpture, giving it the appearance of the surface of a thimble or golf ball, each puncture about as large as diameter of ocellus; frontovertex with about 7 or 8 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena quite shiny, with shallow, longitudinally elongate, polygonally reticulate sculpture; eye reaching occipital margin, with conspicuous, dense, pale setae that are each about as long as diameter of facet; scrobes moderately deep, weakly margined dorsally and laterally, narrowly ∩-shaped, meeting, generally with sculpture a little shallower than that on frontovertex and slightly transversely elongate; interantennal prominence weak, dorsally rounded, with shallow, fine, regular, polygonally reticulate sculpture; antenna as in Fig. 1485; scape subcylindrical, about 5.5X as long as broad; funicle segments subquadrate, F1-F2 subequal and clearly smaller than F3-F5 which are also subequal; clava hardly broadened, less than 1.1X as wide as F5, nearly as long as F3-F5 combined, apex with distinct, oblique truncation; malar sulcus present, but very shallow and indistinct; clypeal margin concave, although slightly protuberant medially; mandible with 3 short, subequal teeth; palp formula 3-3. Relative measurements: HW 95, HH 85, FV 38, POL 24, OOL 1, OCL 4, AOL 16.5, EL 62, EW 40, MS 24, SL 30.5, SW 5.5.

Thorax (Fig. 1489) in dorsal view with pronotum short, largely hidden by head, with posterior margin broadly and shallowly concave; dorsum of thorax with similar sculpture to that on frontovertex in ocellar area between piliferous punctures; visible part of mesoscutum about 1.9X as broad as long, notaular lines present, distinct and reaching slightly more than half way across mesoscutum; scutellum about as broad as long; fore wing with venation and distribution of setae as in Figs 1486, 1486; propodeum (Fig. 1489) medially about 0.2X as long as scutellum and with several irregular, longitudinal carinae and distinct, fine, polygonally reticulate sculpture. Relative measurements: FWL 43, 18.5; HWL 25.5, HWW 8.

Genitalia (Fig. 1490) with 2 or 3 apical teeth on digitus and aedeagus about 0.6X as long as mid tibia, apically spatulate and acute. Relative measurements: AL 53.5, MT 89.5.

Variation. Only holotype examined.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♂: **COSTA RICA**, **San José**, Zurqui de Moravia, 1600m, vii.1992 (P. Hanson). Holotype in NHMUK.

Trechnites kale **sp.nov.**

(Figs 1491-1499; Hab. ♀ 219)

DIAGNOSIS. *Female* (length about 1.3-1.6mm): head mesoscutum and scutellum black and moderately shiny; hind tibia pale orange, tarsus pale orange; fore wing (Fig. 1496) hyaline; flagellum (Fig. 1497) with sparse long setae, generally not more than 4 or 5 between pairs of longitudinal sensilla on clava with majority at least half length of linear sensilla; mandible (Fig. 1495) with 3 very short, subequal teeth; palp formula 3-3; mesoscutum and scutellum (Fig. 1492) with similar deep, imbricate to polygonally reticulate sculpture; notaular lines indistinct, but reaching slightly more than half way across mesoscutum; fore wing (Fig. 1496) with linea calva more or less closed by a line of setae. *Male* (length about 1.2mm): pedicel slightly swollen (Fig. 1498); digitus (Fig. 1491) with 2 small apical teeth, aedeagus about 7X as long as broad and about 0.5X as long as mid tibia with apex broadly rounded.

Female (holotype): length 1.60mm (CPD).

Head black and moderately shiny, lower part of interantennal prominence and gena with a

weak coppery purple sheen; antenna (Fig. 1497) with radicle brown; scape pale orange; pedicel pale brown, pale orange ventrally and narrowly at apex; flagellum pale brown, orange-brown internally; maxillary palpus pale orange; thorax dorsally black and moderately shiny, side and venter dark brown and shiny; pronotum mainly brassy with a hint of coppery purple; mesoscutum brassy; tegula and axilla with a weak coppery purple sheen; scutellum brassy with a hint of coppery purple; mesopleuron generally with a brassy and weak purple sheen; coxae dark brown; all femora dark brown; fore tibia and tarsus pale orange; mid tibia pale orange with a diffuse, brown, subbasal band, spur and tarsus pale orange; hind tibia pale orange with an indistinct, diffuse, pale brown subbasal band, tarsus pale orange; wings (Fig. 1496) hyaline; propodeum dark brown, with a slight brassy and coppery purple sheen; gaster dark brown, generally with a dull coppery purple sheen mixed with some brassy, green, blue and purple reflections; gonostylus dark brown.

Head (Fig. 1495) about 2.8X as wide as frontovertex, in profile about 2.0X as high as deep, submenisciform, in profile clearly more or less evenly curved from occipital margin to mouth margin, although less distinctly curved below top of scrobes, interantennal prominence hardly protuberant; occipital margin sharp, weakly carinate; ocelli forming an angle of about 85°; inner eye margins subparallel; frontovertex (Fig. 1495) shiny, generally with touching, deep, piliferous punctures interspersed with regular, polygonally reticulate sculpture, giving it the appearance of the surface of a thimble or gold ball, each puncture clearly smaller than diameter of ocellus; frontovertex with about 10 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena quite shiny, with shallow, longitudinally elongate, polygonally reticulate sculpture; eye reaching occipital margin, with conspicuous, dense, pale setae that are each about as long as diameter of facet; scrobes moderately deep, weakly margined dorsally and laterally, narrowly ∩-shaped, meeting, generally with sculpture of similar depth to that on frontovertex but distinctly transversely elongate; interantennal prominence weak, dorsally rounded, with shallow, fine, regular, polygonally reticulate sculpture; antenna as in Fig. 1497; scape subcylindrical, about 4.6X as long as broad; F1 clearly smallest, quadrate, F2-F4 slightly longer than broad, F5 quadrate, segments larger and broader distad; clava hardly broadened, less than 1.1X as wide as F5, about as long as F3-F5 combined, sutures hardly oblique, apex more or less rounded; malar sulcus absent; clypeal margin concave, although slightly protuberant medially. Relative measurements: HW 108, HH 97, FV 38, POL 22, OOL 2, OCL 5, AOL 14.5, EL 73.5, EW 47.5, MS 27, SL 39, SW 8.5.

Thorax (Fig. 1492) in dorsal view with pronotum short, largely hidden by head, with posterior margin broadly and shallowly concave; pronotum dorsally with similar sculpture to that in ocellar area between piliferous punctures; mesoscutum and axilla with similar sculpture to that on pronotum but very slightly shallower, with piliferous punctures distinct but clearly much shallower and smaller than those on frontovertex; scutellum with similar sculpture to that on mesoscutum but very slightly coarser and deeper and less regular, extreme apex and side of scutellum with slightly shallower sculpture and more shiny; visible part of mesoscutum about 1.7X as broad as long, notaular lines present, very indistinct, visible externally only at extreme anterolateral corners; scutellum about as broad as long; fore wing with venation and distribution of setae as in Figs 1496, 1499; propodeum (Fig. 1492) medially about 0.08X as long as scutellum and with irregular, distinct, fine, polygonally reticulate sculpture. Relative measurements: FWL 99, FWW 40.5; HWL 58, HWW 17.

Gaster with syntergum about 0.6X as long as mid tibia, with apex broadly rounded.

Paratype. Funicle with linear sensilla present only on F2-F5; flagellum (Fig. 1497) with sparse long setae, generally not more than 4 or 5 between pairs of longitudinal sensilla on clava with majority at least half length of linear sensilla; mandible (Fig. 1495) with 3 very short, subequal teeth; palp formula 3-3; apex of syntergum with a pair of large subapical membranous invaginations. Relative measurements: OL 66, GL 17.5 [MT 114].

Variation. The overall length of the female varies from 1.33-1.60mm, otherwise little variation noted in material available.

Male: length 1.19mm.

Extremely similar to female but for structure of clava and genitalia. Tibiae generally darker than

in female with hind tibia almost completely dark brown; funicle (Fig. 1498) segments quadrate or transverse with F1 slightly longer than F2; clava solid with sensory area enlarged forming a distinct, oblique apical truncation, genitalia (Fig. 1491) with 2 small apical teeth on digitus and aedeagus about 0.5X as long as mid tibia, slender with apex narrowly rounded. Relative measurements: AL 40, MT 84.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Volcán Cacao, Cerro Pedregal, 1000m, ii-iv.1999 (I.D. Gauld). Paratypes: **COSTA RICA**, 2♀, **Guanacaste**, PN Guanacaste, San Cristobal, 17.iv-17.v.1996 and 17.viii-17.ix.1996 (F.A. Quezada); 1♀, **Heredia**, OTS-La Selva, 75m, 10°26'N 84°01'W, xii.1993 (ALAS); 1♂, **Puntarenas**, San Vito, Las Cruces, Wilson Bot. Gdns, 1500m, 18-22.iii.1990 (J.S. Noyes). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

Trechnites spondes sp.nov.

(Figs 1500-1509; Hab. ♀ 220, ♂ 221)

DIAGNOSIS. *Female* (length about 1.2-1.4mm): head with a moderate coppery purple sheen; mesoscutum with a weak brassy sheen; scutellum with a weak coppery purple to dark green sheen; hind tibia pale orange with a brown subbasal ring, tarsus pale orange; fore wing (Fig. 1505) hyaline; flagellum (Fig. 1500) with very dense short setae, generally at least 40 setae between pairs of longitudinal sensilla on clava with majority of setae not more than one-quarter of length of linear sensilla; mandible (Fig. 1507) with very short upper and lower teeth with a broadly truncate middle tooth; palp formula 3-3; mesoscutum and scutellum (Fig. 1508) with similar deep, punctate reticulate sculpture; notaular lines very short, barely visible at anterolateral corners of mesoscutum; fore wing (Fig. 1505) with linea calva closed by 2 lines of setae. *Male* (length about 0.8-1.0mm): pedicel (Fig. 1502) not swollen; digitus (Fig. 1504) with 3 apical teeth, aedeagus about 7X as long as broad and about 0.7X as long as mid tibia with apex obtusely rounded.

Female (holotype): length 1.31mm (CPD).

Head very dark brown to black with a moderate metallic coppery purple sheen, ocellar area with weak brassy reflections; antenna (Fig. 1500) with radicle brown; scape pale orange; pedicel pale brown, pale orange ventrally and narrowly at apex; flagellum pale brown, F5-F6 pale orange-brown; maxillary palpus pale brown; thorax dark brown to black with a weak to moderate metallic sheen; pronotum with a weak coppery purple sheen; mesoscutum generally with a weak brassy sheen; tegula and axilla with a weak coppery purple sheen; scutellum with a weak coppery purple sheen medially and at base, side and apex with a distinct, weak to moderate dark green sheen; mesopleuron generally with a brassy and purple sheen; mesosternum dark brown; fore and mid coxae dark brown, hind coxa brown with apex pale orange; each leg with femur dark orange-brown to dark brown, pale orange at extreme apex, tibia pale orange with a brown subbasal ring, tarsus pale orange, apical tarsomere slightly dusky; wings (Fig. 1505) hyaline; propodeum dark brown, with a slight brassy and purple sheen, side with a slightly brighter sheen; gaster dark brown, generally with a coppery purple sheen mixed with some brassy, green, blue and purple reflections; gonostylus brown.

Head (Fig. 1507) about 3.5X as wide as frontovertex, in profile about 1.6X as high as deep, in profile clearly more or less evenly curved from occipital margin to top of scrobes, then virtually straight to mouth margin, with interantennal prominence hardly protuberant; occipital margin weakly rounded; ocelli forming an angle of about 70°; inner eye margins subparallel; frontovertex shiny, in ocellar area with fairly regular, moderately deep, polygonally reticulate sculpture of mesh size slightly smaller than eye facet, in front of anterior ocellus with slightly transversely elongate, polygonally reticulate to imbricate-reticulate sculpture of similar mesh size to that in

ocellar area; frontovertex with at least 10 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena quite shiny, with shallower, longitudinally elongate, polygonally reticulate sculpture; eye slightly overreaching occipital margin, with conspicuous, dense, pale setae that are each about as long as diameter of facet; scrobes shallow, narrowly Λ-shaped, meeting, generally with sculpture similar to that on frontovertex, weakly margined dorsally and laterally; interantennal prominence weak, moderately acute dorsally, with shallow, regular, polygonally reticulate sculpture; antenna as in Fig. 1500; scape subcylindrical, about 5.6X as long as broad; F1-F3 subequal, smaller and subquadrate, F4-F5 larger and clearly a little longer than broad, segments slightly larger and broader distad; clava hardly broadened, about 1.2X as wide as F5, very slightly longer than F3-F5 combined, sutures very slightly oblique, apex with a slightly oblique apical truncation; malar sulcus absent; clypeal margin concave. Relative measurements: HW 70, HH 62, FV 20, POL 8, OOL 0.5, OCL 4.5, AOL 7.5, EL 49, EW 37, MS 21, SL 31, SW 5.5.

Thorax (Fig. 1508) in dorsal view with pronotum short, largely hidden by head, with posterior margin broadly and shallowly concave; pronotum dorsally with similar sculpture to that in ocellar area; mesoscutum similar sculpture to that in ocellar area but cells perhaps a little smaller; axilla and scutellum with similar sculpture to that on mesoscutum, extreme apex and side of scutellum with shallower sculpture and more shiny; visible part of mesoscutum about 2X as broad as long, notaular lines more or less absent; scutellum about 1.1X as broad as long; fore wing with venation and distribution of setae as in Figs 1503, 1505; propodeum (Fig. 1508) medially about 0.11X as long as scutellum and with distinct, fine, polygonally reticulate sculpture. Relative measurements: FWL 67, FWW 27.5; HWL 40, HWW 10.

Gaster with syntergum about as long as mid tibia, with apex broadly rounded.

Paratype. Funicle with linear sensilla present only on F4-F5; flagellum (Fig. 1500) with very dense short setae, generally at least 40 setae between pairs of longitudinal sensilla on clava with majority of setae not more than one-quarter of length of linear sensilla; mandible (Fig. 1507) with very short upper and lower teeth with a broadly truncate middle tooth; palp formula 3-3; apex of syntergum (Fig. 1509) with a pair of shallow subapical membranous invaginations; hypopygium Fig. 1501; ovipositor Fig. 1506. Relative measurements: OL 50, GL 20.5 [MT 72].

Variation. The overall length of the female varies from 1.19-1.35mm, the scutellum may be virtually entirely dark blue-green, otherwise very little variation noted in material examined.

Male: length 0.81-0.97mm.

Extremely similar to female but for structure of clava and genitalia. Antenna (Fig. 1502) generally unicolourous brown, only with apices of scape and pedicel paler orange-brown; hind tibia with proximal 0.5-0.7X dark brown; clava solid (Fig. 1502) with sensory area enlarged forming a distinct, oblique apical truncation, genitalia (Fig. 1504) with 3 apical teeth on digitus and aedeagus about 0.7X as long as mid tibia, slender with apex narrowly rounded. Relative measurements: AL 39, MT 57.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, 3km S. Puerto Viejo, OTS-La Selva, 100m, iii.1991 (P. Hanson). Paratypes: **COSTA RICA**, 1♂, **Alajuela**, Reserva Rincon Forestal, Est. Caribe, 400m,10°53'N 85°18'W, 19-20.ii.2003 (J.S. Noyes); 1♀, Alajuela, PN Volcán Arenal, Sendero Pilón, LN 296100 457900, red de golpe, #53941, 29.x-5.xi.1999 (G. Carballo); 1♀, **Heredia**, La Selva BS, 50m, 22.i-3.ii.1991 (J.S. Noyes); 3♀, 3♂, Heredia, Est. Biol. La Selva, 10°26'N 84°01'W, ii.2002 (J.S. Noyes); 1♂, Heredia, Puerto Viejo, Est. Biol. La Selva, LN 264463 532850, 30-31.iii.2002 (J. Azofeifa); 1♂, **Puntarenas**, PN Corcovado, Est. Sirena, 8°29'N 83°35'W, 0-10m, 19-20.ii.2004 (J.S. Noyes). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

Genus *PSYLLAEPHAGUS* Ashmead

Psyllaephagus Ashmead, 1900:382. Type species: *Encyrtus pachypsyllae* Howard, by original designation.
Mirocerus Ashmead, 1904:309. Type species: *Mirocerus peyelae* Ashmead, by original designation and monotypy. Synonymy with *Psyllaephagus* by Trjapitzin & Gordh (1978:636).
Calocerineloides Girault, 1913:111. Type species: *Calocerineloides ramosa* Girault, by original designation and monotypy. Synonymy with *Psyllaephagus* by Noyes & Hayat (1984:330).
Epanagyrus Girault, 1915a:160. Type species: *Epanagyrus punctatiscutum*, by original designation and monotypy. Synonymy with *Psyllaephagus* by Noyes & Hayat (1984:330).
Neanagyrus Girault, 1915a:174. Type species: *Neanagyrus capitatus* Girault, by original designation. Synonymy with *Psyllaephagus* by Dahms & Gordh (1997:305,307).
Anagyropsis Girault, 1917c:136. Type species: *Anagyrus purpureus* Girault, by original designation. Synonymy with *Psyllaephagus* by Noyes & Hayat (1984:330).
Metaprionomitus Mercet, 1921:260-261. Type species: *Metaprionomitus intermedius* Mercet, by original designation. Synonymy with *Psyllaephagus* by Trjapitzin (1967:102).
Shakespearia Girault, 1928:3. Type species: *Shakespearia flabellata* Girault, by monotypy. Synonymy with *Psyllaephagus* by Noyes & Hayat (1984:330).
Psyllencyrtus Tachikawa, 1955:63. Type species: *Psyllencyrtus syntomozae*, by original designation. Synonymy with *Psyllaephagus* by Tachikawa (1981:88).
Calluniphilus Erdös, 1961:413. Type species: *Calluniphilus vendicus* Erdös, by monotypy. Synonymy with *Psyllaephagus* by Graham, 1969:248-249.
Anisodromus Riek, 1962b:283. Type species: *Anisodromus tarsius* Riek, by original designation. Synonymy with *Psyllaephagus* by Dahms & Gordh (1997:305,307).
Ooencyrtoides Hoffer, 1963:568. Type species: *Ooencyrtus albopilosus* Hoffer, by original designation (as subgenus of *Ooencyrtus* Ashmead). Synonymy with *Psyllaephagus* by Graham (1969:248).
Propsyllaephagus Blanchard *in* De Santis, 1964:235. Type species: *Propsyllaephagus trellesi* Blanchard, by original designation. Synonym of *Psyllaephagus* by Noyes (1979:165).
Mercetia Bakkendorf, 1965:139. Type species: *Copidosoma lusitanicum* Mercet, by original designation. Synonymy with *Psyllaephagus* by Graham (1969:248-249).
Kaszabicyrtus Szelènyi, 1971:389. Type species: *Kaszabicyrtus acutigastris* Szelènyi, by original designation. Synonymy with *Psyllaephagus* by Trjapitzin & Gordh (1978:636).
Psyllophagus; Sperber & Collevatti, 1996: 59-63. Misspelling.

Female. Overall length 0.7-2.6mm (extralimital species up to 4mm).

Body generally dark brown, with a weak to moderately strong metallic sheen on head and dorsum of thorax, mesoscutum sometimes very bright metallic green or blue, but often quite dull.

Head at most about 3X as wide as frontovertex; occipital margin narrowly rounded, sometimes acute but never carinate; eye clothed with inconspicuous pale setae, usually about as long as diameter of eye facet or a little shorter; funicle 6-segmented, segments subcylindrical; clava 2- or 3-segmented, apically rounded or with a relatively weak, oblique apical truncation although in some extralimital species the clava may be slightly enlarge with a strong, oblique apical truncation; mandible with one tooth and broad truncation, two teeth and a truncation or two teeth and a truncate upper tooth; palp formula 4-3.

Mesoscutum without notaular lines; posterior margin of mesoscutum hardly produced medially, not overlapping axillae medially; fore wing mostly about 2.2-2.5X as long as broad; usually hyaline, sometimes weakly infuscate, rarely strongly infuscate; marginal vein about as long as broad, rarely more than 1.5X as long as broad; postmarginal vein usually at least half as long as stigmal vein, rarely shorter; mesopleuron not expanded posteriorly so that propodeum laterally is broadly in contact with hind coxa clearly separating mesopleuron from base of gaster.

Gaster occasionally with a small, pale, submedian, reticulate area on anterior margin of Gt3 (visible only on slide-mounted material); hypopygium not reaching apex of gaster, not usually reaching more than two-thirds along gaster; apex of syntergum mostly rounded to slightly acute, very acutely extended in species with an elongate ovipositor; ovipositor hidden or hardly exserted,

but in some extralimital species the ovipositor may be very strongly exserted and as long as the gaster or longer; semicircular sheet of second valvifer usually conspicuously enlarged and extended posteriorly, sometimes enormously so and often subrectangular in shape; gonostylus free.

Male. Overall length 0.7-2.2mm.

Similar to female except for structure of antenna and genitalia; some extralimital species have bizarre processes on the face or have a strongly distorted head; antennae vary from filiform with all funicle segments more than 2X as long as broad and clothed in long setae to the segments broadened, sometimes quadrate or transverse and clothed in very short setae; in some extralimital species some or all of the funicle segments may be branched or each segment may be excessively broadened and flabellate; genitalia slender with digiti and parameres well-developed and elongate, each up to 7 or 8 times as long as broad; digitus with one or two apical hooks; paramere with a single seta; cuspis seta absent or present; aedeagus varying from about half as long as mid tibia to much longer than it.

DISTRIBUTION. Cosmopolitan.

HOSTS. Solitary primary endoparasitoids of nymphs of jumping plant lice (Hemiptera: Psylloidea).

BOCONTROL. To date, three species of *Psyllaephagus* have been used in classical biological control programmes worldwide: *bliteus*, *pilosus* and *yaseeni*. The first of these, *Psyllaephagus bliteus* Riek, was introduced into California in 2000-2001 from southern Australia for the control of the red-gum lerp psyllid, *Glycaspis brimblecombei* Moore (Hemiptera: Aphalaridae), a serious pest of *Eucalyptus camaldulensis* Dehnh. (Myrtales: Myrtaceae). It established and quickly became effective in coastal areas but less so in the Central Valley (Dahlsten et al., 2005). The parasitoid was subsequently introduced into Mexico and Chile from California and Australia in 2000 and released against the same pest. (Trjapitzin et al., 2008; Cuello et al., 2021). It has also been introduced accidentally, along with its host, into many other countries where *Eucalyptus camaldulensis* is grown, viz: Hawaii, Brazil, Argentina, Portugal, Spain, Morocco, Tunisia, Italy, Greece and New Zealand (Cuello et al., 2021, Daane et al., 2005). See also below under *P. pilosus* (p. 594) and *P. yaseeni* (p. 595).

COMMENTS. Smaller species of *Psyllaephagus* species are easy to confuse with *Ooencyrtus* because of the similar squat habitus, generally similar mandibular shape and short marginal vein of the fore wing. The two genera can be separated readily on the shape of the posterior margin of the mesoscutum and the mesopleuron. In *Psyllaephagus* the posterior margin of the mesoscutum is only weakly angular and medially hardly overhangs so that the axillae appear to be meeting medially, whereas in *Ooencyrtus* the posterior margin of the mesoscutum is medially convex, distinctly overhanging the axillae distinctly separating them. Further to this the mesopleuron of *Psyllaephagus* is not expanded posteriorly so that it does not separate the propodeum from the hind coxa and is therefore well-separated from the base of the gaster. In *Ooencyrtus* the mesopleuron is posteriorly expanded so that it separates the propodeum from the hind coxa and touches, or nearly touches, the base of the gaster. In general, the stigmal vein is much more slender in *Psyllaephagus* than in *Ooencyrtus*.

The small, reticulate, submedian area on the anterior margin of Gt3 (see diagnosis above) is not present in all species but is found in some New World, European and African species, and may indicate some sort of phylogenetic relationship.

IDENTIFICATION. 252 species worldwide, including 7 species described below as new. See Trjapitzin 1982, 1989 (keys to 43 and 57 Palaearctic species respectively); Riek, 1962a (revision of 59 Australian species); Noyes & Hayat, 1984 (list of 107 Australian species); Hayat, 2006 (review of 10 Indian species); Berry, 2007 (revision of 7 New Zealand species); Prinsloo, 1981 (revision of 20 Afrotropical species).

Key to Costa Rican species of *Psyllaephagus*
(Females and males)

1 Clava 3-segmented (e.g. Figs 1513, 1529, 1539, 1567) ♀♀ 2
Clava entire (e.g. Figs 1535, 1549, 1566, 1592) ♂♂ 21

FEMALES

2 (1) Scape mostly, or completely, pale yellow or orange, much paler than pedicel or flagellum 3
- Scape completely or mostly dark brown, sometimes metallic and not paler than pedicel or flagellum 5

3 (2) Fore wing (Fig. 1511) with only a single line of dorsal setae in apical half of costal cell; linea calva open; head about 4X as wide as frontovertex; antenna (Fig. 1510) with F1 at least 2.5X as long as broad and linear sensilla absent from F1-F2; mid femur yellow ..... *domitius* Noyes & Hanson (p. 582)
- Fore wing (Fig. 1514, 1522) with at least a complete line of dorsal setae on costal cell; linea clava at least partially closed; head at most about 3X as wide as frontovertex; antenna (Fig. 1513, 1521) with F1 less than 2X as long as broad, at most hardly more than 1.5X as long as broad and with linear sensilla on at least F2; mid femur mostly brown 4

4 (3) Antenna (Fig. 1513) with linear sensilla on all funicle segments; scutellum convex and with sculpture that is mostly a little deeper than that on mesoscutum; dorsal surface of costal cell of fore wing (Fig. 1514) with nearly two complete lines of setae; Gt3 without a distinctive strongly reticulate area anteromedially; mandible with two acute teeth and a broad truncation ..... *ufens* Noyes & Hanson (p. 583)
- Antenna (Fig. 1521) with linear sensilla absent from F1; scutellum flat and with sculpture that is clearly shallower than that on mesoscutum; dorsal surface of costal cell of fore wing (Fig. 1522) with only a single line of submarginal setae; Gt3 without a distinct, strongly reticulate area anteromedially; mandible with two acute lower teeth and a truncate upper tooth ..... *heles* **sp.nov.** (p. 584)

5 (2) Tegula yellow at base ..... *othrys* Noyes & Hanson (p. 586)
- Tegula completely dark brown 6

6 (5) Scutellum very flat (occasionally slightly concave) but rounded at margins, usually with shallower sculpture than mesoscutum and sometimes quite smooth, occasionally with sculpture about as deep as that on mesoscutum 7
- Scutellum convex throughout and with sculpture at least as deep as that on mesoscutum, often much deeper 8

7 (6) Scape (Fig. 1534) not more than 2.6X as long as broad; funicle dusky pale yellow, contrasting with brown clava; sculpture on mesoscutum as deep as that on scutellum; fore wing (Fig. 1535) at least 2.5X as long as broad .... *alisanos* **sp.nov.** (p. 586)
- Scape (Fig. 1529, 1541) at least 2.8X as long as broad; funicle and clava concolourous (some extralimital specimens may have contrasting funicle and clava, but these have the scape at least 3.3X as long as broad); sculpture on mesoscutum clearly shallower than that on scutellum; fore wing (Fig. 1546) about 2.4X as long as broad ..... *trioziphagus* (Howard) (p. 588)

8 (6) Hind tibia with brown area reaching more than half-way to apex 9
- Hind tibia mostly yellow or pale orange with brown area not reaching half-way towards apex 13

9 (8) Frontovertex (Figs 1547, 1556) with piliferous punctures each at least about 2.5X diameter of eye facet, mostly separated by much less than their own diameters; posterior ocellus closer to occipital margin than eye margin; funicle (Figs 1554, 1558) with all segments longer than broad (F6 hardly so) and with linear sensilla 10

- Frontovertex (Figs 1569, 1574) with piliferous punctures hardly wider than diameter of eye facet, separated by more than their own diameters; posterior ocellus closer to eye than to occipital margin; funicle (Figs 1569, 1572) with at least some segments quadrate or transverse, at least F1 without linear sensilla 11

10 (9) Antennal clava (Fig. 1554) with apical segment much shorter than middle segment, almost giving it a 2-segmented appearance; mouth opening slightly narrower (Fig. 1547), about 0.35X head width; fore wing (Fig. 1551) with only a single line of dorsal setae on costal cell; ovipositor not longer than mid tibia and hidden .... *creusa* Noyes & Hanson (p. 589)

- Antennal clava (Fig. 1558) with apical segment about as long as middle segment, clearly 3-segmented; mouth opening slightly broader, about 0.4X head width; fore wing (Fig. 1557) with a complete line of dorsal setae on costal cell plus at least a partial second line of setae in proximal half; ovipositor nearly twice as long as mid tibia and slightly exserted, the exserted part about half as long as mid tibial spur .... *kallichoa* **sp.nov.** (p. 590)

11 (9) Funicle (Fig. 1563) with at least F1-F3 clearly longer than broad, linear sensilla on at least F2-F6; mouth nearly half as wide as head; clypeal margin slightly convex and protuberant; ovipositor slightly exserted, the exserted part about one-third as long as mid tibial spur; linea calva (Fig. 1559) completely open .... *epulo* Noyes & Hanson (p. 592)

- Funicle (Figs 1567, 1572) with all funicle segments quadrate or transverse, linear sensilla absent from F2; mouth (Figs 1569, 1574) less than one third as wide as head; clypeal margin straight, not protuberant; ovipositor hidden; linea calva (Figs 1564, 1573) partially closed by a line of setae dorsally 12

12 (11) Fore wing (Fig. 1564) with costal cell densely setose, dorsally with more than two complete lines of setae; legs completely dark brown and weakly metallic; mesoscutum and scutellum with similar sculpture ..... *pilosus* Noyes (p. 593)

- Fore wing (Fig. 1573) with only a partial line of setae dorsally on costal cell; legs with at least tibiae partially pale orange; scutellum with longitudinally elongate striate-reticulate sculpture that contrasts strongly with the shallower more evenly rounded, polygonally reticulate sculpture on mesoscutum .... *yaseeni* Noyes (p. 594)

13 (8) Scape (Figs 1579, 1583, 1587, 1593) more than 4X as long as broad 14

- Scape (Figs 1599, 1603, 1609, 1613, 1624) less than 4X as long as broad 17

14 (13) Posterior ocellus closer to occipital margin than to eye; fore wing (Fig. 1580) with marginal vein at least 2X as long as broad ..... *xepo* **sp.nov.** (p. 596)

- Posterior ocellus not closer to occipital margin then to eye; fore wing (Figs 1584, 1594) with marginal vein more or less punctiform, not more than 1.5X as long as broad 15

15 (14) Ocelli forming a strongly obtuse angle; scape shorter than minimum width of frontovertex ..... *thonis* Noyes & Hanson (p. 598)

- Ocelli forming an angle of about 90°; scape at least as long as minimum width of frontovertex 16

16 (15) Mesoscutum rather dull metallic green and not more shiny than scutellum; sculpture of scutellum (Fig. 1588) rather finely reticulate, cells not arranged in whorls or longitudinal lines ..... *alexion* Noyes & Hanson (p. 599)
- Mesoscutum bright metallic green, conspicuously more shiny than scutellum; sculpture of scutellum (Fig. 1598) coarsely reticulate, cells appearing to be arranged in lines or indistinct whorls ..... *rotundiformis* (Howard) (p. 600)

17 (13) Hind tibia completely pale orange ..... *korus* **sp.nov.** (p. 601)
- Hind tibia with at least narrow, subbasal brown ring 18

18 (17) Mesoscutum relatively bright, metallic dark blue or green and contrasting with the relatively dull scutellum which is slightly coppery towards base and dull blue or green apically; Gt3 with a distinct, strongly reticulate area anteromedially 19
- Mesoscutum and scutellum similar, both relatively dull, dark blue or blue-green; scutellum coppery towards base; Gt3 without a distinct, strongly reticulate area anteromedially 20

19 (18) Pedicel (Fig. 1603) not longer than F1, F1 as long as F2, all funicle segments longer than broad; costal cell (Fig. 1604) with only one line of setae dorsally; clypeal margin (Fig. 1607) clearly convex and protuberant .... *tyche* Noyes & Hanson (p. 603)
- Pedicel (Fig. 1609) longer than F1, F1 smaller than F2, at least one funicle segment quadrate or transverse; costal cell (Fig. 1612) of fore wing with a partial second line of setae dorsally that extends at least about half length of costal cell; clypeal margin straight or very weakly convex, not protuberant or hardly so .... *moros* **sp.nov**. (p. 603)

20 (18) Clypeal margin (Fig. 1614) straight; head about 3X as wide as mouth opening; diameter of piliferous punctures on frontovertex about 1.5X diameter of eye facet; mandible with one tooth and broad truncation; ovipositor with about 16-18 subapical setae on second valvifer ..... *phelys* **sp.nov.** (p. 605)
- Clypeal margin (Fig. 1623) clearly convex, slightly protuberant; head about 2.6X as wide as mouth opening; diameter of piliferous punctures on frontovertex about 2X diameter of eye facet; mandible with two teeth and a truncation, upper tooth short; ovipositor with about 9 or 10 subapical setae on second valvifer .... *gyces* Noyes & Hanson (p. 607)

MALES

21 (1) Tegula yellow at base ..... *othrys* Noyes & Hanson (p. 586)
- Tegula competely dark brown 22

22 (21) Frontovertex with deep, conspicuous, piliferous punctures which are separated by less than their own diameters and extend downwards between antennal scrobe and eye (similar to Fig. 1547); posterior ocellus much closer to occipital margin than eye ..... *creusa* Noyes & Hanson (p. 589)
- Frontovertex without conspicuous piliferous punctures, if present small and separated by much more than their own diameters and hardly extending below anterior ocellus; posterior ocellus about equidistant from occipital margin and eye 23

23 (22) Funicle (Figs 1517, 1545, 1562) with F1 at least 2X as long as broad 24
- Funicle (Figs 1566, 1571, 1592) with F1 relatively short and broad, less than 1.5X as long as broad 26

24 (23) Sculpture of scutellum relatively shallow, sometimes almost smooth and never deeper than that on mesoscutum; smaller species: <1.2mm .... *trioziphagus* (Howard) (p. 588)
- Sculpture of scutellum at least slightly deeper than that on mesoscutum; larger species: >1.5mm 25

25 (24) Scape largely yellow (Fig. 1517) and clearly paler than flagellum; legs except hind femur and coxae mostly yellow; frontovertex slightly less than half head width .... *ufens* Noyes & Hanson (p. 583)
- Scape dark brown (Fig. 1562), concolourous with flagellum; legs almost entirely dark brown, with some paler areas, especially on apices of tibiae and tarsi; frontovertex slightly more than half head width ..... *epulo* Noyes & Hanson (p.592)

26 (23) Fore wing with costal cell densely setose, dorsally with a complete line of submarginal setae and at least two more lines in distal half; legs more or less completely dark brown; mesoscutum dull, dark blue-green hardly contrasting with dull coppery scutellum, both with similar sculpture ..... *pilosus* Noyes (p. 593)
- Fore wing with at most one line of setae dorsally on costal cell; legs with at least mid and hind tibiae marked pale yellow; mesoscutum bright metallic green, contrasting strongly with coppery scutellum, sculpture on mesoscutum shallower than on scutellum 27

27 (25) Antenna (Fig. 1592) with F6 at least 1.35X as long as broad; basal cell of fore wing with at least 50 setae dorsally ..... *rotundiformis* (Howard) (p. 600)
- Antenna (Fig. 1571) with F6 not more than 1.25X as long as broad; basal cell of fore wing with not more than 40 setae dorsally ..... *yaseen*i Noyes (p. 594)

Psyllaephagus domitius **Noyes & Hanson**

(Figs 1510-1512; Hab. ♀ 222)

Psyllaephagus domitius Noyes & Hanson, 1996:126,129-130. Holotype ♀, Costa Rica, CNC, images examined.

Female (length about 2.4mm): head generally dark metallic green mixed purple; scape mostly pale orange, conspicuously paler than dark brown flagellum; mesoscutum black with weak blue sheen, scutellum dull, dark purple brown and coppery, apex and side metallic blue-green; tegula dark brown; fore and hind femora dark brown, mid femur yellow; fore and mid tibiae pale orange, mid tibia with a faint subbasal ring, hind tibia mostly dark brown; head about 3X frontovertex width and 2.8X as wide as mouth opening; clypeal margin slightly emarginate, more or less straight; piliferous punctures on frontovertex shallow and indistinct, hardly larger than eye facet; ocelli forming an angle of about 50°; posterior ocellus much closer to eye than occipital margin; scrobes very deep and elongate, separated from anterior ocellus by less than 0.5X length of torulus; antenna (Fig. 1510) with scape about 4.5X as long as broad and slightly longer than width of frontovertex; pedicel slightly shorter than F1; all funicle segments longer than broad; linear sensilla on F2-F6, or absent from F2; clava with segments becoming gradually shorter towards apex, sensory area slightly enlarged and forming a very slight, oblique, apical truncation; mandible with two sharp teeth and a truncation; mesoscutum and scutellum with similar, shallow polygonally reticulate sculpture, perhaps slightly deeper and coarser proximally on scutellum; scutellum convex; fore wing (Fig. 1511) about 2.4X as long as broad, marginal vein (Fig. 1512) about 2X as long as broad, costal cell with only a single line of setae dorsally, situated in apical half, linea calva open; ovipositor slightly exserted, the exserted part about 0.5X as long as mid tibial spur. *Male*: unknown.

DISTRIBUTION. Costa Rica (Noyes & Hanson, 1996).

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Guanacaste NP, Estacion Cacao, 950-1200m, 13.ii.1995 (L. Masner). Holotype in CNC.

COMMENTS. The unusually long funicle segments and relatively deep, elongate scrobes suggest that this species may be misplaced in *Psyllaephagus*.

Psyllaephagus ufens **Noyes & Hanson**

(Figs 1513-1518; Hab. ♀ 223, ♂ 224)

Psyllaephagus ufens Noyes & Hanson, 1996:126,127,128-129. Holotype ♀, Costa Rica, NHMUK, examined.

Female (length about 1.5-2.2mm): head generally black with a slight purplish and brassy sheen; scape yellow and conspicuously paler than brown flagellum; mesoscutum black with weak blue and purple reflections, scutellum dark purple brown and coppery, apex and side metallic blue-green; tegula dark brown; all femora dark brown; all tibiae yellow with a faint subbasal ring, stronger on hind tibia; head about 2.5X as wide as frontovertex or mouth opening; frontovertex with piliferous punctures shallow and indistinct, hardly larger than eye facet; ocelli forming a slightly obtuse angle, posterior ocellus closer to eye than occipital margin; scrobes shallow, separated from anterior ocellus by at least about 2X length of torulus; antenna (Fig. 1513) with scape about 4.5X as long as broad, slightly shorter than frontovertex width; antenna with pedicel about as long as F1, funicle with F1-F5 longer than broad, F6 transverse, linear sensilla on all segments; clava with segments subequal in length, apex rounded; clypeal margin slightly convex, clearly protuberant, mandible with one tooth and a concave truncation, very nearly tridentate; mesoscutum and scutellum with fine, polygonally reticulate sculpture, slightly deeper and more longitudinally elongate on scutellum; scutellum convex; fore wing (Fig. 1514) about 2.3X as long as broad, marginal vein (Fig. 1516) punctiform; costal cell with two lines of setae dorsally for about half its length, linea calva partially closed by 1 or 2 setae; Gt3 without a distinct, strongly reticulate area anteromedially; hypopygium Fig. 1515; ovipositor (Fig. 1518) slightly longer than mid tibia, not exserted, second valvifer with 7 or 8 subapical setae. *Male* (length about 1.8mm): antenna with scape yellowish and clearly paler than flagellum; legs mostly yellowish; F1 at least 2X as long as broad; frontovertex slightly less than half head width; sculpture on scutellum slightly deeper than that on mesoscutum.

DISTRIBUTION. Costa Rica (Noyes & Hanson, 1996).

HOSTS. Unknown, but reared from triozid galls (almost certainly *Trichochermes magna* (Laing)) (Hemiptera: Triozidae) on *Pseudolmedia oxyphillarya* Donn.Sm. (Rosales: Moraceae) (Noyes & Hanson, 1996).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Zurqui de Moravia, 1600m, i-ii.1992 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **Cartago**, Turrialba, CATIE, Reventazon, 550m, 4.ix.1985 (L. Masner); 3♀, 1♂, **Puntarenas**, Monteverde, *Pseudolmedia oxyphillarya*, vii.1994 (D. Briceño). Holotype in NHMUK, paratypes in INBio, NHMUK and CNC.

Non type material. **COSTA RICA**, 7♀, 1♂, **Guanacaste**, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes); COSTA RICA, 015 AA 20431, no other data. Material in MZUCR and NHMUK.

COMMENTS. In many respects, *Psyllaephagus ufens* is similar to *thonis* and *alexion* (see comments under *thonis*, p. 598 and *alexion*, p. 599). Females differ from those of the other two species by having a largely yellow or pale orange scape, the posterior ocellus nearer to the eye than to the occipital margin, the head only about 2.5X as wide as the mouth and an almost complete

second line of dorsal setae on the costal cell. In *thonis* and *alexion* the scape is mostly dark brown, the posterior ocellus is equidistant from the eye and occipital margin; the head is at least 3X as wide as the mouth and there is only a single line of dorsal setae on the costal cell.

Psyllaephagus ufens is also very similar to *creusa* in general habitus, both species being of a similar size and colouration. Apart from the differences given in the key, females of *ufens* differs from those of *creusa* in having much smaller piliferous punctures on the frontovertex that are hardly wider than the diameter of an eye facet, the head about 2.5X as wide as the mouth, the ovipositor is longer than the mid tibia and the costal cell of the fore wing has a nearly complete second line of setae dorsally. In *creusa* the piliferous punctures on the frontovertex are subequal in size to an ocellus, the head is nearly 3X as wide as the mouth, the ovipositor is shorter than the mid tibia and the costal cell of the fore wing has only one line of setae dorsally.

Psyllaephagus heles **sp.nov.**
(Figs 1519-1524)

DIAGNOSIS. *Female* (length about 1.4mm): antenna (Fig. 1521) with scape very pale orange; flagellum unicolourous brown; tegula dark brown; mid femur brown; hind tibia mostly pale orange with a very weak subbasal brown band in proximal 0.25X; head (Fig. 1523) about 3.1X as wide as frontovertex and about 2.8X as wide as mouth opening; ocelli forming an acute angle with posterior ocellus closer to eye than to occipital margin; frontovertex with piliferous punctures that are hardly larger than diameter of eye facet; clypeal margin very slightly emarginate, straight; antenna (Fig. 1521) with scape about 5X as long as broad, slightly longer than minimum width of frontovertex; pedicel clearly longer than F1 which is slightly longer than broad, all funicle segments longer than broad, except F6 which is more or less quadrate, linear sensilla present on F2-F6, segments of clava subequal in length; mandible with two teeth and a broad truncation; mesoscutum a little more shiny than scutellum with sculpture of similar depth to that on scutellum, but sculpture on scutellum slightly coarser and more longitudinally elongate; than mesoscutum, with cells arranged in whorls or longitudinal lines; scutellum flat; fore wing (Fig. 1522) about 2.5X as long as broad; costal cell with only a single line of setae dorsally; marginal vein (Fig. 1519) about 2X as long as broad; linea clava closed; Gt3 with a distinct, strongly reticulate area anteromedially; hypopygium Fig. 1524; ovipositor (Fig. 1520) longer than mid tibia and hidden; second valvifer with about 11 subapical setae. Male: unknown.

Female (holotype): length 1.37mm (CPD).

Head generally black with occiput and frontovertex quite dull with weak coppery purple and dark green reflections, scrobal area similar, but a little more shiny, area between and below toruli with a violet sheen, mouth margin with a weak dark blue sheen, anterior part of gena coppery violet, posterior part of gena and temple similar to frontovertex, but perhaps slightly more shiny; setae on frontovertex, interantennal prominence and gena moderately distinct, translucent and pale brown; antenna (Fig. 1521) with radicle dark brown; scape very pale orange; pedicel and flagellum brown; thorax generally dark brown to black; pronotum generally coppery, side coppery purple; mesoscutum relatively bright, metallic dark blue, posterior area and side margins narrowly coppery; tegula dark brown with a slight coppery sheen; axilla with a weak coppery purple sheen; scutellum coppery, posteriorly metallic dark green, side narrowly metallic dark green; metanotum with a slight brassy green and purple lustre; mesopleuron with a slight metallic coppery purple, green and brassy lustre; all coxae dark brown; femora dark brown, fore and mid femora pale orange at apices, hind femur pale orange at distal apex; fore tibia pale orange, weakly marked pale brown subbasally, tarsus slightly dusky pale orange; mid tibia pale orange with a narrow, very weak, subbasal pale brown band to about 0.25X, spur and tarsus pale orange; hind tibia pale orange with a narrow, very weak, subbasal pale brown band to about 0.25X, tarsus slightly dusky pale orange; wings (Fig. 1522) hyaline; propodeum dark purple-brown, generally with a slight coppery purple and brassy sheen, side with a metallic dark green sheen and with a few pale, translucent setae outside spiracle; gaster dark brown, dorsally mainly with a coppery sheen, Gt1 with a strong metallic dark blue and slight brassy sheen, side and venter mainly with a coppery purple sheen mixed with some purple, green, blue and brassy reflections; gonostylus dark brown.

Head (Fig. 1523) about 3.1X as wide as frontovertex and about 2.8X as wide as mouth opening, in profile about 1.7X as high as deep, evenly curved from occipital margin to top of scrobes and then fairly straight to mouth margin, with interantennal prominence not protuberant; occipital margin rounded but more or less acute, not carinate; ocelli forming an angle of about 85°; frontovertex with fairly regular, moderately deep, polygonally reticulate sculpture of mesh size subequal to eye facet or perhaps a little smaller, piliferous punctures shallow and small, hardly larger than eye facet, generally separated by at least about their own diameters; frontovertex with about 7 or 8 pairs of setae in front of anterior ocellus, a partial second line descends between eye and scrobe to gena; temple and gena with shallow, longitudinally elongate, imbricate-reticulate to polygonally reticulate sculpture; eye reaching occipital margin, with conspicuous, pale setae, each slightly longer than diameter of facet; scrobes relatively shallow scrobes broadly ∩-shaped, meeting, weakly margined dorsally and laterally with shallow, slightly transversely elongate, polygonally reticulate sculpture; interantennal prominence weak, narrowly rounded dorsally, with shallow, polygonally reticulate sculpture; antenna as in Fig. 1521; scape subcylindrical, about 5X as long as broad; funicle segments subequal in length and becoming slightly broader distad, F1-F5 slightly longer than broad, F6 subquadrate, linear sensilla present on F2-F6; clava slightly shorter than F4-F6 combined, sensory area enlarged and extending nearly half way along ventral surface giving apex an obliquely truncate appearance; malar sulcus absent; clypeal margin very slightly emarginate medially; mandible with two teeth and a broad truncation. Relative measurements: HW 80, HH 67, FV 26, POL 14, OOL 2, OCL 3.5, AOL 9, EL 51, EW 40, MS 20, SL 30, SW 6.

Thorax in dorsal view with pronotum short, largely hidden by head, dorsally with slightly irregular, moderately deep, imbricate-reticulate to polygonally reticulate sculpture that is very slightly shallower than sculpture on frontovertex, but of similar mesh size; mesoscutum with regular, polygonally reticulate sculpture that is similar in depth and mesh size to that in ocellar area on frontovertex; axilla with much shallower polygonally reticulate sculpture than mesoscutum; scutellum generally with polygonally reticulate sculpture that is similar to that on mesoscutum, but slightly coarser, more irregular and more longitudinally elongate; visible part of mesoscutum about 1.8X as broad as long; scutellum flat, about as long as broad; fore wing with venation and distribution of setae as in Figs 1519, 1522; costal cell with only a single line of dorsal setae; propodeum medially about 0.1X as long as scutellum, virtually smooth, but with some very shallow, reticulate sculpture anteriorly. Relative measurements: FWL 95.5, FWW 36.5; HWL 63.5, HWW 17.

Gaster with hypopygium (Fig. 1524) reaching about 0.8X along gaster; Gt3 with a distinct, strongly reticulate area anteromedially; syntergum about 0.6X as long as mid tibia, with apex rounded; ovipositor (Fig. 1520) hidden. Relative measurements: OL 46, GL 34 [MT9.5].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, BN Diriá, Vista del Mar, LN 233900 358750, 890m, #64075, vii-viii.2001 (I. Jiménez). Holotype in NHMUK.

COMMENTS. *Psyllaephagus heles* is very close to both *alisanos* and *trioziphagus*, all three species having a very flat scutellum and Gt3 with a distinct, strongly reticulate area anteromedially. Apart from the characters given in the key, females of *heles* differ from those of both *alisanos* and *trioziphagus* in having the scape about 5X as long as broad and all funicle segments longer than broad, whereas in *alisanos* and *trioziphagus* the scape is less than 4.5X as long as broad and at least F6 is quadrate or transverse

Psyllaephagus othrys Noyes & Hanson
(Figs 1525-1531; Hab. ♀ 225, ♂ 226)

Psyllaephagus othrys Noyes & Hanson, 1996:126,127-128. Holotype ♀, Costa Rica, NHMUK, examined.

Female (length about 1.4-1.9mm): head largely bluish; antenna (Fig. 1529) with scape dark brown, almost black and concolourous with flagellum; dorsum of thorax bright metallic green; tegula yellow basally; all femora dark brown; all tibiae pale orange with a narrow, dark brown subbasal ring; head (Fig. 1527) about 2.5X as wide as frontovertex and about 2.2X as wide as mouth opening; frontovertex with moderately conspicuous piliferous punctures, slightly larger than eye facet, separated by at least about their own diameters; ocelli forming an angle of about 105°, posterior ocellus slightly closer to eye than to occipital margin; scrobes shallow, dorsally separated from anterior ocellus by at least about 1.5X length of torulus; antenna (Fig. 1529) with scape about 4.5X as long as broad and about as long as frontovertex width; pedicel a little longer than F1, all funicle segments longer than broad, linear sensilla on F2-F6; clava with segments subequal, but becoming progressively shorter distally, apex rounded; clypeal margin weakly emarginate, slightly concave; mandible with two teeth and a truncation; mesoscutum and scutellum (Fig. 1526) with fine, punctate-reticulate sculpture, slightly deeper and more longitudinally elongate on scutellum; scutellum slightly convex; fore wing (Fig. 1531) about 2.4X as long as broad, marginal vein (Fig. 1528) slightly longer than broad, but not reaching wing margin, costal cell with a single line of setae dorsally, linea calva open; Gt3 without a distinct, strongly reticulate area anteromedially; ovipositor slightly exserted, the exserted part about 0.5X as long as mid tibial spur. *Male* (length about 1.4-2.0mm): as female but for structure of antenna (Fig. 1525) and genitalia (Fig. 1530), and mid legs conspicuously paler and hind tibia darker.

DISTRIBUTION. Costa Rica (Noyes & Hanson, 1996).

HOSTS. Reared from nymphs of *Euphalerus certus* Tuthill (Hemiptera: Psyllidae) forming galls on *Lonchocarpus atropurpureus* Benth. (Fabales: Fabaceae) (Noyes & Hanson, 1996).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, San Pedro de Montes de Oca, 1100m, ex *Lonchocarpus* psyllid gall, 17.viii.1987 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **San José**, San Pedro de Montes de Oca, agalla de *Lonchocarpus atropurpureus*, 22.vii.1987 (P. Hanson); 12♀, 11♂, San José, San Pedro, Montes de Oca, 1100m, 20.ii.1988 (P. Hanson); 1♀, 2♂, same data but *Lonchocarpus* gall (P. Hanson). Holotype in NHMUK, paratypes in INBio, NHMUK, CNC, MZUCR and USNM.

Non type material. **COSTA RICA**, 2♀, 2♂, **Guanacaste**, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Est. Cacao (ACG), 10°55'N 85°30'W, 19-20.ii.2005 (J.S. Noyes). Material in NHMUK and MZUCR.

COMMENTS. *Psyllaephagus othrys* is superficially similar to *pachypsyllae* (Howard) known only from North America. Both species have the base of the tegula yellow. Both sexes of *othrys* can be separated from those of *pachypsyllae* by the marginal vein not reaching the anterior wing margin and the tibiae being extensively marked with dark brown. In *pachypsyllae* the marginal vein clearly reaches the anterior wing margin and is quadrate or slightly longer than broad and the tibiae are almost entirely yellow. See also comments under *xepo* (0. 000).

Psyllaephagus alisanos sp.nov.
(Figs 1532-1535)

DIAGNOSIS. *Female* (length about 1.2mm): antenna (Fig. 1534) with scape mostly dark brown; funicle pale yellow; clava brown; tegula dark brown; femora dark brown; hind tibia mostly dark brown, apices pale orange; head about 2.4X as wide as frontovertex and about 2.9X as wide as mouth opening; ocelli forming an angle of about 90°, with posterior ocellus very slightly

further from eye than occipital margin; frontovertex with piliferous punctures that are about 2X diameter of eye facet; clypeal margin slightly emarginate and straight; antenna (Fig. 1534) with scape about 2.6X as long as broad and very slightly shorter than minimum width of frontovertex; pedicel clearly longer than F1 which is quadrate, F2-F4 longer than broad, F5-F6 transverse, linear sensilla present F2-F6, or absent from F2; segments of clava subequal in length, sensory area enlarged and extending very nearly half way along ventral surface giving apex an obliquely truncate appearance; mandible with two acute teeth and a broad truncation; mesoscutum more shiny than scutellum; scutellum flat, with sculpture that is slightly longitudinally elongate and shallower than on mesoscutum; fore wing (Fig. 1535) about 2.5X as long as broad; costal cell with one line of setae dorsally, marginal vein (Fig. 1533) sightly less than 2X as long as broad; linea clava closed; Gt3 with a distinct, strongly reticulate area anteromedially; ovipositor (Fig. 1532) longer than mid tibia and hidden; second valvifer with about 9 or 10 subapical setae. Male: unknown.

Female (holotype): length 1.19mm (CPD).

Head with occiput generally dull, dark metallic green, frontovertex coppery, marked metallic green along inner eye margins, scrobal area, temple and gena coppery purple, slightly violet between eye and scrobe, mouth margin largely metallic dark blue; setae on frontovertex, interantennal prominence and gena indistinct, translucent, pale brown, slightly silvery in some aspects; antenna (Fig. 1534) with radicle dark brown; scape dark brown with apical 0.3X or so pale yellow; pedicel dark brown; funicle slightly dusky pale yellow; clava brown; thorax generally dark brown to black; pronotum generally coppery, side coppery purple; mesoscutum relatively bright. metallic blue-green, posterior and side margins narrowly coppery; tegula dark brown with a slight coppery purple sheen; axilla with a coppery purple sheen; scutellum coppery, posteriorly narrowly mixed brassy and metallic dark blue, side narrowly metallic dark blue; metanotum with a slight brassy green and purple lustre; mesopleuron with a slight metallic coppery purple, green and brassy lustre; all coxae dark brown; femora dark brown, fore and mid femora pale orange at apices, hind femur orange-brown at distal apex; fore tibia mostly dark brown, pale orange at apices, tarsus slightly dusky pale orange, apical tarsomere orange-brown; mid tibia pale orange with a subbasal brown band to about 0.4X, spur and tarsus pale orange, apical tarsomere slightly dusky; hind tibia pale orange at extreme base, dark brown to about 0.8X, apex pale orange, tarsus pale orange, apical tarsomere slightly dusky; wings (Fig. 1535) hyaline; propodeum dark purple-brown, generally with a slight coppery purple and brassy sheen, side with a metallic dark green sheen and with a few pale, translucent setae outside spiracle; gaster dark brown, dorsally mainly with a coppery sheen, Gt1 with a strong metallic dark blue and dark green sheen, side and venter mainly with a coppery purple sheen mixed with some purple, green, blue and brassy reflections; gonostylus dark brown

Head about 2.4X as wide as frontovertex and about 2.9X as wide as mouth opening, in profile about 1.5X as high as deep, evenly curved from occipital margin to top of scrobes and then fairly straight to mouth margin, with interantennal prominence not protuberant; occipital margin weakly rounded, more or less acute, not carinate; ocelli forming an angle of about 90°; frontovertex with slightly irregular, shallow, polygonally reticulate sculpture of mesh size subequal to eye facet, piliferous punctures shallow and small, hardly larger than eye facet, generally separated by at least about their own diameters; frontovertex with about 6 or 7 pairs of setae in front of anterior ocellus, only 1 line descends between eye and scrobe to gena; temple and gena with shallow, longitudinally elongate, imbricate-reticulate to polygonally reticulate sculpture; eye reaching occipital margin, with conspicuous, pale setae, each slightly longer than diameter of facet; scrobes shallow, broadly ∩-shaped, meeting, weakly margined dorsally and laterally, dorsally with shallow, slightly transversely elongate, polygonally reticulate sculpture; interantennal prominence weak, narrowly rounded dorsally, with very shallow, polygonally reticulate sculpture; antenna as in Fig. 1534; scape slightly broadened and flattened, widest about middle, about 2.6X as long as broad; funicle segments subequal in length, subquadrate, becoming slightly broader distad, linear sensilla present on F2-F6 or absent from F2; clava slightly longer than F4-F6 combined, sensory area enlarged and extending very nearly half way along ventral surface giving apex an obliquely truncate appearance; malar sulcus absent; clypeal margin slightly concave medially; mandible

with two acute teeth and a broad truncation. Relative measurements: HW 68, HH 55, FV 28, POL 14, OOL 4, OCL 3.5, AOL 8, EL 39.5, EW 32, MS 21, SL 25.5, SW 10.

Thorax in dorsal view with pronotum short, largely hidden by head, dorsally with slightly irregular, moderately deep, imbricate-reticulate to polygonally reticulate sculpture that is about as deep as sculpture on frontovertex, and of similar mesh; mesoscutum with regular, polygonally reticulate sculpture that is similar depth and mesh size to that in ocellar area on frontovertex; axilla almost smooth, with much shallower polygonally reticulate sculpture than mesoscutum; scutellum generally with polygonally reticulate sculpture that is similar to that on mesoscutum, but slightly shallower, more irregular and more longitudinally elongate; visible part of mesoscutum about 1.6X as broad as long; scutellum flat, about as long as broad; fore wing with venation and distribution of setae as in Figs 1533, 1535; costal cell with only a single line of dorsal setae; propodeum medially about 0.1X as long as scutellum, virtually smooth. Relative measurements: FWL 66, FWW 26; HWL 46, HWW 12.5.

Gaster with hypopygium reaching about 0.8X along gaster; Gt3 with a distinct, strongly reticulate area anteromedially; syntergum about 0.6X as long as mid tibia, with apex broadly rounded; ovipositor (Fig. 1532) hidden. Relative measurements: OL 37, GL 8 [MT 28].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, 16km SSE La Virgen, 10°16'N 85°05'W, 1050-1150m, 11/M/TN, 10.ii-21.iv.2001 (INBio-OET-ALAS). Holotype in NHMUK.

COMMENTS. *Psyllaephagus alisanos* is very close to *heles* and *trioziphagus* (see comments under *heles*, p. 585).

***Psyllaephagus trioziphagus* (Howard)**

(Figs 1536-1546; Hab. ♀ 227, ♂ 228)

Encyrtus trioziphagus Howard, 1885:14. Syntype ♀, USA, USNM, examined.
Psyllaephagus trioziphagus (Howard); Ashmead, 1900:383.

Female (length about 1.0-1.5mm): head and dorsum of thorax metallic green, usually with scutellum coppery or with a slight purple sheen; antenna (Figs 1539, 1541) with scape mostly dark brown or black; flagellum brown, occasionally orange-brown; tegula dark brown; mesoscutum metallic blue green, scutellum metallic blue or green, mixed coppery, often quite strongly so; femora mostly dark brown; tibiae mostly yellow, fore and mid tibia each with a narrow, subbasal, brown band, hind tibia varying from mostly yellow with a narrow, subbasal brown band to mostly brown with only apices yellow; head (Figs 1537, 1538) about 2-3X as wide as frontovertex and about 2.5-3.1X width of mouth; frontovertex with indistinct, shallow piliferous punctures, hardly larger than eye facet; ocelli forming an angle of about 85-110°, posterior ocellus about equidistant from eye and occipital margin or a little closer to eye margin; scrobes shallow, separated from anterior ocellus by about 2X length of torulus; antenna (Figs 1539, 1541) with scape about 2.8-4.2X as long as broad; pedicel longer than F1, funicle with F1-F5 longer than broad, F6 quadrate; clava with segments subequal, with an apical truncation that is nearly 0.5X as long as clava; mouth margin slightly emarginate, straight; mandible with one tooth and a broad truncation; mesoscutum (Fig. 1536) with slightly deeper, reticulate sculpture than that on scutellum; fore wing (Fig. 1546) about 2.4X as long as broad, marginal vein (Fig. 1540) about 2X as long as broad, costal cell with only a single line of setae dorsally, linea calva closed; Gt3 with a distinct, strongly reticulate area anteromedially; hypopygium (Fig. 1542); ovipositor (Fig. 1543) hidden

or hardly exserted, second valvifer with about 12-14 subapical setae. *Male* (length about 0.8-1.2mm): similar to female but frontovertex less variable, about 0.5X head width, and different structure of antenna (Fig. 1545) and genitalia (Fig, 1544); posterior ocellus about equidistant from eye and occipital margin; aedeagus about 0.75X as long as mid tibia.

DISTRIBUTION. Canada, USA, Mexico, Cuba, Jamaica, Costa Rica, Panama and Brazil (see Noyes & Hanson, 1996), also Mexico (Trjapitzin et al., 2008).

HOSTS. Recorded as a parasitoid of nymphs of *Trioza diospyri* (Ashmead) (Hemiptera: Triozidae) in the USA (Howard, 1885). It has been recorded from Costa Rica as a solitary parasitoid of the nymphs of *Trioza* sp. near *maritima* Tuthill (Hemiptera: Triozidae) forming galls on the leaves of *Avicennia germinans* (L.) Stearn (Lamiales: Avicenniaceae), and of *Mastigimas* Enderlein (Hemiptera: Calophyidae) on *Cedrela odorata* L. (Sapindales: Meliaceae), and from Cuba as a parasitoid of *Mastigimas ernsti* (Schwarz) (Hemiptera: Calophyidae) (Noyes & Hanson, 1996).

MATERIAL EXAMINED.

Type material. Syntype ♀: 'N.533a In Nov.8.81' 'Type No 2636 U.S.N.M.' 'Encyrtus trioziphagus Howd. typ'. Syntype in USNM (see Noyes & Hanson, 1996).

Non type material. **COSTA RICA**, 1♀, **Guanacaste**, 9km S Santa Cecilia, Est. Pitilla (ACG), LN 330200 380200, 700km, vi.1995 (C. Moraga, P. Rios); 52♀, Guanacaste, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes); 6♀, Guanacaste, Est. Cacao (ACG), ii.2000 (J.S. Noyes); 3♀, Guanacaste, Cacao (ACG), LN 323160 375800, 6-28.ii.1996 (J.S. Noyes); 3♀, Guanacaste, Est. Cacao (ACG), 10°55'N 85°30'W, 1100m, 22.ii.2003 (J.S. Noyes); 12♀, Guanacaste, Est. Cacao (ACG), 10°55'N 85°30'W, 1100m, 19-20.ii.2005 (J.S. Noyes); 1♀, Guanacaste, Santa Rosa NP, 0-300m, ii.2001 (J.S. Noyes); 6♀, Guanacaste, Las Pallas, 6km S Cerro Braun, LN 306300 388700, 800m, 10-24.ii.1996 (J. Ugalde); 3♀, Guanacaste, Las Pallas, 6km S Cerro Braun, LN 306300 388700, 800m, iii.1996 (D. Espinoza); 1♀, Guanacaste, Las Pallas, 6km S Cerro Braun, LN 306300 388700, 800m, iv.1996 (A. Masis); 1♀, Guanacaste, San Cristobal, #51899, 16.v-16.vi.1996 (F.A. Quezada); 2♂, Guanacaste, PN Palo Verde, Sector Catalina, LN 257400 400000, 250m, #54947, 8.i-8.ii.2000 (I. Jiménez); 1♂, Guanacaste, PN Palo Verde, Sect. Catalina, Fila Catalina, LN 257400 400000, 250m, #55151, xii.1999 (I. Jiménez); 7♀, **Alajuela**, Volcán Poas NP, 2500m, 6-28.vi.1996 (S. & J. Peck); 1♀, Alajuela, RF Arenal, Stor Colada, LN 269900 456750, 600m, 9.iii-7.iv.2000 (G. Carballo); 1♀, **Heredia**, 6km NE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/ /TN/ALL, iii.2002 (INBio-OET-ALAS); 1♀, Heredia, 6km NE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/TN, iv.2002 (INBio-OET-ALAS); 1♀, Heredia, Santo Domingo, INBio Parque, 1200m (error for 1100m),19.ii.2001 (J.S. Noyes); 4♀, **San José**, Zurqui de Moravia, 1600m, iii.1992, v.1992 and iv.1995 (P.Hanson). Plus a further 85♀, 60♂ from **CANADA**, **USA**, **COSTA RICA**, **MEXICO**, **PANAMA**, **JAMAICA** and **BRAZIL** as detailed in Noyes & Hanson (1996). Material in NHMUK, MZUCR and CNC.

COMMENTS. *Psyllaephagus trioziphagus* is very close to *heles* and *alisanos* (see comments under *heles*, p. 585).

As suggested in Noyes & Hanson (1996), the material included here under *trioziphagus* may represent a complex of species. At present I prefer to recognise only one until there is good evidence to support the recognition of more. Even within Costa Rica there is some consistent variation between different populations. For instance, specimens from Playa Naranjo (mangrove swamp) have a relatively broader scape, longer funicle segments, a relatively narrower frontovertex and ocelli forming a smaller angle than those collected a few kilometres away at Cacao (950-1100m). Specimens from Canada have the second valvifer of the ovipositor different in shape and the hind wing marginal vein more swollen than material examined from elsewhere.

***Psyllaephagus creusa* Noyes & Hanson**

(Figs 6,1547-1554; Hab. ♀ 229, ♂ 230)

Psyllaephagus creusa Noyes & Hanson, 1996:126,127,130-131. Holotype ♀, Costa Rica, NHMUK, examined.

Female (length about 1.5-2.3mm): head and thorax generally dull metallic green or blue-green; antenna (Fig. 1554) with scape brown; flagellum brown; tegula dark brown; femora and tibiae dark brown; head (Fig. 1547) about 2.8-2.9X as wide as mouth opening; head about 2X frontovertex width and about 2.8-2.9X as wide as mouth; frontovertex with piliferous punctures deep and conspicuous, largest subequal in size to ocellus and all much larger than eye facet; ocelli forming an angle of about 105°, posterior ocellus slightly nearer occipital margin than eye; scrobes deep, but separated from anterior ocellus by at least about 2X length of torulus; antenna (Fig. 1554) with scape about 4X as long as broad, clearly shorter than width of frontovertex and with fairly conspicuous campaniform sensilla on outer surface near apex (Fig. 1554, inset); pedicel about as long as F1, all funicle segments longer than broad, F6 subquadrate, linear sensilla on all segments; clava with apical segment short, almost giving clava a 2-segmented appearance, apex rounded; clypeal margin roundly convex and clearly protuberant; mandible with two teeth and a truncation; mesoscutum and scutellum (Fig. 1553) with similar polygonally reticulate sculpture, perhaps slightly deeper and more elongate on scutellum; fore wing (Fig. 1551) about 2.3X as long as broad, costal cell with only a single line of setae dorsally, marginal vein (Fig. 1552) 1.0-1.5X as long as broad, linea calva partially closed; Gt3 without a distinct, strongly reticulate area anteromedially; hypopygium Fig. 1550) ovipositor shorter than mid tibia and hidden, second valvifer with about 5-7 subapical setae. *Male* (length about 1.5-2.2mm): generally very similar to female but for slightly wider frontovertex, higher placement of antenna and structure of antenna (Fig. 1549) and genitalia (Fig. 1548).

DISTRIBUTION. Costa Rica (Noyes & Hanson, 1996).

HOSTS. Reared from *Neolithus* White & Hodkinson (Hemiptera: Triozidae) forming closed galls on leaves of *Sapium oligoneurum* K.Schum. & Pittier (Malpighiales: Euphorbiaceae) (Noyes & Hanson, 1996).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, 4km E San Jeronimo, ex *Neolithus* sp. in galls on *Sapium oligoneuron*, collected 26.i.1993, emerged i-ii.1993 (D. Hollis, P. Hanson). Paratypes: COSTA RICA, 2♀, 3♂, San José, 6km NE San Jeronimo de Moravia, Carr. Carillo, 1500m, ex gall *Neolithus* sp. on *Sapium oligoneuron*, ii-v.1988 (P. Hanson); 3♀, 1♂, San José, Zurqui de Moravia, psyllid gall on *Sapium*, 22.xii.1990 (P. Hanson); 7♀, 10♂, same data as holotype; 1♂, **Puntarenas**, Monteverde, 10°18'N 84°04'W, 1400m, ex psyllid gall on *Sapium oligoneuron*, v.1989 (K. Brodshaw). Holotype in NHMUK, paratypes in INBio, NHMUK, MZUCR.

COMMENTS. See comments under *ufens* (p. 583) and *gyces* (p. 608).

Psyllaephagus kallichoa **sp.nov.**
(Figs 1555-1558)

DIAGNOSIS. *Female* (length about 2.6mm): antenna (Fig. 1558) with scape dark brown; flagellum dark brown; tegula dark brown; mid femur dark brown; hind tibia dark brown, apices orange; head (Fig. 1556) about 2.4X as wide as frontovertex and about 2.5X as wide as mouth opening; ocelli forming an angle of about 120°, posterior ocellus closer to occipital margin than to eye; frontovertex between anterior ocellus and top of scrobes with conspicuous, dense, touching, piliferous punctures that are at most 0.5X diameter of ocellus; clypeal margin slightly convex and protuberant; scape about 4.5X as long as broad and slightly shorter than minimum width of frontovertex; antenna with pedicel about as long as F1 which is about 2X as long as broad, all funicle segments longer than broad, linear sensilla present on all funicle segments, segments of clava subequal in length, but apical segment shortest; mandible with one tooth and a broad, slightly concave truncation; mesoscutum about as shiny as scutellum; scutellum with very slightly deeper, more longitudinally elongate sculpture than mesoscutum; scutellum convex; fore wing (Fig. 1557) about 2.4X as long as broad, costal cell with a partial second line of setae dorsally in distal half; marginal vein (Fig. 1555) slightly longer than broad, linea clava partially closed; Gt3

without a distinct, strongly reticulate area anteromedially; ovipositor nearly 2X as long as mid tibia, slightly exserted, with exserted part about 0.4X as long as mid tibial spur; second valvifer with about 12 subapical setae. Male: unknown.

Female (holotype): length, including ovipositor, 2.55mm; excluding ovipositor, 2.48mm (CPD).

Head with occiput and frontovertex generally metallic blue-green and green, mixed violet between occipital margin and posterior ocelli and slightly coppery in front of anterior ocellus; scrobal area, temple and gena violet; mouth margin metallic blue-green this continued along position of malar sulcus to lower eye margin; toruli ringed metallic blue-green; setae on frontovertex, interantennal prominence and gena translucent and pale brown, almost silvery in some lights; antenna (Fig. 1558) dark brown; thorax generally dark brown to black; pronotum dorsally with a mainly dark blue and violet sheen, laterally dark blue, blue-green and coppery; mesoscutum metallic blue-green mixed with some violet; tegula dark brown with a slight coppery purple sheen; axilla with a dark blue and violet sheen; scutellum similar to mesoscutum but conspicuously more violet; metanotum with a slight coppery and green lustre; mesopleuron with a slight metallic dark green and brassy lustre, with some coppery purple, especially posteriorly; all coxae dark brown with a slight violet, dark blue and green sheen; fore femur dark brown, pale orange distally, tibia pale orange, medially with a broad, interrupted brown band, tarsus pale orange, distally dusky, apical tarsomere brown; mid femur dark brown, pale orange at apices, tibia pale orange with a broad, interrupted, brown subbasal band to about 0.6X, spur pale orange, tarsus pale orange, slightly dusky distally, apical tarsomere brown; hind femur dark brown, tibia mostly dark brown, dusky pale orange at apices, tarsus dusky pale orange, darker distally, apical tarsomere brown; wings (Fig. 1557) hyaline; propodeum dark purple-brown, generally with a slight copper and dark green sheen, side with a metallic blue-green sheen and with a few translucent, pale brown setae outside spiracle; gaster dark brown, dorsally mainly with a coppery purple sheen, Gt1 with a strong metallic blue-green sheen, syntergum mixed metallic dark green, side largely metallic green, blue-green blue and copper, venter mainly with a coppery purple sheen with some purple, green, blue and brassy reflections; gonostylus dark brown.

Head (Fig. 1556) about 2.4X as wide as frontovertex and about 2.5X as wide as mouth opening, in profile about 1.8X as high as deep, evenly curved from occipital margin to top of scrobes and then fairly straight to mouth margin, with interantennal prominence not protuberant; occipital margin more or less acute, not carinate; ocelli forming an angle of about 120°; frontovertex with regular, moderately deep, polygonally reticulate sculpture of mesh size subequal to eye facet, sculpture largely obscured between anterior ocellus and top of scrobes by conspicuous, dense, touching, piliferous punctures that are at most 0.5X diameter of ocellus; frontovertex with at least 20 pairs of setae in front of anterior ocellus, at least 3 lines of setae in relatively deep piliferous punctures descending between eye and scrobe to gena; temple and gena with longitudinally elongate, imbricate-reticulate to polygonally reticulate sculpture; eye reaching occipital margin, with conspicuous, pale setae, each much longer than diameter of facet; scrobes shallow, broadly ∩-shaped, meeting, weakly margined dorsally and laterally, dorsally with transversely elongate, polygonally reticulate sculpture; interantennal prominence weak, narrowly rounded dorsally, with similar polygonally reticulate sculpture to frontovertex; antenna as in Fig. 1558; scape slightly broadened and flattened, widest above middle, about 4.5X as long as broad; all funicle segments clearly longer than broad, slightly broader distad; linear sensilla present on all segments; clava hardly longer than F5-F6 combined, apex appearing rounded but sensory area slightly enlarged and extending a little way along ventral surface; malar sulcus absent; clypeal margin very slightly protuberant medially; mandible with one tooth and a broad, slightly concave truncation. Relative measurements: HW 132, HH 101, FV 56, POL 30.5, OOL 6, OCL 5, AOL 14.5, EL 65, EW 50, MS 40, SL 53, SW 12.

Thorax in dorsal view with pronotum short, largely hidden by head, dorsally with slightly irregular, moderately deep, imbricate-reticulate to polygonally reticulate sculpture that is about as deep as sculpture on frontovertex; mesoscutum with polygonally reticulate sculpture that is similar to that on frontovertex; axilla with shallower sculpture than mesoscutum that is a little more transversely elongate; scutellum with generally slightly deeper, more longitudinally elongate, irregular, polygonally reticulate sculpture than that on mesoscutum; visible part of mesoscutum

about 1.6X as broad as long; scutellum about as long as broad; fore wing with venation and distribution of setae as in Figs 1555, 1557, costal cell with a partial second line of setae dorsally in proximal half; propodeum medially about 0.11X as long as scutellum, with some shallow, irregular, reticulate sculpture. Relative measurements: FWL 155, FWW 65; HWL 100, HWW 43.

Gaster with hypopygium reaching about 0.6X along gaster; Gt3 without distinct, strongly reticulate area anteromedially; syntergum about 0.8X as long as mid tibia, with apex acute; ovipositor slightly exserted, the exserted part about 0.4X as long as mid tibial spur or about 0.1X mid tibia. Relative measurements: OL 107, GL 21.5 [MT 59].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Cartago**, Madreselva, Finca Los Lagos, LN 550050 184450, 2000-2500m, x.1993 (M. Chavarra). Holotype in NHMUK.

COMMENTS. *Psyllaephagus kallichoa* has some similarities to *gyces, korus* and *phelys*, all species having distinct piliferous punctures on the frontovertex and fairly similar colouration. Females of *kallichoa* can be separated from all three other species by having piliferous punctures on the frontovertex that are at least 2.5X the diameter of an eye facet with 3 or 4 lines of punctures descending between the eye and antennal scrobe and the costal cell of the fore wing having a partial second line of setae dorsally. In the other species the piliferous punctures are at most 2X the diameter of an eye facet with not more than 2 lines descending between the eye and antennal scrobe and the costal cell of the fore wing has only a single line of setae dorsally. In addition, *kallichoa* differs from both *gyces* and *phelys* by the scape being more than 4X as long as broad, whereas in *gyces* and *phelys* the scape is less than 4X as long as broad. *Psyllaephagus kallichoa* further differs from gyces in having the ovipositor about 5X as long as the gonostylus whereas in *gyces* it is only about 4X as long. *Psyllaephagus kallichoa* also differs from *phelys* by having the head about 2.5X as wide as the mouth and the clypeal margin is slightly protuberant whereas in *phelys* the head is about 3X as wide as the mouth and the clypeal margin is straight. *Psyllaephagus kallichoa* can also be separated from both *phelys* and *korus* by having the hind tibia mostly brown whereas in the other species the hind tibia is mostly or completely pale orange. *Psyllaephagus kallichoa* has linear sensilla on all funicle segments whilst in *korus* linear sensilla are absent from F1. Finally, in *kallichoa* all the funicle segments are longer than broad, but in *phelys* at least 2 funicle segments are quadrate or transverse. See also comments under *xepo* (p. 597)

Psyllaephagus epulo **Noyes & Hanson**

(Figs 1559-1563; Hab. ♀ 231)

Psyllaephagus epulo Noyes & Hanson, 1996:127,134-135. Holotype ♀, Costa Rica, NHMUK, examined.

Female (length about 1.3-1.4mm): head dull coppery, green and blue; mesoscutum and scutellum metallic green with some coppery reflections, especially on scutellum, scutellum sometimes slightly bluish; scape and flagellum dark brown; tegula brown; femora dark brown; tibiae brown, yellowish towards apices; head about 2X as wide as frontovertex and about 2.2X as wide as mouth opening; frontovertex with very indistinct, shallow piliferous punctures, hardly larger than eye facet and somewhat obscured by the relatively deep, polygonally reticulate sculpture; ocelli forming an angle of about 130°, posterior ocellus a little closer to eye than to occipital margin; scrobes shallow, separated from anterior ocellus by slightly more than length of torulus; antenna (Fig. 1563) with scape about 4X as long as broad and about 0.75X as long as minimum

width of frontovertex; pedicel longer than F1, F1-F4 a little longer than broad, F5 subquadrate, F6 transverse, linear sensilla on F2-F6; clava with sensory area hardly extended ventrally, apex appearing rounded; clypeal margin slightly convex and protuberant; mandible with two teeth and a truncation; mesoscutum with shallower sculpture than that on scutellum; scutellum convex; fore wing (Fig. 1559) about 2.3X as long as broad, marginal vein (Fig. 1560) about 2X as long as broad; costal cell with only a single line of setae dorsally, linea calva open; Gt3 without a distinct, strongly reticulate area anteromedially; ovipositor hardly exserted, the exserted part about 0.3X as long as mid tibial spur. *Male* (length about 1.5mm): similar to female but head with an abrupt change of colour and sculpture between antennal toruli, above purplish changing to blue-green with relatively finely reticulate sculpture and below green with some brassy and blue reflections with conspicuously smoother, less regular, reticulate sculpture of larger mesh; antenna as in Fig. 1562; genitalia (Fig. 1561) with aedeagus about 0.7X as long as mid tibia.

DISTRIBUTION. Costa Rica (Noyes & Hanson, 1996).

HOSTS. Reared from galls of *Trioza* sp. *magnoliae* group (Hemiptera: Triozidae) on the fruit of *Cinnamomum hammelianum* (Noyes & Hanson, 1996).

MATERIAL EXAMINED.

Type material. Holotype♀: **COSTA RICA**, **Alajuela**, P.N. Volcan Poas, 2500m, psyllid gall on Magnoliaceae, 25.x.1990 (P. Hanson). Paratypes: **COSTA RICA**, 2♀, 1♂, **Alajuela**, Volcan Poas, 2400m, ex triozid galls on fruit of *Phoebe cinnamomifolia*, i/ii.1995 (P. Hanson). Holotype in NHMUK, paratypes in NHMUK and INBio.

COMMENTS. In some ways *Psyllaephagus epulo* is superficially similar to *tyche,* both having a protuberant clypeal margin and convex scutellum. The two species can be separated on a number of characters, most notably the relative width of the frontovertex, width of the mouth and relative length of the gaster. In *epulo* the head is about 2X the width of the frontovertex and hardly more than 2X as wide as the mouth, and the gaster is only about half as long as the thorax, whereas in *tyche* the head is about 3X as wide as the frontovertex and more than 2.5X as wide as the mouth, and the gaster is nearly as long as the thorax. Further to this in *epulo* the ocelli form a strongly obtuse angle, the mesoscutum and scutellum hardly contrast in colour and the tibia are mostly dark brown, whereas in *tyche* the ocelli form an angle of barely more than 90°, the mesoscutum is much brighter than the scutellum and the tibiae are mostly yellow with a narrow subbasal brown band.

Psyllaephagus pilosus **Noyes**

(Figs 1564-1570; Hab. ♀ 232, ♂ 233)

Psyllaephagus pilosus Noyes, 1988a:103,105-106. Holotype♀, New Zealand, NZAC, examined.

Female (length about 0.9-1.3mm): head generally dull, dark, blue-green, mesoscutum with a slight purple sheen, scutellum slightly brassy; antenna (Fig. 1567) with scape dark brown, flagellum dark brown; tegula dark brown; femora and tibiae dark brown; head (Fig. 1568) about 2.5X as wide as frontovertex and 3.4X as wide as mouth opening; frontovertex with shallow piliferous punctures, each subequal in size to eye facet and somewhat obscured by the fine, relatively deep, punctate-reticulate sculpture; ocelli forming an angle of about 90°, posterior ocellus a little closer to eye than occipital margin; scrobes shallow, separated from anterior ocellus by slightly more than length of torulus; antenna (Fig. 1567) with scape about 4.2X as long as broad and very slightly longer than frontovertex width; funicle segments quadrate or transverse, linear sensilla on F3-F6; clava with segments subequal, apex rounded; clypeal margin slightly emarginate, straight; mandible with one tooth and a broad truncation; mesoscutum and scutellum (Fig. 1565) with similar reticulate sculpture; fore wing (Fig. 1564) about 2.3X as long as broad, marginal vein (Fig. 1568) about 1.5X as long as broad; costal cell with 2 or 3 lines of setae dorsally in distal half but only a single complete line of setae reaching base, linea calva more or less closed; Gt3 with a

distinct, strongly reticulate area anteromedially; ovipositor longer than mid tibia, virtually hidden, second valvifer with about 12 subapical setae on second valvifer. *Male* (length about 0.8-1.2mm): generally similar to female but for colour and structure of antenna (Fig. 1566) and genitalia (Fig. 1570); mesoscutum green, scutellum purplish; funicle segments with some very short, apically branching setae; aedeagus about 0.8X as long as mid tibia.

DISTRIBUTION. A native of New Zealand (Noyes, 1988a) and Australia (Dahlsten et al. 1998) and introduced into Wales, Republic of Ireland and France, (see above), also accidentally introduced into Mexico (Trjapitzin et al., 2008), Brazil (Kurylo et al., 2010), Isle of Man (Bennett, 2005), Germany (**new record**) and Costa Rica (**new record**).

HOSTS. *Psylaephagus pilosus* is a parasitoid of the nymphs of *Ctenarytaina eucalypti* (Maskell) (Hemiptera: Aphalaridae) on various species of *Eucalyptus* L'Hér. (Myrtales: Myrtaceae).

BIOCONTROL. *Psyllaephagus pilosus* was introduced into California from Australia and New Zealand in 1992 for the control of *Ctenarytaina eucalypti* (Maskell) (Hemiptera: Aphalaridae) an important pest of various *Eucalyptus* species (Myrtales: Myrtaceae). This resulted in a dramatic reduction in the psyllid population and completely controlled the pest with a benefit:cost ratio of 24:1 over 5 years (Dahlsten et al. 1998). The parasitoid was later released in north Wales (UK) in 1994 and in southeast France in 1997 and Republic of Ireland in 1998 and rapidly established, proving highly effective in controlling the pest in all areas in which it was released (Hodkinson, 1999; Chauzat et al., 2002).

MATERIAL EXAMINED.

Type material. Holotype♀: New Zealand, OL, Lake Wakatipu, Bob's Cove, *Nothofagus* forest and mixed broadleaf, 23.i.1981 (J.S. Noyes, E.W. Valentine). Paratypes: 80♀, 20♂ from New Zealand. Holotype in NHMUK, see Noyes (1988) for a full list of type depositories.

Non type material. **COSTA RICA**, 15♀, 8♂, **San José**, Sabanilla, Eucalyptus psyllid, 29.iii.2011 (X. Miranda). **ISLE OF MAN**, 5♀, Curraghs Wildlife Park, coll. as adult nr *Ctenarytaina eucalypti*/*Eucalyptus*, 6.viii.2002 (F.D. Bennett); 10♀, 2♂, Curraghs Wildlife Park, host: *Ctenarytaina eucalypti*/*Eucalyptus*, 6.viii.2002, em 8.viii.2002 and 10.viii.2002 (F.D. Bennett). **GERMANY**, 2♀, 2♂, Sachsen, Dresden,ex *Ctenarytaina eucalypti*, 5.iv.2001 (H. Schnee). **AUSTRALIA**, 2♀, **Victoria**, Melbourne, Tecoma, , ex *Ctenarytaina eucalypti* on *E. globulus*, #14, 3.i.1992 (D. Dahlsten); 3♀, **ACT**, Canberra, ex *Ctenarytaina eucalypti* on *Euc. globulus*, #16, 8.i.1992 (D. Dahlsten). Material in NHMUK and MZUCR.

***Psyllaephagus yaseeni* Noyes**

(Figs 1571-1576; Hab. ♀ 234, ♂ 235)

Psyllaephagus yaseeni Noyes, 1990:39-40. Holotype♀, Hawaii, NHMUK, examined.

Female (length about 0.8-1.3mm): head generally metallic green or blue-green, scrobes purple, mouth margin blue, mesoscutum bright metallic green, scutellum much less shiny metallic green, coppery in basal half or more; antenna (Fig. 1572) with scape dark brown, funicle generally slightly dusky orange, clava slightly darker dusky orange or testaceous orange; tegula brown; mesoscutum bright metallic green or blue-green, scutellum duller and largely coppery; femora dark brown; fore tibia yellow, with a faint, narrow, brown, subbasal ring, mid tibia yellow, with a well-marked, conspicuous, dark brown, subbasal ring, hind tibia almost entirely dark brown with only apical quarter yellow; head (Fig. 1574) about 2.5X as wide as frontovertex and about 3.1X as wide as mouth opening; frontovertex with shallow piliferous punctures, each a little larger than eye facet but somewhat obscured by the coarse, relatively deep, polygonally reticulate sculpture; ocelli forming an angle of about 90°, posterior ocellus a little closer to eye than occipital margin; pedicel and flagellum together shorter than head width; scrobes shallow, separated from anterior ocellus by slightly more than length of torulus; antenna (Fig. 1572) with scape about 4.3-4.6X as long as broad; clava with apex rounded; clypeal margin emarginate, straight; mandible with one tooth and a broad truncation; scutellum with deep, longitudinally striate-reticulate sculpture more

or less arranged in whorls that is conspicuously deeper than sculpture on mesoscutum; marginal vein (Fig. 1576) a little less than 2X as long as broad and very slightly longer than frontovertex width; antenna (Fig. 1572) with pedicel clearly longer than F1, which is smaller than F2 and subquadrate, remaining funicle segments quadrate or transverse, linear sensilla on F3-F6; costal cell (Fig. 1573) with only a single line of setae dorsally, this hardly reaching more than half way to base of cell; dorsal surface of basal cell with not more than 50 setae, linea calva partially closed; Gt3 without a distinct, strongly reticulate area anteromedially; hypopygium Fig. 1577; ovipositor hidden, slightly longer than mid tibia, second valvifer with 5 or 6 subapical setae. *Male* (length about 0.8-1.2mm): generally similar to female but for colour and structure of antenna (Fig. 1571) and genitalia (Fig. 1575); face shining metallic green, scape yellow to brown; flagellum pale yellowish to testaceous-brown; posterior ocellus about equidistant from eye and occipital margin; F6 not more than 1.25X as long as broad; dorsal surface of basal cell with not more than 40 setae.

DISTRIBUTION. USA (Texas & Florida), Mexico, Cuba, Haiti, Jamaica, Puerto Rico, Tobago, Anguilla, Costa Rica, Colombia and introduced into Hawaii, Kenya, Tanzania, Nepal, Sri Lanka, Thailand, Malaysia, Indonesia, Philippines, China (Hainan) and New Caledonia (Noyes & Hanson, 1996; Napompeth, 1995; Kairo et al., 2003).

HOSTS. *Psyllaephagus yaseeni* is a solitary, internal parasitoid of first and second instar nymphs of *Heteropsylla cubana* (Crawford) (Murai, 1986, as *Psyllaephagus* sp near *rotundiformis*) (Hemiptera: Psyllidae). *P. yaseeni* has also been reared from an unidentified species of *Heteropsylla* on *Mimosa invisa* (Noyes, 1990), but in host specificity tests it did not attack *Heteropsylla huasachae* Caldwell and *H. fusca* Crawford (Murai, 1986). The species has been collected with *H. curta* Muddiman, Hodkinson & Hollis in Jamaica and has been reared from an unidentified psyllid on *Cojoba arborea* (Noyes & Hanson, 1996) and from *Heteropsylla* on *Pithecelobium arboreum* (see below).

BIOCONTROL. Between 1987 and 1996, *Psyllaephagus yaseeni* was introduced into Hawaii, Kenya, Tanzania, Sri Lanka, Malaysia, Thailand, Indonesia and New Caledonia, in attempts to control *Heteropsylla cubana* Crawford, a pest of *Leucaena leucocephala* (Lam.) de Wit (Fabales: Fabaceae) (see Noyes & Hayat, 1994; IIBC, 1993, Napompeth, 1995, Kairo et al., 2003). This plant is used commonly as cattle fodder, green manure, a shade plant for coffee and cocoa and as a nitrogen fixing plant in alley cropping. The parasitoid has become established in at least some countries, even spreading to adjacent countries and it at least partially responsible for effective control of the psyllid (IIBC, 1994; Napompeth, 1995), although studies in Thailand indicated that the parasitoid was not very effective (Geiger & Gutierrez, 2000).

MATERIAL EXAMINED.

Type material. Holotype♀: HAWAII, Oahu, Manoa, ex *Heteropsylla cubana* nymphs on *Leucaena leucocephala*, xi.1988 (G.Y. Funasaki). Paratypes: 68♀, 33♂ from HAWAII, MEXICO, CUBA, HAITI, JAMAICA, TOBAGO and COLOMBIA. Holotype in NHMUK, see Noyes (1990) for a full list of type depositories.

Non type material. **COSTA RICA**, 1♀, 1♂, **Guanacaste**, Santa Rosa NP, H10, 26.iv-16.v.1987 (D. Janzen, I.D. Gauld); 1♀, **Alajuela**, RF Arenal, Sect. la Peninsula, LN 271500 453800, #55166, 1-14.iii.2000 (G. Carballo); 3♀, **Heredia**, Santo Domingo, INBio Parque, LN 217300 526200, 1100m, ii.2000 and iii-iv.2001 (R. Zuñiga); 1♀, Heredia, Santo Domingo, INBio Parque, LN 526200 217400, 1100m, iii.2002 (J.A. Azofeifa, J.S. Noyes); 1♀, Heredia, Santo Domingo, INBio Parque, LN 526200 217400, 1100m, 1-12.iv.2002 (D. Rubí, J.S. Noyes); 1♀, Heredia, Santo Domingo, INBio Parque, LN 217300 526200, 1100m, 6.x.2002 (J.A. Azofeifa); 5♀, 2♂, **San José**, UCR Campus, 1100m, ex *Heteropsylla* on *Pithecelobium arboreum*, iii.1994 and iv.1994(P. Hanson); 1♀, **Puntarenas**, Pen. Osa, Puerto Jimenez, 8°32'N 83°19'W, iii.1991 (P. Hanson). Plus a further 40♀, 16♂ from **USA**, **MEXICO**, **JAMAICA**, **PUERTO RICO**, **ANGUILA**, **ST LUCIA**, **COSTA RICA**, **COLOMBIA** and **PHILIPPINES** as detailed in Noyes & Hanson (1996). Material in NHMUK, INBio, and MZUCR.

COMMENTS. *Psyllaephagus yaseeni* can easily be confused with *rotundiformis*. Both sexes can

be separated by the characters given in the key. The females can also be distinguished on the colour of the mid and hind tibia, relative length of the flagellum and setation of the fore wing. In *yaseeni* the mid tibia has a distinct dark brown, subbasal ring, the hind tibia has the basal three-quarters or so dark brown, the pedicel and flagellum combined are shorter than the width of the head and the costal cell of the fore wing has a dorsal line of setae present only in the apical half. In *rotundiformis* the mid tibia has the subbasal ring very indistinct or absent, the hind tibia has the dark brown area extending only about half-way along its length, the pedicel and flagellum combined are longer than the width of the head and the costal cell of the fore wing has a dorsal line of setae more or less along its length.

Psyllaephagus xepo **sp.nov.**
(Figs 1577-1582)

DIAGNOSIS. *Female* (length about 2.5mm): antenna (Fig. 1579) with scape mostly dark brown; flagellum dark brown; tegula dark brown; mesoscutum and scutellum dull with some violet and dark blue reflections; mid femur dark brown; hind tibia mostly pale orange with a broad brown subbasal band in proximal one-third; head (Fig. 1581) about 2.6X as wide as frontovertex and about 3.0X as wide as mouth opening; ocelli forming an obtuse angle of about 105°, posterior ocellus closer to occipital margin than to eye; frontovertex with relatively shallow and small piliferous punctures that are slightly larger than eye facet and generally separated by at least about their own diameters; antenna (Fig. 1579) with scape about 4.9X as long as broad and about as long as minimum width of frontovertex; antenna with pedicel slightly longer than F1, all funicle segments longer than broad, F6 subquadrate, linear sensilla on all funicle segments, segments of clava subequal in length, but becoming shorter towards apex, the apex more or less rounded; clypeal margin emarginate, but very weakly convex; mandible with one tooth and a broad truncation; scutellum with similar sculpture to mesoscutum, with cells slightly longitudinally elongate; scutellum convex; fore wing (Fig. 1582) about 2.3X as long as broad; costal cell with one line of setae dorsally, marginal vein (Fig. 1580) about 2X as long as broad, linea clava closed; Gt3 without a distinct, strongly reticulate area anteromedially; hypopygium Fig. 1577; ovipositor longer than mid tibia and slightly exserted with exserted part about 0.4X as long as mid tibial spur; second valvifer with about 16 subapical setae. *Male*: unknown.

Female (holotype): length, including ovipositor, 2.53mm; excluding ovipositor, 2.48mm (CPD).

Head with occiput and frontovertex generally dull, mixed, metallic dark blue and coppery purple; scrobal area, temple and gena dull, coppery purple, interantennal prominence marked dark metallic blue between toruli, parts of mouth margin and position of malar sulcus; a metallic violet line across face immediately below toruli; setae on frontovertex, interantennal prominence and gena indistinct, translucent, pale brown, slightly silvery in some aspects; antenna (Fig. 1579) with radicle dark brown; scape dark brown with extreme apex pale orange; pedicel dark brown, extreme apex pale orange; flagellum dark brown; thorax generally dark brown to black; pronotum with posterior margin coppery, remainder dull, dark, metallic green reflections, laterally more extensively coppery; mesoscutum dull violet with some dull, dark blue reflections; tegula dark brown with a slight coppery purple sheen; axilla mainly with a coppery purple sheen, mixed with some metallic dark green and brassy; scutellum somewhat similar to mesoscutum but narrowly more blue along mid line and side and dark green at apex; metanotum with a slight coppery purple and brassy lustre; mesopleuron with a slight metallic coppery purple, green and brassy lustre; all coxae dark brown with a slight violet, dark blue and coppery purple sheen; fore femur dark brown, pale orange at extreme apices, tibia pale orange, with a broad, subbasal, interrupted brown band, tarsus pale orange, distally dusky, apical tarsomere brown; mid femur dark brown, pale orange at apices, tibia pale orange with a narrow, indistinct, interrupted, brown subbasal band, spur pale orange, tarsus pale orange, slightly dusky distally, apical tarsomere orange-brown; hind femur dark brown, pale orange at extreme distal apex, tibia mostly pale orange with a broad, dark brown, subbasal band to about 0.3X, tarsus dusky pale orange, darker distally, apical tarsomere dark brown; wings (Fig. 1582) hyaline; propodeum dark purple-brown, generally with a slight coppery purple, green and brassy sheen, side with a metallic dark green sheen and with a few silvery

setae outside spiracle; gaster dark brown, dorsally mainly with a coppery purple sheen, Gt1 with a strong metallic dark blue and dark green sheen, syntergum weakly mixed metallic dark green, side largely metallic green, blue-green blue and copper, venter mainly with a coppery purple sheen with some purple, green, blue and brassy reflections; gonostylus dark brown.

Head (Fig. 1581) about 2.6X as wide as frontovertex and about 3.0X as wide as mouth opening, in profile about 1.8X as high as deep, evenly curved from occipital margin to top of scrobes and then fairly straight to mouth margin, with interantennal prominence not protuberant; occipital margin more or less acute, not carinate; ocelli forming an angle of about 105°; frontovertex with slightly irregular, moderately deep, polygonally reticulate sculpture of mesh size subequal to eye facet, piliferous punctures relatively shallow and small, but slightly larger than eye facet, generally separated by at least about their own diameters; frontovertex with about 12 or 13 pairs of setae in front of anterior ocellus, 2 lines descend between eye and scrobe virtually to gena; temple and gena with longitudinally elongate, imbricate-reticulate to polygonally reticulate sculpture; eye reaching occipital margin, with fairly conspicuous, pale setae, each slightly longer than diameter of facet; scrobes shallow, broadly Λ-shaped, meeting, weakly margined dorsally and laterally, dorsally with shallow, transversely elongate, polygonally reticulate sculpture; interantennal prominence weak, narrowly rounded dorsally, with shallow, polygonally reticulate sculpture; antenna as in Fig. 1579; scape slightly broadened and flattened, widest just above middle, about 4.9X as long as broad; funicle segments subequal in length, longer than broad, becoming slightly broader distad, linear sensilla present on all segments; clava slightly shorter than F4-F6 combined, sensory area slightly enlarged, but hardly extending along ventral surface so that apex is of rounded appearance; malar sulcus absent; clypeal margin hardly protuberant medially; mandible with one tooth and a broad truncation. Relative measurements: HW 112, HH 85, FV 43, POL 21, OOL 6, OCL 4.5, AOL 12, EL 61, EW 49, MS 30, SL 42, SW 8.5.

Thorax in dorsal view with pronotum short, largely hidden by head, dorsally with slightly irregular, moderately deep, imbricate-reticulate to polygonally reticulate sculpture that is about as deep as sculpture on frontovertex, but generally of slightly larger mesh; mesoscutum with regular, polygonally reticulate sculpture that is of similar depth and mesh size to that in ocellar area on frontovertex; axilla almost smooth, with much shallower polygonally reticulate sculpture than mesoscutum; scutellum generally with polygonally reticulate sculpture that is similar to that on mesoscutum but slightly irregular and more longitudinally elongate; visible part of mesoscutum about 1.4X as broad as long; scutellum nearly 1.1X as broad as long; fore wing with venation and distribution of setae as in Figs 1580, 1582, costal cell with only a single line of dorsal setae; propodeum medially about 0.15X as long as scutellum, with distinct, irregular, polygonally reticulate sculpture. Relative measurements: FWL 117.5, FWW 51; HWL 79, HWW 26.

Gaster with hypopygium (Fig. 1577) reaching about 0.8X along gaster; Gt3 without a distinct, strongly reticulate area anteromedially; syntergum about 0.7X as long as mid tibia, with apex forming an angle of about 90°; ovipositor (Fig. 1578) slightly exserted, the exserted part about 0.4X as long as mid tibial spur or a little less than 0.1X mid tibia. Relative measurements: OL 74, GL 15 [MT 45].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, Vara Blanca [Finca Georgina, 10°09'N, 84°09'W, 2100m], vi-viii.1990 (P. Hanson). Holotype in NHMUK.

COMMENTS. *Psyllaephagus xepo* might be confused with *gyces*, both species having distinct piliferous punctures on the frontovertex. Females of *xepo* can be separated from *gyces* by having the head about 3X as wide as the mouth, the posterior ocelli clearly closer to the occipital margin

than to the eye, virtually straight clypeal margin and scape about 5X as long as broad. In *gyces* the head is about 2.6X as wide as the mouth, the posterior ocellus is equidistant from the occipital margin and eye, the clypeal margin is slightly convex and protuberant and the scape is less than 4X as long as broad.

In some ways *xepo* is also similar to *kallichoa* but apart from having a protuberant clypeal margin *kallichoa* also has the mandible with two acute teeth (upper tooth short) and a broad truncation, at least a partial second line of setae on the surface of the costal cell of the fore wing, the hind tibia is mostly dark brown and the linea clava is mostly open. In *xepo* the mandible has only one acute tooth and a broad truncation, there is only one line of setae on the dorsal surface of the costal cell, the hind tibia is mostly pale orange and the linea calva is closed.

Psyllaephagus xepo is also similar to *othrys* but as with *gyces* it can be separated from *othrys* by the relative position of the posterior ocelli and width of the mouth and as with *kallichoa*, *xepo* can be distinguished from *othrys* by the distribution of setae on the dorsal surface of the costal cell. Furthermore, in *xepo* the linea calva of the fore wing is closed, whereas in *othrys* it is open.

Psyllaephagus thonis **Noyes & Hanson**

(Figs 1583-1586; Hab. ♀ 236)

Psyllaephagus thonis Noyes & Hanson, 1996:127,135-136. Holotype ♀, Costa Rica, NHMUK, examined.

Female (length about 1.7-1.8mm): head with a very weak coppery purple and blue sheen; antenna (Fig. 1583) with scape dark brown, flagellum dark brown; mesoscutum with a very weak coppery purple and brassy sheen, scutellum with a relatively strong coppery purple and dark blue sheen; tegula brown; femora dark brown; tibiae yellow, each with an inconspicuous, narrow, pale brown, subbasal ring; head (Fig. 1585) about 2.5X as wide as frontovertex and 3.4X as wide as mouth opening; frontovertex with shallow piliferous punctures, hardly larger than an eye facet that are virtually indistinguishable from the relatively deep, polygonally reticulate sculpture; ocelli forming an angle of about 105°; posterior ocellus about equidistant from eye and occipital margins; scrobes shallow, separated from anterior ocellus by about 1.5X length of torulus; antenna (Fig. 1583) with scape about 4.8X as long as broad and slightly shorter than width of frontovertex; pedicel slightly longer than F1; funicle with F1-F4 longer than broad, F5 quadrate, F6 transverse, linear sensilla on all segments; clava with segments becoming gradually shorter towards apex, sensory area at apex enlarged and extending about 0.4X along ventral surface; clypeal margin slightly convex and protuberant; mandible with one tooth and a broad truncation; mesoscutum with slightly shallower sculpture than that on scutellum; scutellum convex; fore wing (Fig. 1586) about 2.3X as long as broad, marginal vein (Fig. 1584) more or less punctiform; costal cell with only a single line of setae dorsally, linea calva closed; Gt3 without a distinct, strongly reticulate area anteromedially; ovipositor slightly longer than mid tibia and hidden, second valvifer with about 16-19 subapical setae. *Male*: unknown.

DISTRIBUTION. Costa Rica (Noyes & Hanson, 1996).

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype♀: **COSTA RICA**, **San José**, Ciudad Colon, 800m, ii.1990 (L. Fournier). Holotype in NHMUK.

Non type material. **COSTA RICA**, 1♀, **Guanacaste**, PN Palo Verde, Sector Catalina, LN 257400 400000, 250m, #54947, 8.i-8.ii.2000 (I. Jiménez); 1♀, **Guanacaste**, ZP Nozara, Fila Maravilla, 800m, #66663, 24.xi-21.xii.2001 (I. Jiménez). Material in MZUCR and NHMUK.

COMMENTS. Females of *Psyllaephagus thonis* are similar to those of *alexion* and *ufens*, all three having a generally similar colouration, elongate antennal segments, similar-sized piliferous punctures on the frontovertex, punctiform marginal vein, partially closed linea calva and hidden

ovipositor (see comments under *ufens*, p. 583 and *alexion*, p. 599).

***Psyllaephagus alexion* Noyes & Hanson**
(Figs 4,5,1587-1590; Hab. ♀ 237)

Psyllaephagus alexion Noyes & Hanson, 1996:127,136-137. Holotype ♀, Costa Rica, NHMUK, examined.

Female (length about 1.5-1.6mm): head black with a very dull, mixed, dark, metallic green and coppery purple sheen, mesoscutum more shiny, predominantly coppery purple with some blue-green reflections; scutellum with a relatively strong blue-green sheen with some coppery purple reflections; antenna (Fig. 1587) scape dark brown, flagellum brown; tegula dark brown; femora dark brown; tibiae yellow, each with a faint pale brown, subbasal spot; head (Fig. 1589) about 3.1X as wide as mouth opening; frontovertex about 0.4X head width and 3.1X as wide as mouth opening, with shallow piliferous punctures, each a little larger than eye facet but somewhat obscured by the coarse, relatively deep, polygonally reticulate sculpture; ocelli forming an angle of about 95°, posterior ocellus about equidistant from eye and occipital margins; scrobes shallow, separated from anterior ocellus by about 2X length of torulus; antenna (Fig. 1587) with scape about 4.3X as long as broad and very slightly longer than width of frontovertex; pedicel slightly longer than F1; all funicle segments longer than broad, linear sensilla on all segments or absent from F1; clava with segments becoming gradually shorter towards apex which is more or less rounded; clypeal slightly convex, protuberant; mandible with one tooth and a broad truncation; mesoscutum with slightly shallower sculpture than that on scutellum; scutellum slightly convex; fore wing (Fig. 5) about 2.4X as long as broad, marginal vein (Fig. 4) more or less punctiform; costal cell with only a single line of setae dorsally, linea calva closed; T3 of gaster without a distinct, strongly reticulate area anteromedially; ovipositor longer than mid tibia and hidden, second valvifer with about 10 subapical setae. *Male*: unknown.

DISTRIBUTION. Costa Rica (Noyes & Hanson, 1996).

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype♀: **COSTA RICA**, **Puntarenas**, R.F. Golfo Dulce, 24km W Piedras Blancas, 200m, 11.v.1991 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **Alajuela**, Peñas Blancas, 23.v.1987 (E. Cruz). Material in NHMUK.

Non type material. **COSTA RICA**, 1♀, **Puntarenas**, PN Corcovado, Los Patos, 8°33'N 83°30'W, 200m, MT/YPT, ii.2000 (J.S. Noyes, J. Azofeifa). Material in MZUCR.

COMMENTS. *Psyllaephagus alexion* and *thonis* are very close and were once thought to represent varieties of the same species. However, in *alexion* the sensory part of the clava is shorter than the combined ventral lengths of the first two segments, the ocelli form an angle of about 90°, and the sculpture of the frontovertex below the anterior ocellus and on the mesoscutum is relatively shallower. In *thonis* the sensory part of the clava is longer than the combined ventral lengths of its first two segments, the ocelli form a distinctly obtuse angle and the sculpture of the frontovertex below the anterior ocellus and on the mesoscutum is relatively coarse. *Psyllaephagus alexion* is also similar to *ufens* but females of *alexion* differ from those of the other two species in having the scape a little longer than the minimum frontovertex width, all funicle segments at least slightly longer than broad and the mesoscutum slightly more shiny than the scutellum, whereas in *thonis* and *ufens* the scape is a little shorter than the frontovertex width at least F6 is transverse and the mesoscutum is about as dull as, or duller than, the scutellum. See also comments under *ufens* (p. 583) and *thonis* (p. 598).

There is also some similarity between *alexion* and *baccharidis* Tavares and Perioto described from southern Brazil. The species have a similar habitus and leg colouration. *Psyllaephagus baccharidis* differs in being generally brighter in colouration, the head and dorsum of the

thorax being bright metallic green whereas in *alexion* these parts are relatively dull. Also, in *baccharidis*, the scutellum is similar in colouration and sculpture to the mesoscutum whilst in *alexion* the scutellum is significantly brighter and with deeper sculpture than the mesoscutum. The frontovertex of *baccharidis* also has no distinct piliferous punctures and the posterior ocellus is clearly closer to the eye margin than occipital margin, whilst in *alexion* the frontovertex has shallow, but conspicuous piliferous punctures and the posterior ocellus is about equidistant from the eye and occipital margin.

***Psyllaephagus rotundiformis* (Howard)**

(Figs 1591-1598; Hab. ♀ 238, ♂ 239)

Encyrtus rotundiformis Howard, 1897:154. Lectotype♀ designated by Noyes (1979), Grenada, USNM, examined.
Psyllaephagus rotundiformis (Howard); Noyes, 1979:165.

Female (length about 1.0-1.5mm): head generally metallic green or blue-green, scrobes purple, mouth margin blue, mesoscutum bright metallic green, scutellum less shiny metallic green, slightly coppery in basal half; antenna (Fig. 1593) scape dark brown; flagellum brown; tegula dark brown; femora dark brown; fore and mid tibiae yellow, each with a faint, narrow, brown, subbasal ring, hind tibia yellow with basal half almost entirely dark brown; head (Fig. 1591) about 2.9-3.0X as wide as mouth opening; frontovertex about 2.5-3.3X head width and 2.9-3.0X as wide as mouth opening, with shallow piliferous punctures, each a little larger than eye facet but somewhat obscured by the coarse, relatively deep, polygonally reticulate sculpture; ocelli forming an angle of about 90°; posterior ocellus a little closer to eye than occipital margin; pedicel and flagellum together longer than head width; scrobes shallow, separated from anterior ocellus by nearly 2X length of torulus; antenna (Fig. 1593) with scape about 4.2-4.7X as long as broad and very slightly longer than width of frontovertex; clava with apex rounded; pedicel clearly longer than F1; funicle segments quadrate or very slightly longer than broad; linear sensilla on F2-F6; clava with segments subequal but becoming gradually shorter towards apex which is rounded; clypeal margin weakly emarginate and straight; mandible with one tooth and a broad truncation; scutellum (Fig. 1598) with deep, longitudinally striate-reticulate sculpture, more less arranged in whorls and conspicuously deeper than sculpture on mesoscutum; scutellum convex; fore wing (Fig. 1597) about 2.4X as long as broad, marginal vein (Fig. 1594) a little less than 2X as long as broad; costal cell with only a single line of setae dorsally, these extending nearly to base; dorsal surface of basal cell with at least 60 setae; linea calva closed; Gt3 with a pale, anteromedian area; ovipositor (Fig. 1595) longer than mid tibia and hidden; second valvifer with about 8 subapical setae. *Male* (length about 0.8-1.4mm): generally similar to female but for colour and structure of antenna (Fig.1592) and genitalia (Fig. 1596); face shining metallic green, scape yellow with a dark brown subbasal spot dorsally; flagellum pale testaceous-brown; posterior ocellus about equidistant from eye and occipital margin; F6 at least 1.35X as long as broad; dorsal surface of basal cell with at least 50 setae.

DISTRIBUTION. Jamaica, Grenada, St Vincent, Tobago, Trinidad, Belize, Costa Rica, Panama, Peru and Brazil (Noyes & Hanson, 1996).

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Lectotype♀: GRENADA, windward side, Mirabeau Est., HH. Smith, '*Encyrtus rotundiformis* How ♀, parts on slide labelled '*Encyrtus rotundiformis* How, ♀ type'. Paralectotype: GRENADA, 1♀, windward side, Balthazar (H.H. Smith) (right fore wing and gaster only). Lectotype in USNM, paralectotype in NHMUK.

Non type material. **COSTA RICA**, 1♀, **Guanacaste**, NP, 9km S Santa Cecilia, Est. Pitilla, ii.1993 (C. Moraga); 3♀, Guanacaste, Est. Maritza (ACG), 10°58'N 95°29'W, 700m, 23.ii.2003 (J.S. Noyes); 1♀, Guanacaste, PN Guanacaste, San Cristobal, #51848, 15.iii-16.iv.1996 (F.A. Quezada); 1♀, Guanacaste, ZP

Nosara, Fila Maravilla, LN 221350 381700, 800m, #66663, 24.xi-21.xii.2001 (I. Jiménez); 2♀, Guanacaste, PN Palo Verde, Sector Palo Verde, LN 260952 385020, 50m, 5-18.i.2000 and 8-9.ii.2000 (I. Jiménez); 5♀, Guanacaste, PN Palo Verde, Sector Catalina, LN 257400 400000, 250m, #54947, 8.i-8.ii.2000 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Sect. Catalina, Fila Catalina, LN 257400 400000, 250m, xii.1999 (I. Jiménez); 1♀, **Alajuela**, Est. Cabro Muco, 10°43'N 85°09'W, 1100m, 13.ii.2004 (C. Hansson, J. Azofeifa); 1♂, Alajuela, PN Arenal, La Peninsula, 10°27'N 84°40'W, 600m, 25.ii.2003 (J.S. Noyes); 1♀, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m , 14-14.ii.2005 (J.S. Noyes); 3♀, Puntarenas, Est. Altamira, 9°03'N 83°00'W, 1450m, ii.2002 (C. Hansson, D. Rubí); 1♂, Puntarenas, PN Corcovado, Est. Agujas, LS 526550 276750, 300m, 11.ii.2002 (J. Azofeifa); 1♀, Puntarenas, PN Corcovado, Sirena, LS 507750 270000, 10m, 19.ii.2002 (J. Azofeifa); 3♂, **Limón**, RB Hitoy-Cerere, 100m, 14-19.i.1991 (J.S. Noyes). Plus a further 34♀, 60♂ from **JAMAICA**, **ST VINCENT**, **TOBAGO**, **TRINIDAD**, **BELIZE**, **COSTA RICA**, **PANAMA**, **PERU** and **BRAZIL** as detailed by Noyes & Hanson (1996). Material in NHMUK, INBio, MZUCR and CNC.

COMMENTS. See comments under *yaseeni* (p. 595).

Psyllaephagus korus sp.nov.
(Figs 1599-1602)

DIAGNOSIS. Female (length about 1.8mm): antenna with scape mostly dark brown; flagellum dark brown; tegula mostly black with base pale orange-brown; mid femur mostly dark brown; hind tibia pale orange; head (Fig. 1601) about 2.6X as wide as frontovertex and about 2.4X as wide as mouth opening; ocelli forming an angle of about 100°, posterior ocellus very slightly closer to eye than to occipital margin; frontovertex with piliferous punctures shallow, distinct and a little larger than eye facet, separated by at least about their own diameters; clypeal margin convex and protuberant; antenna (Fig. 1601) with scape nearly 4X as long as broad and slightly shorter than minimum width of frontovertex; pedicel very slightly longer than F1, all funicle segments a little longer than broad, but F6 subquadrate, linear sensilla present on F2-F6, segments of clava subequal in length, but becoming progressively shorter towards apex which is rounded; mandible with one tooth and a broad truncation; mesoscutum about as shiny as scutellum; scutellum with similar sculpture to mesoscutum but very slightly more longitudinally elongate; scutellum convex; fore wing (Fig. 1602) about 2.4X as long as broad; costal cell with one line of setae dorsally; marginal vein (Fig. 1600) about 1.2X as long as broad; linea calva partially closed; gaster without a distinct, strongly reticulate anteromedian area on Gt3; ovipositor nearly 2X as long as mid tibia and exserted, with exserted part about 0.5X as long as mid tibia; second valvifer with about 12 subapical setae. Male: unknown.

Female (holotype): length, including ovipositor, 1.83mm; excluding ovipositor, 1.77mm (CPD).

Head with frontovertex coppery, mixed metallic blue-green along inner eye margins and ocellar area; scrobal area violet; temple and gena violet, mixed metallic blue-green; mouth margin blue-green; setae on frontovertex, interantennal prominence and gena brown; antenna with radicle dark brown; antenna (Fig. 1599) with scape with proximal 0.7X dark brown with a slight blue and purple sheen, apex pale orange; pedicel dark brown with extreme apex and venter pale orange; flagellum dark brown; thorax generally dark brown to black; pronotum with a mixed copper, purple, blue-green and green sheen; mesoscutum shining, metallic dark blue and dark green, mixed violet anteriorly; tegula pale orange-brown at extreme base, otherwise black with a distinct, mixed coppery, purple and dark blue sheen; axilla with a weak violet and slightly brassy sheen; scutellum metallic dark blue and green mixed violet medially and with some coppery and brassy reflections; metanotum with a slight coppery purple lustre; mesopleuron with a slight metallic dark green lustre, mixed brassy with some coppery purple posteriorly; all coxae dark brown with a slight violet, dark blue and green sheen; all femora dark brown with apices pale orange; fore tibia pale orange with a small, subbasal brown spot externally, tarsus slightly dusky pale orange; mid tibia pale orange with a small, weak, dusky area subbasally, spur and tarsus pale orange; hind tibia pale orange, tarsus dusky pale orange, brownish dorsally; wings (Fig. 1602) hyaline; propodeum dark purple-brown, generally with a slight copper and dark green sheen, side with a metallic blue-

green sheen and with a few translucent, pale brown setae outside spiracle; gaster dark brown, dorsally mainly with a coppery purple sheen, Gt1 with a strong metallic dark blue sheen, mixed violet medially, syntergum mixed metallic dark green, side largely metallic green, blue-green blue and copper, venter mainly with a coppery purple sheen with some purple, green, blue and brassy reflections; gonostylus dark brown.

Head (Fig. 1601) about 2.6X as wide as frontovertex and about 2.4X as wide as mouth opening, in profile about 1.9X as high as deep, evenly curved from occipital margin to top of scrobes and then fairly straight to mouth margin, with interantennal prominence not protuberant; occipital margin more or less acute, not carinate; ocelli forming an angle of about 100°; frontovertex with fairly regular, moderately deep, polygonally reticulate sculpture of mesh size subequal to eye facet, piliferous punctures shallow, distinct and a little larger than eye facet, separated by at least about their own diameters; frontovertex with 7 or 8 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin to gena; temple and gena with longitudinally elongate, polygonally reticulate sculpture; eye reaching occipital margin, with conspicuous, pale setae, each much longer than diameter of facet; scrobes shallow, narrowly ∩-shaped, meeting, weakly margined dorsally and laterally, with similar polygonally reticulate sculpture to frontovertex; interantennal prominence weak, narrowly rounded dorsally, with similar polygonally reticulate sculpture to frontovertex; antenna as in Fig. 1599; scape slightly broadened and flattened, widest above middle, nearly 4X as long as broad; all funicle segments longer than broad, larger and broader distad with F6 subquadrate, linear sensilla present only on F2-F6; clava slightly shorter than F4-F6 combined, sensory area at apex only; malar sulcus absent; clypeal margin slightly, but clearly protuberant medially as a narrow flange; mandible with one tooth and a broad truncation. Relative measurements: HW 104, HH 88, FV 40, POL 20.5, OOL 4.5, OCL 5, AOL 11.5, EL 58, EW 44, MS 23, SL 38, SW 10.

Thorax in dorsal view with pronotum short, largely hidden by head, dorsally with slightly irregular, moderately deep, polygonally reticulate sculpture that is about as deep as sculpture on frontovertex; mesoscutum with polygonally reticulate sculpture that is similar to that on frontovertex; axilla with similar sculpture to mesoscutum but slightly shallower and a little more transversely elongate; scutellum with generally similar sculpture to that on mesoscutum but a little more longitudinally elongate, especially laterally; visible part of mesoscutum about 1.5X as broad as long; scutellum about as long as broad; fore wing with venation and distribution of setae as in Figs 1600, 1602, costal cell with only one line of submarginal setae dorsally; propodeum medially about 0.13X as long as scutellum, with some shallow, irregular, reticulate sculpture. Relative measurements: FWL 112, FWW 46; HWL 75, HWW 22.5.

Gaster with hypopygium reaching about 0.7X to apex; Gt3 without strongly reticulate anteromedian area; syntergum about 0.8X as long as mid tibia, with apex angular, slightly acute; ovipositor slightly exserted, the exserted part about 0.5X as long as mid tibial spur or 0.1X mid tibia; second valvifer with about 12 subapical setae. Relative measurements: OL 87.5, GL 20 [MT 45].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. The holotype was reared from a leaf gall of *Hemitrioza* Crawford (Hemiptera: Triozidae) on *Sideroxylon stenospermum* (Standl.) T.D.Penn (Ericales: Sapotaceae).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Alajuela**, Zarcero, 200m [error for approx. 1700m], ex psyllid gall on *Sideroxylon stenospermum*, iii.1997 (P. Hanson). Holotype in NHMUK.

COMMENTS. *Psyllaephagus korus* is similar to *gyces* and *tyche*, all three species having a protuberant clypeal margin; 1 line of dorsal setae on costal cell and the linea clava partially closed. Apart from the characters given in the key, it can be separated from the two other species by

lacking linear sensilla on F1, the mouth being more than 0.4X head width, the mandible has 1 tooth and a broad truncation, the mesoscutum is shining dark blue and green and similar to the dark blue scutellum and the gaster lacks a distinct, strongly reticulate anteromedian area on Gt3. In both *gyces* and *tyche* all funicle segments have linear sensilla, the mouth is narrower than 0.4X head width and the mandible has 2 teeth and a truncation. In *gyces* both the mesoscutum and scutellum are dull metallic green and in *tyche* the mesoscutum is bright metallic blue contrasting with the relatively dull coppery scutellum and Gt3 of the gaster has a strongly reticulate area anteromedially. See also comments under *kallichoa* (p. 592)

Psyllaephagus tyche **Noyes & Hanson**
(Figs 1603-1608; Hab. ♀ 240)

Psyllaephagus tyche Noyes & Hanson, 1996:127,132-133. Holotype ♀, Costa Rica, NHMUK, examined.

Female (length about 1.8-2.2mm): head relatively dull metallic blue or green, mesoscutum relatively bright metallic blue contrasting with the scutellum which is dull and coppery in basal half and blue apically with only extreme apex about as shiny as mesoscutum; antenna (Fig. 1603) with scape dark brown; flagellum dark brown; tegula dark brown; femora dark brown; tibiae mostly yellow, each with a narrow, subbasal, brown ring; head (Fig. 1607) about 3X as wide as frontovertex and 2.7X as wide as mouth opening; frontovertex with indistinct, shallow piliferous punctures, hardly larger than eye facet; ocelli forming an angle of about 95°; posterior ocellus slightly nearer eye than occipital margin; scrobes shallow, separated from anterior ocellus by at least about 2X length of torulus; antenna (Fig. 1603) with scape about 3.7X as long as broad and slightly longer than width of frontovertex; pedicel about as long as F1; all funicle segments longer than broad; linear sensilla on all segments; clava with segments becoming gradually shorter towards apex which is rounded; clypeal margin (Fig. 1607) slightly convex, protuberant; mandible with two teeth and a truncation; mesoscutum and scutellum (Fig. 1608) with similar reticulate sculpture, but that on scutellum more elongate; scutellum convex; fore wing (Fig. 1604) about 2.3X as long as broad, marginal vein (Fig. 1611) about 2X as long as broad; costal cell with only a single line of setae dorsally, linea calva closed; gaster with a distinct, strongly reticulate anteromedian area on Gt3; ovipositor (Fig. 1605) about 2X as long as mid tibia, slightly exserted, the exserted part about 0.5X as long as mid tibial spur; second valvifer with about 12 or 13 subapical setae. *Male*: unknown.

DISTRIBUTION. Costa Rica (Noyes & Hanson, 1996).

HOSTS. Unknown, but the holotype was collected together with a *Calophya* Löw (Hemiptera: Calophyidae).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, San Vito, Las Cruces, Wilson Botanical Gardens, 1500m, swept with *Calophya* sp. B. Brown and Hodkinson (det. D. Hollis), 18-22.iii.1990 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **San José**, Zurqui de Moravia, 1600m, vii.1990 (P. Hanson). Holotype and paratype in NHMUK.

Non type material. **COSTA RICA**, 2♀, **Heredia**, 16km SSE La Virgen, 10°16'N 85°05'W, 1050-1150m, 11/M/TN, 10.ii-21.iv.2001 (INBio/OET-ALAS). Material in MZUCR and NHMUK.

COMMENTS. See comments under *epulo* (p. 593), *korus* (p. 602) and *moros* (p. 605).

Psyllaephagus moros **sp.nov.**
(Figs 1609-1612)

DIAGNOSIS. *Female* (length about 1.8mm): antenna (Fig. 1609) with scape mostly dark brown;

flagellum brown, F2-F5 ventrally pale orange; tegula dark brown; mid femur dark brown; hind tibia mostly pale orange with a broad subbasal band to about 0.5X long its length; head about 2.6X as wide as frontovertex and about 2.8X as wide as mouth opening; ocelli forming an angle of about 110° with posterior ocellus much closer to eye than to occipital margin; frontovertex with piliferous punctures relatively shallow and small, hardly larger than eye facet; antenna (Fig. 1609) with scape about 3.3X as long as broad and about as long as minimum width of frontovertex; antenna with pedicel slightly longer than F1, all funicle segments very slightly longer than broad except F6 which is quadrate, linear sensilla present on all funicle segments, segments of clava subequal in length, apex narrowly rounded; clypeal margin slightly emarginate, straight; mandible with two teeth and a broad truncation; mesoscutum more shiny than scutellum; scutellum with perhaps very slightly shallower sculpture than mesoscutum; scutellum convex; fore wing (Fig. 1612) about 2.4X as long as broad; costal cell with one line of setae dorsally; marginal vein (Fig, 1611) about 1.5X as long as broad; linea clava closed; gaster with a distinct, strongly reticulate anteromedian area on Gt3; hypopygium Fig, 1610; ovipositor longer than mid tibia and hidden; second valvifer with about 6 or 7 subapical setae. *Male*: unknown.

Female (holotype): length 1.82mm (CPD).

Head with occiput and frontovertex generally dull, metallic dark blue, mixed coppery purple; occipital margin slightly coppery; scrobal area, temple and gena coppery purple to violet, lower part of interantennal prominence and parts of mouth margin marked dark metallic blue; setae on frontovertex, interantennal prominence and gena indistinct, translucent, pale brown; antenna with radicle dark brown; scape dark brown with extreme apex pale orange; pedicel dark brown, extreme apex and venter pale orange; flagellum brown, F2-F5 ventrally marked pale orange; thorax generally dark brown to black; pronotum dorsally mainly coppery with some green reflections, laterally slightly brassy; mesoscutum relatively bright, metallic, dark green, narrowly margined coppery and posteriorly with some violet areas in middle; tegula dark brown with a slight coppery purple sheen; axilla mainly with a coppery purple sheen, mixed with some metallic dark green and brassy; scutellum duller than mesoscutum, medially with a slight coppery and brassy sheen, with some pale green reflections, laterally metallic dark green and brassy, posterior 0.25X metallic dark blue mixed dark green; metanotum with a slight coppery purple lustre; mesopleuron with a slight metallic coppery purple and brassy lustre; all coxae dark brown with a slight violet, dark blue and coppery purple sheen; fore femur dark brown, pale orange at extreme apices, tibia pale orange, with a broad, subbasal, interrupted brown band, tarsus pale orange, distally dusky, apical tarsomere brown; mid femur dark brown, pale orange at apices, tibia pale orange with a narrow, indistinct, interrupted, brown subbasal band, spur pale orange, tarsus pale orange, slightly dusky distally, apical tarsomere pale orange-brown; hind femur dark brown, pale orange at extreme distal apex, tibia mostly pale orange with a broad, dark brown, subbasal band to about 0.5X, tarsus dusky pale orange, darker distally, apical tarsomere brown; wings (Fig. 1612) hyaline; propodeum dark purple-brown, generally with a slight coppery purple and brassy sheen, side with a metallic dark green sheen and with a few translucent, pale brown setae outside spiracle; gaster dark brown, dorsally mainly with a coppery purple sheen, Gt1 with a strong metallic dark blue and dark green sheen, syntergum weakly mixed metallic dark green, side largely metallic green, blue-green blue and copper, venter mainly with a coppery purple sheen with some purple, green, blue and brassy reflections; gonostylus dark brown.

Head about 2.6X as wide as frontovertex and about 2.8X as wide as mouth opening, in profile about 1.7X as high as deep, evenly curved from occipital margin to top of scrobes and then fairly straight to mouth margin, with interantennal prominence hardly protuberant; occipital margin more or less acute, not carinate; ocelli forming an angle of about 110°; frontovertex with regular, moderately deep, polygonally reticulate sculpture of mesh size a little smaller than eye facet, piliferous punctures relatively shallow and small, hardly larger than eye facet; frontovertex with about 5 pairs of setae in front of anterior ocellus, a single line adjacent to eye margin that descends below eye to gena; temple and gena with longitudinally elongate, imbricate-reticulate to polygonally reticulate sculpture; eye reaching occipital margin, with fairly conspicuous, pale setae, each about as long as diameter of facet; scrobes shallow, broadly ∩-shaped, meeting, weakly margined dorsally and laterally, dorsally with shallow, polygonally reticulate sculpture;

interantennal prominence weak, narrowly rounded dorsally, with shallow, polygonally reticulate sculpture; antenna as in Fig. 1609; scape slightly broadened and flattened, widest just above middle, about 3.3X as long as broad; F1-F5 longer than broad, F6 quadrate, linear sensilla present on all segments; clava nearly as long as F4-F6 combined, sensory area slightly enlarged and extending about 0.4X along ventral surface giving at an obliquely truncate appearance; malar sulcus absent; clypeal margin very slightly protuberant medially; mandible with two teeth and a broad truncation. Relative measurements: HW 94, HH 77, FV 35.5, POL 20.5, OOL 2.5, OCL 5, AOL 11, EL 55, EW 45, MS 24, SL 33, SW 10.

Thorax in dorsal view with pronotum short, largely hidden by head, dorsally with slightly irregular, moderately deep, imbricate-reticulate to polygonally reticulate sculpture that is about as deep as sculpture on frontovertex, but generally of larger mesh; mesoscutum with polygonally reticulate sculpture that is similar to that on frontovertex; axilla with shallower sculpture than mesoscutum that is a little more transversely elongate; scutellum generally with polygonally reticulate sculpture that is similar to that on mesoscutum, but more longitudinally elongate, more irregular and perhaps very slightly shallower; visible part of mesoscutum about 1.4X as broad as long; scutellum nearly 1.1X as broad as long; fore wing with venation and distribution of setae as in Figs 1611, 1612, costal cell with only a single line of dorsal setae; propodeum medially about 0.11X as long as scutellum, virtually smooth with some very shallow, irregular, sculpture. Relative measurements: FWL 95, FWW 40.5; HWL 61, HWW 20.5.

Gaster with hypopygium (Fig. 1610) reaching about 0.7X along gaster; Gt3 with a distinct, strongly reticulate area anteromedially; syntergum about 0.8X as long as mid tibia, with apex rounded; ovipositor hidden. Relative measurements: OL 62, GL 12 [MT 39.5].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Alajuela**, RB San Ramon, 900m, v.2000 (P. Hanson). Holotype in NHMUK.

COMMENTS. *Psyllaephagus moros* is similar to *tyche*, in that they both have indistinct piliferous punctures on the frontovertex, the mesoscutum relatively more metallic than the scutellum, a convex scutellum and Gt3 of the gaster has a distinct, strongly reticulate area anteromedially. The two species can be separated using the characters given in the key.

The Mexican species *Psyllaephagus trjapitzini* Myartseva & Martinez Ramírez could run to *moros* in the key if the gaster has a distinct, strongly reticulate anteromedian area on Gt3. It differs in having only a single line of setae on the dorsal surface of the costal cell, uniformly brown funicle segments, scutellum mostly coppery with only sides and extreme apex metallic green, mandible with one tooth and a truncation, slightly exserted ovipositor, exserted part about half length of mid tibial spur. In *moros* there is a partial second line of dorsal setae on the costal cell, the funicle segments are ventrally orange, the scutellum medially has a slight coppery and brassy sheen, with some pale green reflections, laterally metallic dark green and brassy, the mandible has two teeth and truncation, and the ovipositor is hidden.

Psyllaephagus phelys **sp.nov.**

(Figs 1613-1619)

DIAGNOSIS. *Female* (length about 1.7mm): antenna (Fig. 1613) with scape mostly dark brown; flagellum dark brown; tegula dark brown; mid femur brown; hind tibia pale orange with an incomplete, brown, subbasal ring; head (Fig. 1614) about 2.5X as wide as frontovertex and about 3.0X as wide as mouth opening; ocelli forming an angle or about 110°, with posterior ocellus

slightly closer to eye than to occipital margin; frontovertex with piliferous punctures shallow, distinct and clearly larger than eye facet, separated by at least about their own diameters; antenna (Fig. 1613) with scape nearly 4X as long as broad and slightly shorter than minimum width of frontovertex; antenna with pedicel longer than F1, funicle with F1-F4 a little longer than broad, F5 quadrate, F6 transverse, linear sensilla on all funicle segments, segments of clava subequal in length, but becoming shorter towards apex which is rounded; clypeal margin hardly convex and hardly protuberant; mandible with one tooth and a broad truncation; mesoscutum about as shiny as scutellum (Fig. 1615); scutellum convex and with slightly deeper and more longitudinally elongate sculpture than mesoscutum; fore wing (Fig. 1616) about 2.2X as long as broad; costal cell dorsally with only one line of setae; marginal vein (Fig. 1618) about 2X as long as broad; linea clava partially closed; gaster without a distinct, strongly reticulate anteromedian area on Gt3; ovipositor about 1.5X as long as mid tibia and slightly exserted, the exserted part about 0.3X as long as mid tibial spur; second valvifer with about 16-18 subapical setae. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.65mm; excluding ovipositor, 1.61mm (CPD).

Head with occiput and frontovertex dull, metallic dark blue with some purple reflections; scrobal area with a dull purple sheen, slightly more shiny metallic blue-green immediately above interantennal prominence and dark blue between toruli and along mouth margin; temple and gena dull purple mixed with some dark blue; setae on frontovertex, interantennal prominence and gena translucent and pale, brown, almost silvery in some lights; antenna (Fig. 1613) with radicle dark brown; scape mostly dark brown with a slightly purple and dark blue sheen, extreme apex pale orange; pedicel dark brown with extreme apex and venter dusky pale orange; flagellum dark brown; thorax generally dark brown to black; pronotum with copper and dark green reflections; mesoscutum slightly dull, metallic dark blue with some violet reflections; tegula dark brown with a slight coppery purple sheen; axilla dark purple-brown and slightly brassy; scutellum about as shiny as mesoscutum, metallic dark blue and dark green mixed with some violet, slightly coppery on side anteriorly; metanotum with a slight coppery and brassy lustre; mesopleuron with a slight metallic dark green and brassy lustre, with some copper posteriorly; all coxae dark brown with a slight violet, dark blue and green sheen; all femora dark brown with apices pale orange; fore tibia pale orange with an incomplete, brown, subbasal ring, tarsus pale orange, apical tarsomere brown; mid tibia pale orange with an incomplete, brown, subbasal ring, spur and tarsus pale orange, distal tarsomeres slightly dusky, terminal tarsomere brown; hind tibia pale orange with an incomplete, brown, subbasal ring, tarsus pale orange, distal tarsomeres slightly dusky, terminal tarsomere brown; wings (Fig. 1613) hyaline; propodeum dark purple-brown, generally with a slight copper and dark green sheen, side with a metallic blue-green sheen and with a few translucent, pale brown setae outside spiracle; gaster dark brown, dorsally mainly with a coppery purple sheen, Gt1 with a strong metallic green sheen, syntergum mixed metallic dark blue and green, side largely metallic green, blue-green blue and copper, venter mainly with a coppery purple sheen with some purple, green, blue and brassy reflections; gonostylus dark brown

Head (Fig. 1614) about 2.5X as wide as frontovertex and about 3.0X as wide as mouth opening, in profile about 1.9X as high as deep, evenly curved from occipital margin to top of scrobes and then fairly straight to mouth margin, with interantennal prominence not protuberant; occipital margin more or less acute, not carinate; ocelli forming an angle of about 110°; frontovertex with slightly irregular, moderately deep, polygonally reticulate sculpture of mesh size subequal to eye facet, piliferous punctures shallow, distinct and clearly larger than eye facet, separated by at least about their own diameters; frontovertex with 8 or 9 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin to gena; temple and gena with longitudinally elongate, polygonally reticulate sculpture; eye reaching occipital margin, with conspicuous, pale setae, each much longer than diameter of facet; scrobes shallow, narrowly ∩-shaped, meeting, weakly margined dorsally and laterally, with similar polygonally reticulate sculpture to frontovertex; interantennal prominence weak, narrowly rounded dorsally, with similar polygonally reticulate sculpture to frontovertex; antenna as in Fig. 1613; scape slightly broadened and flattened, widest above middle, nearly 4X as long as broad; all funicle segments longer than broad, larger and broader distad, F6 subquadrate; linear sensilla present on all segments; clava slightly shorter than F4-F6 combined, apex appearing rounded but sensory area slightly enlarged

and extending a little way along ventral surface; malar sulcus absent; clypeal margin virtually straight; mandible with one tooth and a broad truncation. Relative measurements: HW 96, HH 78, FV 39, POL 20.5, OOL 3, OCL 4, AOL 10, EL 54.5, EW 43, MS 23, SL 35.5, SW 9.

Thorax (Fig. 1615) in dorsal view with pronotum short, largely hidden by head, dorsally with slightly irregular, moderately deep, polygonally reticulate sculpture that is about as deep as sculpture on frontovertex; mesoscutum with polygonally reticulate sculpture that is similar to that on frontovertex; axilla with similar sculpture to mesoscutum but slightly shallower and a little more transversely elongate; scutellum with generally slightly deeper, more longitudinally elongate sculpture than that on mesoscutum; visible part of mesoscutum about 1.6X as broad as long; scutellum about as long as broad; fore wing with venation and distribution of setae as in Figs 1616, 1618, costal cell dorsally with only one line of submarginal setae; propodeum medially about 0.14X as long as scutellum, with some shallow, irregular, reticulate sculpture. Relative measurements: FWL 98, FWW 44; HWL 65, HWW 19.5.

Gaster with hypopygium (Fig. 1617) reaching about 0.8X along gaster; Gt3 without strongly reticulate anteromedian area; syntergum about 0.7X as long as mid tibia, with apex weakly angular; ovipositor (Fig. 1619) slightly exserted, the exserted part about 0.3X as long as mid tibial spur or a little less than 0.1X mid tibia; second valvifer with about 16-18 subapical setae. Relative measurements: OL 63.5, GL 12.5 [MT 40].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Monteverde, 1760m, v.1988 (B.V. Brown). Holotype in CNC.

COMMENTS. *Psyllaephagus phelys* is very similar to *gyces* and can be separated reliably using the characters given in the key. It is also somewhat similar to *korus* but lacks the protuberant clypeus, has linear sensilla on F1, slightly deeper and more longitudinally elongate sculpture on the scutellum than that on mesoscutum, more slender apically rounded gonostylus and the sculpture on frontovertex is less regular than in *korus*. See also comments under *kallichoa* (p. 592).

The Mexican species *Psyllaephagus trjapitzini* Myartseva & Martinez Ramírez (2003) is very close to *phelys* and could possibly run to *phelys* in the key if the gaster lacks a distinct, strongly reticulate anteromedian area on Gt3. It differs from *phelys* in having OCL more than 2X OOL, F1 subequal to F2 and lacking linear sensilla, the mesoscutum very shiny contrasting strongly with the much duller scutellum and the mid femur as dark as the hind femur. In *phelys,* OCL is about 1.3X OOL, F1 is clearly smaller than F2, all funicle segments have linear sensilla, the mesoscutum and scutellum are similar in colouration and the mid femur much paler brown than the hind femur.

Psyllaephagus gyces **Noyes & Hanson**

(Figs 1620-1625; Hab. ♀ 241)

Psyllaephagus gyces Noyes & Hanson, 1996:126,131-132. Holotype ♀, Costa Rica, NHMUK, examined.

Female (length about 1.2-1.6mm): head and mesoscutum generally dull metallic green or blue with some violet reflections, scutellum generally dull metallic green with apex slightly brighter; antenna (Fig. 1624) with scape mostly dark brown; flagellum brown; tegula dark brown; femora dark brown; tibiae mostly yellow with bases brownish; head (Fig. 1623) about 2.4X frontovertex

width and 2.6X as wide as mouth opening; frontovertex with piliferous punctures deep and conspicuous, largest clearly smaller than ocellus, but all much larger than eye facet; ocelli forming an angle of about 100°; posterior ocellus equidistant from eye and occipital margin; scrobes fairly deep, but separated from anterior ocellus by at least about 2X length of torulus; antenna (Fig. 1624) with scape about 3.7X as long as broad and slightly shorter than width of frontovertex; pedicel slightly longer than F1; funicle segments longer than broad except for F6 which is quadrate, linear sensilla on all segments; clava with segments becoming gradually shorter towards apex which is narrowly rounded; clypeal margin slightly convex, protuberant; mandible with two acute teeth and a truncation, upper tooth short; mesoscutum generally with a dull metallic violet and blue sheen; scutellum with a dull dark coppery purple and metallic blue sheen; mesoscutum and scutellum with similar polygonally reticulate sculpture, but that on scutellum clearly deeper, more sharply defined and more elongate; scutellum convex; fore wing (Fig. 1622) about 2.4X as long as broad, marginal vein (Fig. 1621) about 1.5X as long as broad; costal cell with only a single line of setae dorsally; linea clava more or less open; gaster without a distinct, strongly reticulate anteromedian area on Gt3; ovipositor (Fig. 1620) about 1.7X as long as mid tibia, slightly exserted, the exserted part about 0.5X as long as mid tibial spur to about as long; second valvifer with about 9 or 10 subapical setae. *Male*: unknown.

DISTRIBUTION. Mexico (Trjapitzin et al., 2008), Costa Rica (Noyes & Hanson, 1996).

HOSTS. Reared from *Triozoida limbata* Enderlein (Hemiptera: Triozidae) on guava, *Psidium guajava* L. (Myrtales: Myrtaceae) (see Trjapitzin et al., 2008).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Golfito, 20.iii.1990 (J.S. Noyes). Paratypes: **COSTA RICA**, 2♀, **Puntarenas**, Puerto Jimenez, 8 32'N 83°19'W, 10m, viii.1991 and xi.1991 (P. Hanson). Holotype in NHMUK, paratypes in INBio and NHMUK.

Non type material. **COSTA RICA**, 1♀, **Alajuela**, Aguas Zarcas, La Chiles, café, iii.1990 (P. Hanson); 1♀, Alajuela, PN Volcán Tenorio, Est. El Pilón, 700-800m, #74622, 28.vii.2003 (A. Azofeifa); 2♀, Alajuela, RF Arenal, Sendero Pilón, 600m, LN 269100 457900, 14.x-3.xii.1998 and 17-18.v.1999 (G. Carballo); 1♀, **Puntarenas**, Puerto Jimenez, 8°32'N 83°21'W, 10m, x-xi.1991 (P. Hanson). Material in NHMUK, MZUCR.

COMMENTS. Females of *Psyllaephagus gyces* are very similar to *creusa*, both having deep, conspicuous piliferous punctures on the frontovertex and very similar colouration. Apart from the more extensive brown marking on the hind tibia of *creusa* the two species can be separated on body size, relative size of punctures on the frontovertex, relative position of the ocelli, scutellum sculpture and the ovipositor structure. Females of *gyces* are generally not more than 1.6mm in length, the piliferous punctures on the frontovertex are much smaller than the diameter of an ocellus, the posterior ocellus is equidistant from the occipital margin and eye, the sculpture of the scutellum is clearly deeper than that on the mesoscutum, the darker, coppery purple colouration of the scutellum is limited to the ridges of the cells and the ovipositor is longer than the mid tibia and also slightly exserted. In *creusa* the females are mostly longer than 1.6mm, the piliferous punctures on the frontovertex are mostly subequal in diameter to an ocellus, the posterior ocellus is nearer the occipital margin than the eye, the sculpture of the scutellum is hardly deeper than that on the mesoscutum and the darker coppery purple colouration is not limited to the ridges of the cells and the ovipositor is shorter than the mid tibia and hidden. See also comments under *kallichoa* (p. 592), *xepo* (p. 597), *korus* (p. 602) and *phelys* (p. 607).

Genus *CERCOBELUS* Walker

Cercobelus Walker *in* Haliday, 1842:vi. Type species: *Encyrtus jugaeus* Walker, by monotypy.

Female. Length about 1.1-2.8mm.

Body dark (brown or black) with a weak to moderate metallic sheen; fore wing hyaline or with infuscate areas.

Head oval or spherical in facial view with eye relatively small, not longer than minimum width of frontovertex or hardly so; inner eye margin slightly emarginate; occipital margin sharp from mandibular bases; antenna inserted close to mouth margin; scape about 3.7-6.3X as long as broad; funicle 4segmented; clava 3-segmented; malar sulcus absent; mandible with one very short tooth and a very broad, slightly oblique, sometimes concave truncation with a very finely serrate margin, rarely with 4 very short, obtuse teeth.

Mesoscutum without notaular lines; axillae broadly meeting medially; mid tibial spur very long and longer than basitarsus; fore wing about 2.4-2.5X as long as broad, with marginal vein varying from very short, almost absent, to about 5X as long as broad; postmarginal vein almost absent; setae in basal cell much less dense than in disc; hindwing 3-4X as long as broad.

Gaster somewhat elongate, normally longer than thorax, segments telescopic; hypopygium reaching apex of gaster, generally subtriangular, longitudinally divided and with distinct anterior apodemes, posterior margin sometimes produced as paired lobes medially (Figs 1679, 1686); ovipositor short and not more than 0.5X as long as mid tibia or hardly longer, with a unique, highly modified structure (see Figs 1632, 1638, 1653, 1658, 1669, 1677, 1684); outer plates of the ovipositor connected to enlarged, lateral, subapical lobes of syntergum (see Figs 1634, 1653, 1661, 1674, 1687).

Male. Length about 1.1-1.9mm.

Similar to female, but antenna usually with segments relatively slightly longer and clothed with setae that are longer than diameter of segments; clava entire; genitalia with aedeagus apically very acute and digiti distinct but relatively slender and apically armed with a pair of hooks.

DISTRIBUTION. Probabaly cosmopolitan but recorded from Europe, Africa, India, Indonesia, Australia and central America (Noyes & Hanson, 1996; Noyes, 2019).

HOSTS. *Cercobelus jugaeus* (Walker) has been recorded as a primary parasitoid of *Psyllopsis* Löw (Hemiptera: Liviidae) (see Trjapitzin, 1989). A record of *Psyche* ?*crassiorella* (Bruand, 1851) (Lepidoptera: Psychidae) as the host of the same species (Hansen et al., 2012) requires confirmation.

COMMENTS. *Cercobelus* can be separated quite easily from other genera of encyrtids by the combination of 4-segmented funicle, completely carinate occipital margin, entire mesoscutum and relatively elongate, uniquely structured telescopic gaster with a relatively short ovipositor. It is likely that the telescopic gaster is used to gain access to the nymphs of its host which live within leaf galls formed by their host food plant.

IDENTIFICATION. 12 described species known worldwide including those described as new below. See Noyes & Hanson, 1996 (5 Costa Rican species); Hayat, 2005 (1 Indian species); Trjapitzin, 1989 (1 Palaearctic species).

Key to Costa Rican species of *Cercobelus*
(Females and males)

1. Clava 3-segmented (e.g. Figs 1626, 1642, 1659, 1670) (females) 2
- Clava entire (e.g. Figs 1631, 1643, 1652, 1664) (males) 11

FEMALES

2 (1) Antenna (Figs 1626, 1640, 1655, 1656) with F1 without linear sensilla, at least a little shorter than F2 3
- Antenna (Figs 1659, 1670, 1678, 1680, 1685, 1693) with F1 with linear sensilla, at least as long as F2 5

3 (2) Fore wing (Fig. 1627) completely hyaline; syntergum (Fig. 1634) with numerous, dense pegs on apex, rasp-like ..... *epimetheus* **sp.nov.** (p. 611)
- Fore wing (Figs 1635, 1650) with a distinct infuscate area around stigmal vein; syntergum (Fig. 1653) not apically rasp-like 4

4 (3) Hind tibia dark brown with a well-defined, basal, white band; scape (Figs 1640-1642) more than 4X as long as broad; antennal pedicel at least 1.8X as long as broad; hypopygium (Figs 1645, 1646) completely longitudinally divided medially, about as long as broad with slender, anterior apodemes long and slender .... *adrastea* **sp.nov.** (p. 613)
- Hind tibia entirely brown without a well-defined, basal, white band; scape (Figs 1655, 1656) less than 4X as long as broad; antennal pedicel not more than 1.6X as long as broad; hypopygium (Figs 1648, 1649) transverse, only partially longitudinally divided medially, at least 1.5X as broad as long and without slender anterior apodemes ..... *isara* Noyes & Hanson (p. 614)

5 (2) Antenna (Figs 1559, 1670, 1678) with F4 transverse or subquadrate, less than 1.2X as long as broad 6
- Antenna (Figs 1680, 1685, 1693; Hab. 251) with F4 at least 1.2X as long as broad 8

6 (5) Apical half of fore wing (Fig. 1662) with a distinct elongate, infuscate, wedge-shaped area ..... *sithon* Noyes & Hanson (p. 615)
- Apical half of fore wing (Figs 1672, 1675) generally very weakly infuscate or hyaline 7

7 (6) Fore wing with marginal vein punctiform (Fig. 1671), not longer than broad; spiracle on propodeum relatively small and separated from anterior margin by about its own diameter; hind tibia dark brown with a well-defined, white, basal band .... *pleiades* **sp.nov.** (p. 616)
- Fore wing with marginal vein more than 1.5X as long as broad (Fig. 1676); spiracle on propodeum large and separated from anterior margin by about 0.3X its own diameter; hind tibia entirely brown without a well-defined white band .... *tartarus* **sp.nov.** (p. 617)

8 (5) Fore wing with marginal vein (Fig. 1681) about 5X as long as broad .... *ulixes* Noyes & Hanson (p. 619)
- Fore wing with marginal vein (Figs 1689, 1691; Hab. 251) punctiform, not longer than broad 9

9 (8) Fore wing (Fig. 1688) hyaline with only a small infuscate area adjacent to stigmal vein; hind wing about 3X as long as broad..... *phanes* **sp.nov.** (p. 620)
- Fore wing (Fig. 1691; Hab. 251) with infuscate area extending at least half way across wing below stigmal vein; hind wing more than 3.5X as long as broad 10

10 (9) Scape and flagellum concolourous amber-testaceous; width of head equal to length of pedicel and flagellum combined; fore and mid femora mostly dark brown; propodeum with submedian, longitudinal carinae .... *godoyae* Noyes & Hanson (p. 621)
- Scape pale orange, clearly paler than brown flagellum; width of head less than length of pedicel and flagellum combined; fore and mid femora mostly pale orange; propodeum with a single median longitudinal carina .... *daphne* Noyes & Hanson (p. 622)

MALES

11 (1) Fore wing completely hyaline; head in facial view with eyes kidney-shaped with inner margins strongly concave (similar to Fig. 1630) ..... *epimetheus* **sp.nov.** (p. 611)
- Fore wing with at least area adjacent to stigmal vein infuscate; head in facial view with eyes not kidney-shaped, inner margins weakly concave 12

12 (11) Fore wing with a weak median, longitudinal, infuscate streak distad of apex of venation; costal cell with two lines of ventral setae ..... *sithon* Noyes & Hanson (p. 615)
- Fore wing hyaline distad of apex of venation; costal cell with only a single line of setae ventrally in distal half 13

13 (12) Hind tibia entirely brown without a well-defined, basal, white band .... *isara* Noyes & Hanson (p. 614)
- Hind tibia dark brown with a well-defined, basal, white band 14

14 (13) Flagellum clothed in setae that are more than 2X as long as diameter of segments, mesoscutum bright metallic green, scutellum coppery .... *adrastea* **sp.nov.** (p. 613)
- Flagellum clothed in setae that are shorter than diameter of segments; mesoscutum and scutellum hardly shiny, more or less black ..... *ulixes* Noyes & Hanson (p. 619)

***Cercobelus epimetheus* sp.nov.**
(Figs 1626-1634; Hab. ♀ 242, ♂ 243)

DIAGNOSIS. *Female* (length about 1.9-2.0mm): antenna (Fig. 1626) with scape pale orange; wings (Fig. 1627) hyaline; all coxae dark brown; fore and mid femora mostly dark brown; hind tibia largely dark brown, distinctly white at base; scape (Fig. 1626) about 3.7X as long as broad; pedicel about 1.6X as long as broad; F1 quadrate, F2-F4 slightly longer than broad; F1 without linear sensilla; mandible (Fig. 1630) with 1 very short obtuse tooth and a broad truncation with a finely serrate margin; fore wing with marginal vein (Fig. 1628) punctiform; hind wing about 4X as long as broad; propodeum medially with irregular sculpture, spiracle separated from anterior margin of propodeum by about 0.7X its own diameter; apex of syntergum (Fig. 1634) rasp-like; hypopygium (Fig. 1629) not longitudinally divided and with short anterior apodemes. *Male* (length about 1.6-1.8mm): hind tibia brown with a well-defined white, basal band; fore wing hyaline; head in facial view with eyes kidney-shaped; setae on funicle about 2X as long as diameter of segments (Fig. 1631); costal cell of fore wing mostly with a single line of setae ventrally.

Female (holotype): length 1.95mm (CPD).

Head black and slightly shiny, interantennal prominence with a weak purple sheen; radicle pale orange mixed dark brown; antenna (Fig. 1626) with scape pale orange, slightly dusky proximally; pedicel largely pale orange, dark brown proximally; flagellum pale orange, but slightly dusky dorsally, terminal segment of clava slightly dusky; maxillary palpus white; thorax black and slightly shiny; mesoscutum and tegula with a dull dark blue and weak purple sheen; axilla slightly shiny; scutellum shiny with a brassy and very weak purple sheen, very weakly green at extreme apex; mesopleuron with a weak purple and brassy sheen; all coxae very dark brown; fore femur dark brown, extreme apices pale orange, tibia dark brown, apices pale orange, tarsus orange-brown, basitarsus pale orange; mid femur with proximal 0.4X white, apex very dark brown, tibia with proximal 0.4X white, apex very pale orange, remainder very dark brown, spur white, tarsus with proximal 3 tarsomeres white, apical tarsomeres dark brown; hind femur very dark brown, tibia with proximal 0.3X white, remainder very dark brown, tarsus very dark brown; wings (Fig. 1627) hyaline; propodeum dark brown and slightly shiny; gaster dark brown, slightly shiny with a weak purple sheen, with some coppery, green and blue reflections; gonostylus dark brown.

Head (Fig. 1630) about 1.6X as wide as frontovertex, in profile about 1.8X as high as deep, more or less evenly convexly rounded from occipital margin to top of scrobes, then straight to

mouth margin; occipital margin sharp, carinate; ocelli forming an angle of about 130°; frontovertex shiny, in ocellar area with moderately deep, regular, polygonally reticulate sculpture of mesh size subequal to eye facet, of larger mesh in front of anterior ocellus; temple with longitudinally elongate, polygonally reticulate to striate sculpture; gena with shallow, polygonally reticulate sculpture; eye separated from occipital margin by about 1.5X diameter of posterior ocellus or 5X diameter of facet, slightly kidney shaped with inner margin sinuate, clothed with inconspicuous, sparse, pale setae that are each a little longer than diameter of facet; scrobes shallow, broadly ∩-shaped, virtually smooth but with shallow, polygonally reticulate sculpture; interantennal prominence weak, dorsally rounded, with moderately deep, polygonally reticulate sculpture; lower margin of torulus about level with lower eye margin; antenna as in Fig. 1626; scape slightly broadened, about 3.7X as long as broad; pedicel about 1.6X as long as broad; F1 more or less quadrate, relatively small, F2-F4 slightly longer than broad, linear sensilla present only on F2-F4; clava slightly longer than F2-F4 combined; clypeal margin slightly protuberant medially, tentorial pit clearly visible below torulus. Relative measurements: HW 92, HH 78, FV 58, POL 26, OOL 16, OCL 9, AOL 11, EL 49, EW 29, MS 13, SL 33.5, SW 9.

Thorax in dorsal view with pronotum slightly elongate, a large part visible behind head, with posterior margin hardly concave; pronotum with fairly regular, polygonally reticulate sculpture, of mesh size similar to that in ocellar area, but conspicuously shallower; mesoscutum with similar sculpture to that on frontovertex in front of anterior ocellus; axilla with transversely elongate, polygonally reticulate sculpture of similar mesh size and depth to that on pronotum; scutellum with irregular, polygonally reticulate sculpture of similar mesh size to that on mesoscutum, but conspicuously shallower, apex and side virtually completely smooth and shiny; visible part of mesoscutum about 1.6X as broad as long and medially very nearly 2X as long as pronotum; scutellum about as broad as long; fore wing with venation and distribution of setae as in Figs 1627, 1628; marginal vein punctiform; propodeum medially about 0.23X as long as scutellum and virtually smooth, with very shallow, irregular, sculpture, spiracle separated from anterior margin of propodeum by about 0.7X its own diameter. Relative measurements: FWL 109.5, FWW 44; HWL 77, HWW 19.5.

Gaster very slightly shorter than thorax, syntergum about 0.5X as long as mid tibia, apex tapering, acute and with dense, short, peg-like structures forming a rough, rasp-like structure (Fig. 1634).

Paratype. Mandible with 1 very short more or less obtuse tooth and a broad truncation with a finely serrate edge; hypopygium (Fig. 1629) not longitudinally divided and with short anterior apodemes; ovipositor Fig. 1632. Relative measurements: OL 56.5 [MT 120].

Variation. Females vary in overall length from 1.87-1.95mm, the flagellum may be completely pale brown, otherwise very little variation in material available.

Male: length 1.61-1.68mm (CPD).

Generally very similar to female but for structure of antenna (Fig. 1631) and genitalia (Fig. 1633). Eye relatively shorter, about 1.7X as long as malar space with straight inner margin; hind tibia brown with a well-defined white, basal band; fore wing hyaline; head in facial view with eyes kidney-shaped; setae on funicle (Fig. 1631) about 2X as long as diameter of segments; costal cell of fore wing mostly with a single line of setae ventrally; gaster without rasp-like structure on apex of syntergum. Relative measurements: AL 48.5, MT 113.5.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/TN, iii.2002 (INBio-OET-ALAS). Paratypes: **COSTA RICA**, 2♀, 2♂, **Heredia**, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/NOTN, iii.2002 and iv.2002 (INBio-OET-ALAS); 1♂, Heredia, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/TN, iv.2002 (INBio-OET-ALAS). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

COMMENTS. Probably the easiest species of the genus to identify because of the presence of the rasp-like structure on the apex of the syntergum. This appears to be unique within the Encyrtidae

***Cercobelus adrastea* sp.nov.**
(Figs 1635-1646; Hab. ♀ 244, ♂ 245)

DIAGNOSIS. *Female* (length about 1.2-1.5mm): scape dark brown; wings largely hyaline, but fore wing (Figs 1635, 1639) weakly infuscate below apex of venation; all coxae dark brown; fore femur dark brown, mid femur dark brown and white; hind tibia dark brown with a distinct white basal band; antenna (Figs 1640-1642) with scape about 4.3X as long as broad; pedicel about 2.1-2.3X as long as broad; antenna without linear sensilla on F1; all funicle segments slightly longer than broad; F1 subequal to F2 or slightly smaller; mandible (Fig. 1637) with 1 very short, acute tooth and a broad, slightly oblique, truncation with a distinctly serrate margin; fore wing (Figs 1635, 1639) with marginal vein about 2X as long as broad; hind wing about 4X as long as broad; propodeum (Fig. 1636) medially smooth, spiracle separated from anterior margin of propodeum by about 0.5X its own diameter; apex of syntergum smooth; hypopygium (Figs 1645, 1646) completely longitudinally divided, with long anterior apodemes. *Male* (length about 1.1-1.2mm): fore wing mostly hyaline but infuscate below apex of venation; hind tibia brown with a well-defined white, basal band; head in facial view with inner margins of eyes weakly concave; setae on funicle (Fig. 1643) 2X as long as diameter of segments; costal cell of fore wing with a single line of setae ventrally.

Female (holotype): length, including ovipositor, 1.42mm; excluding ovipositor, 1.37mm (CPD).

Head black and slightly shiny, generally with a distinct coppery sheen, frontovertex with some dull, metallic, dark green reflections; antenna (Fig. 1640) with radicle dark brown; scape dark brown, extreme apex pale orange; pedicel brown with extreme apex and venter pale orange; funicle orange-brown; clava brown; maxillary palpus white; thorax black and slightly shiny; pronotum with coppery and dull, dark green reflections; mesoscutum with a moderate blue-green sheen; tegula with a coppery purple sheen; axilla and scutellum shiny with a coppery sheen, apex and side of scutellum metallic green and brassy; mesopleuron with a weak coppery purple sheen; all coxae dark brown; fore femur dark brown, tibia dark brown, pale orange at extreme apices, tarsus dark brown; mid femur with proximal 0.3X white, extreme apex white, remainder dark brown, tibia with extreme base white, apical 0.2X pale orange, remainder dark brown, spur pale yellow, tarsus pale orange, apical tarsomere brown; hind femur with extreme base white, remainder dark brown, tibia with extreme base white, remainder dark brown, tarsus dark brown; wings largely hyaline, but fore wing infuscate below marginal and stigmal veins to about half way across wing (Fig. 1635); propodeum dark brown and moderately shiny, side with a weak coppery purple and green sheen; gaster dark brown, moderately shiny with a slight coppery purple sheen with brassy, purple, blue and green reflections; gonostylus dark brown.

Head (Fig. 1637) about 1.5X as wide as frontovertex, in profile about 1.8X as high as deep, convexly rounded from occipital margin to top of scrobes, then virtually straight mouth margin; occipital margin sharp, carinate; ocelli forming an angle of about 125°; frontovertex shiny, with moderately deep, polygonally reticulate sculpture of mesh size generally larger than eye facet; temple and gena with longitudinally elongate, polygonally reticulate to striate sculpture; eye separated from occipital margin by about 1.5X diameter of posterior ocellus, or about 2.5X diameter of facet, with inner margin not sinuate, clothed with fairly conspicuous, sparse, pale setae that are about as long as diameter of facet; scrobes shallow, ∩-shaped, quite smooth; interantennal prominence weak, dorsally rounded, with very shallow, polygonally reticulate sculpture; torulus with its upper margin a little below lower eye margin; antenna as in Fig. 1640; scape hardly broadened, about 4.3X as long as broad; pedicel about 2.3X as long as broad; all funicle segments slightly longer than broad, subequal in length but becoming slightly broader distad, linear sensilla present on F2-F4; clava nearly as long as funicle; clypeal margin broadly and weakly emarginate medially, tentorial pit visible below torulus. Relative measurements: HW 60, HH 55, FV 40, POL 17, OOL 9, OCL 3.5, AOL 9, EL 30, EW 20, MS 21, SL 30, SW 7.

Thorax (Fig. 1636) in dorsal view with pronotum hardly elongate, partly visible behind head, with posterior margin clearly and evenly concave; pronotum with shallow, polygonally reticulate sculpture, of smaller mesh size to that in ocellar area and clearly much shallower, side with transversely elongate reticulate sculpture of larger mesh; mesoscutum with similar sculpture to that on frontovertex in front of anterior ocellus, but a little shallower; axilla with similar sculpture to dorsal part of pronotum; scutellum with irregular, relatively coarse, polygonally reticulate sculpture that is slightly shallower than that on mesoscutum, especially at apex and side where it is virtually completely smooth and shiny; visible part of mesoscutum about 1.3X as broad as long, medially about 4X as long as pronotum; scutellum about 1.1X as long as broad; fore wing with venation and distribution of setae as in Figs 1635, 1639; propodeum (Fig. 1636) medially about 0.24X as long as scutellum, smooth and shiny. Relative measurements: FWL 77, FWW 32.5; HWL 54.5, HWW 13.5.

Gaster slightly longer than thorax, last tergite about 0.5X as long as mid tibia, with apex truncate and slightly medially invaginate; ovipositor slightly exserted, the exserted part about 0.3X as long as mid tibial spur or 0.1X mid tibia.

Paratype. Mandible with 1 very short, hardly acute tooth and a broad, slightly oblique, truncation with a distinctly serrate margin; hypopygium (Fig. 1645) completely longitudinally divided, with long anterior apodemes; ovipositor (Fig, 1638). Relative measurements: OL 39 [MT 76].

Variation. Females vary in overall length from 1.29-1.44mm, the pedicel may be about 2.1-2.3X as long as broad; F1 may be subequal to F2 or distinctly smaller, the funicle segments vary from all being quadrate to all being distinctly longer than broad, the longest up to 1.5X as long as broad (Figs 1640-1642), otherwise little variation noted in type series.

Male (length 1.10-1.24mm).

Generally very similar to female in all respects except for structure of antenna (Fig. 1643) and genitalia (Fig. 1644). Eye separated from occipital margin by about diameter of posterior ocellus; antenna with scape slightly broadened and flattened, only about 3X as long as broad; all funicle segments at least 2X as long as broad, clothed dorsally with long setae, each of which is at least about 2X as long as diameter of segments, clava entire; phallobase with a single apical hook on each digitus, aedeagus about 0.5X as long as mid tibia and apical very acutely pointed. Relative measurements: AL 35, MT 76.5.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Est. Altamira, Cerro Quemado, LS 336200 575560, 2279m, #64572, 16.viii-16.ix.2001 (D. Rubí). Paratypes: **COSTA RICA**, 1♀, **Heredia**, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/TN, ii.2002 (INBio-OET-ALAS); 1♀, Heredia, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/NOTN, iii.2002 (INBio-OET-ALAS); 3♀, Heredia, Est. La Esperanza, 2500m, 24.iii.2002 (J. Azofeifa); 1♂, **Cartago**, PN Tapanti, 1200-1500m, 9°45'N 83°47'W, 20.iii-10.iv.2000 (C. Hansson, D. Rubí); 3♀, Cartago, Genesis II, 4km NE Cañon, 2350m, ii.1995, iii.1995 and v.1995 (P. Hanson); 4♀, 1♂, **Puntarenas**, same data as holotype but various dates 17.v.2001-13.i.2002; 1♀, **Limón**, Bratsi, Cerro Nai, LS 352300 564950, 3129m, #59118, 20.vii-20.viii.2000 (M. Alfaro). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

COMMENTS. *Cercobelus adrastea* is very similar to *isara* but can be reliably separated using the characters in the key.

Cercobelus isara **Noyes & Hanson**

(Figs 1647-1656; Hab. ♀ 246)

Cercobelus isara Noyes & Hanson, 1996:108-109. Holotype ♀, Costa Rica, NHMUK, examined.

DIAGNOSIS. *Female* (length about 1.1-1.4mm): scape (Figs 1655, 1656) dark brown; scutellum black mainly with a coppery purple sheen; all coxae dark brown; legs mostly dark brown with mid femur white at base and mid tarsus largely white to pale yellow; hind tibia dark brown without a white basal area; fore wing (Figs 1650, 1651) weakly infuscate below marginal and stigmal veins, otherwise more or less hyaline; mandible with one small acute tooth and a broad, straight, truncation with a serrate margin; scrobes shallow, but distinct and meeting dorsally; antenna (Figs 1655, 1656) with scape about 3.7X as long as broad; pedicel about 1.5X as long as broad; funicle without linear sensilla on F1; F1 smaller than F2, all funicle segments quadrate or transverse; clava about as long as funicle; mesoscutum at least 3X as long as pronotum medially in dorsal view (Fig. 1654); marginal vein (Fig. 1651) about 1.5X as long as broad and touching anterior wing margin; hind wing nearly 4X as long as broad; propodeum (Fig. 1654) about one-fifth as long as scutellum and virtually smooth medially, spiracle about its own diameter from anterior margin; gaster slightly shorter than thorax; apex of syntergum smooth; hypopygium (Figs 1648, 1649) not longitudinally divided with very short anterior apodemes; ovipositor Fig. 1653). *Male* (length about 1.4-1.9mm): fore wing completely hyaline; hind tibia brown without a white, basal band; antenna (Fig. 1652) with all funicle segments longer than broad and clothed in setae that are about 2X as long as diameter of segments, otherwise similar to female; costal cell of fore wing with a single line of setae ventrally; genitalia Fig. 1647.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, San Vito, Est. Las Alturas, 1500m, i.1992 (P. Hanson). Paratypes: **COSTA RICA**, 1♂, **Guanacaste**, Volcán Cacao, Cerro Pedregal, 1000m, ii-iv.1989 (I.D. Gauld); 2♀, **San José**, Zurqui de Moravia, 1600m, iii.1992 and v.1994 (P. Hanson);1♂, same data as holotype but xi.1991 (P. Hanson, C. Godoy); 1♂, same data as holotype. Holotype in NHMUK, paratypes in INBio and NHMUK.

Non type material. **COSTA RICA**, 3♀, **San José**, Zurqui de Moravia, 1600m, vi-vii.1994, iv.1995 and viii.1995 (P. Hanson); 1♀, **Cartago**, Genesis II, 4km NE Cañon, 2350m, ii.1995 (P. Hanson); 1♀, Cartago, PN Tapanti, 1200-1500m, 9°45'N 83°47'W, 20.iii-10.iv.2000 (C. Hansson, D. Rubí). Material in MZUCR and NHMUK.

COMMENTS. See comments under *adrastea* (p. 613).

***Cercobelus sithon* Noyes & Hanson**

(Figs 1657-1666; Hab. ♀ 247, ♂ 248)

Cercobelus sithon Noyes & Hanson, 1996:109-110. Holotype ♀, Costa Rica, NHMUK, examined.

DIAGNOSIS. *Female* (length about 1.9-2.1mm): scape orange; scutellum black with a brassy sheen; fore and hind coxa mostly pale orange; legs largely pale orange with hind femur apically brown and hind tibia mostly dark brown with a white basal ring; fore wing (Fig. 1662) with an interrupted dark brown fascia from stigmal vein to posterior margin and with an elongate wedge-shaped mark beyond this to wing apex; scrobes shallow, but distinct and meeting dorsally; antenna (Fig. 1659) with scape about 4.3X as long as broad; pedicel about 1.4X as long as broad; F1 with linear sensilla; F1 slightly longer than broad and longer than any other funicle segment, F2-F4 quadrate; clava about as long as F2-F4 combined; mandible (Fig. 1666) with a weak, virtually absent, lower tooth and a broad, almost straight truncation with margin weakly serrate; mesoscutum about one-third longer than pronotum medially in dorsal view; marginal vein punctiform (Fig. 1665) and touching anterior wing margin; hind wing nearly 4X as long as broad; propodeum about one-third as long as scutellum, virtually smooth, but with shallow, irregular sculpture in posterior half and with a pair of very shallow, inconspicuous, anteriorly

diverging carinae medially, spiracle separated from anterior margin by about 0.5X its diameter; gaster slightly shorter than thorax; apex of syntergum smooth; syntergum with subapical, lateral extensions, apex smooth; hypopygium (Fig. 1660) triangular, longitudinally medially divided, anterior apodemes short; ovipositor Fig. 1658. *Male* (length about 1.8-2.0mm): antenna (Fig. 1664) with all funicle segments longer than broad and clothed in setae that are at least 2X as long as diameter of segments, otherwise similar to female but with fore wing infuscation (Fig. 1663) a little weaker.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Guanacaste NP, 950m, 13.ii.1995 (J.S. Noyes). Paratypes: **COSTA RICA**, 3♂, **Guanacaste**, Guanacaste NP, Cacao, 950-1200m, 13.ii.1995 (L. Masner); 1♂, **Puntarenas**, Monteverde, St Luis Valley, 17.viii.1986 (L. Masner). Holotype in NHMUK, paratypes in INBio, NHMUK and CNC.

Non type material. **COSTA RICA**, 2♀, **Guanacaste**, Est. Cacao (ACG), 1100m, 26.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Est. Cacao (ACG), LN 323150 375500 1000-1150m, vii.1996 (A. Masis); 2♂, Guanacaste, Est. Cacao (ACG), 10°55'N 85°30'W, 1100m, 19-20.ii.2003 (J.S. Noyes). Material in NHMUK and MZUCR.

COMMENTS. The scutellum and axilla are more or less black with a brassy lustre and not coppery purple as in the original description.

Cercobelus pleiades sp.nov.

(Figs 1667-1674)

DIAGNOSIS. *Female* (length about 2.5mm): scape orange-brown; fore wing (Fig. 1672) largely hyaline, but weakly infuscate below apex of venation and towards apex; all coxae dark brown; fore and mid femora mostly dark brown; hind tibia dark brown with a distinct white basal band; antenna (Fig. 1670) with scape about 4.2X as long as broad; pedicel about 1.4X as long as broad; antenna with linear sensilla on F1; all funicle segments longer than broad, F1 longer than F2; mandible (Fig. 1668) with 2 very short, sharp teeth and a broadly truncate, short upper tooth with a weakly serrate margin; fore wing with marginal vein punctiform (Fig. 1671); hind wing about 3.7X as long as broad; propodeum (Fig. 1667) medially with irregular sculpture, spiracle separated from anterior margin of propodeum by about its own diameter; apex of syntergum smooth; hypopygium (Fig. 1673) triangular, completely longitudinally divided, with short anterior apodemes. *Male*: unknown.

Female (holotype): length, including ovipositor, 2.51mm; excluding ovipositor, 2.42mm (CPD).

Head black and slightly shiny, generally with a very weak coppery purple sheen, occipital margin distinctly coppery purple; antenna (Fig. 1670) with radicle dark brown; scape, pedicel and flagellum orange-brown, pedicel proximally dark brown; clava brown; maxillary palpus orange-brown; thorax black and slightly shiny; mesoscutum with a dull dark blue sheen with some coppery purple; tegula with a weak purple sheen; axilla slightly shiny with a weak coppery purple sheen; scutellum shiny, with a weak coppery sheen, apex and side brassy; mesopleuron with a weak coppery purple sheen; all coxae dark brown; fore femur dark brown, extreme apex orange-brown, tibia largely dusky pale orange with an incomplete, broad, diffuse brown band, tarsus dorsally dark brown, ventrally dusky pale orange; mid femur dark brown with a narrow, subbasal, white ring, extreme apex dusky pale orange, tibia dark brown with an indistinct, narrow, dusky pale orange, subbasal ring, spur and tarsus pale yellow, two apical tarsomeres dark brown; hind leg dark brown, tibia narrowly white basally; wings largely hyaline, but fore wing (Fig 1672) generally infuscate distally from distal margin of linea calva, most strongly so below marginal and stigmal veins and along anterior wing margin; propodeum dark brown and moderately shiny,

side relatively dull; gaster dark brown, moderately shiny with a slight coppery sheen with brassy, purple, blue and green reflections; gonostylus dark brown.

Head (Fig. 1668) about 1.6X as wide as frontovertex, in profile about 1.7X as high as deep, more or less evenly, convexly rounded from occipital margin to top of scrobes, then virtually straight mouth margin; occipital margin sharp, carinate; ocelli forming an angle of about 130°; frontovertex shiny, with moderately deep, polygonally reticulate sculpture of mesh size subequal to, or larger than, eye facet, of larger mesh in front of anterior ocellus; temple and gena with longitudinally elongate, polygonally reticulate to striate sculpture; eye separated from occipital margin by about 0.8X diameter of posterior ocellus, or about 3.5X diameter of facet, with inner margin not sinuate, clothed with fairly conspicuous, pale setae that are clearly longer than diameter of facet; scrobes absent, area immediately above toruli smooth; interantennal prominence extremely, weak, with very shallow, polygonally reticulate sculpture; upper margin of torulus very slightly below lower eye margin; antenna as in Fig. 1670; scape hardly broadened, about 4.2X as long as broad; pedicel about 1.4X as long as broad; all funicle segments slightly longer than broad, F1 clearly longest, remainder becoming slightly larger and broader distad, linear sensilla present on all segments; clava about as long as F2-F4 combined; clypeal margin deeply and broadly emarginate medially, tentorial pit visible below torulus; mandible (Fig. 1668) with 2 very short, sharp teeth and a broadly truncate, short upper tooth with a weakly serrate margin. Relative measurements: HW 93, HH 81, FV 57, POL 26, OOL 12.5, OCL 8.5, AOL 13, EL 44, EW 32, MS 26.5, SL 33, SW 8.

Thorax (Fig. 1667) in dorsal view with pronotum slightly elongate, conical, a large part visible behind head, with posterior margin weakly, but fairly evenly concave; pronotum with very shallow, polygonally reticulate sculpture, of similar mesh size to that in ocellar area, but clearly much shallower, side with transversely elongate reticulate sculpture of larger mesh; mesoscutum with similar sculpture to that on frontovertex in front of anterior ocellus, but very slightly shallower; axilla and most of scutellum with similar sculpture to dorsal part of pronotum, apex and side of scutellum virtually completely smooth and shiny; visible part of mesoscutum about 1.6X as broad as long and medially about 1.5X as long as pronotum; scutellum about 1.1X as long as broad; fore wing with venation and distribution of setae as in Figs 1671, 1672; propodeum (Fig. 1667) medially about 0.42X as long as scutellum, anterior part smooth, but with a broad, median Λ-shaped area enclosing irregular sculpture, this extending laterally along posterior margin. Relative measurements: FWL 118.5, FWW 46.5; HWL 82, HWW 22.

Gaster slightly longer than thorax, syntergum (Fig. 1674) about 0.5X as long as mid tibia, with apex broadening subapically, narrowly rounded at apex smooth; hypopygium (Fig. 1673) triangular, completely longitudinally divided, with short anterior apodemes; ovipositor (Fig. 1669) slightly exserted, the exserted part about 0.3X as long as mid tibial spur or 0.1X mid tibia. Relative measurements: OL 36 [MT 67].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Zurqui de Moravia, 1600m, ii.1995 (P. Hanson). Holotype in NHMUK.

Cercobelus tartarus **sp.nov.**

(Figs 1675-1679)

DIAGNOSIS. *Female* (length about 2.3mm): scape mostly pale orange; wings mostly hyaline, but fore wing (Figs 1675, 1676) weakly infuscate below apex of venation; all coxae dark brown; fore and mid femora mostly dark brown; hind tibia dark brown without a distinct white basal band; antenna (Fig. 1678) with scape about 4.4X as long as broad; pedicel about 1.6X as long as broad;

funicle segments slightly longer than broad; antenna with or without linear sensilla on F1; F1 subequal to F2; mandible with 1 short, obtuse tooth and a broad truncation with a weakly serrate margin; fore wing (Fig. 1676) with marginal vein about 2X as long as broad; hind wing about 3.5X as long as broad; propodeum with a longitudinal, median carina, spiracle separated from anterior margin of propodeum by about 0.15X its own diameter; apex of syntergum smooth; hypopygium (Fig. 1679) completely longitudinally divided, with moderately long anterior apodemes. *Male*: unknown.

Female (holotype): length, including ovipositor, 2.32mm; excluding ovipositor, 2.18mm (CPD).

Head black and slightly shiny, parts of interantennal prominence and gena with a weak coppery purple sheen; antenna (Fig. 1678) with radicle dark brown; scape pale orange, brown on dorsal margin proximally; pedicel largely pale orange, dark brown proximally; flagellum pale orange, but proximal segments slightly dusky dorsally, terminal segment of clava slightly dusky; maxillary palpus pale orange; thorax black and slightly shiny; mesoscutum and tegula with a dull dark green and weak purple sheen; axilla slightly shiny with a weak purple sheen; scutellum shiny with a brassy and very weak purple sheen; mesopleuron with a weak purple and brassy sheen; all coxae dark brown; fore femur dark brown, extreme apices pale orange, tibia dark brown, apices pale orange, tarsus pale orange, apical tarsomeres dusky; mid femur and tibia narrowly pale orange proximally, broadly dark brown medially and pale orange at apex, spur white, tarsus white to very pale yellow, apical tarsomere dark brown; hind leg dark brown with only extreme apex of tibia and proximal tarsomeres slightly paler dark orange-brown; wings virtually hyaline, but fore wing (Fig. 1675) with a narrow, infuscate area extending about half way across wing from marginal and stigmal veins; propodeum dark brown and slightly shiny; gaster dark brown, moderately shiny with brassy, purple and green reflections; gonostylus dark brown.

Head about 1.9X as wide as frontovertex, in profile about 1.8X as high as deep, more or less evenly, convexly rounded from occipital margin to top of scrobes, then hardly curved to mouth margin; occipital margin sharp, carinate; ocelli forming an angle of about 120°; frontovertex shiny, in ocellar area with moderately deep, regular, polygonally reticulate sculpture of mesh size subequal to eye facet, of larger mesh in front of anterior ocellus; temple with longitudinally elongate, polygonally reticulate to striate sculpture; gena with polygonally reticulate sculpture, more longitudinally elongate posteriorly; eye separated from occipital margin by about 0.3X diameter of posterior ocellus, or about 1.5X diameter of facet, with inner margin hardly sinuate, clothed with fairly conspicuous, pale brown setae that are each a little longer than diameter of facet; scrobes shallow, ∩-shaped, meeting, virtually smooth but with shallow, polygonally reticulate sculpture; interantennal prominence weak, dorsally rounded, with moderately deep, polygonally reticulate sculpture; upper margin of torulus about level with lower eye margin; antenna as in Fig. 1678; scape slightly broadened, about 4.4X as long as broad; pedicel about 1.6X as long as broad; funicle segments subequal, all slightly longer than broad, becoming slightly broader distad, linear sensilla present on all funicle segments; clava about as long as F2-F4 combined; tentorial pit visible below torulus; mandible with 1 short, more or less obtuse tooth and a broad truncation with a weakly serrate margin. Relative measurements: HW 100, HH 85, FV 53, POL 26.5, OOL 9.5, OCL 7, AOL 13.5, EL 54, EW 38, MS 31, SL 39.5, SW 9.

Thorax in dorsal view with pronotum slightly elongate, a large part visible behind head, with posterior margin moderately concave, more strongly so laterally, weakly so medially; pronotum with shallow, polygonally reticulate sculpture, of smaller mesh size than that in ocellar area, and conspicuously shallower; mesoscutum with similar sculpture to that on frontovertex in front of anterior ocellus, but of slightly larger mesh size; axilla with slightly transversely elongate, polygonally reticulate sculpture of similar mesh size and depth to that on pronotum; scutellum with irregular, imbricate-reticulate to polygonally reticulate sculpture of similar mesh size to that on mesoscutum, but conspicuously shallower, apex and side virtually completely smooth and shiny; visible part of mesoscutum about 1.4X as broad as long and medially about 4X as long as pronotum; scutellum about 1.1X as long as broad; fore wing with venation and distribution of setae as in Figs 1675, 1676; marginal vein about 2X as long as broad; propodeum medially about 0.17X as long as scutellum, with a median, longitudinal carina and two, shallow, submedian carinae, otherwise virtually completely smooth, spiracle separated from anterior margin by about

0.15X its own diameter. Relative measurements: FWL 107.5, FWW 43.5; HWL 73, HWW 21.

Gaster very slightly longer than thorax, syntergum about 0.6X as long as mid tibia, with apex broadening, truncate and smooth; hypopygium (Fig. 1679) about 1.2X as long as broad, longitudinally divided with moderately long anterior apodemes; ovipositor (Fig. 1677) exserted, the exserted part about 0.6X as long as mid tibial spur or 0.2X as long as mid tibia. Relative measurements: OL 51.5 [MT 110].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (JS. Noyes). Holotype in NHMUK.

COMMENTS. Females of *Cercobelus tartarus* are very similar to those of *godoyae*. Apart from the relatively shorter funicle segments (see key), *tartarus* can be separated from *godoyae* by having the marginal vein of the fore wing more than 2X as long as broad and the hypopygium less slender with the posterior lobes strongly delimited from the anterior part by a deep invagination that is about half as deep as width of lobe. In *godoyae* the marginal vein is punctiform, and the hypopygium is more slender, about 1.4X as long as broad, with the posterior lobes hardly delimited from the anterior part with an invagination that is not more than about 0.1X as wide as lobe.

Cercobelus ulixes Noyes & Hanson

(Figs 1680-1682; Hab. ♀ 249)

Cercobelus ulixes Noyes & Hanson, 1996:108,110. Holotype ♀, Costa Rica, NHMUK, examined.

DIAGNOSIS. *Female* (length about 2.7mm): scape dark brown; scutellum black mainly with a weak brassy sheen; all coxae dark brown; legs largely dark brown with fore and mid tibiae and tarsi mostly pale orange, mid tibia with a white subbasal band, hind tibia white at base; fore wing (Fig. 1682) conspicuously infuscate from linea calva to apex with a hyaline area in disc at apex of stigmal vein and another opposite on posterior wing margin; scrobes short and shallow, not meeting dorsally; antenna (Fig. 1680) with scape about 6.3X as long as broad; pedicel about 2.4X as long as broad; F1 with linear sensilla and slightly longer than F2; funicle with all segments clearly longer than broad; clava very slightly shorter than F2-F4 combined; mandible with one small acute tooth and a broad, straight, truncation with a serrate margin; mesoscutum slightly shorter than pronotum medially in dorsal view; marginal vein (Fig. 1681) 4-5X as long as broad and touching anterior wing margin; propodeum about two-thirds as long as scutellum, with a very shallow, longitudinal median groove and very shallow, irregular, polygonally reticulate sculpture, spiracle separated from anterior margin of propodeum by about its own diameter; gaster longer than head and thorax combined; apex of syntergum smooth. *Male* (length about 1.8mm): similar to female; head in facial view with inner margins of eyes ventrally virtually straight; antenna with funicle segments at least about 2X as long as broad and clothed in setae that are not longer than diameter of segments; costal cell of fore wing mostly with a single line of setae ventrally but two lines in apical one-third; gaster shorter than thorax.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Cartago**, La Cangreja, 1950m, vii.1991 (P. Hanson, C. Godoy). Paratypes: **COSTA RICA**, 1♂, **Heredia**, Uvita, San Rafael, 1700m, 10.iii.1991 (P. Hanson). Holotype in NHMUK, paratype in NHMUK.

COMMENTS. Females of *Cercobelus ulixes* can be distinguished from those of other species of the genus by the relatively long funicle segments, extremely long pronotum and propodeum. The males have unusually short setae on the funicle.

***Cercobelus phanes* sp.nov.**

(Figs 1683-1689)

DIAGNOSIS. *Female* (length about 2.4mm): scape pale orange; wings (Fig. 1688) hyaline; all coxae dark brown; fore and mid femora mostly pale orange; hind tibia dark brown without a distinct white basal band; antenna with scape (Fig. 1685) about 5.9X as long as broad; pedicel about 2X as long as broad; all funicle segments longer than broad; antenna with linear sensilla on F1; F1 slightly longer than F2; mandible (Fig. 1683) with 2 very short, sharp, broad teeth and a narrow truncation with a weakly serrate margin; fore wing with marginal vein (Fig. 1689) punctiform; hind wing about 3X as long as broad; propodeum with a pair of shallow, longitudinal, submedian carinae, spiracle separated from anterior margin of propodeum by about 0.4X its own diameter; apex of syntergum smooth (Fig. 1687); hypopygium (Fig. 1686) completely longitudinally divided, with long anterior apodemes. *Male*: unknown.

Female (holotype): length, including ovipositor, 2.42mm; excluding ovipositor, 2.32mm (CPD).

Head black and slightly shiny, frontovertex with a very weak, dull blue sheen, slightly coppery along occipital margin, weakly coppery purple on temple and interantennal prominence; antenna (Fig. 1685) with radicle dark orange-brown; scape pale orange, dorsal margin dusky; pedicel and flagellum brown, pedicel and funicle ventrally pale orange; maxillary palpus pale orange; thorax black and slightly shiny; mesoscutum with a dull dark blue sheen with some coppery purple; tegula with a weak purple sheen; axilla slightly shiny with a weak coppery purple sheen; scutellum shiny, slightly brassy with some dull, coppery purple reflections, apex and side brassy and coppery purple; mesopleuron with a weak coppery purple sheen; all coxae dark brown; fore femur mostly pale orange, mixed brown in proximal 0.5X, tibia and tarsus pale orange, tibia slightly dusky dorsally near base, tarsus darker distally, pretarsus dark brown; mid femur pale yellow proximally a broad, median, brownish band, apex pale orange, tibia pale orange with a diffuse, subbasal, brown band, spur white, apex pale orange, tarsus proximally white, pale orange towards apex, apical tarsomere dark brown; hind femur pale orange in in proximal 0.3X, otherwise hind leg completely dark brown; wings (Fig. 1688) hyaline; propodeum dark brown and slightly shiny, side with a weak metallic dark green and dark blue sheen; gaster dark brown, moderately shiny with a slightly coppery sheen with brassy, purple, blue and green reflections; gonostylus dark brown.

Head (Fig. 1683) about 1.7X as wide as frontovertex, in profile about 2.1X as high as deep, more or less evenly, but weakly convexly rounded from occipital margin to top of scrobes, then virtually straight mouth margin; occipital margin sharp, carinate; ocelli forming an angle of about 120°; frontovertex shiny, in ocellar area with moderately deep, slightly transversely elongate, polygonally reticulate sculpture of mesh size subequal to eye facet, more regular polygonally reticulate sculpture of larger mesh in front of anterior ocellus; temple and gena with longitudinally elongate, polygonally reticulate to striate sculpture; eye separated from occipital margin by about 0.4X diameter of posterior ocellus, or about 1.5X diameter of facet, with inner margin not sinuate, clothed with fairly conspicuous, pale setae that are slightly longer than diameter of facet; scrobes shallow, ∩-shaped, meeting, virtually smooth but with shallow, polygonally reticulate sculpture; interantennal prominence weak, dorsally rounded, with moderately deep, polygonally reticulate sculpture; dorsal margin of torulus a little below lower eye margin; antenna as in Fig. 1685; scape subcylindrical, about 5.9X as long as broad; pedicel about 2X as long as broad; all funicle segments slightly longer than broad, F1 slightly longer than F2, remaining segments becoming

slightly larger and broader distad, linear sensilla present on all segments; clava slightly shorter than F2-F4 combined; clypeal margin weakly emarginate, tentorial pit visible below torulus; mandible (Fig. 1683) with 2 very short, sharp, broad teeth and a narrow truncation with a weakly serrate margin. Relative measurements: HW 100, HH 100, FV 59, POL 32, OOL 9.5, OCL 7, AOL 17, EL 52.5, EW 37, MS 35, SL 53, SW 9.

Thorax in dorsal view with pronotum slightly elongate, a large part visible behind head, with posterior margin moderately and fairly evenly concave; pronotum with shallow, polygonally reticulate sculpture, of smaller mesh size than that in ocellar area, and slightly shallower, side with transversely elongate reticulate sculpture of larger mesh; mesoscutum with similar sculpture to that on frontovertex in front of anterior ocellus; axilla with polygonally reticulate sculpture of much smaller mesh size than that on mesoscutum and conspicuously shallower; scutellum with polygonally reticulate sculpture that is generally a little shallower and of smaller mesh than that on mesoscutum, of distinctly smaller mesh medially, apex and side virtually completely smooth and shiny; visible part of mesoscutum about 1.5X as broad as long and medially nearly 2X as long as pronotum; scutellum about 1.1X as long as broad; fore wing with venation and distribution of setae as in Figs 1688, 1689; propodeum medially about 0.35X as long as scutellum and with a pair of shallow, subparallel, submedian carinae and some shallow, irregular, polygonally reticulate sculpture, spiracle separated from anterior margin of propodeum by about 0.4X its own diameter. Relative measurements: FWL 141, FWW 59.5; HWL 95, HWW 31.

Gaster slightly longer than thorax, syntergum about 0.5X as long as mid tibia, broadening at apex with apex truncate and smooth; hypopygium (Fig. 1686) completely longitudinally divided, with long anterior apodemes; ovipositor (Fig. 1684) slightly exserted, the exserted part about 0.5X as long as mid tibial spur or 0.13X as long as mid tibia. Relative measurements: OL 61 [MT 136.5].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/TN, iv.2002 (INBio-OET-ALAS). Holotype in NHMUK.

Cercobelus godoyae Noyes & Hanson
(Figs 1690-1693; Hab. ♀ 250)

Cercobelus godoyae Noyes & Hanson, 1996:108, 110-111. Holotype ♀, Costa Rica, NHMUK, examined.

DIAGNOSIS. *Female* (length about 2.2mm): scape amber-testaceous; scutellum black with coppery purple sheen; all coxae dark brown; legs largely dark brown, fore tibiae and tarsus mostly pale orange, mid tibia partly pale orange, tarsus pale orange, hind femur dusky pale orange at base, hind tibia dark brown; fore wing (Fig. 1690) infuscate across wing below marginal vein; mandible with two very short sharp teeth and a slightly rounded, truncate, upper tooth with a weakly serrate margin; scrobes shallow, distinct, meeting dorsally; antenna (Fig. 1693) with scape about 5.2X as long as broad; pedicel about 1.9X as long as broad; funicle segments subequal, all clearly longer than broad; F1 with linear sensilla; clava very nearly as long as F2-F4 combined; mesoscutum about 2-2.5X as long as pronotum medially in dorsal view; marginal vein (Fig. 1691) punctiform, not quite touching anterior wing margin; hind wing about 3X as long as broad; propodeum nearly one-third as long as scutellum, with a pair of posteriorly diverging, submedian carinae; spiracle separated from anterior margin by about 0.5X its own diameter; gaster about as long as thorax; apex of syntergum smooth; hypopygium (Fig. 1692) longitudinally divided with elongate anterior

apodemes. *Male*: unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Reared from *Katacephala* Crawford (Hemiptera: Liviidae) on *Eugenia carthagenensis* (Jacq.) (Myrtales: Myrtaceae) (Noyes & Hanson, 1996).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Cartago**, Tobasi, 1500m, ex *Katacephala* on Myrtaceae, 6.vi.1993 (P. Hanson, D. Hollis). Paratypes: **COSTA RICA**, 2♀, same data as holotype. Holotype in NHMUK, paratypes in INBio and NHMUK.

COMMENTS. See comments under *tartarus* (p. 617).

Cercobelus daphne Noyes & Hanson
(Hab. ♀ 251)

Cercobelus daphne Noyes & Hanson, 1996:108, 111-112. Holotype ♀, Costa Rica, NHMUK, examined.

DIAGNOSIS. *Female* (length about 2.8mm): scape yellow; scutellum black mostly with a weak blue sheen, apex slightly coppery; all coxae dark brown, mid coxa partially mixed pale orange; fore and mid leg mostly pale orange, mid tibia slightly dusky proximally, hind leg dark brown with femur proximally pale orange; fore wing infuscate at apex of venation; scrobes very shallow, meeting dorsally; scape about 5.7X as long as broad; pedicel about 2X as long as broad; funicle with all segments clearly longer than broad, F1 slightly longer than F2, remaining segments subequal, F1 with longitudinal sensilla; clava a little shorter than F2-F4 combined; mesoscutum about 2X as long as pronotum medially in dorsal view; marginal vein punctiform, not quite touching anterior wing margin; hind wing about 3.7X as long as broad; propodeum about one-third as long as scutellum, with a distinct, longitudinal, median carina and some very shallow, irregular sculpture, spiracle separated from anterior margin of propodeum by about 0.7X its own diameter; gaster nearly as long as head and thorax combined; apex of syntergum smooth. *Male*: unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Monteverde, 25.v.1993 (Michalski). Holotype in NHMUK.

Genus *ARIANUS gen.nov.*

Type species: *Arianus porusos* sp.nov. Gender masculine

Female. Length about 2.7mm.

Generally dark brown with a weak to moderate metallic sheen; fore wing very weakly infuscate; hind wing hyaline.

Head with occipital margin sharp, carinate; frontovertex about half head width, with large, conspicuous piliferous punctures, similar in appearance to surface of a thimble; ocelli forming a slightly obtuse angle; antennal scrobes moderately deep, short and ∩-shaped, more or less meeting dorsally so that interantennal prominence does not meet frontovertex; malar sulcus absent; dorsal tentorial arm meeting face very close to torulus; torulus separated from mouth margin by about 1.4X its own length, its upper margin about level with lower eye margin; clypeal

margin very slightly convexly produced medially; occiput, near mouth margin either side of the labiomaxillary complex, with a pair of circular, gland-like structures (Fig 1695, highlighted); funicle with segments subequal in size, each slightly longer than broad; clava 3-segmented, about half as long as funicle, sensory area enlarged, extending about half way along ventral surface; eye almost naked, clothed with inconspicuous setae, each about half as long as diameter of facet; mandible with one acute tooth and broad truncation; palp formula 4-3.

Thorax with pronotum short; mesoscutum and scutellum with polygonally reticulate sculpture, slightly shallower on scutellum; notaular lines absent; mesoscutum and scutellum slightly convex, posterior margin of mesoscutum roundly produced, separating axillae medially; scutellum densely setose, clothed in about 100 subequal, setae, those at apex hardly longer than those at base; posterior margin of scutellum rounded; mid tibial spur very slightly shorter than basitarsus; fore wing about 2.4X as long as wide; costal cell very setose, dorsally with a complete line of submarginal setae and ventrally with up to 6 lines of setae; linea calva present, virtually closed posteriorly; filum spinosum present, composed of about 6 modified setae; submarginal vein with parastigma not swollen, junction with marginal vein with a hyaline break, marginal vein punctiform, stigmal vein long with a distinct apical uncus, postmarginal vein extending a little way past apex of stigmal vein; hindwing about 2.8X as long as broad, costal cell broad with 2 or 3 lines of conspicuous setae ventrally; mesopleuron nearly reaching level with posterior margin of propodeum; propodeum medially quite short, less than 0.1X as long as scutellum, spiracle large, about equal to diameter of anterior ocellus, nearly touching anterior margin of propodeum, and about half as long as dorsal part of propodeum laterally, posterolateral margin of propodeum forming a sharp, acute angle, posterior margin, above hind coxa forming a very thin, elongate flange that, in dorsal view, forms a very sharp, acute angle at the posterolateral margin of the propodeum.

Gaster with syntergum shorter than mid tibia, apex truncate, Gt2 to apex each divided longitudinally by a median membranous suture; sternites with Gs2 (Fig. 1698) to apex similarly but more weakly, divided and each V-shaped and bearing a pair slender anteromedian apodemes; hypopygium (Fig. 1700) more or less reaching apex of gaster and with a pair of short, median, "gonostylus-like" structures bearing sensory setae; ovipositor shorter than mid tibia, not exserted, about 10X as long as gonostylus; outer and inner plates of ovipositor very slender, semicircular sheet greatly modified (Fig. 1699), subrectangular, more than 5X as long as wide with 1st and 2nd valulae bent almost at right angles medially.

Male. Unknown.

DISTRIBUTION. Peru and Costa Rica

HOSTS. An unidentified species of the genus, perhaps *porusos* **sp.nov**., has been observed parasitizing nymphs of *Tuthillia cognata* Hodkinson, Brown & Burckhart (Hemiptera: Liviidae) causing blister galls on leaves of *Myrciaria dubia* (Myrtales: Myrtaceae) in Ucayali, Perú (Bladimir Guerra Ambrosio, pers. comm. 2020).

COMMENTS. The gland-like structures on the occiput near the labiomaxillary complex (Fig. 1695) are reminiscent of the structures in a similar position of the occiput in *Merlen* Noyes & Woolley (1994). The function and phylogenetic importance of these structures is unknown. The dorsal tentorial arms surfacing very close to the torulus is also unusual and worthy of note as is the densely hairy, convex scutellum and densely setose ventral surface of the costal cell.

The structure of the gaster and ovipositor are highly unusual and are probably an adaptation to enable the female to oviposit into psyllid host nymphs that live inside leaf galls produced by their host plant. The gaster is telescopic (as in *Cercobelus*) and the ovipositor is strongly modified with the right-angle bend of the 1st and 2nd valvulae of the ovipositor appearing to be a unique modification.

Arianus porusos sp.nov.

(Figs 1694-1701; Hab. ♀ 252)

Female (holotype): length, including ovipositor, 2.72mm; excluding ovipositor, 2.64mm (CPD).

Body generally dark brown with a weak to moderate metallic sheen; frontovertex generally with a moderately metallic dark blue-green sheen, but distinctly coppery violet when viewed from some angles, bottoms of piliferous punctures mostly coppery violet; temple and gena somewhat coppery, anterior part of gena mixed metallic dark blue-green; scrobal area mainly metallic dark blue-green but mixed coppery violet as frontovertex, interantennal prominence quite strongly violet in part, mouth margin dull coppery; antenna (Fig. 1697) with radicle pale orange with some dark brown dorsally; scape pale orange; pedicel brown, paler distally and ventrally; flagellum orange-brown; palpi pale orange, slightly darker proximally; mandible dark brown, teeth slightly paler; pronotum with a slight coppery sheen; mesoscutum predominantly with a moderate coppery sheen mixed with some very dull metallic dark green, viewed from some angles almost completely dull metallic dark green; axilla similar to mesoscutum but more strongly coppery; scutellum with a moderate coppery sheen, stronger towards apex; metanotum dark orange-brown with a slight weak coppery sheen; tegula slightly coppery; prepectus with a slight coppery sheen; mesopleuron anteriorly with a slight brassy lustre, posterior half more coppery; all coxae dark brown; fore femur dark brown with apical one-third pale orange, tibia and tarsus pale orange, apical tarsomere partially orange-brown; mid femur dark brown with apical half pale orange, tibia and tarsus pale orange, spur dark orange-brown; hind femur dark brown with apical half pale orange, tibia and tarsus pale orange; fore wing (Fig. 1701) generally very weakly infuscate with a small, posterior, dark brown, triangular area towards base, hind wing hyaline, venation pale orange; propodeum slightly coppery with a weak brassy sheen; gaster dorsally with a distinct coppery sheen with green and violet reflections, side and venter similar but less coppery; gonostylus pale brown, apex off-white.

Head (Fig. 1695) about 2.2X as wide as frontovertex, in profile about 2.1X as high as deep, frontovertex fairly evenly and slightly convex between occipital margin and top of scrobes, below top of scrobes hardly convex to mouth margin, tangent of frontovertex forming an angle of about 118° with that of face, interantennal prominence hardly protuberant between toruli; ocelli forming an angle of about 98°; frontovertex moderately shiny with fine, polygonally reticulate sculpture of mesh size slightly smaller than eye facet; piliferous punctures only slightly smaller than ocellus and very nearly touching, punctures extending partway between scrobe and eye; setal sockets on gena fine, separated by a little less than their own diameters; temple mostly with moderately deep longitudinally elongate polygonally reticulate sculpture, this continuing on to gena but anterior part of gena with more regular polygonally reticulate sculpture; antenna as in Fig. 1697; scape about 4.3X as long as broad; funicle with F1 about 1.5X and F6 about 1.3X as long as broad respectively, hardly becoming shorter or broader distally, linear sensilla present on all segments; clava 3-segmented, both sutures oblique, about 1.3X as wide as F6, about 2.8X as long as broad, slightly shorter than F4-F6 combined, sensory area extending slightly more than half way along ventral surface; eye reaching occipital margin, clothed in very inconspicuous, very sparse setae, each not more than about 0.5X as long as diameter of facet. Relative measurements: HW 187.5, HH 179, FVL 110, FV 86, POL 57, OOL 3, OCL 10, AOL 32.5, EL 111.5, EW 76, MS 53, SL 58, SW 13.5.

Thorax (Fig. 1696) with pronotum exposed behind head, posterior margin hardly concave, the exposed part medially about as long as AOL; pronotum with moderately deep polygonally reticulate to coriaceous sculpture that is slightly shallower than sculpture on frontovertex; mesoscutum mostly with fine polygonally reticulate sculpture that is about as deep as that on frontovertex but generally of slightly larger mesh; axilla with slightly shallower, finer, polygonally reticulate sculpture than that on mesoscutum; scutellum with similar sculpture to mesoscutum but very slightly shallower, more irregular and of smaller mesh; visible part of mesoscutum nearly 2X as broad as long; scutellum very slightly broader than long; anterior half of mesopleuron with shallow, very poorly defined, polygonally reticulate sculpture, posterior half with distinct, well-defined, polygonally reticulate sculpture; fore wing with venation and setation as in Figs 1694,

1701; propodeum (Fig. 1696), medially with some irregular polygonally reticulate sculpture, area outside spiracle with about 20-25 conspicuous setae, these extending part way down side towards hind coxa; diameter of spiracle about equal to anterior ocellus. Relative measurements: FWL 190, FWW 79.5; HWL 118, HWW 38.

Gaster with hypopygium more or less reaching apex; syntergum about 0.7X as long as mid tibia, with apex narrowly truncate; ovipositor not exserted.

Paratype. Gaster with Gs2 as in Fig. 1698; hypopygium Fig. 1699; ovipositor Fig. 1699. Relative measurements: OL 58.5, GL 6 [MT 70].

Variation. Females vary in overall length from 2.33-2.72mm.

Male. Unknown.

HOSTS. Unknown.

DISTRIBUTION. Costa Rica.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Cartago**, La Cangreja, 1950m, vii.1991 (P. Hanson, C. Godoy). Paratypes: **COSTA RICA**, 1♀, **Alajuela**, Peñas Blancas, 9.vi.1987 (E. Cruz). Holotype in MZUCR, paratype in NHMUK.

Genus *CALDENCYRTUS* Noyes & Hanson

Caldencyrtus Noyes & Hanson, 1996:114-115. Type species: *Caldencyrtus mitchelli* Noyes & Hanson, by original designation.

Female. Length about 1.9-2.5mm.

Body generally with a weak to moderately strong metallic green sheen

Head in facial view suboval, slightly broader than high and about 2.2-2.6X as wide as frontovertex, in profile more or less evenly curved; occipital margin sharp, carinate at least medially; frontovertex weakly metallic, with shallow indistinct piliferous punctures or with conspicuous, large piliferous punctures; ocelli forming an angle of about 90°; eye with sparse, extremely short setae; malar space about 2/3 as long as eye, suture present and distinct or absent; antennal scrobes shallow, hardly meeting dorsally, not reaching half way from toruli to anterior ocellus; mouth varying from about one-third to half head width; antennal torulus separated from mouth margin by slightly more than its own length, its upper margin about level with lower eye margin or slightly above; antennal scape about 3X as long as broad, subcylindrical to slightly flattened; antennal flagellum filiform, generally about as long as head width or conspicuously longer, all funicle segments longer than broad, except sometimes F6 which may be quadrate; linear sensilla on all funicle segments; clava 3-segmented with apex rounded, sensory area small, at apex only; clypeal margin with a convex or biconvex median lobe; mandible with two teeth and a truncate third, upper tooth, lowest teeth acute, long and widely separated; maxillary palp 4-segmented, labial palp 3-segmented.

Thorax moderately robust with mesoscutum and scutellum moderately convex and with a slight metallic sheen, especially on scutellum where apically it may be relatively strong; notaular lines virtually absent, but present at anterolateral corners of mesoscutum and subparallel to sides of mesoscutum; scutellum about as long as broad, with apex rounded; mesoscutum and scutellum both with similar, fairly deep, coarse, raised, polygonally reticulate sculpture, mesopleuron slightly enlarged posteriorly and usually extending a little way past posterior margin of propodeum and nearly touching base of gaster; mid tibial spur from very slightly shorter to very slightly longer than basitarsus; fore wing about 2.5X as long as broad; hyaline to weakly infused pale brown, sometimes more strongly infuscate in apical half or so; costal cell about 11X as long as broad with at least 1 line of setae dorsally, but sometimes only in distal half; venation with a subapical hyaline break on submarginal vein, parastigma hardly widened, marginal vein 3-4X as long as

broad and subequal in length to postmarginal and stigmal veins; linea calva open, filum spinosum present, basal cell moderately setose with a small to moderate sized naked area proximally; propodeum medially about 0.15X as long as scutellum, with some shallow irregular sculpture, usually including some carinae, posterolaterally with at least a small projection above hind coxa (see Fig. 1714) and with conspicuous, moderately dense, silvery setae surrounding spiracle.

Gaster about as long as thorax; cercal plates in basal half of gaster; syntergum about 1.1-1.8X as long as mid tibia; hypopygium reaching about one-third to half-way along gaster, transverse, weakly concave anteriorly with lateral, anterior arms absent or very short without an external notch, posterior margin biconvex with a fairly deep, median invagination; paratergites absent; ovipositor not exserted or hardly exserted with the exserted part never longer than mid tibial spur; ovipositor varying from about as long as mid tibia to 1.8 X as long and 3.0-4.5X as long as gonostylus; gonostylus free.

Male. Length about 1.6-2.0mm.

Very similar to female except for antenna and genitalia. Antenna separated from mouth margin by nearly 2X length of torulus, about level with lower eye margin; funicle 6-segmented with segments slightly broadened, but longer than broad, clothed in relatively short setae, generally not more than one-quarter as long as diameter of segments; clava 2-segmented; aedeagus a little less than half as long as mid tibia; phallobase with paramere developed but short and inconspicuous, digitus moderately long and with an apical hook.

DISTRIBUTION. Currently known only from Costa Rica but certain to occur more widely throughout the Neotropical region.

HOSTS. Reared from galls formed by Triozidae and Psyllidae (Hemiptera: Psylloidea) on the fruit and leaves of *Cinnamomum* Spreng. (Laurales: Lauraceae) and *Ilex* L. (Aquifoliales: Aquifoliaceae).

COMMENTS. *Caldencyrtus* may be close to *Lohiella* Noyes, 1980, species of both genera having relatively long, subequal marginal, postmarginal and stigmal veins, relatively high placement of antennal toruli, and elongate funicle segments all with longitudinal sensilla. *Caldencyrtus* can be readily separated from *Lohiella* because F1 is subequal to, or hardly longer than the pedicel, but if F1 is conspicuously longer than the pedicel then the posterolateral angle of the propodeum has a short, but very distinct finger-like or spine-like projection. Most species of *Lohiella* have F1 at least about 1.5X as long as the pedicel and none has a projection from the posterolateral angle of the propodeum. The placement of the torulus in *Caldencyrtus* is generally lower than in *Lohiella*. In *Caldencyrtus* the upper margin of the torulus is at most barely above the lower eye margin whereas in *Lohiella* the middle of the torulus is at least level with the lower eye margin or above. All species of *Caldencyrtus* have the mandible tridentate, with the upper tooth broadly truncate and, except in *balor*, the lowermost tooth very long and relatively widely separated from the middle tooth and the mesoscutum and scutellum with very similar, coarse, polygonally reticulate sculpture. In *Lohiella* the mandibles are sometimes similar to those of *Caldencyrtus* but the lowest tooth is subequal in length to the others and the sculpture of the scutellum is frequently very different from that of the mesoscutum. In males of *Caldencyrtus* the clava is 2-segmented whilst in those of *Lohiella* the clava is 1-segmented. It is highly likely that, as currently understood, *Lohiella* is an unnatural assemblage of species that requires further systematic investigation.

See also comments under *Dalek* (p. 636) and *Strigenia* (p. 172).

The species of *Caldencyrtus* can be divided into two groups: *meresmo* group - mesopleuron not extending past posterior margin of propodeum; scape at least 4X as long as broad; process on posterolateral angle of propodeum moderately large, distinct, finger-like or thorn-like; mid tibial spur shorter than basitarsus; known hosts Psyllidae; *acamas* group - mesopleuron extending a little way past posterior margin of propodeum; scape less than 4X as long as broad; process on posterolateral angle of propodeum very small, indistinct, hardly more than a bump; mid tibial spur at least as long as basitarsus; known hosts Triozidae.

Key to Costa Rican species of *Caldencyrtus*
(Females and males)

1. Clava 3-segmented (e.g. Figs 1705, 1715, 1723, 1741) (females) 2
- Clava 2-segmented (Figs 1729, 1737, 1743) (males; known only for previously described new species) 7

FEMALES

2. Frontovertex, lower face and interantennal prominence with numerous distinct, large piliferous punctures giving appearance of surface of thimble or golf ball (Figs 1704, 1709); punctures generally at least about 0.5X diameter of ocellus 3
- Frontovertex, face and interantennal prominence with shallow, inconspicuous piliferous punctures (Figs 1718, 1732), at most two or three distinct punctures below anterior ocellus 4

3 (2) Piliferous punctures relatively small, mostly separated by about half their own diameters (Fig. 1704); flagellum about 1.5X head width, F1 at least about 1.3X as long as pedicel; mid femur and tibia completely pale orange ..... *balor* **sp.nov.** (p. 628)
- Piliferous punctures relatively large, those on frontovertex nearly touching;(Fig. 1709); flagellum about 1.1X head width, F1 about as long as pedicel; mid femur mostly dark brown, tibia proximally orange-brown, apically pale orange .... *meresmo* **sp.nov.** (p. 629)

4 (2) Scape (Fig. 1715) almost completely pale orange and at least 5X as long as broad .... *olwen* **sp.nov.** (p. 631)
- Scape (Figs 1, 1723, 1724, 1741) mostly dark brown and not more than 4X as long as broad 4

5 (4) Fore tibia mostly or completely yellow or pale orange, hind tibia with at least distal one-third yellow or pale orange ..... *acamas* Noyes & Hanson (p. 632)
- Fore tibia mostly dark brown, hind tibia more or less completely dark brown 5

6 (5) Antenna (Fig. 1) with F1 about 2X as long as broad, F6 at least one-third longer than broad; syntergum at least nearly as long as mid tibia; scutellum with colours fairly uniform throughout ..... *antander* Noyes & Hanson (p. 633)
- Antenna (Fig. 1741) with F1 not more than about 1.5X as long as broad, F6 quadrate or transverse; syntergum not more than 0.75X as long as mid tibia; scutellum with anterior half conspicuously duller than brighter posterior half .... *mitchelli* Noyes & Hanson (p. 634)

MALES

7 (1) F1 (Fig. 1737) with not more than 10 longitudinal sensilla and at least about 2.5X as long as broad and a little narrower than pedicel .... *antander* Noyes & Hanson (p. 633)
F1 (Figs 1729, 1743) with at least 15 longitudinal sensilla and not more than 2X as long as broad and at least as wide as pedicel 8

8 (7) Eye nearly reaching occipital margin, separated by not more than diameter of facet; F1 (Fig. 1729) with not more than 25 longitudinal sensilla, each relatively long, longer than one-quarter length of segment ..... *acamas* Noyes & Hanson (p. 632)
- Eye separated from occipital margin by more than twice diameter of facet; F1 (Fig. 1743) with at least 30 longitudinal sensilla, each no more than one-fifth length of segment ..... *mitchelli* Noyes & Hanson (p. 634)

***Caldencyrtus balor* sp.nov.**
(Figs 1702-1707)

DIAGNOSIS. *Female* (length about 2.5mm): antennal scape dark orange-brown; scutellum uniformly dull blue-green with some copper and purple; fore tibia pale orange; mid femur and tibia pale orange; hind tibia orange-brown, paler proximally; frontovertex (Fig. 1704) with numerous, deep, conspicuous piliferous punctures; antenna (Fig. 1705) with flagellum about 1.5X head width; F1 2.2X as long as wide and 1.3X as long as pedicel; F6 about 1.4X as long as wide; mid tibia about 1.5X as long as syntergum, with mid tibial spur a little shorter than basitarsus; mesopleuron not extending past posterior margin of propodeum; postero-lateral angle of propodeum with a moderately long, finger-like process; ovipositor (Fig. 1703) slightly more than 2X as long as syntergum and 3X as long as gonostylus; hypopygium (Fig. 1706) with depth of posterior invagination about 0.3X length of mid tibial spur. *Male:* unknown.

Female (holotype): length, including ovipositor, 2.53mm; excluding ovipositor, 2.31mm (CPD).

Head with occiput generally dull coppery purple; frontovertex, scrobal area and anterior part of gena fairly bright, metallic blue-green, bottoms of piliferous punctures with a violet hue; mouth margin, temple and posterior part of gena coppery and slightly brassy; setae on frontovertex, interantennal prominence and gena pale brown, slightly translucent and fairly conspicuous; antenna (Fig. 1705) with radicle orange-brown; scape and pedicel dark orange-brown; flagellum dark brown; thorax generally dark brown to black; pronotum with a weak metallic blue-green sheen with some violet reflections, posterior margin coppery purple; mesoscutum with relatively dull dark blue and violet sheen; tegula with a weak coppery purple sheen; axilla with a weak coppery purple and metallic green sheen; scutellum with a relatively dull metallic blue-green sheen with some coppery purple and violet reflections; metanotum with a weak brassy sheen; mesopleuron slightly brassy; coxae dark brown; fore femur dark brown in proximal half, apex pale orange, tibia pale orange, tarsus pale orange, orange-brown distally; mid femur and tibia pale orange, spur pale orange, extreme apex dark brown, tarsus pale orange, slightly dusky apically; hind femur brown, proximally and distally pale orange, pale area wider ventrally, tibia orange-brown, slightly paler at extreme base, tarsus pale orange, apical tarsomere brown; wings largely hyaline but fore wing (Fig. 1702) weakly infuscate apically distad of apex of venation; propodeum dark purple-brown, with a slight brassy sheen, side with a relatively bright metallic blue-green, dark green and coppery sheen, at least about 40 dense, conspicuous, silvery setae outside spiracle; gaster dark purple-brown with a slight coppery and brassy sheen with some green and purple reflections, Gt1 anteriorly with a bright dark blue, blue-green and violet sheen, side and venter of gaster with mixed green, coppery, and purple reflections; gonostylus brown, apex pale orange.

Head (Fig. 1704) submenisciform, about 2.4X as wide as frontovertex, in profile, about 2X as high as deep, evenly curved from occipital margin to top of scrobes and fairly straight from top of scrobes to mouth margin with interantennal prominence hardly protuberant; occipital margin acute, sharp and carinate; a slender, shallow, shiny-bottomed groove adjacent to eye margin extends from level with anterior margin of posterior ocellus nearly to occipital margin; ocelli forming an angle of about 95°; frontovertex with irregular, shallow, polygonally reticulate sculpture of generally smaller mesh size than eye facet, piliferous punctures large and conspicuous, about 0.5X size of ocellus, mostly separated by about half their own diameters, a few almost touching, frontovertex with 11-12 pairs of setae in front of anterior ocellus and at least 2 lines descending between eye and scrobal area on to gena; temple and posterior part of gena with similar sculpture to frontovertex, but slightly longitudinally elongate; eye virtually reaching occipital margin, separated by much less than 0.5X diameter of facet, with sparse, inconspicuous, pale setae, each much shorter than diameter of facet; scrobes shallow, short, very broadly ∩-shaped, meeting shallowly, weakly margined dorsally and laterally, bottoms of scrobes smooth and shiny; interantennal prominence hardly prominent, truncate dorsally, with finer and much shallower polygonally reticulate sculpture than on frontovertex, but with conspicuous piliferous punctures that are only slightly smaller and shallower than those on frontovertex; upper margin of torulus a little above lower eye margin; antenna as in Fig. 1705; scape very slightly broadened and flattened, nearly 5X as long as broad; all funicle segments clearly longer than broad, slightly broader and shorter distad,

linear sensilla present in more than a single row on all funicle segments; clava a little longer than F5-F6 combined, sensory area at apex only; malar sulcus present, distinct; mouth margin about 1.2X as wide as frontovertex, with a broadly truncate median lobe; mandible with two relatively short lower teeth and a truncate upper tooth. lowest tooth acute, middle tooth rounded. Relative measurements: HW 125, HH 114, FV 53, POL 22, OOL 6.5, OCL 7.5, AOL 12, EL 70, EW 49.5, MS 44, SL 56.5, SW 11.5.

Thorax in dorsal view with pronotum largely hidden by head, with similar sculpture to that on frontovertex above scrobes; mesoscutum and axilla with similar sculpture to on frontovertex; scutellum with similar sculpture to mesoscutum, but slightly deeper; visible part of mesoscutum about 1.8X as broad as long, notaular lines absent; scutellum about 1.1X as long as broad, a short carina between axillae; fore wing with venation and distribution of setae as in Figs 1702, 1707, costal cell with only one line of dorsal submarginal setae in distal 0.5X; mesopleuron not quite reaching level with posterior margin of propodeum; propodeum medially about 0.17X as long as scutellum, with 7 longitudinal carinae in middle one-third or so, otherwise with irregular, shallow sculpture and virtually smooth, side with a conspicuous, truncate tooth posteriorly above hind coxa, area between tooth and spiracle not depressed, more or less convex. Relative measurements: FWL 81, FWW 34; HWL 42.5, HWW 15.

Gaster about as long as thorax with hypopygium (Fig. 1706) reaching about 0.5X to apex; last tergite about 0.7X as long as mid tibia, with apex acute; ovipositor (Fig. 1703) slightly exserted, the exserted part about 0.8X as long as mid tibial spur or a little more than 0.2X mid tibia. Relative measurements: OL 102, GL 33 [MT 70].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Cartago**, La Cangreja, 9°48'N 83°58'W, 1950m, vi-vii.1992 (P. Hanson). Holotype in NHMUK.

Caldencyrtus meresmo **sp.nov.**

(Figs 1708-1714)

DIAGNOSIS. *Female* (length about 2.3mm): antennal scape (Fig. 1708) pale orange with some pale brown dorsally; scutellum uniformly dull blue-green with some copper and violet; fore tibia pale orange with a weak, pale brown subbasal band; mid femur dark brown proximally, apex pale orange, tibia orange-brown, apex pale orange hind tibia dark brown, slightly paler at apices; frontovertex (Fig. 1709) with numerous, deep, conspicuous piliferous punctures; antenna (Fig. 1708) with flagellum about 1.1X head width; F1 1.8X as long as wide and as long as pedicel; F6 about 1.3X as long as wide; mid tibia about 1.4X as long as syntergum, with mid tibial spur a little shorter than basitarsus; mesopleuron not extending past posterior margin of propodeum; postero-lateral angle of propodeum (Fig 1714) with a short, finger-like process; ovipositor (Fig. 1710) about 2.5X as long as syntergum and a little more than 3X as long as gonostylus; hypopygium (Fig. 1713) with depth of posterior invagination about 0.3X length of mid tibial spur. *Male:* unknown.

Female (holotype): length, including ovipositor, 2.34mm; excluding ovipositor, 2.13mm (CPD).

Head with occiput black with a generally dull brassy and purple sheen; frontovertex, scrobal area and anterior part of gena fairly bright, metallic blue-green with an additional purple sheen, piliferous punctures with a purple hue; temple and posterior part of gena coppery and slightly brassy; setae on frontovertex, interantennal prominence and gena, white, translucent and slightly silvery; antenna (Fig. 1708) with radicle pale orange; scape pale orange, marked pale brown dorsally and internally; pedicel dark brown, pale orange at extreme apex and ventrally; flagellum

dark brown; thorax generally dark brown to black; pronotum with a weak metallic dark green sheen with some brassy reflections, posterior margin coppery purple; mesoscutum with very dull dark blue and violet sheen; tegula brown with a weak coppery purple sheen; axilla with a weak coppery purple and metallic green sheen; scutellum with a relatively dull metallic blue-green sheen with some coppery purple and violet reflections; metanotum with a weak brassy sheen; mesopleuron slightly brassy and coppery purple; coxae dark brown; fore femur dark brown in proximal 0.7X, apex pale orange, tibia pale orange with a very weak, pale brown, subbasal band, tarsus pale orange, orange-brown distally; mid femur dark brown in proximal 0.7X, apex pale orange, tibia orange-brown in proximal 0.5X or so, apex pale orange, spur pale orange, extreme apex dark brown, tarsus very pale orange, slightly dusky apically; hind femur dark brown, extreme apex pale orange-brown, tibia mostly dark brown, slightly paler at extreme base and apex, tarsus very pale orange, apical tarsomere slightly dusky; wings basically hyaline but fore wing (Fig. 1712) weakly infuscate below marginal vein and apically distad of apex of venation; propodeum dark purple-brown, with a slight brassy sheen, side with a relatively bright metallic dark blue, green and coppery sheen, at least about 40 dense, conspicuous, silvery setae outside spiracle descending to just above hind coxa; gaster dark purple-brown with a slight coppery and brassy sheen with some green and purple reflections, Gt1 anteriorly with a bright dark blue and violet sheen, side and venter of gaster with mixed green, coppery, and purple reflections; gonostylus brown, extreme apex pale orange.

Head (Fig. 1709) submenisciform, about 2.2X as wide as frontovertex, in profile about 1.9X as high as deep, evenly curved from occipital margin to top of scrobes and fairly straight from top of scrobes to mouth margin with interantennal prominence hardly protuberant; occipital margin acute, sharp and carinate; a slender, shallow, shiny-bottomed groove adjacent to eye margin extending from level with anterior margin of posterior ocellus nearly to occipital margi; ocelli forming an angle of about 110°n; frontovertex (Fig. 1709) with irregular, shallow, polygonally reticulate sculpture of generally much smaller mesh size than eye facet, piliferous punctures large and conspicuous, about 0.5X size of ocellus, some almost as large, almost touching, frontovertex with 15 pairs of setae in front of anterior ocellus and at least 3 lines descending between eye and scrobal area on to gena; temple and posterior part of gena with similar sculpture to frontovertex, but slightly longitudinally elongate; eye virtually reaching occipital margin, separated by much less than 0.5X diameter of facet, with sparse, inconspicuous, pale setae, each much shorter than diameter of facet; scrobes shallow, short, very broadly ∩-shaped, meeting shallowly, carinately margined medially above, otherwise weakly margined dorsally and laterally, bottoms of scrobes smooth and shiny; interantennal prominence hardly prominent, truncate dorsally, with finer and much shallower polygonally reticulate sculpture than on frontovertex, but with conspicuous piliferous punctures that are only slightly smaller and shallower than those on frontovertex; midline of torulus about level with lower eye margin; antenna as in Fig. 1708; scape very slightly broadened and flattened, about 4.4X as long as broad; all funicle segments clearly longer than broad, slightly broader and shorter distad, linear sensilla on all segments but present in at least 2 rows only on F3-F6; clava about as long as F5-F6 combined, sensory area at apex only; malar sulcus present, distinct; mouth margin about 0.9X as wide as frontovertex, with a broadly truncate median lobe; mandible (Fig. 1709) with two long, acute teeth and a truncate upper tooth, lowest tooth long. Relative measurements: HW 115, HH 94, FV 51.5, POL 23, OOL 6.5, OCL 6, AOL 11.5, EL 59, EW 50.5, MS 37, SL 46, SW 10.5.

Thorax (Fig. 1714) in dorsal view with pronotum largely hidden by head, with similar sculpture to that on frontovertex above scrobes but of larger mesh; mesoscutum and axilla with similar sculpture to that on frontovertex; scutellum with similar sculpture to mesoscutum, but slightly deeper; visible part of mesoscutum about 2.1X as broad as long, notaular lines absent; scutellum about 1.1X as long as broad, a short carina between axillae; fore wing with venation and distribution of setae as in Figs 1711, 1712, costal cell with only one line of dorsal submarginal setae in distal 0.5X; mesopleuron not quite reaching level with posterior margin of propodeum; propodeum (Fig. 1714) medially about 0.15X as long as scutellum, with about 10 longitudinal carinae in middle one-third or so, otherwise with irregular, shallow sculpture and virtually smooth, side with a conspicuous, finger-like tooth posteriorly (Fig. 1714) above hind coxa, area between this and spiracle not depressed, more or less convex. Relative measurements: FWL 71, FWW

28.5; HWL 47.5, HWW 13.5.

Gaster about as long as thorax with hypopygium (Fig. 1713) reaching about 0.5X to apex; last tergite about 0.75X as long as mid tibia, with apex slightly acute; ovipositor (Fig. 1710) slightly exserted, the exserted part about 1.3X as long as mid tibial spur or about 0.3X mid tibia. Relative measurements: OL 95, GL 30 [MT 54].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Reared from leaf galls of *Gryopsylla clypeata* Brown & Hodkinson (Hemiptera: Psyllidae) on *Ilex lamprophylla* Standl. (Aquifoliales: Aquifoliaceae) (P. Hanson, pers. comm.).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, 1km SE Casa Mata, 1900m, ex psyllid leaf galls on *Ilex*, 26.ii.1994 (P. Hanson). Holotype in NHMUK.

Caldencyrtus olwen sp.nov.
(Figs 1715-1721)

DIAGNOSIS. *Female* (length about 2.2mm): antenna (Fig. 1715) with scape pale orange; scutellum uniform metallic dark blue, mixed purple; fore tibia pale orange; mid femur dark brown, apex pale orange; mid tibia and hind tibiae each proximally dark brown and distally pale orange; frontovertex (Fig. 1718) with shallow, inconspicuous piliferous punctures; antennal flagellum length about 1.2X head width; antenna (Fig. 1715) with F1 about 1.5X as long as wide and a little longer than pedicel; F6 nearly 1.5X as long as wide; mid tibia about 1.2X as long as syntergum, mid tibial spur slightly shorter than basitarsus; mesopleuron not extending past posterior margin of propodeum; postero-lateral angle of propodeum with a distinct but short, thorn-like process; ovipositor (Fig. 1720) about 1.4X as long a syntergum and 3.3X as long as gonostylus; hypopygium (Fig. 1717) with depth of posterior invagination about 0.7X mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 2.23mm; excluding ovipositor, 2.13mm (CPD).

Head generally very dark brown; occiput with a weak metallic dark green and coppery purple sheen; frontovertex dull with a very slight brassy sheen; temple with a relatively bright metallic green and coppery sheen; gena and scrobal area with a dull coppery purple sheen, interantennal prominence slightly brassy; setae on frontovertex, interantennal prominence and gena pale brown, slightly translucent; antenna (Fig. 1715) with radicle brown; scape pale orange, slightly dusky along dorsal margin proximally; pedicel and flagellum dark brown; thorax generally dark brown to black; pronotum with a weak brassy and slightly coppery sheen; mesoscutum with a weak brassy sheen; tegula with a weak coppery purple sheen; axilla weakly brassy; scutellum with a relatively strong metallic dark blue, mixed purple sheen, slightly greenish on side; metanotum with a weak brassy sheen; mesopleuron slightly brassy; coxae dark brown; fore femur dark brown in proximal half, apex pale orange, tibia pale orange, tarsus pale orange, brown distally; mid femur dark brown, extreme apex pale orange, tibia with proximal 0.3X dark brown, apical 0.7X pale orange, spur pale orange, extreme apex dark brown, tarsus pale orange, slightly dusky apically; hind femur dark brown, extreme apex orange-brown, tibia with proximal 0.3X brown, apical 0.7X pale orange; tarsus orange-brown; wings largely hyaline but fore wing conspicuously infuscate below marginal vein (Fig. 1719), along anterior margin distad of venation and in apical one-third or so (Fig. 1716); propodeum dark purple-brown, with a slight brassy sheen, side relatively bright metallic dark green, brassy and coppery, at least 30-40 dense, conspicuous, silvery setae outside spiracle; gaster dark purple-brown with a slight coppery sheen and some green and purple reflections, Gt1 anteriorly with a relatively bright, blue-green sheen, syntergum with a slightly duller, dark blue, violet and green lustre, side and venter of gaster with mixed green, coppery, and purple reflections; gonostylus brown, apex pale orange

Head (Fig. 1718) about 2.3X as wide as frontovertex, in profile about 1.9X as high as deep, evenly curved from posterior ocellus to top of scrobes and slightly curved from top of scrobes to mouth margin with interantennal prominence slightly protuberant; occipital margin acute, sharp and carinate; a slender, shallow, shiny-bottomed groove adjacent to eye margin extending from level with anterior margin of posterior ocellus nearly to occipital margin; ocelli forming an angle of about 105°; frontovertex with fairly regular, moderately deep, polygonally reticulate sculpture of mesh size subequal to eye facet, becoming more imbricate-reticulate above scrobes and slightly transversely elongate; piliferous punctures shallow, somewhat obscured by sculpture, slightly larger than eye facet, mostly separated by at least their own diameters; frontovertex with 2 pairs of setae in front of anterior ocellus, a line of setae along inner eye margin continued along lower eye margin to gena; temple and gena with shallow, longitudinally elongate, polygonally reticulate sculpture; eye nearly reaching occipital margin, separated by less than 0.5X diameter of facet, with inconspicuous, pale setae, each much shorter than diameter of facet; scrobes shallow, more or less ∩-shaped, shallowly meeting, weakly margined dorsally and laterally, with much shallower, polygonally reticulate sculpture than on frontovertex, bottoms of scrobes smooth and shiny; interantennal prominence rounded dorsally, with finer and much shallower polygonally reticulate sculpture than on frontovertex; mid-line of torulus about level with lower eye margin; antenna as in Fig. 1715; scape subcylindrical, about 5.4X as long as broad; all funicle segments longer than broad, slightly broader and shorter distad, linear sensilla present in only a single row on all funicle segments; clava a little longer than F5-F6 combined, sensory area at apex only; malar sulcus absent; mouth margin about 1.2X as wide as frontovertex, with a broadly truncate median lobe; mandible with two, long, acute teeth and a truncate upper tooth. Relative measurements: HW 98, HH 90, FV 43, POL 18, OOL 6, OCL 8.5, AOL 10, EL 57, EW 41, MS 32, SL 38, SW 7.

Thorax in dorsal view with pronotum largely hidden by head, with similar sculpture to that on frontovertex above scrobes, although much shallower, and of smaller mesh near posterior margin; mesoscutum and axilla with similar sculpture to that lateral to anterior ocellus; scutellum with similar sculpture to mesoscutum, but slightly finer and deeper; visible part of mesoscutum about 1.5X as broad as long, notaular lines absent; scutellum about 1.1X as long as broad, no carina between axillae; fore wing with venation and distribution of setae as in Figs 1716, 1719, costal cell with only one line of dorsal submarginal setae in distal 0.4X; mesopleuron not quite extending past posterior margin of propodeum; propodeum medially about 0.18X as long as scutellum, with some shallow, polygonally reticulate sculpture, side with a conspicuous, acute, tooth posteriorly above hind coxa, area between tooth and spiracle conspicuously depressed, concave. Relative measurements: FWL 106.5, FWW 43; HWL 71.5, HWW 18.

Gaster about as long as thorax with hypopygium (Fig. 1717) reaching at least about 0.6X to apex; last tergite about 0.8X as long as mid tibia, with apex broadly rounded; ovipositor (Fig. 1720) slightly exserted, the exserted part about 0.4X as long as mid tibial spur or 0.1X mid tibia. Relative measurements: OL 56, GL 17 [MT 47.5].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Golfito, RF Golfo Dulce, Est. Agujas, Cerro Rincon, LS 275200 520100, 640m, YPT, #53490, 15.ix-15.x.1999 (J.A. Azofeifa). Holotype in NHMUK.

Caldencyrtus acamas Noyes & Hanson
(Figs 1722-1732; Hab. ♀ 253, ♂ 254)

Caldencyrtus acamas Noyes & Hanson, 1996:116,117-118. Holotype ♀, Costa Rica, NHMUK, examined.

DIAGNOSIS. *Female* (length about 2.1-2.5mm): antenna (Figs 1723-1725) with scape dark brown; scutellum in proximal half relatively dull coppery purple with some weak violet reflections laterally, in apical half contrasting shiny metallic blue-green; fore tibia more or less completely pale orange, mid and hind tibiae pale orange in apical half; eye separated from occipital margin by much less than diameter of facet, occipital margin sharp at nearest point to eye; vertex with a broadly oval, shiny bottomed depression adjacent to eye, slightly smaller than diameter of posterior ocellus and a little behind it; frontovertex (Fig. 1732) with shallow, small, inconspicuous piliferous punctures; antenna (Figs 1723-1725) with pedicel a little more than 2X as long as broad, F1 subequal in length and width to pedicel and about 1.5-2X as long as broad; F6 subquadrate, not more than 1.2X as long as broad; flagellum very slightly shorter than head width; fore wing with venation and distribution of setae as in Figs 1730, 1731; posterolateral angle of propodeum (Fig. 1726) with a short, broadly truncate tooth above hind coxa, area between tooth and spiracle convex not depressed; gaster very slightly shorter than thorax; last tergite about 0.75X as long as mid tibia; hypopygium (Fig. 1727) with depth of posterior invagination about 0.5-0.8X mid tibial spur; ovipositor (Fig,. 1728) about 1.7-1.9X as long as syntergum and about 3.6-3.9X as long as gonostylus. *Male* (length about 1.8mm): antenna (Fig. 1729) with F1 at most about 2X as long as broad, as wide as pedicel, with at most 25 longitudinal sensilla, each of which is about 0.25X as long as segment; aedeagus (Fig 1722) with pores separated from apex by about 2X their own diameters, apex acute; setae on each side of phallobase relatively close, separated by not more than 1.5X the diameter of sockets.

DISTRIBUTION. Costa Rica.

HOSTS. Reared from galls formed by *Trioza* Förster *magnoliae* group (Hemiptera: Triozidae) on fruit of *Cinnamomum hammelianum* (W.C. Burger) (Laurales: Lauraceae) (Noyes & Hanson, 1996).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Alajuela**, Volcan Poas, 2500m, Lauraceae psyllid fruit gall, 22.ix.1991 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, same data as holotype; 3♂, **Alajuela**, Volcan Poas, ex triozid fruit gall on *Phoebe cinnamomifolia*, i/ii.1995 (P. Hanson). Holotype and paratypes in NHMUK.

Caldencyrtus antander **Noyes & Hanson**

(Figs 1,1733-1738; Hab. ♀ 255, ♂ 256)

Caldencyrtus antander Noyes & Hanson, 1996:116,118. Holotype ♀, Costa Rica, NHMUK, examined.

DIAGNOSIS. *Female* (length about 2.2-2.6mm): antennal scape dark brown (Fig. 1); scutellum uniform dull metallic dark green and purple; fore tibia dark brown in basal half, pale orange distally; mid femur dark brown; mid and hind tibiae dark brown proximally and pale orange in apical half; eye separated from occipital margin by about diameter of facet, occipital margin sharp at nearest point to eye; vertex with a broadly oval, shiny bottomed depression adjacent to eye, slightly smaller than diameter of posterior ocellus and a little behind it; frontovertex with inconspicuous, shallow, piliferous punctures; antenna (Fig. 1) with pedicel a little more than 2X as long as broad, F1 subequal in length and width of pedicel and about 2X as long as broad; F6 about 1.3X as long as broad; flagellum slightly longer than head width; mid tibial spur about as long as basitarsus; fore wing with venation and distribution of setae as in Figs 1733, 1735; mesopleuron extending slightly past posterior margin of propodeum; propodeum with a short, truncate tooth posteriorly above hind coxa, area between tooth and spiracle convex not depressed; gaster at least about as long as head and thorax combined; syntergum at least about as long as mid tibia; hypopygium (Fig. 1738) with posterior margin quite strongly incised, the incised part about 0.75X mid tibial spur; ovipositor more than 1.5X as long as mid tibia, about 1.8X as long a syntergum and nearly 4X as long as gonostylus. *Male* (length about 1.8-2.0mm): antenna (Fig. 1737)

with F1 at least about 2.5X as long as broad, slightly narrower than pedicel, at most with about 10 longitudinal sensilla, each of which is about 0.2X as long as segment; dorsal view of mesosoma Fig. 1736; aedeagus (Fig. 1734) with pores separated from apex by about 3X their own diameters, apex very acute; setae on each side of phallobase separated by at least about 2.5X the diameters of their own sockets.

DISTRIBUTION. Costa Rica.

HOSTS. Reared from galls formed by *Trioza* Förster *magnoliae* group (Hemiptera: Triozidae) on leaves of *Cinnamomum hammelianum* (W.C. Burger) (Laurales: Lauraceae) (Noyes & Hanson, 1996).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Alajuela**, Volcan Poas, 2400m, Volcan Poas, 2400m, *Cinnamomum cinnamomifolia* leaf gall, *Trioza* sp. *magnoliae* group (as ?*Trioza anceps*), 4.iii.1994 (P. Hanson, C. Godoy). Paratypes: **COSTA RICA**, 1♀, **Alajuela**, PN Volcan Poas, ex psyllid gall on Lauraceae, 2500m, 25.x.1990 (P. Hanson); 1♂, Alajuela, Volcan Poas, ex triozid gall on leaf of *Phoebe cinnamomifolia*, i/ii.1995 (P. Hanson); 1♀, **Cartago**, La Cangreja, 1950m, vii.1991 (P. Hanson, C. Godoy); 1♀, Cartago, La Cangreja, 1950m, v.1991 (P. Hanson); 1♀, Cartago, La Cangreja, 9°48'N 83°58'W, 1950m, v./vii.1992 (P. Hanson). Holotype and paratypes in NHMUK.

Non type material. **COSTA RICA**, 1♀, **Heredia**, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/TN, iii.2002 (INBio-OET-ALAS). Material in MZUCR.

Caldencyrtus mitchelli Noyes & Hanson

(Figs 1739-1743; Hab. ♀ 257, ♂ 258)

Caldencyrtus mitchelli Noyes & Hanson, 1996:116-117. Holotype ♀, Costa Rica, NHMUK, examined.

DIAGNOSIS. *Female* (length about 1.9-2.2mm): antennal scape (Fig. 1741) dark brown; scutellum with anterior half conspicuously duller coppery purple contrasting with brighter blue-green of posterior half; fore tibia dark brown, extreme apex amber; mid femur dark brown with apices amber; mid tibia dark brown proximally, dusky yellow distally; hind tibia almost entirely dark brown, apex amber; eye separated from occipital margin by very nearly 2X diameter of facet, occipital margin rounded at nearest point to eye; vertex with broadly oval, shiny bottomed depression adjacent to eye, conspicuously smaller than diameter of posterior ocellus and a little behind it; frontovertex with inconspicuous, shallow piliferous punctures; antenna (Fig. 1741) with pedicel about 1.7X as long as broad, F1 shorter than pedicel but about as wide and about 1.4-1.6X as long as broad; F6 quadrate or clearly transverse; flagellum slightly shorter than head width; fore wing with venation and distribution of setae as in Figs 1739, 1742; propodeum extending a little way past posterior margin of propodeum; posterolateral angle of propodeum with only a very short, truncate tooth posteriorly above hind coxa, area between tooth and spiracle convex not depressed; gaster slightly shorter than thorax; syntergum about 0.6X as long as mid tibia; mid tibial spur slightly longer than basitarsus; hypopygium with posterior margin not strongly incised, the incised part not more than about 0.3X as long as mid tibial spur; ovipositor about as long as mid tibia or 1.7X as long as syntergum and about 4X as long as gonostylus. *Male* (length about 1.6-2.0mm): antenna (Fig. 1743) with F1 at most about 2X as long as broad, as wide as pedicel, with at least 30 longitudinal sensilla, each of which is not more than 0.2X as long as segment; aedeagus (Fig. 1740) with pores separated from apex by about their own diameters, apex hardly acute; setae on each side of phallobase relatively far apart, separated by at least 2.5X diameter of socket.

DISTRIBUTION. Costa Rica.

HOSTS. Reared from galls formed by *Trioza* Förster *magnoliae* group (Hemiptera: Triozidae) on leaves of *Cinnamomum hammelianum* (W.C. Burger) (Laurales: Lauraceae) (Noyes & Hanson, 1996).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Alajuela**, Volcan Poas, 2400m, ex triozid gall on fruit of *Phoebe cinnamomifolia*, i/ii.1995 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **Alajuela**, Volcan Poas, 2500m, ex psyllid gall on Lauraceae, 26.v.1991 (P. Hanson); 1♂, Alajuela, PN volcan Poas, 2500m, Lauraceae, ex psyllid leaf gall, 22.ix.1991 (P. Hanson); 1♀, 1♂, Alajuela, Volcan Poas, 2400m, 4.iii.1994 (P. Hanson, C. Godoy); 2♂, Alajuela, Volcan Poas, psyllid leaf gall on *Cinnamomum cinnamomifolia*, 4.iii.1994 (P. Hanson, C. Godoy); 2♀, 2♂, same data as holotype; 1♂, **Cartago**, La Cangreja, 1950m, 9°48'N 83°58'W, vi-vii.1992 (P. Hanson). Holotype in NHMUK, paratypes in NHMUK and INBio.

Non type material. **COSTA RICA**, 2♀, 1♂, **Alajuela**, PN Volcan Poas, 2500m, *Trioza* leaf gall on Lauraceae, 22.ix.1991 (P. Hanson). Material in NHMUK and MZUCR.

Genus *DALEK* gen.nov.

Type species: *Dalek nationi* **sp.nov.** Gender masculine.

Female. Length about 1.3-2.1mm.

Body robust, generally dark with a weak to moderate metallic sheen; flagellum variable, usually unicolourous dark brown, sometimes paler or bicoloured; palpi white to very pale orange; dorsum of thorax with dark setae; tegula dark brown; wings hyaline or with a small infuscate area below marginal vein, rarely very weakly suffused brown, venation pale orange to brown; propodeum dark with a weak metallic sheen, side more strongly metallic, some silvery setae near spiracle; gaster dark with a metallic sheen.

Head in profile about 1.6-2.0X as high as deep, anteriorly fairly evenly curved from occipital margin to top of scrobes, more strongly curved or angled at top of scrobes and virtually straight to mouth margin, interantennal prominence hardly protuberant; occipital margin sharp, carinate; frontovertex about 0.4-0.5X head width and with irregular, polygonally reticulate to imbricate sculpture and sparse, shallow piliferous punctures, usually 2-8 setae medially between anterior ocellus and top of scrobes; ocelli forming an obtuse angle; no shiny, oval depression adjacent to eye margin behind posterior ocellus; temple and gena with shallow, longitudinally elongate, polygonally reticulate to striate-reticulate sculpture; eye not quite reaching occipital margin, with setae sparse, usually conspicuous; scrobes shallow, ∩-shaped, weakly margined dorsally and laterally; antenna attached below lower eye margin but well above mouth, dorsal margin of torulus about level with lower eye margin or only slightly below; scape about 2.5-7.0X as long as broad, about 0.4-0.5X as long as head width; all funicle segments longer than broad, usually subequal in length, F6 occasionally quadrate, segments gradually becoming slightly broader distally, linear sensilla often conspicuous and on all segments or absent from F1; clava shorter than funicle, 3-segmented, sutures subparallel, sensory area slightly enlarged, hardly extending along ventral surface giving apex of clava a rounded or weakly truncate appearance; malar sulcus absent or present, but very indistinct when present; mouth about 0.40-0.46X head width, clypeal margin often with a distinct medial lobe; mandible tridentate, upper tooth truncate or rarely rounded; palp formula 4-3.

Thorax with pronotum short, its posterior margin distinctly concave; mesoscutum without notaular lines, with polygonally reticulate to imbricate-reticulate sculpture; scutellum convex and usually with side and apex partially mirror smooth and shiny, with sculpture only rarely reaching apex of scutellum, apex and side of scutellum often vertical; sculptured parts with coarse sculpture that is almost always conspicuously deeper than that on mesoscutum; mid tibial spur variable in length; fore wing fully developed; about 2.4-2.6X as long as broad; costal cell with at least 1-2 complete lines of setae ventrally and a line of setae dorsally in apical half or so; submarginal vein with an apical hyaline break; marginal vein about 3.5-6.0X as long as broad, about as long as stigmal vein and about 1.3-2.0X as long as postmarginal vein; linea calva open; filum spinosum present, consisting of a line of about 2-5 stouter setae; posterior margin of mesopleuron not

reaching level with posterior margin of propodeum, falling short by distance equivalent to about diameter of propodeal spiracle; mesopleuron posteriorly not reaching level of posterior margin of propodeum, falling short by about diameter of spiracle or a little less; propodeum fairly short, medially with irregular sculpture, side smooth or with rough sculpture, almost always with a carina posteriorly above hind coxa that runs almost vertically finishing in a posterolateral tooth behind spiracle; about 15-30 setae near spiracle, sometimes extending towards hind coxa.

Gaster with hypopygium not reaching apex; paratergites absent; syntergum shorter than mid tibia, apex variable; ovipositor slightly exserted; ovipositor longer than mid tibia, rarely shorter, second valvifer with up to 2 subapical seta, proximal part broadly C-shaped; hypopygium W-shaped, mid anterior process short, lateral arms quite long each with a shallow but distinct notch on external margin, posterior margin with a shallow to moderately deep invagination.

Male. Length about 1.2-1.9mm.

Generally very similar to female but for slightly wider frontovertex, higher placement of antenna and structure of antenna and genitalia. Frontovertex about 0.5X head width; antennal torulus with lower margin about level with lower eye margin; flagellum filiform, all funicle segments longer than broad and clothed with setae that are 1.5-2X as long as diameter of segments; phallobase with relatively short digiti, each about 1.4-1.5X as long as broad with a single apical tooth and a short outer seta; aedeagus about 0.5X as long as mid tibia with apex acute.

DISTRIBUTION. Known only from Mexico and Costa Rica, but likely to be more widespread in the Neotropics.

HOSTS. More than likely parasitoids of triozids (Hemiptera: Triozidae). *Dalek pleione* was reared from an unidentified triozid on *Oreomunnea costaricensis* D.E. Stone (Fagales: Juglandaceae), *Dalek orthia* was reared from an unknown gall (possibly of Triozidae) on *Vernonia* and *Dalek arax* was collected on *Psidium guajava* L. (Myrtales: Myrtaceae) infested with *Triozoida limbata* (Enderlein) (Triozidae) and some unidentified males were reared from *Leuronota flavipennis* Brown & Hodkinson (det. D. Hollis) (Triozidae) on *Weinmania pinnata* L. (Oxalidales: Cononiaceae).

COMMENTS. *Dalek* is close to *Caldencyrtus* and perhaps other similar genera (e.g. *Hebynthus*, *Alkonia Raquanus*, *Mendisa,* etc.) that may form a monophyletic group (see comments under *Alkonia*, p. 708). Females of *Dalek* can be separated from those of other genera in this group by having all funicle segments longer than broad, F6 occasionally quadrate, the scape at least 3X as long as broad, the mandible tridentate with a truncate upper tooth and the hypopygium W-shaped with lateral arms quite long, each with a distinct notch on the external margin.

Females of *Dalek* differ consistently from those of *Caldencyrtus* in the shape of the hypopygium. In *Caldencyrtus* the hypopygium is transverse, not W-shaped, anteriorly weakly concave, posteriorly strongly biconvex with a deep median invagination. Additonally, in *Dalek* the sculpture on the scutellum is generally deeper than that on the mesoscutum, the apex of the scutellum is at least narrowly smooth and shiny and the posterior margin of the propodeum has a distinct carina that runs almost vertically from above the hind coxa finishing in a posterolateral tooth behind the spiracle. In *Caldencyrtus* the sculpture on the scutellum is similar to that on the mesoscutum and extends to the apex and the propodeum has at most a very indistinct, sloping carina above the hind coxa that does not end in a conspicuous tooth-like projection. Males of *Dalek* have the clava entire, whilst those of *Caldencyrtus* have the clava 2-segmented.

Dalek is also close to *Syrphophagus* Ashmead (1900), species of both genera having similarly structured mandibles (three teeth with upper tooth truncate), carinate occipital margin, wing venation (relatively long marginal vein and postmarginal veins) and strong association with psyllids (many species of *Syrphophagus* are hyperparasitoids of psyllids). Females of *Dalek* differ from those of *Syrphophagus* in having the scutellum very strongly sculptured with the apex always at least narrowly smooth and shiny, a posterior carina and tooth on the propodeum above the hind coxa and a strongly W-shaped hypopygium with notched anterolateral arms. In *Syrphophagus* the sculpture of the scutellum is usually relatively shallow, not deeper than that on mesoscutum, and reaches the posterior margin of the scutellum, the side of the propodeum never has a posterior

carina and does not have a lateral tooth and the anterolateral arms of the hypopygium, if present, do not have a notch on their external margin. The Costa Rican species of *Syrphophagus* will be dealt with in detail in the next contribution to the taxonomy of the Encyrtidae of Costa Rica.

Host relationships suggest that *Dalek* may also be close to *Ginsiana* Erdös & Novicky (1955) because some of North American species currently placed in this genus (*arbuticola* (Gahan & Waterston, 1926), *richardsi* (Barron, 1970) and *vectius* (Walker, 1847)) have been associated with psyllids or triozids. No European species, including the type species of the genus, *obscura*, has a known host. *Ginsiana vectius* (Walker), from Florida, does show some similarities to *Dalek* in that it has a carina on the propodeum terminating in a tooth behind the spiracle, similar mandibular structure, hypopygium and fore wing venation. *Ginsiana vectius* differs from species of *Dalek* by having the sculpture on the scutellum extending all the way to the apex. *Ginsiana arbuticola* from California, is similar to *Dalek orthia*, *ananke* and *carme* but differs from these species in having the postmarginal vein about 0.5X as long as the stigmal vein and the hypopygium reaching the apex of the gaster. It is possible that *vectius, arbuticola* and the other north American species would be better placed in *Dalek*, but this requires further study. None of the European species currently placed in *Ginsiana* has a carina posteriorly on the propodeum that ends in a tooth and the venation is different in that the stigmal vein forms a much greater angle with the anterior margin of the fore wing than in any species of *Dalek*, although the hypopygium of *longicornis* is somewhat similar to that of *Dalek* species. All European species of *Ginsiana* have the gena straight in facial view, the malar sulcus very strong and conspicuous, the mandible with 1 tooth and a broad, slightly concave truncation and the stigmal vein forming an angle of about 45-50° with the anterior wing margin. In *Dalek* the gena is distinctly curved in facial view, the malar sulcus is absent, or very weak and inconspicuous, the mandible is tridentate with the upper tooth truncate and the stigmal vein forms an angle of about 30° with the anterior wing margin.

Key to Costa Rican species of *Dalek*
(Females)

1. Scape more than 6X as long as broad ..... *thanatos* **sp.nov.** (p. 639)
- Scape less than 6X as long as broad 2

2 (1) Scutellum with not more than apical one-fifth smooth and shiny (Figs 1753, 1758, 1766) 3
- Scutellum with at least apical one-third smooth and shiny (e.g. Figs 1773, 1796, 1804, 1820, 1828) 5

3 (2) Funicle with linear sensilla on F1; clypeal margin (Fig. 1752) with a distinct, convex median lobe; fore wing (Fig. 1750) not more than about 2.4X as long as broad; ovipositor shorter than mid tibia with gonostylus shorter than mid tibial spur so that ovipositor is hidden or hardly exserted, the exserted part not more than 0.2X as long as mid tibial spur; syntergum apically broadly truncate .... *carme* **sp.nov.** (p. 640)
- Funicle without linear sensilla on F1; clypeal margin (Figs 1761, 1765) medially virtually straight or hardly convex, without a distinct median lobe; fore wing (Figs. 1759, 1764) at least about 2.5X as long as broad; ovipositor longer than mid tibia with gonostylus at least as long as mid tibial spur so that ovipositor is clearly exserted, the exserted part at least 0.5X as long as mid tibial spur; syntergum apically broadly rounded or acute 4

4 (3) Posterior ocellus closer to eye than to occipital margin; mesosocutum bright, metallic, dark green; mid tibial spur as long as corresponding basitarsus; sculpture on scutellum (Fig. 1758) more or less reaching apex ..... *ananke* **sp.nov.** (p. 642)
- Posterior ocellus closer to occipital margin than to eye; mesosocutum dull, dark blue; mid tibial spur clearly longer than corresponding basitarsus; apical one-fifth of scutellum (Fig. 1766) smooth and shiny ..... *orthia* **sp.nov.** (p. 644)

5 (2) Funicle segments (Fig. 1771) relatively slender, F1 at least 2X as long as broad, F6 1.8X as long as broad, scape mostly yellow, subcylindrical and at least 4.5X as long as broad ..... *pleione* **sp.nov.** (p. 646)
- Funicle (e.g. Figs 1778, 1790, 1799, 1807) with both F1 and F6 not more than about 1.5X as long as broad, if F1 nearly 2X as long as broad then scape almost entirely dark brown. clearly broadened and flattened and less than 4X as long as broad 6

6 (5) Exserted part of ovipositor more than 1.5X as long as mid tibial spur, gonostylus at least 2.5X as long as mid tibial spur 7
- Exserted part of ovipositor not longer than mid tibial spur, gonostylus not more than 2.0X as long as mid tibial spur 8

7 (6) Propodeum with only about 10 silvery setae outside spiracle that extend towards posterior margin but not down side towards hind coxa; flagellum (Fig. 1778) uniformly dark brown, fore wing (Fig. 1779) completely hyaline except for a small weakly infuscate area immediately below marginal vein ..... *jigas* **sp.nov.** (p. 648)
- Propodeum with at least 30 very conspicuous, silvery setae outside spiracle that extend towards posterior margin and down side nearly to hind coxa; antenna (Fig. 1784) with F1 pale orange and F2 orange-brown; fore wing (Fig. 1782) weakly suffused brown medially as well as having a small infuscate area immediately below marginal vein ..... *minerva* **sp.nov.** (p. 650)

8 (6) Scape (Figs 1790, 1798, 1799) completely yellow or pale orange 9
- Scape (e.g. Figs 1808, 1813, 1816, 1826) brown at least proximally 10

9 (8) All coxae dark brown; side of propodeum above hind coxa with conspicuous sculpture, dull, without a smooth and shiny area anteriorly ..... *arax* **sp.nov**. (p. 652)
- Fore and hind coxae yellow, mid coxa largely yellow or pale orange with some brown proximally or completely brown; side of propodeum above hind coxa with shallow sculpture, quite shiny anteriorly ..... *saurax* **sp.nov.** (p. 654)

10 (8) Scape (Fig. 1808) more or less completely dark brown; sculpture on mesoscutum (Fig. 1804) about as deep as that on scutellum ..... *cyclos* **sp.nov.** (p. 656)
- Scape (e.g. Figs 1813, 1816, 1826, 1833) proximally dark brown with at least apical one-third pale orange or yellow; sculpture on mesoscutum (Figs 1812, 1820, 1825, 1828) usually distinctly shallower than that on scutellum 11

11 (10) Posterior ocellus closer to occipital margin than to eye ..... *gubrana* **sp.nov.** (p. 658)
- Posterior ocellus equidistant from eye and occipital margin or closer to eye 12

12 (11) Scape less than 4X as long as broad ..... *pomona* **sp.nov.** (p. 660)
- Scape more than 4X as long as broad 13

13 (12) Ovipositor about 1.1X as long as mid tibia, gonostylus less than 1.4X as long as mid tibial spur, exserted part of ovipositor less than 0.2X length of mid tibial spur; sculpture on scutellum (Fig. 1825) extending some way past pair of campaniform sensilla so that sculptured area immediately distad of these sensilla is at least 5 cells deep, smooth distad of these ..... *elana* **sp.nov.** (p. 662)
- Ovipositor about 1.6X as long as mid tibia, gonostylus more than 1.5X as long as mid tibial spur, exserted part of ovipositor more than 0.5X as long as mid tibial spur; sculpture on scutellum (Fig. 1828) not reaching more posteriorly than pair of campaniform sensilla or hardly so, distally completely smooth and shiny .... *nationi* **sp.nov.** (p. 664)

***Dalek thanatos* sp.nov.**
(Figs 1744-1747)

DIAGNOSIS. *Female* (length about 1.7mm): scape (Fig. 1744) pale orange; mesoscutum dull metallic dark green; all coxae black; clypeal margin medially weakly convex; OOL slightly more than OCL; antenna (Fig. 1744) with scape about 6.5X as long as broad; funicle segments with F1 about 2X as long as broad, F6 slightly longer than broad; linear sensilla on all segments; mesoscutum with sculpture about as deep as on main part of scutellum; scutellum with apex and side smooth and shiny; mid tibial spur shorter than basitarsus; fore wing (Fig. 1747) about 2.5X as long as broad; propodeum with about 30 setae around spiracle, side with rough reticulate sculpture; apex of syntergum angular; ovipositor longer than mid tibia, exserted part about 0.5X as long as mid tibial spur; gonostylus longer than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.74mm; excluding ovipositor, 1.67mm (CPD).

Head mainly black; frontovertex generally with a weak, dark green and purple sheen, occipital margin slightly coppery; lower scrobal area, temple and gena with a distinct coppery purple sheen, temple and gena very shiny; frontovertex, gena and interantennal prominence with fairly inconspicuous brown setae; antenna (Fig. 1744) with radicle orange-brown, scape pale orange, pedicel and flagellum dark brown; maxillary palpus pale orange; pronotum black generally with a brassy sheen and some weak green, coppery and purple reflections; propleuron and prosternum black; mesoscutum overall dull, metallic, dark green, anteriorly coppery purple; tegula dark brown with a slight brassy and purple sheen; axilla black with coppery, brassy and green reflections; scutellum much duller than mesoscutum, dorsally with a weak dark metallic green and coppery sheen, apical 0.3X and side strongly metallic, shining coppery, this coppery area extending medially about 0.2X into duller dark green area on dorsum; mesoscutum clothed with inconspicuous, translucent pale brown setae, axilla and scutellum with dark brown setae; metanotum black, with a weak brassy and purple sheen; mesopleuron black with a brassy sheen; mesosternum black; fore coxa black; fore femur dark brown with apices pale orange, tibia pale orange with a subbasal pale brown ring, tarsus orange-brown, apical tarsomere brown; mid coxa black; mid femur pale orange at base, mostly black, tibia brown in proximal half with a dark brown subbasal ring, apical half pale orange, spur and tarsus pale orange, apical tarsomere brown; hind coxa black; femur black, apices pale orange, tibia dark brown, extreme apices pale orange, tarsus orange-brown, apical tarsomere brown; wings (Fig. 1747) hyaline, venation brown; propodeum black with a weak brassy sheen, side dorsally with a brassy and blue-green sheen, about 30 conspicuous, long, silvery setae behind and outside spiracle extending most of the way to posterior margin; gaster dark brown, with a distinct coppery purple sheen, dorsal part of Gt1 with a strong metallic blue-green sheen in proximal two-thirds, side of gaster anteriorly purple, otherwise with a mixed metallic green, brassy and coppery sheen; gonostylus dark brown.

Head about 2.6X as wide as frontovertex, in profile about 1.8X as high as deep; occipital margin sharp, strongly carinate; ocelli forming an angle of about 110°; frontovertex slightly shiny, with irregular, moderately deep, rounded to transversely elongate polygonally reticulate to imbricate-reticulate sculpture of mesh size generally subequal to eye facet; frontovertex with piliferous punctures very shallow, 3 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; interantennal prominence with two submedian lines of conspicuous long setae; temple and gena much more shiny than frontovertex, anterior part of temple and upper part of gena completely smooth, posterior part of temple and lower and posterior part of gena with shallow longitudinally elongate, strigose to striate-reticulate sculpture; eye not quite reaching occipital margin, separated by about diameter of facet, with sparse, conspicuous setae that are a little longer than diameter of facet, eye separated from scrobal margin by about 0.4X diameter of ocellus, area between eye and scrobe with shallow sculpture; scrobes very shallow, narrowly ∩-shaped, more or less meeting, fairly smooth but with shallow, transversely elongate, imbricate-reticulate sculpture, extremely weakly margined dorsally and laterally; interantennal prominence weak, dorsally moderately acute, virtually smooth; antenna as in Fig. 1744; scape subcylindrical, about 6.7X as long as broad; all funicle segments clearly longer than broad, subequal in length, segments slightly broader distad, linear sensilla present and

conspicuous on all segments; clava hardly broader than F6, slightly shorter than F4-F6 combined, sutures not oblique, sensory area slightly enlarged, extending ventrally about 0.15X length of clava, apex appearing rounded; malar sulcus absent; clypeal margin weakly convex medially; mandible with two acute teeth and a truncate upper tooth. Relative measurements: HW 120, HH 100, FV 45.5, POL 21, OOL 5.5, OCL 5, AOL 10, EL 72, EW 55, MS 31, SL 60, SW 9.

Thorax in dorsal view with pronotum short, mostly hidden by head; pronotum dorsally with imbricate-reticulate to polygonally reticulate sculpture that is about as deep as that on frontovertex above scrobes; mesoscutum with coarse, regular polygonally reticulate sculpture that is slightly deeper than sculpture on pronotum, ridges delimiting cells relatively wide and very smooth; axilla with polygonally reticulate sculpture that is finer and slightly shallower than that on mesoscutum; dorsal part of scutellum with very similar sculpture to mesoscutum, vertical apex (approximately apical 0.3X) and side completely smooth and shiny, the smooth area extending medially about 0.2X into dorsal, sculptured part; visible part of mesoscutum about 1.4X as broad as long; scutellum convex, about as broad as long; fore wing with venation and distribution of setae as in Figs 1745, 1747; costal cell with a single line of setae dorsally in apical 0.35X; mid tibial spur shorter than corresponding basitarsus; propodeum medially about 0.24X as long as scutellum and strongly sculptured, with at least 5 carinae and some shallow, reticulate sculpture medially, side with rough reticulate sculpture; side of propodeum posteriorly sharp and carinate posteriorly above hind coxa and with a short, triangular tooth about half way to spiracle. Relative measurements: FWL 121, FWW 49; HWL 88, HWW 22.5.

Gaster with hypopygium (Fig. 1746) reaching about 0.8X to apex; syntergum about 0.75X as long as mid tibia, with apex angular, but not acute; ovipositor slightly exserted, the exserted part about 0.5X as long as mid tibial spur or about 0.13X mid tibia. Relative measurements: OL 117, GL 33.5 [MT 81, MTS 18].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, 16km SSE La Virgen, 10°16'N 85°05'W, 1050-1150m, 11/M/NOTN, 9.ii-21.iv.2001 (INBio/OET-ALAS). Holotype in NHMUK.

COMMENTS. At a quick glance, females of *Dalek thanatos* may be confused with those of *pomona*, both being generally similar in colouration and proportions of the funicle segments. Apart from the relatively more slender scape (see key), *thanatos* can be separated from *pomona* by the colour of scape and funicle and sculpture of the scutellum. In *thanatos*, the scape is pale orange, F1-F3 are orange or orange-brown and paler than F4-F6, the scutellum has sculpture of similar depth to the mesoscutum with the smooth, shiny area extending only about 0.2X into sculptured part. In *pomona* the scape is mostly dark brown, the flagellum is unicolourous dark brown, the scutellum has slightly deeper sculpture than mesoscutum with the smooth, shiny area extending about 0.4X into sculptured part.

Dalek carme **sp.nov.**

(Figs 1748-1754; Hab. ♀ 259)

DIAGNOSIS. *Female* (length about 1.3-1.8mm): scape (Fig. 1749) dark brown with apex orange; mesoscutum dull, metallic, dark green; all coxae dark brown; clypeal margin (Fig. 1752) with a very short, truncate, median lobe; OOL slightly less than OCL; antenna (Fig. 1749) with scape about 4.5X as long as broad; funicle with F1 smallest, remaining segments subequal, all about 1.5X as long as broad; linear sensilla on all segments; mesoscutum with shallower sculpture than on scutellum (Fig. 1753); sculpture on scutellum extending to side and apex; mid tibial spur

longer than basitarsus; fore wing (Fig. 1750) about 2.4X as long as broad; propodeum with about 20 setae around spiracle; apex of syntergum broadly truncate; ovipositor (Fig. 1754) shorter than mid tibia, exserted part about 0.2X as long as mid tibial spur; gonostylus shorter than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.77mm; excluding ovipositor, 1.73mm (CPD).

Head generally black with a coppery sheen; ocellar and scrobal areas dull, metallic dark green; temple metallic green near eye; frontovertex, gena and interantennal prominence with inconspicuous, brown setae; antenna (Fig. 1749) with radicle dark orange-brown; scape mostly dark brown, apical 0.3X pale orange; pedicel dark brown, pale orange ventrally and at extreme apex; flagellum brown, F2-F6 mixed pale orange ventrally; maxillary palpus white, terminal segments very pale orange; thorax generally dark brown to black; pronotum with a moderate coppery purple and dark green sheen; mesoscutum with a dull metallic dark green sheen mixed coppery purple, more strongly coppery purple posteriorly, posterior margin narrowly coppery purple; tegula dark brown with a coppery purple sheen; axilla dark purple-brown with a coppery purple sheen; scutellum relatively bright metallic blue-green and dark green, mixed with some coppery purple medially and towards base, extreme apex with a coppery and dark blue sheen; mesoscutum clothed with fairly conspicuous, translucent, pale brown setae, scutellum with slightly less conspicuous dark brown setae; metanotum dark purple-brown; mesopleuron very dark brown, with a brassy sheen mixed with some coppery purple; mesosternum dark brown; all coxae dark brown; fore femur dark brown with extreme apices pale orange, tibia and tarsus pale orange, apical tarsomere slightly dusky; mid femur off-white in proximal 0.2X, apical 0.2X pale orange, otherwise dark brown, tibia dusky pale orange with a broad, brown, subbasal ring extending to about 0.6X, spur and tarsus pale orange; hind femur dark brown, extreme apices pale orange, tibia mostly dark brown with extreme base and apex pale orange-brown, tarsus dusky pale orange, apical tarsomere brown; wings mostly hyaline, but fore wing (Fig. 1750) with a small, weak, infuscate area immediately below marginal and stigmal veins, and generally extremely weakly infuscate below submarginal vein and adjacent to anterior wing margin; propodeum dark brown, with a weak purple and brassy sheen, side with a dull metallic green, brassy and coppery sheen with about 20 conspicuous, translucent, silvery setae outside spiracle, extending towards posterior margin but not towards hind coxa; gaster dark brown, with a distinct coppery purple sheen, dorsal anterior part of Gt1 with a distinct, blue-green sheen, side of gaster with a mixed metallic green, brassy and coppery sheen; gonostylus dark brown.

Head (Fig. 1752) about 2.4X as wide as frontovertex, in profile about 1.7X as high as deep; occipital margin sharp, carinate; frontovertex with irregular, fairly deep, polygonal sculpture, in ocellar area of mesh size smaller than eye facet, subequal in front of anterior ocellus; ocelli forming an angle of about 100°; frontovertex with piliferous punctures shallow and indistinct, about 4 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin on to gena; interantennal prominence with a few inconspicuous setae; temple and gena with shallow to moderately deep, longitudinally elongate, polygonally reticulate sculpture of relatively large mesh, area immediately below eye completely smooth; eye nearly reaching occipital margin, separated by less than 0.5X diameter of facet, clothed with fairly conspicuous setae, each about as long as diameter of facet, separated from scrobal margin by very slightly less than diameter of ocellus, area between eye and scrobe partly with shallow, transversely elongate, polygonally reticulate sculpture; scrobes shallow, more or less ∩-shaped, meeting dorsally, very weakly margined dorsally and laterally; interantennal prominence shallow, dorsally rounded; antenna as in Fig. 1749; scape slightly broadened and flattened, about 4.5X as long as broad, dorsal margin straight; funicle segments subequal in length, all clearly longer than broad, becoming slightly broader distad, linear sensilla on all segments; clava hardly enlarged, about 1.2X as wide as F6, a little shorter than F4-F6 combined, outer suture not oblique, sensory area not enlarged, at apex only giving it a rounded or slightly pointed appearance; malar sulcus present dorsally but very shallow and inconspicuous; clypeal margin with a very short, truncate median lobe; mandible with two acute teeth and a truncate, broad, upper tooth. Relative measurements: HW 84, HH 76.5, FV 35, POL 15.5, OOL 4.5, OCL 5, AOL 9.5, EL 49, EW 36, MS 26, SL 36, SW 8.

Thorax (Fig. 1753) in dorsal view with pronotum clearly visible behind head, its posterior margin concave, with polygonally reticulate sculpture that is generally similar to that on anterior part of frontovertex; mesoscutum with slightly irregular, polygonally reticulate sculpture that is similar to that on pronotum, of conspicuously smaller mesh posteriorly; axilla with transversely elongate, polygonally reticulate to imbricate-reticulate sculpture that is of similar depth to that on posterior part of mesoscutum; scutellum dorsally convex, mostly with similar sculpture to that on posterior part of mesoscutum, but clearly coarser, much deeper, slightly longitudinally elongate and more or less arranged in whorls, especially laterally, sculpture continued on to side and almost to apex, but clearly shallower; visible part of mesoscutum about 1.6X as broad as long; scutellum nearly 1.1X as long as broad, apex not flange-like; fore wing with venation and distribution of setae as in Figs 1748, 1750; costal cell with a single line of setae dorsally in apical 0.5X or so; mid tibial spur clearly longer than basitarsus; propodeum (Fig. 1753) medially about 0.14X as long as scutellum, virtually smooth, side posteriorly sharp above hind coxa, but not carinate, with a small, triangular tooth a little above half way towards spiracle. Relative measurements: FWL 98, FWW 40.5; HWL 63, HWW 17.

Gaster with hypopygium reaching about 0.8X to apex; syntergum about 0.5X as long as mid tibia, with apex broadly truncate; ovipositor hardly exserted, the exserted part about 0.2X as long as mid tibial spur or less than 0.1X as long as mid tibia.

Paratype. Hypopygium Fig, 1751; ovipositor Fig. 1754. Relative measurements: OL 76, GL 21 [MT 95, MTS 32].

Variation. Females vary in overall length from 1.34-1.77mm, the ovipositor may be completely hidden, otherwise very little variation noted in material available.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Est. Altamira, Send. a Casa Coca, LS 331750 574400, 1700m, #61431, 15.i-14.ii.2001 (D. Rubí). Paratypes: **COSTA RICA**, 1♀, **Puntarenas**, Est. Altamira, Send. Los Gigantes, LS 331800 572100, 1460m, #62097, 13.ii-15.ii.2001 (D. Rubí); 1♀, Puntarenas, San Vito, Est. Las Alturas, 1500m, i.1992 (P. Hanson). Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. *Dalek carme* is very similar to *ananke*, both species having a similar antenna, general colouration, scutellum with sculpture extending to the apex and propodeum without a carina above the hind coxa. In *carme* F2-F6 are mixed pale orange ventrally, the mesoscutum is dull, metallic dark green, the scape is about 4.5X as long as broad, linear sensilla are present on F1, the syntergum is only about half as long as the mid tibia with a truncate apex and the ovipositor is shorter than the mid tibia and hidden or hardly exserted. In *ananke* the funicle is unicolourous dark brown; the mesoscutum is bright metallic dark green or blue-green, the scape is about 3.3X as long as broad, linear sensilla are absent from F1, the syntergum is about 0.8X as long as the mid tibia with an acute apex and the ovipositor is longer than the mid tibia and clearly exserted with the exserted part at least about 0.5X as long as the mid tibial spur.

Dalek ananke **sp.nov.**

(Figs 1755-1761; Hab. ♀ 260)

DIAGNOSIS. *Female* (length about 1.7-1.9mm): scape (Fig. 1757) dark brown, apex orange; mesoscutum bright metallic dark green or blue-green; all coxae dark brown; clypeal margin (Fig. 1761) with a very short, rounded, median lobe; OOL much less than OCL; antenna (Fig. 1757) with scape about 3.3X as long as broad; funicle with F1 smallest, remaining segments subequal, mostly about 1.5X as long as broad, F6 relatively broader; linear sensilla only on F2-F6; mesoscutum with shallower sculpture than scutellum (Fig. 1758); sculpture on scutellum extending to side

and apex; mid tibial spur about as long as basitarsus; fore wing (Fig. 1759) about 2.5X as long as broad; propodeum with about 15 setae around spiracle; apex of syntergum acute; ovipositor (Fig. 1756) longer than mid tibia, exserted part about 0.5X as long as mid tibial spur; gonostylus very slightly longer than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.71mm; excluding ovipositor, 1.60mm (CPD).

Head generally black with a coppery purple sheen; ocellar and scrobal areas dull, metallic dark green; temple and gena metallic green near eye, posteriorly coppery and brassy, gena coppery purple near mouth; mouth margin coppery purple; frontovertex, gena and interantennal prominence with inconspicuous, brown setae; antenna (Fig. 1757) with radicle mostly dark brown, mixed with some pale orange; scape mostly dark brown, extreme apex pale orange; pedicel dark brown, pale orange ventrally and at extreme apex; flagellum brown; maxillary palpus white, terminal segment very pale orange; thorax generally dark brown to black; pronotum with a moderate coppery purple and dark green sheen; mesoscutum relatively bright metallic dark green and blue-green, with some coppery purple reflections, posterior margin narrowly coppery purple; tegula dark brown with a coppery purple sheen; axilla dark purple-brown with a coppery purple sheen; scutellum relatively bright metallic dark green and blue-green, with some coppery reflections, extreme apex with a coppery and dark blue sheen; mesoscutum and scutellum clothed with fairly inconspicuous dark brown setae; metanotum dark purple-brown; mesopleuron very dark brown, with a brassy sheen mixed with some coppery purple; mesosternum dark brown; all coxae dark brown; fore femur dark brown with extreme apices pale orange, tibia dark brown with extreme base and apical 0.3X pale orange, tarsus dusky pale orange, apical tarsomere brown; mid femur off-white in proximal 0.2X, apical 0.2X pale orange, otherwise dark brown, tibia dusky pale orange with a broad, brown, subbasal ring extending to about 0.6X, spur and tarsus pale orange, distal tarsomeres slightly dusky, apical tarsomere brown; hind femur dark brown, extreme apex pale orange, tibia mostly dark brown with extreme base and apex pale orange-brown, tarsus dark orange-brown, apical tarsomeres dark brown; wings mostly hyaline, but fore wing (Fig. 1759) with a small, weak, infuscate area immediately below marginal and stigmal veins; propodeum dark brown, with a weak purple and brassy sheen, side with a dull metallic green sheen with about 15 conspicuous, translucent, silvery setae outside spiracle, extending towards posterior margin but not towards hind coxa; gaster dark brown, with a distinct coppery purple sheen, dorsal anterior part of Gt1 with a distinct dark blue, blue-green, brassy and coppery sheen, side of gaster with a mixed metallic green, brassy and coppery sheen; gonostylus dark brown.

Head (Fig. 1761) about 2.5X as wide as frontovertex, in profile about 1.7X as high as deep; occipital margin sharp, carinate; frontovertex with irregular, fairly deep, polygonal sculpture, in ocellar area of mesh size smaller than eye facet, subequal or conspicuously larger in front of anterior ocellus; ocelli forming an angle of about 105°; frontovertex with piliferous punctures shallow and indistinct, about 4 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin on to gena; interantennal prominence with a few inconspicuous setae; temple and gena with moderately deep, longitudinally elongate, polygonally reticulate sculpture of relatively large mesh, area immediately below eye completely smooth; eye nearly reaching occipital margin, separated by about 0.5X diameter of facet, clothed with fairly inconspicuous setae, each clearly shorter than diameter of facet, separated from scrobal margin by very slightly less than diameter of ocellus, area between eye and scrobe partly with shallow, transversely elongate, polygonally reticulate sculpture; scrobes shallow, more or less ∩-shaped, meeting dorsally, very weakly margined dorsally and laterally; interantennal prominence shallow, dorsally rounded; antenna as in Fig. 1757; scape broadened and flattened, about 3.3X as long as broad, dorsal margin straight; all funicle segments at least a little longer than broad, becoming slightly broader distad; clava hardly enlarged, less than 1.1X as wide as F6, a little shorter than F4-F6 combined, outer suture not oblique, sensory area hardly enlarged, at apex only giving it a rounded or slightly pointed appearance; malar sulcus absent; clypeal margin with a very weak, convexly rounded median lobe; mandible with two acute teeth and a broad, truncate, upper tooth. Relative measurements: HW 76, HH 69, FV 31, POL 15, OOL 3, OCL 5, AOL 8.5, EL 44, EW 32, MS 26, SL 30, SW 9.

Thorax (Fig. 1758) in dorsal view with pronotum clearly visible behind head, its posterior

margin concave, with polygonally reticulate sculpture that is generally similar to that on anterior part of frontovertex; mesoscutum with slightly irregular, polygonally reticulate sculpture that is similar to that on pronotum, of conspicuously smaller mesh posteriorly; axilla with transversely elongate, polygonally reticulate to imbricate-reticulate sculpture that is of similar depth to that on posterior part of mesoscutum; scutellum dorsally convex, mostly with similar sculpture to that on posterior part of mesoscutum, but clearly coarser, and much deeper, this continued on to side and almost to apex, but clearly shallower; visible part of mesoscutum about 1.8X as broad as long; scutellum nearly 1.1X as long as broad, apex not flange-like; fore wing with venation and distribution of setae as in Figs 1755, 1759; costal cell with a single line of setae dorsally in apical 0.5X or so; mid tibial spur about as long as basitarsus; propodeum (Fig. 1758) medially about 0.16X as long as scutellum, with some distinct, but irregular sculpture, side posteriorly sharp above hind coxa, but not carinate, with a small triangular tooth a little above half way towards spiracle. Relative measurements: FWL 88, FWW 35; HWL 60, HWW 15.

Gaster with hypopygium reaching about 0.6X to apex; syntergum about 0.8X as long as mid tibia, with apex acute; ovipositor clearly exserted, the exserted part about 0.5X as long as mid tibial spur or about 0.2X as long as mid tibia.

Paratype. Funicle with linear sensilla only on F2-F6; hypopygium Fig. 1760; ovipositor Fig. 1756. Relative measurements: OL 131, GL 43.5 [MT 78, MTS 27].

Variation. Females vary in overall length from 1.71-1.87mm, F1 may have linear sensilla, otherwise very little variation noted in material available.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, 26km N San Isidro, 9°30'N 83°43'W, vi-vii.1992 (P. Hanson). Paratypes: **COSTA RICA**, 2♀, **Guanacaste**, ZP Miravalles, Las Hornillas, LN 299400 409200, 900m, #79677, 21.vii.2004, (J. Azofeifa); 2♀, **San José**, Zurqui de Moravia, 1600m, v.1992 and iv.1995 (P. Hanson); 1♀, San José, San Pedro, UCR Campus, 1200m, 28.ii.1997 (C. Hansson); 1♀, San José, 26km N San Isidro, 9°30'N 83°43'W, 2100m, i-ii.1991 (P. Hanson, C. Godoy); 1♀, San José, 26km N San Isidro, 9°30'N 83°43'W, 2100m, xi1992-i.1993 (P. Hanson); 1♀, San José, Cerro (de la) Muerte, 19km S, 3km W Empalme, 2600m, iv-vii.1992 (P. Hanson, C. Godoy). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

COMMENTS. See comments under *carme* (p. 642).

Dalek orthia **sp.nov.**

(Figs 1762-1767; Hab. ♀ 261)

DIAGNOSIS. *Female* (length about 1.3-1.7mm): scape (Fig. 1767) mostly dark brown, apex orange; mesoscutum dull metallic dark blue; all coxae dark brown; clypeal margin (Fig. 1765) virtually straight medially; OOL considerably less than OCL; antenna (Fig. 1767) with scape about 4.3X as long as broad; funicle segments with all segments slightly longer than broad; linear sensilla only on F2-F6; mesoscutum with sculpture shallower than on scutellum (Fig. 1766); scutellum with side and apical one-fifth completely smooth and shiny; mid tibial spur longer than basitarsus; fore wing (Fig. 1764) about 2.6X as long as broad; propodeum with about 20 setae around spiracle, side virtually smooth; apex of syntergum rounded; ovipositor (Fig. 1762) longer than mid tibia, exserted part about 0.7X as long as mid tibial spur; gonostylus hardly longer than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.70mm; excluding ovipositor, 1.56mm (CPD).

Head mainly black; frontovertex shiny with a metallic dark blue sheen mixed coppery along

occipital margin and weak coppery purple along inner eye margins and immediately above scrobes; scrobal area and dorsal part of interantennal prominence with a weak coppery purple sheen; lower part of interantennal prominence and below and outside torulus with a metallic, dark blue sheen; area between eye and scrobe with a slight brassy and coppery sheen and area immediately below lowest part of eye with a strong metallic purple, green, brassy and coppery sheen; temple, gena, scrobes, interantennal prominence and mouth margin shining coppery purple, temple coppery along eye margin, then narrowly very shiny, metallic blue-green and brassy and posteriorly coppery; gena largely coppery, but metallic green towards torulus; frontovertex, gena and interantennal prominence with fairly inconspicuous translucent, pale brown setae; antenna (Fig. 1767) with radicle orange-brown, apex dark brown; scape dark brown with apical 0.25X pale orange; pedicel mostly pale orange, dorsally and laterally proximally dark brown, flagellum brown with linear sensilla conspicuous and white; maxillary palpus white to very pale orange; pronotum black generally with a coppery purple sheen, mixed green, dark blue and brassy; propleuron and prosternum black; mesoscutum overall dull, metallic, dark blue with some purple reflections; tegula dark brown with a slight brassy and purple sheen; axilla black with a very weak brassy sheen; scutellum dorsally about as shiny as mesoscutum, with a metallic, dark blue sheen and some weak purple reflections anteriorly, apical 0.2X of scutellum strongly shining purple, side strongly shining metallic green and blue-green; mesoscutum, axilla and scutellum clothed with fairly conspicuous, translucent pale brown setae; metanotum dark brown with a weak brassy sheen; mesopleuron dark brown, mainly with a weak brassy and coppery sheen, but anterior part with a weak metallic, dark blue sheen; mesosternum dark brown; fore coxa dark brown; fore femur proximally dark brown, apical half pale orange, tibia pale orange, tarsus pale orange; mid coxa dark brown; mid femur with a broad, median dark brown band, otherwise white to very pale orange, tibia pale orange with a narrow, brown subbasal ring extending to about 0.4X, spur and tarsus pale orange; hind coxa dark brown; hind femur mostly dark brown with apices pale orange, tibia with extreme base pale orange, a broad, dark brown subbasal ring, apical half or so dusky pale orange with an inconspicuous, brownish subapical ring, tarsus dusky pale orange; wings mainly hyaline but fore wing (Fig. 1764) with a small infuscate patch below the marginal vein, submarginal vein slightly dusky pale orange, venation otherwise brown; propodeum dark brown with a weak brassy sheen, laterally with a weak blue-green and coppery sheen, side dorsally with a weak green sheen, about 20 conspicuous, long, silvery setae behind and outside spiracle extending about half way to posterior margin; gaster dark brown, with a distinct coppery purple sheen, dorsal part of Gt1 with a strong metallic dark blue, blue-green and purple sheen, side of gaster anteriorly coppery, otherwise with a mixed metallic green, brassy and coppery sheen; gonostylus dark brown, extreme apex dusky orange.

Head (Fig. 1765) about 2.7X as wide as frontovertex, in profile about 1.6X as high as deep; occipital margin sharp, strongly carinate; ocelli forming an angle of about 110°; frontovertex shiny, with irregular, moderately deep, rounded polygonally reticulate to imbricate-reticulate sculpture of mesh size generally slightly smaller, to slightly larger, than eye facet; frontovertex with piliferous punctures very shallow, 3 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; interantennal prominence with two submedian lines of short, conspicuous setae; temple and gena much more shiny than frontovertex, anterior part of temple and upper part of gena completely smooth, posterior part of temple and lower and posterior part of gena with very shallow longitudinally elongate, strigose to striate-reticulate sculpture; eye not quite reaching occipital margin, separated by about diameter of facet, with sparse, fairly inconspicuous setae that are much shorter than diameter of facet, eye separated from scrobal margin by about 0.7X diameter of ocellus, area between eye and scrobe with shallow sculpture; scrobes extremely weakly margined dorsally and laterally, very shallow, narrowly ∩-shaped, meeting, fairly smooth but with shallow, transversely to longitudinally elongate, imbricate-reticulate sculpture; interantennal prominence weak, dorsally rounded, with shallow, polygonally reticulate sculpture; antenna as in Fig. 1767; scape slightly broadened, about 4.3X as long as broad; all funicle segments clearly longer than broad, subequal in length, segments slightly broader distad; clava hardly broader than F6, very nearly as long as F4-F6 combined, sutures not oblique, sensory area slightly enlarged, at apex only giving it a rounded appearance; malar sulcus absent; clypeal margin virtually straight medially; mandible with two acute teeth and

a rounded, upper tooth. Relative measurements: HW 107.5, HH 94, FV 40, POL 20, OOL 3.5, OCL 9, AOL 12.5, EL 63, EW 47, MS 32.5, SL 45, SW 10.5.

Thorax (Fig. 1766) in dorsal view with pronotum short, mostly hidden by head; pronotum dorsally, mesoscutum and axilla with similar imbricate-reticulate to polygonally reticulate sculpture that is about as deep as that on frontovertex above scrobes; dorsal part of scutellum with similar sculpture to mesoscutum, but conspicuously deeper and coarser, apical 0.2X and side completely smooth and shiny; visible part of mesoscutum about 1.9X as broad as long; scutellum convex, about as broad as long, apex very fairly thin, but not flange-like, slightly overhanging scutellum medially; fore wing with venation and distribution of setae as in Figs 1763, 1764; costal cell with a single line of setae dorsally in apical two-fifths or so; mid tibial spur slightly longer than basitarsus; propodeum (Fig. 1766) medially about 0.18X as long as scutellum and with shallow, irregular sculpture, almost smooth, side virtually smooth; side of propodeum weakly rounded posteriorly above hind coxa, but with a truncate, short, triangular tooth about half way to spiracle. Relative measurements: FWL 104, FWW 40.5; HWL 69, HWW 17.5.

Gaster with hypopygium reaching about 0.8X to apex; syntergum about 0.7X as long as mid tibia, with apex more or less rounded; ovipositor clearly exserted, the exserted part about 0.7X as long as mid tibial spur or about 0.25X a long as mid tibia.

Paratype. Funicle with linear sensilla present and conspicuous, present only on F2-F6; ovipositor Fig. 1762. Relative measurements: OL 103, GL 31.5 [MT 73, MTS 28.5].

Variation. Females vary in overall length from 1.33-1.70mm, otherwise very little variation noted in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown, but the type series was reared from an unknown gall on *Vernonia* (Asterales: Asteraceae).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, Parrasati, 2000m, ex gall in *Vernonia*, iii.1997 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **Heredia**, same data as holotype. Holotype and paratype in NHMUK.

Dalek pleione **sp.nov.**

(Figs 1768-1774; Hab. ♀ 262, ♂ 263)

DIAGNOSIS. *Female* (length about 2.0-2.3mm): scape (Fig. 1771) dark brown with apical half orange; mesoscutum dull metallic dark blue; all coxae dark brown; clypeal margin (Fig. 1774) with a short, convexly rounded, median lobe; OOL slightly less than OCL; antenna (Fig. 1771) with scape about 4.7X as long as broad; funicle with all segments at least nearly 2X as long as broad; linear sensilla on all segments; mesoscutum with sculpture shallower than on scutellum (Fig. 1773); scutellum with side and apex completely smooth and shiny; mid tibial spur shorter than basitarsus; fore wing (Fig. 1768) about 2.5X as long as broad; propodeum with about 15 setae around spiracle; apex of syntergum angular; ovipositor longer than mid tibia, exserted part slightly longer than mid tibial spur; gonostylus longer than mid tibial spur. *Male*: (length about 1.7-1.9mm): generally very similar to female but for slightly wider frontovertex, higher placement of antenna and structure of antenna (Fig. 1770) and genitalia (Fig. 1772).

Female (holotype): length, including ovipositor, 2.13mm; excluding ovipositor, 1.92mm (CPD).

Head generally black with a coppery sheen; ocellar area metallic blue-green, slightly brassy with some purple reflections; temple slightly brassy; frontovertex, gena and interantennal prominence with inconspicuous, brown setae; antenna (Fig. 1771) with radicle mostly dark brown, mixed with some pale orange; scape with extreme base and apical 0.5X pale orange, remainder dark brown; pedicel dark brown, pale orange ventrally and at extreme apex; flagellum

brown; maxillary palpus very pale orange; thorax generally dark brown to black; pronotum with a moderate coppery purple sheen; mesoscutum dull, metallic dark blue, posterior margin narrowly coppery purple; tegula dark brown with a coppery purple sheen; axilla dark purple-brown with a coppery purple sheen; scutellum very dull, metallic dark green, weakly mixed coppery purple, in basal 0.7X, apex and side strongly shining, metallic dark green, brassy and coppery; mesoscutum and scutellum clothed with fairly inconspicuous dark brown setae; metanotum dark purple-brown; mesopleuron very dark brown, with a brassy sheen mixed with some coppery purple; mesosternum dark brown; all coxae dark brown; fore femur dark brown in proximal 0.7X, apex pale orange, tibia pale orange with a weak indication of a pale brown subbasal ring, tarsus dusky pale orange, apical tarsomere orange-brown; mid femur virtually white in proximal 0.3X, extreme apex pale orange, otherwise dark brown, tibia pale orange with a narrow, brown, subbasal ring, spur and tarsus very pale orange, apical tarsomere very slightly dusky; hind femur pale orange in proximal 0.4X, extreme apex pale orange, remainder dark brown, tibia mostly dark brown with extreme base pale orange and extreme apex orange-brown, tarsus dark orange-brown; wings (Fig. 1768) hyaline; propodeum dark brown, with a weak purple and brassy sheen, side mainly with a dull metallic blue-green and coppery purple sheen with about 15 conspicuous, translucent, silvery setae outside spiracle, extending towards posterior margin and most of the way towards hind coxa; gaster dark brown, with a distinct coppery purple sheen, dorsal anterior part of Gt1 with a distinct dark blue sheen, side of gaster with a mixed metallic green, brassy and coppery sheen; gonostylus dark brown.

Head (Fig. 1774) about 2.4X as wide as frontovertex, in profile about 2.0X as high as deep; occipital margin sharp, strongly carinate; ocelli forming an angle of about 105°; frontovertex with irregular, fairly deep, polygonal sculpture, in ocellar area of mesh size smaller than eye facet, subequal or conspicuously larger in front of anterior ocellus; frontovertex with piliferous punctures moderately deep and distinct, about 7 or 8 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin on to gena; interantennal prominence with a few inconspicuous setae; temple and gena with some shallow, longitudinally elongate, polygonally reticulate sculpture of relatively large mesh, area immediately below eye completely smooth; eye nearly reaching occipital margin, separated by about 0.5X diameter of facet, clothed with fairly conspicuous setae, each slightly longer than diameter of facet, separated from scrobal margin by slightly less than diameter of ocellus, area between eye and scrobe partly with shallow, transversely elongate, polygonally reticulate sculpture, completely smooth towards gena; scrobes shallow, more or less ∩-shaped, meeting dorsally, very weakly margined dorsally and laterally; interantennal prominence shallow, dorsally rounded; antenna as in Fig. 1771; scape subcylindrical, about 4.7X as long as broad, dorsal margin straight; all funicle segments at least nearly 2X as long as broad, becoming slightly broader distad, linear sensilla on all funicle segments; clava hardly enlarged, less than 1.1X as wide as F6, a little shorter than F4-F6 combined, outer suture not oblique, sensory area hardly enlarged, at apex only giving it a rounded or slightly pointed appearance; malar sulcus present but shallow and indistinct; clypeal with a short, broad, rounded median lobe; mandible with two acute teeth and a truncate upper tooth. Relative measurements: HW 94, HH 90, FV 38.5, POL 18, OOL 4, OCL 5.5, AOL 10.5, EL 56, EW 39, MS 35, SL 52, SW 11.

Thorax (Fig. 1773) in dorsal view with pronotum clearly visible behind head, its posterior margin concave, with polygonally reticulate sculpture that is generally similar to that on anterior part of frontovertex; mesoscutum with slightly irregular, polygonally reticulate sculpture that is similar to that on pronotum, a little coarser posteriorly and of conspicuously smaller mesh; axilla with transversely elongate, polygonally reticulate to imbricate-reticulate sculpture that is of similar depth to that on posterior part of mesoscutum; scutellum dorsally convex, in proximal 0.7X or so with similar sculpture to that on posterior part of mesoscutum, but clearly coarser, and much deeper, apical 0.3X completely smooth and shiny, this smooth area extending slightly more anteriorly in middle; visible part of mesoscutum about 1.5X as broad as long; scutellum nearly 1.1X as long as broad, apex not flange-like; fore wing with venation and distribution of setae as in Figs 1768, 1769; costal cell with a single line of setae dorsally in apical 0.5X or so; mid tibial spur slightly shorter than basitarsus; propodeum (Fig. 1773) medially about 0.16X as long as scutellum, with some irregular longitudinal carinae and polygonally reticulate sculpture; side

clearly carinate and flange-like posteriorly above hind coxa, and with a distinct, triangular tooth behind spiracle. Relative measurements: FWL 117, FWW 46; HWL 81, HWW 21.

Gaster with hypopygium reaching about 0.9X to apex; syntergum about 0.7X as long as mid tibia, with apex angular; ovipositor clearly exserted, the exserted part slightly longer than mid tibial spur or about 0.3X as long as mid tibia.

Paratype. Relative measurements: OL 79.5, GL 23.5 [MT 52, MTS 13.5].

Variation. Females vary in overall length from 2.00-2.29mm, the fore wing varies from about 2.4-2.5X as long as broad, otherwise very little variation noted in material available.

Male: length 1.68-1.94mm.

Generally very similar to female but for slightly wider frontovertex, higher placement of antenna and structure of antenna and genitalia. Frontovertex about 0.5X head width; antenna as in Fig. 1770; antennal torulus about 2X its own length from mouth margin, its lower margin slightly below lower eye margin; phallobase (Fig. 1772) with each digitus about 1.4X as long as broad with a single apical tooth and a short outer seta. Relative measurements: HW 97, FV 46, MT 102.5, AL 46.

DISTRIBUTION. Costa Rica.

HOSTS. The type series was reared from an unidentified triozid (Hemiptera: Triozidae) on *Oreomunnea costaricensis* D.E. Stone (Fagales: Juglandaceae).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, San Gerardo de Dota, ex (1 of 3 spp. of) triozid on *Oreamunnea costaricensis*, 2300m, xii.1995 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **Heredia**, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, iv.2002 (INBio-OET-ALAS); 5♀, 7♂, **San José**, same data as holotype. Holotype in MZUCR, paratypes in MZUCR and NHMUK.

Dalek jigas **sp.nov.**

(Figs 1775-1779; Hab. ♀ 264)

DIAGNOSIS. *Female* (overall length about 1.6-1.8mm): scape (Fig. 1778) dark brown with apical half orange; mesoscutum metallic blue-green; all coxae dark brown; clypeal margin medially straight; OOL very slightly greater than OCL; antenna (Fig. 1778) with scape about 5.2X as long as broad; funicle with F1-F5 slightly longer than broad, F6 quadrate; linear sensilla on all segments; mesoscutum with sculpture shallower than on scutellum (Fig. 1775); scutellum completely smooth and shiny on side and apex; mid tibial spur shorter than basitarsus; fore wing (Fig. 1779) about 2.4-2.5X as long as broad; propodeum with about 10 setae around spiracle; apex of syntergum acute; ovipositor (Fig. 1776) longer than mid tibia, exserted part longer than mid tibial spur; gonostylus longer than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.63mm; excluding ovipositor, 1.44mm. (CPD)

Head generally black with a strong blue-green sheen in ocellar area, dark green between anterior ocellus and top of scrobes, a little coppery along occipital margin and inner eye margin and near posterior ocellus; temple, gena and scrobal area metallic coppery purple; frontovertex, gena and interantennal prominence with inconspicuous, brown setae; antenna (Fig. 1778) with radicle dark brown; scape largely dark brown, apical half or so pale orange, but dorsal margin brown along its length; pedicel ventrally and apically pale orange, remainder dark brown; flagellum dark brown; maxillary palpus off-white; thorax generally dark brown to black; pronotum mostly metallic coppery purple; mesoscutum mostly metallic blue-green with some purple reflections, posterior margin narrowly coppery purple; tegula dark brown with a weak coppery purple sheen; axilla dark brown with a coppery purple sheen; scutellum proximally with a weak, metallic, dark green sheen, apical half with a very strong coppery sheen this extending anteriorly part way along mid line, vertical side with a strong, metallic, dark green sheen; mesoscutum and scutellum with dark brown setae; metanotum dark purple-brown; mesopleuron very dark brown, with a brassy

sheen; mesosternum dark brown; all coxae dark brown; fore femur dark brown, extreme apices pale orange, fore tibia pale orange with a broad, brown, subbasal band, tarsus pale orange, apical tarsomere pale brown; mid femur dark brown, extreme base pale orange, tibia dark brown, apical half pale orange, spur and tarsus pale orange, tarsus slightly dusky, apical tarsomere brown; hind femur, tibia and tarsus dark brown; wings hyaline, fore wing (Figs 1777, 1779) with a very small, weakly infuscate area immediately below marginal and stigmal veins; propodeum dark brown, with a weak brassy sheen, side with a metallic green, and coppery purple sheen with about 10 conspicuous, translucent, silvery setae outside spiracle, extending towards posterior margin but not towards hind coxa; gaster dark brown, with a distinct coppery purple sheen, dorsal anterior part of Gt1 with a distinct, dark blue sheen, side of gaster with some metallic green and dark blue reflections; gonostylus dark brown.

Head about 2.5X as wide as frontovertex, in profile about 1.7X as high as deep; occipital margin sharp, carinate; ocelli forming an angle of about 95°; frontovertex with irregular, shallow, polygonal sculpture, in ocellar area of mesh size slightly larger than eye facet, slightly transversely elongate and partly imbricate-reticulate in front of anterior ocellus with relatively large mesh, conspicuously larger than eye facet; frontovertex with piliferous punctures shallow and indistinct, none in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin on to gena; interantennal prominence with a few, short, inconspicuous setae; temple and gena completely smooth, without sculpture; eye nearly reaching occipital margin, separated by very slightly less than diameter of facet, virtually naked, but clothed with sparse, very short setae, each much shorter than diameter of facet, separated from scrobal margin by about 0.5X diameter of ocellus, area between eye and scrobe completely smooth; scrobes shallow, more or less ∩-shaped, meeting dorsally, very weakly margined dorsally and laterally; interantennal prominence shallow, dorsally more or less rounded; antenna as in Fig. 1778; scape subcylindrical, about 5.2X as long as broad, dorsal margin straight; F1-F5 slightly longer than broad, F5 subquadrate, F6 quadrate, linear sensilla conspicuous and on all funicle segments; clava hardly enlarged, about 1.1X as wide as F6, about as long as F4-F6 combined, outer suture hardly oblique, sensory area small, giving apex a rounded appearance; malar sulcus absent; clypeal margin medially quite straight, without a median lobe; mandible with two acute teeth and a broad, truncate, upper tooth. Relative measurements: HW 112, HH 95.5, FV 45, POL 20.5, OOL 6, OCL 5, AOL 12, EL 62, EW 47, MS 39, SL 49, SW 9.5.

Thorax (Fig. 1775) in dorsal view with pronotum clearly visible behind head, its posterior margin concave, with polygonally reticulate sculpture that is generally similar to that on frontovertex; mesoscutum with fairly regular, polygonally reticulate sculpture that is similar in depth to pronotum, but of a slightly smaller mesh; axilla with shallow, fine, transversely elongate, polygonally reticulate sculpture; scutellum convex, basal half with sculpture of similar mesh to that on mesoscutum, but much coarser and deeper, side and apical 0.4X completely smooth and shiny, the smooth area conspicuously advanced medially about 0.4X into the coarsely sculptured basal area; visible part of mesoscutum about 1.6X as broad as long; scutellum hardly longer than broad; fore wing with venation and distribution of setae as in Figs 1777, 1779; costal cell with a single line of setae dorsally in apical 0.5X or so; mid tibial spur shorter than basitarsus; propodeum (Fig. 1775) medially about 0.22X as long as scutellum, with some irregular, longitudinal carinae and other sculpture medially, side posteriorly carinate above hind coxa, with a shallow, obtuse tooth a little above half way towards spiracle. Relative measurements: FWL 89, FWW 36; HWL 62, HWW 16.

Gaster with hypopygium reaching about 0.8X to apex; syntergum about 0.7X as long as mid tibia, with apex acute; ovipositor exserted, the exserted part about 1.7X as long as mid tibial spur or nearly 0.4X as long as mid tibia.

Paratype. Ovipositor Fig. 1776. Relative measurements: OL 68, GL 24.5 [MT 39, MTS 10].

Variation. Females vary in overall length from 1.63-1.79mm and the fore wing varies from about 2.4-2.5X as long as broad.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Zurqui de Moravia, 1600m, vii.1992 (P. Hanson). Paratype: **COSTA RICA**, 1♀, **Heredia**, 9km NE Vara Blanca, 10°14'N 84°06'W, 1450-1550m, 15/TN/04/012, 20.iii.2005 (INBio/OET – ALAS). Holotype and paratype in NHMUK.

COMMENTS. *Dalek jigas* is very close to *minerva,* Apart from the colour of the funicle and forewing and setation on the propodeum (see key), *jigas* can be separated from *minerva* by the fore tibia pale orange with a broad, brown, subbasal band, the mid tibia dark brown with the apical half pale orange, the frontovertex without any median setae between the anterior ocellus and antennal scrobes, the scape about 5X as long as broad and the sculpture on the mesoscutum shallower than that on the scutellum. In *minerva* the fore tibia is dark brown with extreme base and apical 0.25X pale orange, the mid tibia generally dark brown with apices dark orange-brown, the frontovertex has about 6 or 7 median setae between the anterior ocellus and antennal scrobes, the scape is less than 4.5X as long as broad and the sculpture of the mesoscutum is about as deep as that on scutellum.

Dalek jigas may also be close to *saurax* and *arax*, but can be separated from these species by having the scape largely dark brown and the clypeal margin straight whereas in the other species the scape is completely yellow or pale orange and the clypeal margin has a short, broad, convex median lobe. Also, in *saurax* the fore and hind coxa are yellow whereas in *jigas* all coxae are dark brown.

***Dalek minerva* sp.nov.**

(Figs 1780-1784; Hab. ♀ 265)

DIAGNOSIS. *Female* (length about 1.6-1.8mm): scape (Fig. 1784) dark brown with apex orange; mesoscutum bright metallic blue-green and dark green; all coxae dark brown; clypeal margin medially straight; OOL much greater than OCL; antenna (Fig. 1784) with scape about 4.3X as long as broad; funicle with all segments slightly longer than broad, linear sensilla on all segments or absent from F1; mesoscutum with similar sculpture to scutellum; side and apical 0.5X of scutellum completely smooth and shiny; mid tibial spur shorter than basitarsus; fore wing (Fig. 1782) about 2.5X as long as broad; propodeum with more than 30 setae around spiracle; apex of syntergum angular; ovipositor (Fig. 1781) longer than mid tibia, exserted part about 2.2X as long as mid tibial spur; gonostylus much longer than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.84mm; excluding ovipositor, 1.58mm (CPD).

Head generally black, occiput with a moderate, metallic, dark green sheen mixed slightly coppery; frontovertex with a metallic blue-green, green and brassy sheen, mixed coppery purple along occipital margin; scrobal area coppery purple; temple shining metallic blue-green, dark green and coppery; gena immediately below eye shining coppery purple and green, below this relatively dull coppery purple; frontovertex, gena and interantennal prominence with moderately conspicuous, brown setae; antenna (Fig. 1784) with radicle dark brown; scape dark brown with extreme apex pale orange; pedicel dark brown, extreme apex pale orange; funicle with F1 pale orange, F2 orange-brown, remaining segments and clava dark brown; maxillary palpus white; thorax generally dark brown to black, pronotum with a moderate coppery purple sheen mixed brassy; mesoscutum relatively bright metallic blue-green, mixed dark green, narrowly coppery purple along posterior margin; tegula dark brown with a weak coppery purple sheen; axilla dark purple-brown with a weak coppery purple sheen; scutellum proximally relatively dull dark green and coppery purple, distinctly coppery medially in apical 0.5X, apex otherwise shining green and blue-green, side proximally dark blue, extreme apex mixed copper and metallic dark green; mesoscutum clothed with conspicuous, translucent pale brown setae, scutellum with slightly less conspicuous, dark brown setae; metanotum dark purple-brown; mesopleuron dark brown, with a weak coppery purple and brassy sheen; mesosternum dark brown; all coxae dark brown; fore femur dark brown with extreme apices pale orange, tibia dark brown with extreme base and apical

0.25X pale orange, tarsus orange-brown with apical tarsomere brown; mid femur with proximal 0.3X pale orange, apex dark brown, tibia generally dark brown with apices dark orange-brown, spur pale orange, tarsus dark orange-brown; hind femur dark brown, extreme base pale orange, tibia dark brown with extreme base pale orange, tarsus dark brown; wings virtually hyaline, but fore wing (Figs 1780, 1782) weakly suffused brown medially with a more conspicuous, small, infuscate area below marginal and stigmal veins; propodeum dark brown, with a weak purple and brassy sheen, side mainly relatively dull, metallic, blue-green, about 30 conspicuous, translucent, silvery setae outside spiracle, extending most of the way down side of propodeum and towards posterior margin; gaster dark brown, with a distinct coppery purple sheen, dorsal part of Gt1 with a distinct dark blue and blue-green sheen, medially slightly coppery and brassy, side of gaster with a mixed metallic green, brassy and coppery sheen; gonostylus dark brown.

Head about 2.1X as wide as frontovertex, in profile about 1.7X as high as deep; occipital margin sharp, strongly carinate; ocelli forming an angle of about 120°; frontovertex with irregular, moderately deep, sculpture, more rounded and polygonally reticulate and of smaller mesh behind posterior ocellus, transversely elongate and of larger mesh in front of anterior ocellus and here of conspicuously larger mesh than eye facet; frontovertex with piliferous punctures shallow and indistinct, about 6 or 7 in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; interantennal prominence with two submedian lines of inconspicuous setae; temple completely smooth adjacent to eye, otherwise with relatively shallow, longitudinally elongate, polygonally reticulate sculpture of relatively large mesh; gena mostly quite smooth but posteriorly with similar sculpture to temple but of smaller mesh; eye separated from occipital margin by about 1.5X diameter of facet, clothed with inconspicuous, short setae, each clearly shorter than diameter of facet, separated from scrobal margin by about diameter of ocellus, area between eye and scrobe with transversely elongate, imbricate-reticulate sculpture; scrobes shallow, more or less ∩-shaped, meeting dorsally, very weakly margined dorsally and laterally; interantennal prominence shallow, dorsally narrowly rounded, separated from frontovertex, with fine, very shallow, polygonally reticulate sculpture; antenna as in Fig. 1784; scape slightly broadened and flattened, about 4.3X as long as broad, dorsal margin straight; funicle with all segments slightly longer than broad, becoming broader and larger distad; clava hardly enlarged, only about 1.1X as broad as F6, slightly longer than F4-F6 combined, sutures very slightly oblique, sensory area slightly enlarged, but hardly extending along ventral surface giving apex a rounded appearance; malar sulcus absent; clypeal margin virtually straight medially; mandible with 2 teeth and a truncation upper tooth. Relative measurements: HW 95.5, HH 84, FV 45.5, POL 19, OOL 8, OCL 4, AOL 12, EL 51.5, EW 39.5, MS 32, SL 52, SW 12.

Thorax in dorsal view with pronotum clearly visible behind head, its posterior margin concave; pronotum with polygonally reticulate sculpture that is generally similar to that on anterior part of frontovertex; mesoscutum with irregular, polygonally reticulate sculpture that is similar to that on pronotum but of smaller mesh and posteriorly a little deeper and coarser; axilla with transversely elongate, polygonally reticulate to imbricate-reticulate sculpture that is very slightly shallower than that on posterior part of mesoscutum; scutellum dorsally convex, in proximal 0.5X or so with similar sculpture to that on posterior part of mesoscutum, apical 0.5X completely smooth and shiny, this smooth area extending slightly more anteriorly in middle; visible part of mesoscutum about 1.5X as broad as long; scutellum about 1.1X as long as broad, apex moderately thin and flange-like; fore wing with venation and distribution of setae as in Figs 1780, 1782; costal cell with a single line of setae dorsally in apical 0.5X or so; mid tibial spur shorter than basitarsus; propodeum medially about 0.16X as long as scutellum and with some shallow, irregular sculpture; side of propodeum sharp and carinate posteriorly above hind coxa and with a distinct, triangular tooth a little above half way to spiracle. Relative measurements: FWL 127, FWW 50; HWL 89, HWW 23.

Gaster with hypopygium very nearly to apex; syntergum about 0.7X as long as mid tibia, with apex angular, more or less acute; ovipositor clearly exserted, the exserted part about 2.2X as long as mid tibial spur or 0.6X as long as mid tibia.

Paratype. Funicle with linear sensilla on all segments or absent from F1; hypopygium Fig. 1783; ovipositor Fig. 1781. Relative measurements: OL 133.5, GL 47 [MT 71, MTS 18].

Variation. Females vary in overall length from 1.61-1.84mm, the scutellum may have a small

area of metallic dark blue medially, otherwise very little variation noted in material available,

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Est. Biol. Cerro de la Muerte, 9°33'N 83°44'W, 3100m, v-vi.2000 (P. Hanson). Paratypes: **COSTA RICA**, 1 ♀, **San José**, 19km S Empalme, Mirador Quetzal, 9°39'N 83°52'N, 2600m, xii.1999 (P. Hanson). Holotype in MZUCR, paratype in NHMUK.

COMMENTS. See comments under *jigas* (p. 650).

***Dalek arax* sp.nov.**
(Figs 1785-1792; Hab. ♀ 266, ♂ 267)

Caldencyrtus canindo; Trjapitzin & Ruiz Cancino, 2001:209-211. Unavailable name.

DIAGNOSIS. *Female* (length about 1.2-1.4mm): scape (Fig. 1790) yellow; mesoscutum dull metallic dark blue or green; all coxae dark brown, fore coxa sometimes partially pale orange; clypeal margin with a very short, broad, truncate, median lobe; OOL slightly greater than OCL; antenna (Fig. 1790) with scape about 4.6X as long as broad; funicle with all segments slightly longer than broad; linear sensilla only on F2-F6; mesoscutum with sculpture shallower than on scutellum; side and apex of scutellum completely smooth and shiny; mid tibial spur shorter than basitarsus; fore wing (Fig. 1788) about 2.6X as long as broad; propodeum with about 15 setae around spiracle; apex of syntergum angular; ovipositor longer than mid tibia, exserted part about 0.6X as long as mid tibial spur; gonostylus longer than mid tibial spur. *Male* (length about 1.2mm): generally very similar to female but for slightly wider frontovertex, higher placement of antenna and structure of antenna (Fig. 1791) and genitalia (Fig. 1786).

Female (holotype): length, including ovipositor, 1.38mm; excluding ovipositor, 1.31mm (CPD).

Head generally black with a coppery sheen; ocellar area metallic dark green and slightly brassy; frontovertex, gena and interantennal prominence with inconspicuous, brown setae; antenna (Fig. 1790) with radicle dusky yellow, apex brown; scape yellow; pedicel and flagellum mostly brown with venter of pedicel and F1-F5 mixed pale orange-brown; maxillary palpus virtually white; thorax generally dark brown to black, pronotum with a moderate coppery purple sheen; mesoscutum dull, metallic dark blue with some violet and purple reflections posteriorly, posterior margin narrowly coppery purple; tegula dark brown with a coppery purple sheen; axilla dark purple-brown with a coppery purple sheen; scutellum coppery purple in basal 0.7X, apex and side strongly shining metallic dark green, brassy and coppery; mesoscutum and scutellum clothed with fairly inconspicuous dark brown setae; metanotum dark purple-brown; mesopleuron very dark brown, with a brassy sheen mixed with some coppery purple; mesosternum dark brown; all coxae dark brown; fore femur dark brown in proximal 0.7X, apex pale orange, tibia and tarsus pale orange, tibia with a weak indication of a pale brown subbasal ring, apical tarsomere a little dusky; mid femur virtually white in proximal 0.3X, extreme apex pale orange, otherwise dark brown, tibia pale orange with a narrow, brown, subbasal ring, spur and tarsus very pale orange, apical tarsomere very slightly dusky; hind femur dark brown with extreme apices pale orange, tibia largely pale orange with a brown subbasal band to about 0.7X, tarsus pale orange-brown, apical tarsomere orange-brown; wings (Fig. 1788) hyaline; propodeum dark brown, with a weak purple and brassy sheen, side mainly with a dull metallic dark green and coppery purple sheen with about 15 conspicuous, translucent, silvery setae outside spiracle, extending part of the way down side of propodeum and towards posterior margin; gaster dark brown, with a distinct coppery purple sheen, dorsal part of Gt1 with a distinct dark blue sheen mixed with some purple, side of

gaster with a mixed metallic green, brassy and coppery sheen; gonostylus dark brown.

Head (Fig. 1789) about 2.4X as wide as frontovertex, in profile about 1.6X as high as deep; occipital margin sharp, strongly carinate; ocelli forming an angle of about 95°; frontovertex with irregular, shallow, polygonal sculpture, in ocellar area of mesh size smaller than eye facet, generally subequal or conspicuously larger in front of anterior ocellus; frontovertex with piliferous punctures shallow and indistinct, 2 slightly in front of anterior ocellus and another pair beyond these, a line of sparse setae along inner eye margin continued along lower eye margin on to gena; interantennal prominence with a few inconspicuous setae; temple and gena virtually completely smooth and shiny, posteriorly with some extremely shallow, longitudinally elongate, polygonally reticulate sculpture of relatively large mesh; eye virtually reaching occipital margin, separated by much less than 0.5X diameter of facet, clothed with fairly conspicuous setae, each nearly as long as diameter of facet, separated from scrobal margin by slightly less than diameter of ocellus, area between eye and scrobe partly with shallow, transversely elongate, polygonally reticulate sculpture, completely smooth towards gena; scrobes shallow, more or less ∩-shaped, meeting dorsally, very weakly margined dorsally and laterally; interantennal prominence shallow, dorsally rounded; antenna as in Fig. 1790; scape subcylindrical, about 4.6X as long as broad, dorsal margin straight; all funicle segments slightly longer than broad, becoming slightly broader distad; clava hardly enlarged, about 1.1X as wide as F6 and about as long as F4-F6 combined, outer suture very slightly oblique, sensory area slightly enlarged, but hardly extending along ventral surface giving apex a weakly truncate or rounded appearance; malar sulcus absent; clypeal margin (Fig. 1789) with a very short, broad, virtually truncate median lobe; mandible with two acute teeth and a broad, truncate, upper tooth. Relative measurements: HW 71, HH 63, FV 30, POL 13, OOL 3.5, OCL 2.5, AOL 7, EL 42.5, EW 34, MS 20, SL 32, SW 7.

Thorax in dorsal view with pronotum clearly visible behind head, its posterior margin concave, with polygonally reticulate sculpture that is generally similar to that on anterior part of frontovertex; mesoscutum with slightly irregular, polygonally reticulate sculpture that is similar to that on pronotum but of smaller mesh and posteriorly a little deeper and coarser; axilla with transversely elongate, polygonally reticulate to imbricate-reticulate sculpture that is of similar depth to that on posterior part of mesoscutum; scutellum dorsally convex, in proximal 0.7X or so with similar sculpture to that on posterior part of mesoscutum, but clearly coarser, of smaller mesh and deeper, apical 0.3X completely smooth and shiny, this smooth area extending slightly more anteriorly in middle; visible part of mesoscutum about 1.5X as broad as long; scutellum about 1.1X as long as broad, apex not flange-like; fore wing with venation and distribution of setae as in Figs 1788, 1792; costal cell with a single line of setae dorsally in apical 0.5X or so; mid tibial spur shorter than basitarsus; propodeum medially about 0.17X as long as scutellum, with about 9 or 10 longitudinal irregular carinae and some irregular, shallow, polygonally reticulate sculpture, otherwise virtually smooth; side clearly carinate posteriorly above hind coxa, but without a tooth behind spiracle. Relative measurements: FWL 68, FWW 26; HWL 48, HWW 11.

Gaster with hypopygium reaching about 0.8X to apex; syntergum about 0.8X as long as mid tibia, with apex angular but not acute, ovipositor clearly exserted, the exserted part about 0.6X as long as mid tibial spur or nearly 0.2X as long as mid tibia.

Paratype. Funicle with linear sensilla only on F2-F6; hypopygum Fig, 1787; ovipositor Fig. 1785. Relative measurements: OL 91, GL 27 [MT 63, MTS 15.5].

Variation. Females vary in overall length from 1.23-1.35mm, the mesoscutum may be dull, metallic dark green with some coppery reflections posteriorly, the fore coxa may be partially pale orange, especially towards apex and ventrally, Gt1 of the gaster may be metallic blue-green, the mesoscutum may be about 1.7X as broad as long, the propodeum may have carinae obscured by conspicuous polygonally reticulate sculpture and there may be a very short, triangular tooth visible on carina above hind coxa and the fore wing varies from 2.5-2.6X as long as broad.

Male: length 1.21-1.24mm.

Generally, very similar to female but for slightly wider frontovertex, higher placement of antenna and structure of antenna and genitalia. Frontovertex about 0.5X head width; antenna as in Fig. 1791; antennal torulus about 2X its own length from mouth margin, its lower margin slightly below lower eye margin; phallobase (Fig. 1786) with each digitus about 1.4X as long as broad,

with a single apical tooth and a short, outer seta; aedeagus with apex acute. HW 67, FV 32.5, MT 59, AL 30.

DISTRIBUTION. Mexico, Costa Rica.

HOSTS. Unknown, but some of the type series was collected from *Psidium guajava* L. (Myrtales: Myrtaceae) infested with *Triozoida limbata* (Enderlein) (Hemiptera: Triozidae).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, San Vito, El Ceibo Gdns, on *Psidium guajava* inf. with *Triozoida limbata*, 11.v.1989 (D. Hollis). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, ZP Nosara, File Maravilla, LN 221350 381700, 800m, #66663, xi-xii.2001 (I. Jiménez); 2♀, Guanacaste, PN Bosque Diría, 10°10'N 85°34'W, 200m, 14-15.ii.2011 (J.S. Noyes); 10♀, 3♂, **Puntarenas**, same data as holotype; 2♀, Puntarenas, PN Corcovado, Cerro Mueller, LS 273200 521500, 744m, 6.xi.2001 and xii.2001-ii.2002 (J. Azofeifa). Holotype in MZUCR, paratypes in MZUCR, USNM and NHMUK.

Non type material. **MEXICO**, 3♀, Tam., G. Farias Res., El Cielo, Canindo, ex *Psidium guajava*, 14.vii.1995, 16.vii.1995 and 19.vii.1995 (V. Trjapitzin); 1♀, Tam., G. Farias Res., El Cielo, Valle de Ovnis y Arroyd, 20.vii.1995 (V. Trjapitzin). Material in NHMUK.

COMMENTS. This species was described earlier as *Caldencyrtus canindo* by Trjapitzin & Ruiz Cancino (2001) but this name is unavailable because, in the original description, it was not accompanied by a statement indicating the name and location of the type depository (ICZN, 1999 Article 16.4.2). The authors were informed of this at the time but they failed to rectify the error. I have compared the material listed above from Mexico and collected alongside the "type" material of *canindo* recorded in the original description and it agrees well with the type material of *arax.* I am therefore proposing the name *arax* as the valid name for this species in order to prevent any future confusion. The species was originally placed in *Caldencyrtus* by Trjapitzin & Ruiz Cancino (2001) on my advice but I now consider it better placed in *Dalek* as discussed above (see p. 636).

***Dalek saurax* sp.nov.**

(Figs 1793-1799; Hab. ♀ 268)

DIAGNOSIS. *Female* (length about 1.2-1.6mm): scape (Figs 1798, 1799) yellow; mesoscutum bright metallic blue-green to dark green; coxae yellow to pale orange, mid coxa brown basally and ventrally or completely brown; clypeal margin (Fig 1797) with a very short, truncate, median lobe; OOL slightly more than OCL; antenna (Figs 1798, 1799) with scape about 4.4-5.1X as long as broad; all funicle segments slightly longer than broad; linear sensilla on all funicle segments or absent from F1; mesoscutum with sculpture shallower than on scutellum (Fig. 1796); side and apex of scutellum completely smooth and shiny; mid tibial spur shorter than basitarsus; fore wing (Fig. 1793) about 2.4-2.5X as long as broad; propodeum with about 15-20 setae around spiracle; apex of syntergum slightly angular; ovipositor longer than mid tibia, exserted part about 0.6X as long as mid tibial spur; gonostylus longer than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.40mm; excluding ovipositor, 1.31mm (CPD).

Head generally black with a coppery sheen; ocellar area metallic dark green and slightly brassy; frontovertex, gena and interantennal prominence with inconspicuous, brown setae; antenna (Fig. 1799) with radicle dusky yellow, apex brown; scape yellow; pedicel and flagellum mostly brown with venter of pedicel and F1-F5 mixed pale orange-brown; maxillary palpus slightly dusky pale yellow; thorax generally dark brown to black, pronotum with a moderate coppery purple sheen; mesoscutum relatively bright metallic blue-green, posterior margin narrowly coppery purple; tegula dark brown with a coppery purple sheen; axilla dark purple-brown with a coppery purple sheen; scutellum coppery purple in basal 0.7X, apex and side strongly shining metallic green, blue-green and coppery; mesoscutum and scutellum clothed with fairly inconspicuous dark brown setae; metanotum dark purple-brown; mesopleuron very dark brown, with a brassy sheen mixed with some coppery purple; mesosternum dark brown; fore and hind coxae yellow, mid

coxa mostly very pale orange, but mixed brown towards base, especially ventrally; fore femur, tibia and tarsus pale orange, apical tarsomere a little dusky; mid femur pale orange, mixed pale brown dorsally towards apex, tibia pale orange with a narrow, weak, pale brown, subbasal ring, extreme apex pale brown, tarsus pale orange, apical tarsomere slightly dusky; hind femur pale orange mixed pale brown dorsally towards apex, tibia pale orange mixed with some pale brown throughout, tarsus pale orange-brown; wings mostly hyaline, but fore wing (Figs 1793, 1795) with a small, very weakly infuscate patch below the marginal and stigmal veins; propodeum dark brown, with a weak purple and brassy sheen, side mainly with a metallic dark green and coppery sheen with about 15 conspicuous, translucent, silvery setae outside spiracle, extending part of the way down side of propodeum and towards posterior margin; gaster dark brown, with a distinct coppery purple sheen, dorsal part of Gt1 with a distinct blue-green sheen, side of gaster with a mixed metallic green, brassy and coppery sheen; gonostylus dark brown.

Head (Fig. 1797) about 2.7X as wide as frontovertex, in profile about 1.7X as high as deep; occipital margin sharp, strongly carinate; ocelli forming an angle of about 95°; frontovertex with irregular, shallow, polygonal sculpture, in ocellar area of mesh size smaller than eye facet, generally subequal or conspicuously larger in front of anterior ocellus; frontovertex with piliferous punctures shallow and indistinct, 2 in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin on to gena; interantennal prominence with a few inconspicuous setae; temple and gena virtually completely smooth and shiny, posteriorly with some extremely shallow, longitudinally elongate, polygonally reticulate sculpture of relatively large mesh; eye virtually reaching occipital margin, separated by less than 0.5X diameter of facet, clothed with fairly conspicuous setae, each about as long as diameter of facet, separated from scrobal margin by about diameter of ocellus, area between eye and scrobe partly with shallow, transversely elongate, polygonally reticulate sculpture, completely smooth towards gena; scrobes shallow, more or less ∩-shaped, meeting dorsally, very weakly margined dorsally and laterally; interantennal prominence shallow, dorsally rounded; antenna as in Fig. 1799; scape subcylindrical, about 5.1X as long as broad, dorsal margin straight; all funicle segments slightly longer than broad, becoming slightly broader distad; clava hardly enlarged, about 1.1X as wide as F6 and about as long as F4-F6 combined, outer suture very slightly oblique, sensory area slightly enlarged, but hardly extending along ventral surface giving apex a weakly truncate appearance; malar sulcus absent; clypeal margin with a very short, broad, virtually truncate median lobe; mandible with two acute teeth and a broad, truncate, upper tooth. Relative measurements: HW 79, HH 71, FV 29.5, POL 12, OOL 3, OCL 2.5, AOL 7, EL 48, EW 38.5, MS 25, SL 36, SW 7.

Thorax (Fig. 1796) in dorsal view with pronotum clearly visible behind head, its posterior margin concave, with polygonally reticulate sculpture that is generally similar to that on anterior part of frontovertex; mesoscutum with slightly irregular, polygonally reticulate sculpture that is similar to that on pronotum but of smaller mesh and posteriorly a little deeper and coarser; axilla with transversely elongate, polygonally reticulate to imbricate-reticulate sculpture that is of similar depth to that on posterior part of mesoscutum; scutellum dorsally convex, in proximal 0.7X or so with similar sculpture to that on posterior part of mesoscutum, but clearly coarser, of smaller mesh and deeper, apical 0.3X completely smooth and shiny, this smooth area extending slightly more anteriorly in middle; visible part of mesoscutum about 1.6X as broad as long; scutellum about 1.1X as long as broad, apex not flange-like; fore wing with venation and distribution of setae as in Figs 1793, 1795; costal cell with a single line of setae dorsally in apical 0.5X or so; mid tibial spur shorter than basitarsus; propodeum (Fig. 1796) medially about 0.15X as long as scutellum, with 2 submedian carinae and some shallow, irregular sculpture; side clearly carinate posteriorly above hind coxa, but without a truncate tooth behind spiracle. Relative measurements: FWL 84, FWW 33; HWL 58, HWW 14.

Gaster with hypopygium reaching about 0.9X to apex; syntergum about 0.7X as long as mid tibia, with apex slightly angular; ovipositor clearly exserted, the exserted part about 0.6X as long as mid tibial spur or nearly 0.2X as long as mid tibia.

Paratype. Funicle with linear sensilla on F2-F6; ovipositor Fig. 1794. Relative measurements: OL 93, GL 27 [MT 58.5, MTS 14].

Variation. Females vary in overall length from 1.22-1.57mm, the funicle varies from pale yellow brown and conspicuously paler than the clava to brown and concolourous with the clava,

the mesoscutum varies from bright metallic blue-green to dark green, the mid coxa may be completely dark brown, the infuscate area below the marginal vein may be more or less absent, the scape may be 4.4-5.1X as long as broad, linear sensilla may be present on all funicle segments or absent from F1, F1 may be conspicuously smaller than F2 (Fig. 1798) or subequal (Fig. 1799) with larger specimens having F1 relatively larger, the fore wing varies from 2.4-2.5X as long as broad, the propodeum may have 3 or 4 submedian carinae and 15-20 setae around the spiracle and the ovipositor may be hardly exserted, otherwise little variation noted in material available.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Est. Altamira, Send. los Gigantes, LS 331800 572100, 1460m, ii.2002 (C. Hansson, D. Rubí). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Macizo Miravalles, Est. Cabro Muco, LN 299769 411243, 1100m, #73635, iii.2003 (J. Azofeifa); 1♀, **Alajuela**, Peñas Blancas, 1° rainforest, 700m, ii.1987 (E. Cruz); 1♀, Alajuela, PN Arenal, Sendero Mena, LN 4541670 271800, 600m, 17.iv-19.v.2001 (G. Carballo); 1♀, **San José**, Zurqui de Moravia, 1600m, viii.1996 (P. Hanson); 1♀, **Puntarenas**, Res. Priv. Karen Mogensen, 305m, LN205300 419750, #74655, 22.vi-9.vii.2003 (D. Briceño); 2♀, Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 11-21.ii.2005 (C. Hansson); 2♀, Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 19-20.ii.2009 (J.S. Noyes); 4♀, Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 17-18.ii.2011 (J.S. Noyes); 2♀, Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 22-24.ii.2013 (J.S. Noyes). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

COMMENTS. See comments under *jigas* (p. 650).

***Dalek cyclos* sp.nov.**
(Figs 1800-1808; Hab. ♀ 269, ♂ 270)

DIAGNOSIS. *Female* (length about 1.5-2.0mm): scape (Fig. 1808) dark brown; mesoscutum relatively bright metallic blue-green or dark green; all coxae dark brown; clypeal margin (Fig. 1803) with a very short, truncate, median lobe; OOL slightly greater than OCL; antenna (Fig. 1808) with scape about 3.6X as long as broad; funicle segments with F1-F5 slightly longer than broad, F6 quadrate, linear sensilla on all segments; mesoscutum with sculpture shallower than on scutellum (Fig, 1804); side and apex of scutellum completely smooth and shiny; mid tibial spur shorter than basitarsus; fore wing (Fig. 1805) about 2.5X as long as broad; propodeum with about 15 setae around spiracle; apex of syntergum rounded; ovipositor longer than mid tibia, exserted part nearly as long as mid tibial spur; gonostylus longer than mid tibial spur. *Male* (length about 1.3-1.6mm): generally very similar to female but for slightly wider frontovertex, higher placement of antenna and structure of antenna (Fig. 1807) and genitalia (Fig. 1800).

Female (holotype): length, including ovipositor, 1.63mm; excluding ovipositor, 1.53mm (CPD).

Head generally black with a distinct coppery sheen; ocellar area metallic dark green and brassy; frontovertex, gena and interantennal prominence with inconspicuous, brown setae; antenna (Fig. 1808) dark brown; maxillary palpus white to very pale yellow; thorax generally dark brown to black, pronotum with a moderate coppery purple sheen mixed brassy with some violet and coppery reflections; mesoscutum relatively bright metallic blue-green, mixed dark green, posterior 0.4X or so slightly coppery; tegula dark brown with a weak coppery purple sheen; axilla dark purple-brown with a slight coppery sheen; scutellum similarly coloured to mesoscutum with scattered coppery reflections and coppery medially towards apex, apical 0.3X and side strongly shining brassy, blue-green and green; mesoscutum clothed with fairly conspicuous, translucent, pale brown setae, scutellum with less conspicuous dark brown setae; metanotum dark purple-

brown; mesopleuron very dark brown, with a brassy sheen mixed with some coppery purple; mesosternum dark brown; all coxae dark brown; fore femur dark brown with extreme base and apex dusky pale orange, tibia mostly dark brown medially with apices pale orange, tarsus orange-brown, apical tarsomere brown; mid femur with proximal 0.4X pale yellow, extreme apex pale orange otherwise dark brown, tibia pale orange-brown at base, otherwise dark brown with extreme apex dark orange-brown, spur yellow, tarsus pale orange-brown, apical tarsomere brown; hind femur dark brown, extreme base pale orange, tibia dark brown with extreme base pale orange, tarsus dark brown; wings mostly hyaline, but fore wing (Figs 1805, 1806) weakly infuscate below marginal and stigmal veins; propodeum dark brown, with a weak purple and brassy sheen, side mainly with a metallic dark green sheen with about 15 conspicuous, translucent, silvery setae outside spiracle, extending part of the way down side of propodeum and towards posterior margin; gaster dark brown, with a distinct coppery purple sheen, dorsal part of Gt1 with a distinct dark blue and green sheen mixed violet, side of gaster with a mixed metallic green, brassy and coppery sheen; gonostylus dark brown.

Head (Fig. 1803) about 2.1X as wide as frontovertex, in profile about 1.6X as high as deep; occipital margin sharp, strongly carinate; ocelli forming an angle of about 100°; frontovertex with irregular, shallow, polygonal sculpture, in ocellar area of mesh size smaller than eye facet, generally subequal or conspicuously larger in front of anterior ocellus; frontovertex with piliferous punctures shallow and indistinct, 2 in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin on to gena; interantennal prominence with a few inconspicuous setae; temple completely smooth adjacent to eye, otherwise with extremely shallow, longitudinally elongate, polygonally reticulate sculpture of relatively large mesh; gena mostly quite smooth but posteriorly with similar sculpture to temple but of smaller mesh; eye virtually reaching occipital margin, separated by less than 0.5X diameter of facet, clothed with very inconspicuous setae, each much shorter than diameter of facet, separated from scrobal margin by very slightly less than diameter of ocellus, area between eye and scrobe partly with transversely elongate, polygonally reticulate sculpture, completely smooth towards gena; scrobes shallow, more or less ∩-shaped, meeting dorsally, very weakly margined dorsally and laterally; interantennal prominence shallow, dorsally acute, nearly meeting frontovertex; antenna as in Fig. 1808; scape clearly broadened and flattened, about 3.6X as long as broad, dorsal margin straight; funicle with F1-F5 slightly longer than broad, becoming broader and larger distad, F6 quadrate, linear sensilla on all funicle segments; clava hardly enlarged, about 1.1X as wide as F6 and about as long as F4-F6 combined, outer suture very slightly oblique, sensory area slightly enlarged, but hardly extending along ventral surface giving apex a weakly truncate or rounded appearance; malar sulcus absent; clypeal margin with a very short, broad, virtually truncate median lobe; mandible with two acute teeth and a broadly truncate upper tooth. Relative measurements: HW 78.5, HH 70, FV 37.5, POL 16, OOL 5.5, OCL 4.5, AOL 8.5, EL 43, EW 32.5, MS 27.5, SL 39.5, SW 11.

Thorax (Fig. 1804) in dorsal view with pronotum clearly visible behind head, its posterior margin concave, with polygonally reticulate sculpture that is generally similar to that on anterior part of frontovertex but conspicuously deeper; mesoscutum with slightly irregular, polygonally reticulate sculpture that is similar to that on pronotum but of smaller mesh and posteriorly a little deeper and coarser; axilla with transversely elongate, polygonally reticulate to imbricate-reticulate sculpture that is very slightly shallower than that on posterior part of mesoscutum; scutellum dorsally convex, in proximal 0.7X or so with similar sculpture to that on posterior part of mesoscutum, but clearly coarser, of smaller mesh and deeper, apical 0.3X completely smooth and shiny, this smooth area extending slightly more anteriorly in middle; visible part of mesoscutum about 1.5X as broad as long; scutellum about 1.1X as long as broad, apex not flange-like; fore wing with venation and distribution of setae as in Figs 1805, 1806; costal cell with a single line of setae dorsally in apical 0.5X or so; mid tibial spur shorter than basitarsus; propodeum (Fig. 1804) medially about 0.19X as long as scutellum, with 6 longitudinal carinae medially and some shallow, irregular sculpture; side clearly carinate posteriorly above hind coxa, this ending in a short, broad, truncate tooth a little way behind spiracle. Relative measurements: FWL 107, FWW 43; HWL 70, HWW 18.5.

Gaster with hypopygium reaching about 0.9X to apex; syntergum about 0.7X as long as mid

tibia, with apex rounded; ovipositor clearly exserted, the exserted part very nearly as long as mid tibial spur or 0.2X as long as mid tibia.

Paratype. Hypopygium Fig 1801; ovipositor Fig. 1802. Relative measurements: OL 54.5, GL 14.5 [MT 35.5, MTS 9].

Variation. Females vary in overall length from 1.48-2.01mm, OOL may be subequal to OCL, the funicle segments may be relatively slender with F2 about 2X as long as broad and F6 slightly longer than broad and the ovipositor may be hardly exserted.

Male: length 1.29-1.55mm.

Generally very similar to female but for slightly wider frontovertex, higher placement of antenna and structure of antenna and genitalia. Frontovertex about 0.5X head width; antenna as in Fig. 1807; antennal torulus about 2X its own length from mouth margin, its lower margin slightly below level of lower eye margin; phallobase (Fig. 1800) with digiti each about 1.5X as long as broad, with a single apical tooth and a shorter, outer seta; apex of aedeagus acute. Relative measurements: HW 71, FV 39, MT 67, AL 35.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Cerro de la Muerte, 20km S Empalme, 2800m, vi.vii.1989 (P. Hanson). Paratypes: **COSTA RICA**, 2♀, **Heredia**, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/NOTN, iv.2002 (INBio-OET-ALAS); 1♀, Heredia, Est. Las Esperanza, 2500m, 24.iii.2002 (M. Gates); 5♀, 3♂, **San José**, Cerro de la Muerte, 20km S Empalme, 2800m, various dates iii.1989-iv.1990(P. Hanson); 3♀, San José, 19km S Empalme, Mirador Quetzal, 9°29'N 83°52'W, 2600m, i.2000, ii.2000 and v.2000 (P. Hanson); 1♀, San José, Hwy 2, km 93, 83°44'W, 9°36'N, 3200m, 3-13.iv.1985 (H. Goulet, L. Masner); 2♀, San José, Hwy 2, km 95, 83°45'W, 9°36'N, 3200m, 3-13.iv.1985 (H. Goulet, L. Masner); 2♀, San José, RF Rio Macho, Est. Ojo de Agua, LS 396500 482060, 3000m, 13-26.i.1997 (B. Gamboa, M. Segura); 1♀, **Cartago**, 20km S El Empalme, iii-vi.1990 (P. Hanson). Holotype in MZUCR, paratypes in MZUCR, USNM and NHMUK.

Dalek gubrana sp.nov.

(Figs 1809-1817; Hab. ♀ 271)

DIAGNOSIS. *Female* (length about 1.0-1.7mm): scape (Figs 1813, 1814, 1816) dark brown with apex yellow to pale orange; mesoscutum relatively bright metallic blue-green to green; all coxae dark brown; clypeal margin (Fig. 1811) with a very short, truncate, median lobe; OOL greater than OCL; antenna (Figs 1813, 1814, 1816) with scape about 4.3X as long as broad; all funicle segments slightly longer than broad; linear sensilla only on F2-F6; mesoscutum with sculpture slightly shallower than on scutellum (Fig. 1812); side and apex of scutellum completely smooth and shiny; mid tibial slightly shorter than basitarsus; fore wing (Fig. 1817) about 2.6X as long as broad; propodeum with about 20 setae around spiracle; apex of syntergum rounded; ovipositor longer than mid tibia, exserted part about 0.6X as long as mid tibial spur; gonostylus longer than mid tibial spur. *Male* (length about 1.00-1.2mm): generally very similar to female but for slightly wider frontovertex, higher placement of antenna and structure of antenna and genitalia.

Female (holotype): length, including ovipositor, 1.18mm; excluding ovipositor, 1.13mm (CPD).

Head generally black, occiput and frontovertex with a moderate, metallic, dark green sheen, distinctly coppery between anterior ocellus and top of scrobes, coppery purple along occipital margin; scrobal area coppery purple; temple shining metallic coppery purple; anterior part of gena coppery and brassy mixed with purple reflections; frontovertex, gena and interantennal prominence with moderately conspicuous, pale brown setae; antenna (Fig. 1816) with radicle dark brown; scape dark brown in proximal two-thirds, apical one-third yellow to pale orange; pedicel brown, paler ventrally and at extreme apex; flagellum ventrally pale yellow, F1 pale yellow,

F2 yellow-brown, segments becoming progressively darker distally so that F6 is pale brown; clava dark brown; maxillary palpus white to very pale yellow; thorax generally dark brown to black; pronotum with a moderate coppery sheen mixed brassy; mesoscutum anteriorly coppery, otherwise relatively bright metallic blue-green, mixed dark green, coppery and brassy, narrowly coppery purple along posterior margin; tegula dark brown with a weak coppery purple sheen; axilla dark purple-brown with a slight coppery purple sheen; scutellum proximally relatively dull coppery purple, distinctly coppery medially in apical 0.5X, apical 0.4X and side strongly shining green and blue-green, side proximally dark blue, extreme apex mixed copper and metallic dark green; mesoscutum and scutellum clothed with inconspicuous, dark brown setae; metanotum dark purple-brown; mesopleuron very dark brown, with a brassy sheen mixed with some coppery purple; mesosternum dark brown; all coxae dark brown; fore femur dark brown with extreme apex pale orange, tibia similarly coloured to femur, tarsus dark brown; mid femur dark brown with extreme base pale yellow, tibia dark brown with a small dusky pale orange area at base, spur pale orange, tarsus brown, apical tarsomere dark brown; hind femur dark brown, a small dusky orange area at apex, tibia dark brown, tarsus dark brown; wings hyaline but fore wing (Figs 1809, 1817) with a small infuscate area below marginal and stigmal veins; propodeum dark brown, with a weak purple and brassy sheen, side mainly with a metallic blue-green, green and coppery sheen with about 20 conspicuous, translucent, silvery setae outside spiracle, extending part of the way down side of propodeum and towards posterior margin; gaster dark brown, with a distinct coppery purple sheen, dorsal part of Gt1 with a distinct blue-green sheen, side of gaster with a mixed metallic green, brassy and coppery sheen; gonostylus dark brown

Head (Fig. 1811) about 2.6X as wide as frontovertex, in profile about 1.7X as high as deep; occipital margin sharp, strongly carinate; ocelli forming an angle of about 95°; frontovertex with irregular, moderately deep, polygonal sculpture, in ocellar area of mesh size smaller than eye facet, generally subequal or conspicuously larger in front of anterior ocellus; frontovertex with piliferous punctures shallow and indistinct, about 3 or 4 in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin to gena; interantennal prominence with a few inconspicuous setae; temple completely smooth adjacent to eye, otherwise with relatively shallow, longitudinally elongate, polygonally reticulate sculpture of relatively large mesh; gena mostly quite smooth but posteriorly with similar sculpture to temple but of smaller mesh; eye reaching occipital margin, clothed with inconspicuous setae, each about 0.5X as long as diameter of facet, separated from scrobal margin by very slightly less than diameter of ocellus, area between eye and scrobe partly with transversely elongate, polygonally reticulate sculpture, completely smooth towards gena; scrobes shallow, more or less ∩-shaped, meeting dorsally, very weakly margined dorsally and laterally; interantennal prominence shallow, dorsally acute, nearly meeting frontovertex; antenna as in Fig. 1816; scape slightly broadened and flattened, about 4.3X as long as broad, dorsal margin straight; funicle with all segments slightly longer than broad, becoming broader and larger distad, linear sensilla on F2-F6; clava hardly enlarged, slightly longer than F4-F6 combined, outer suture hardly oblique, sensory area slightly enlarged, but hardly extending along ventral surface giving apex a weakly truncate appearance; malar sulcus absent; clypeal margin with a short, broad, truncate median lobe. Relative measurements: HW 79, HH 70, FV 39.5, POL 17, OOL 6, OCL 3.5, AOL 9.5, EL 44, EW 31, MS 29, SL 39, SW 9.

Thorax (Fig. 1812) in dorsal view with pronotum clearly visible behind head, its posterior margin concave, with polygonally reticulate sculpture that is generally similar to that on anterior part of frontovertex; mesoscutum with slightly irregular, polygonally reticulate sculpture that is similar to that on pronotum but of smaller mesh and posteriorly deeper and coarser; axilla with transversely elongate, polygonally reticulate to imbricate-reticulate sculpture that is clearly shallower than that on posterior part of mesoscutum; scutellum dorsally convex, in proximal 0.6X or so with similar sculpture to that on posterior part of mesoscutum, but slightly coarser and of smaller mesh, apical 0.4X completely smooth and shiny, this smooth area hardly extending anteriorly in middle; visible part of mesoscutum about 1.8X as broad as long; scutellum about 1.1X as long as broad, apex not flange-like; fore wing with venation and distribution of setae as in Figs 1809, 1817; costal cell with a single line of setae dorsally in apical 0.5X or so; mid tibial spur slightly shorter than basitarsus; propodeum (Fig. 1812) medially about 0.18X as long as scutellum, with a distinct longitudinal carina medially and some shallow, irregular sculpture; side

clearly carinate posteriorly above hind coxa, this ending in a short, broad, truncate tooth a little way behind spiracle. Relative measurements: FWL 100, FWW 39; HWL 60, HWW 17.

Gaster with hypopygium reaching about 0.8X to apex; syntergum about 0.8X as long as mid tibia, with apex rounded; ovipositor slightly exserted, the exserted part about 0.6X as long as mid tibial spur or 0.2X as long as mid tibia.

Paratype. Mandible with two acute teeth and a truncate upper tooth; gonostylus longer than mid tibial spur; hypopygium Fig. 1810; ovipositor Fig. 1815. Relative measurements: OL 37, GL 10.5 [MT 30, MTS 6.5].

Variation. Females vary in overall length from 1.04-1.65mm, the funicle may be more or less completely brown or pale yellow, the scape varies from 3.3-4.4X as long as broad, F1 may have linear sensilla and some specimens appear to have fewer silvery setae on the side of the propodeum. One specimen excluded from the type series below is about 1.66mm in overall length and has the scape about 2.6X as long as broad, but this may represent a different species.

Male: length 1.05-1.21mm.

Generally very similar to female but for slightly wider frontovertex, higher placement of antenna and structure of antenna and genitalia. Frontovertex about 0.6X head width; antenna very similar to that of *nationi* (Fig. 1834); antennal torulus about 2X its own length from mouth margin, its lowest margin about level with lower eye margin.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED

Holotype ♀: **COSTA RICA**, **Heredia**, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/TN, iv.2002 (INBio-OET-ALAS). Paratypes: **COSTA RICA**, 2♀, 1♂, **Guanacaste**, Santa Maria, 25km N Liberia, LN 304700 393450, 1250m, 15.x-15.xi.1996 (D. Briceño); 1♀, Guanacaste, Santa Maria, 25km N Liberia, LN 304700 393450, 790m, #47551, xii.1996-i.1997 (D. Briceño); 6♀, Guanacaste, Santa Maria, 25km NE Liberia, 790m, 15.i-15.ii.1997 (D. Briceño); 1♀, **Alajuela**, Albergue Heliconias, Send. Laguna Danto, LN 298100 423760, 1150m, #56829, iv-v.2000 (J.D. Gutiérrez); 1♀, **Heredia**, 16km SSE La Virgen, 10°16'N 85°05'W, 1050-1150m, 11/TN/ALL, 11.ii-21.iv.20012 (INBio/OET – ALAS); 1♀, Heredia, 16km SSE La Virgen, 10°16'N 85°05'W, 1050-1150m, 11/M/TN, 10.ii-21.iv.2001 (INBio/OET – ALAS); 3♀, 1♂, Heredia, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/TN, ii.2002, iii.2002 and iv.2002 (INBio-OET-ALAS); 2♀, 2♂, Heredia, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/NOTN, iii.2002 and iv.2002 (INBio-OET-ALAS); 1♀, Heredia, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/ /TN/ ALL, iv.2002 (INBio-OET-ALAS); 1♀, Heredia, 9km NE Vara Blanca, 10°14'N 84°06'W, 1450-1550m, 15/M/TN, ii-iv.2005 (INBio/OET-ALAS); 1♀, **Cartago**, 20km S El Empalme, xi.1989 (P. Hanson); 1♀, Cartago, Genesis II, 4km NE Cañon, 2350m, ii.1995 (P. Hanson); 1♀, Cartago, AC Amistad, Madreselva, Finca Los Lagos, LN 184450 550050, 2000-2600m, i.1994 (M. Chavarría); 3♀, Puntarenas, Monteverde, 15-16.vii.1986 (L. Masner); 1♀, **Puntarenas**, Est. Biol. Monteverde, 10°18'N 84°49'W, 1540-1890m, 25-26. ii.2007 (J.S. Noyes). Holotype in MZUCR, paratypes in MZUCR, NHMUK and CNC.

Excluded from type series: **COSTA RICA**, 1♀, **Cartago**, 20km S El Empalme, v-vii.1989 (P. Hanson); 1♀, **Limón**, Valle de Silencio, Alred, de Refugio, LS 340258 577465, 2480m, 19-27.vi.2003 (R. González, D. Rubí, M. Alfaro, R. Delgado). Material in NHMUK.

COMMENTS. *Dalek gubrana* is very similar to *nationi* but generally has a slightly wider frontovertex, the posterior ocelli are always closer to the occipital margin than to the eye and the sculpture of the mesoscutum is generally relatively deeper than in *nationi*.

Dalek pomona **sp.nov.**

(Figs 1818-1822)

DIAGNOSIS. *Female* (length about 1.4-1.5mm): scape (Fig. 1819) dark brown with apex orange; mesoscutum dull metallic dark green; all coxae dark brown to black; clypeal margin (Fig. 1822)

medially straight; OOL about equal to OCL; antenna (Fig. 1819) with scape about 3.6X as long as broad; all funicle segments slightly longer than broad; linear sensilla only on F2-F6; mesoscutum with sculpture slightly shallower than on scutellum (Fig. 1820); side and apex of scutellum completely smooth and shiny; mid tibial spur shorter than basitarsus; fore wing (Fig 1818) about 2.5X as long as broad; propodeum with about 25 setae around spiracle; apex of syntergum angular; ovipositor longer than mid tibia, exserted part about 0.5X as long as mid tibial spur; gonostylus longer than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.44mm; excluding ovipositor, 1.34mm (CPD).

Head mainly black; frontovertex shiny with a metallic green sheen mixed with coppery purple on ridges between reticulate cells, area between posterior ocelli and occipital margin coppery purple; temple, gena, scrobes, interantennal prominence and mouth margin shining coppery purple, temple and gena very shiny; frontovertex, gena and interantennal prominence with fairly inconspicuous brown setae; antenna (Fig. 1819) with radicle orange-brown, scape dark brown in proximal half or so, apex pale orange, pedicel dark brown, ventrally pale orange, F1-F2 pale orange, F3 orange-brown, F4-F6 and clava brown; maxillary palpus very pale orange; pronotum black generally with a brassy sheen and some weak green, coppery and purple reflections; propleuron and prosternum black; mesoscutum overall dull, metallic, dark green, anteriorly with some weak coppery purple reflections; tegula dark brown with a slight brassy and purple sheen; axilla black with coppery, brassy and green reflections; scutellum dorsally much duller than mesoscutum, with a weak, dark, metallic green sheen and some coppery reflections, with a narrow, very shiny, coppery strip in posterior 0.4X, apical 0.3X of scutellum and side strongly shining, metallic green; mesoscutum clothed with inconspicuous, translucent pale brown setae, axilla and scutellum with dark brown setae; metanotum black, with a weak brassy and purple sheen; mesopleuron dark brown with a brassy sheen; mesosternum dark brown; fore coxa black; fore femur dark brown with apices pale orange, tibia pale orange with a subbasal pale brown ring, tarsus orange-brown, apical tarsomere dusky; mid coxa dark brown; mid femur white in proximal half, apex dark brown, tibia pale orange with a wide, dark brown subbasal ring extending to about 0.5X, spur and tarsus pale orange, apical tarsomere slightly dusky; hind coxa dark brown; hind femur pale orange in proximal half, apex dark brown, tibia dark brown, extreme base pale orange, tarsus dark brown; wings (Fig. 1818) hyaline, venation orange-brown; propodeum black with a weak brassy sheen, side dorsally with a blue-green sheen, about 25 conspicuous, long, silvery setae behind and outside spiracle extending most of the way to posterior margin; gaster dark brown, with a distinct coppery purple sheen, dorsal part of Gt1 with a strong metallic blue-green sheen in proximal two-thirds, side of gaster anteriorly purple, otherwise with a mixed metallic green, brassy and coppery sheen; gonostylus dark brown, extreme apex pale orange.

Head (Fig. 1822) about 2.5X as wide as frontovertex, in profile about 1.6X as high as deep; occipital margin sharp, strongly carinate; ocelli forming an angle of about 110°; frontovertex shiny, with irregular, moderately deep, rounded to transversely elongate polygonally reticulate to imbricate-reticulate sculpture of mesh size generally subequal to, or clearly larger than eye facet; frontovertex with piliferous punctures very shallow, 3 setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; interantennal prominence with two submedian lines of short, inconspicuous setae; temple and gena much more shiny than frontovertex, anterior part of temple and upper part of gena completely smooth, posterior part of temple and lower and posterior part of gena with very shallow longitudinally elongate, strigose to striate-reticulate sculpture; eye not quite reaching occipital margin, separated by about diameter of facet, with sparse, conspicuous setae that are about as long as diameter of facet, eye separated from scrobal margin by about 0.3X diameter of ocellus, area between eye and scrobe with shallow sculpture; scrobes very shallow, narrowly ∩-shaped, meeting, fairly smooth but with shallow, transversely elongate, imbricate-reticulate sculpture, extremely weakly margined dorsally and laterally; interantennal prominence weak, dorsally moderately acute, and virtually smooth; antenna as in Fig. 1819; scape slightly broadened and flattened, about 3.6X as long as broad; all funicle segments slightly longer than broad, subequal in length, segments slightly broader distad, linear sensilla present and conspicuous, only on F2-F6; clava hardly broader than F6, slightly longer than F4-F6 combined, sutures not oblique, sensory area slightly

enlarged, extending ventrally about 0.22X length of clava, apex appearing rounded; malar sulcus absent; clypeal margin virtually straight medially; mandible with two acute teeth and a truncate, upper tooth. Relative measurements: HW 94, HH 80, FV 37.5, POL 16.5, OOL 4, OCL 4, AOL 10, EL 54, EW 41, MS 29, SL 41, SW 11.5.

Thorax (Fig. 1820) in dorsal view with pronotum short, mostly hidden by head; pronotum dorsally with imbricate-reticulate to polygonally reticulate sculpture that is about as deep as that on frontovertex above scrobes; mesoscutum with coarse, regular polygonally reticulate sculpture that is slightly deeper than sculpture on pronotum; axilla with polygonally reticulate sculpture that is finer and slightly shallower than that on mesoscutum; dorsal part of scutellum with similar sculpture to mesoscutum, but slightly deeper and of much smaller mesh size, vertical apex (approximately apical 0.3X) and side completely smooth and shiny, the smooth area extending medially about 0.4X into dorsal, sculptured part; visible part of mesoscutum about 1.5X as broad as long; scutellum convex, about as broad as long, apex very thin and flange-like, overhanging propodeum medially; fore wing with venation and distribution of setae as in Figs 1818, 1821; costal cell with a single line of setae dorsally in apical half; mid tibial spur shorter than basitarsus; propodeum (Fig. 1820) medially about 0.24X as long as scutellum and strongly sculptured, with several irregular carinae and sculpture medially, side with rough reticulate sculpture; side of propodeum sharp and carinate posteriorly above hind coxa, with a short, triangular tooth about half way to spiracle. Relative measurements: FWL 103.5, FWW 41; HWL 71, HWW 17.5.

Gaster with hypopygium reaching about 0.8X to apex; syntergum about 0.75X as long as mid tibia, with apex angular, but not acute; ovipositor slightly exserted, the exserted part about 0.5X as long as mid tibial spur or about 0.2X mid tibia. Relative measurements: OL 100.5, GL 28 [MT 68, MTS 16].

Variation. Females vary in overall length from 1.44-1.47mm, the femora may be paler than in the holotype with apical half or so of the mid and hind femora being almost completely pale orange with only the dorsal margin slightly dusky, otherwise little variation noted.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, PN Braulio Carrillo, 9.5km E tunel, 1000m, i-iii.1990 (P. Hanson). Paratypes: **Puntarenas**, 1♀, **San José**, Zurqui de Moravia, 1600m, xi.1995 (P. Hanson). Holotype and paratype in NHMUK.

COMMENTS. *Dalek pomona* is very similar to *nationi* and apart from the slightly broader scape (see key) can be distinguished from *nationi* in having the mid and hind femora paler with at least the proximal half pale orange whereas in *nationi* the mid and hind femora are almost completely dark brown. See also comments under *thanatos* (p. 640).

Dalek elana **sp.nov.**

(Figs 1823-1827)

DIAGNOSIS. *Female* (length about 1.5mm): scape (Fig. 1826) pale brown proximally otherwise pale orange; mesoscutum dull metallic dark green; all coxae dark brown to black; clypeal margin medially slightly convex; OOL equal to OCL; antenna (Fig. 1826) with scape about 5.6X as long as broad; funicle segments all clearly longer than broad, subequal, linear sensilla on all segments; mesoscutum with sculpture shallower than on scutellum (Fig. 1825); scutellum with side and apex completely smooth and shiny; mid tibial spur shorter than basitarsus; fore wing (Fig. 1823) about 2.5X as long as broad; propodeum with about 30 setae around spiracle, side with rough sculpture; apex of syntergum weakly rounded; ovipositor slightly longer than mid tibia, exserted part less than 0.1X as long as mid tibial spur; gonostylus slightly longer than mid tibial spur. *Male*:

unknown.

Female (holotype): length, including ovipositor, 1.48mm; excluding ovipositor, 1.46mm (CPD).

Head mainly black; frontovertex shiny with a metallic dark green sheen mixed with coppery on occipital margin; temple, gena, scrobes, interantennal prominence and mouth margin shining coppery purple, temple and gena very shiny; frontovertex, gena and interantennal prominence with fairly inconspicuous brown setae; antenna (Fig. 1826) with radicle orange-brown, scape pale orange, pale brown in proximal half; pedicel dark brown, ventrally pale orange, flagellum dark brown; maxillary palpus very pale orange, virtually white; pronotum black generally with a brassy sheen and some weak dark green reflections, slightly coppery on side; propleuron and prosternum black; mesoscutum overall, dull, metallic, dark green with some weak coppery purple reflections; tegula dark brown with a slight brassy and purple sheen; axilla black with a very weak brassy sheen; scutellum dorsally slightly duller than mesoscutum, with a metallic, dark blue sheen and some weak coppery reflections towards apex, apical 0.3X of scutellum and side strongly shining coppery, metallic green and blue-green; mesoscutum clothed with inconspicuous, translucent pale brown setae, axilla and scutellum with dark brown setae; metanotum black, with a weak brassy sheen; mesopleuron dark brown with a brassy sheen; mesosternum dark brown; fore coxa black; fore femur proximally dark brown, apical half pale orange, tibia pale orange, tarsus orange-brown; mid coxa dark brown; mid femur white to very pale orange in proximal half, apex dark brown, tibia pale orange with a wide, dark brown subbasal ring extending to about 0.5X, spur and tarsus pale orange; hind coxa dark brown; hind femur pale orange proximally, apical half or so dark brown, tibia with extreme base pale orange, a broad, dark brown subbasal ring, apical half or so dusky pale orange with an inconspicuous, brownish subapical ring, tarsus dusky pale orange; wings more or less hyaline butfore wing with a small infuscate spot below marginal vein (Figs 1823, 1827), venation slightly dusky pale orange; propodeum black with a weak brassy sheen, side dorsally with a weak green sheen, about 30 conspicuous, long, silvery setae behind and outside spiracle extending most of the way to posterior margin; gaster dark brown, with a distinct coppery purple sheen, dorsal part of Gt1 with a strong metallic blue-green and green sheen in proximal two-thirds, side of gaster anteriorly coppery, otherwise with a mixed metallic green, brassy and coppery sheen; gonostylus dark brown, extreme apex pale orange.

Head about 2.6X as wide as frontovertex, in profile about 1.7X as high as deep; occipital margin sharp, strongly carinate; ocelli forming an angle of about 110°; frontovertex shiny, with irregular, moderately deep, rounded to transversely elongate polygonally reticulate to imbricate-reticulate sculpture of mesh size generally subequal to, or clearly larger than eye facet; frontovertex with piliferous punctures very shallow, 2 setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; interantennal prominence with two submedian lines of short, inconspicuous setae; temple and gena much more shiny than frontovertex, anterior part of temple and upper part of gena completely smooth, posterior part of temple and lower and posterior part of gena with very shallow longitudinally elongate, strigose to striate-reticulate sculpture; eye virtually reaching occipital margin, separated by less than 0.5X diameter of facet, with sparse, fairly inconspicuous setae that are much shorter than diameter of facet, eye separated from scrobal margin by about 0.3X diameter of ocellus, area between eye and scrobe with shallow sculpture; scrobes very shallow, narrowly ∩-shaped, meeting, fairly smooth but with shallow, transversely elongate, imbricate-reticulate sculpture, extremely weakly margined dorsally and laterally; interantennal prominence weak, dorsally moderately acute, and virtually smooth; antenna as in Fig. 1826; scape subcylindrical, about 5.6X as long as broad; all funicle segments clearly longer than broad, subequal in length, segments slightly broader distad, linear sensilla present and conspicuous on all segments; clava hardly broader than F6, about as long as F4-F6 combined, sutures not oblique, sensory area slightly enlarged, at apex only giving it a rounded appearance; malar sulcus absent; clypeal margin slightly convex medially; mandible with two acute teeth and a truncate, upper tooth. Relative measurements: HW 107, HH 93, FV 41.5, POL 18, OOL 5, OCL 5, AOL 10, EL 63, EW 51, MS 30, SL 50, SW 9.

Thorax (Fig. 1825) in dorsal view with pronotum short, mostly hidden by head; pronotum dorsally with imbricate-reticulate to polygonally reticulate sculpture that is slightly deeper than that on frontovertex above scrobes; mesoscutum with coarse, regular polygonally reticulate

sculpture that is slightly deeper than sculpture on pronotum; axilla with polygonally reticulate sculpture that is finer and slightly shallower than that on mesoscutum; dorsal part of scutellum with similar sculpture to mesoscutum, but conspicuously deeper and of much smaller mesh size, vertical apex (approximately apical 0.3X) and side completely smooth and shiny; visible part of mesoscutum about 1.5X as broad as long; scutellum convex, about as broad as long, apex very thin and flange-like, slightly overhanging scutellum medially; fore wing with venation and distribution of setae as in Figs 1823, 1827; costal cell with a single line of setae dorsally in apical two-fifths or so; mid tibial spur slightly shorter than basitarsus; propodeum (Fig. 1825) medially about 0.24X as long as scutellum and strongly sculptured, with several irregular carinae and sculpture medially, side with rough reticulate sculpture; side of propodeum sharp and carinate posteriorly above hind coxa, with a distinct triangular tooth about half way to spiracle. Relative measurements: FWL 125, FWW 51; HWL 88.5, HWW 22.5.

Gaster with hypopygium reaching about 0.8X to apex; syntergum about 0.7X as long as mid tibia, with apex weakly rounded; ovipositor (Fig. 1824) slightly exserted, the exserted part less than 0.1X as long as mid tibial spur. Relative measurements: OL 91, GL 26 [MT 84, MTS 21].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Cartago**, La Cangreja, 9°48'N 83°58'W, 1950m, vi-vii.1992 (P. Hanson). Holotype in NHMUK.

Dalek nationi sp.nov.

(Figs 1828-1835; Hab. ♀ 272, ♂ 273)

DIAGNOSIS. *Female* (length about 1.3-1.7mm): scape (Fig. 1833) dark brown, apical half pale orange; mesoscutum bright metallic blue-green; all coxae dark brown; clypeal margin with a short, broad, median lobe; OOL equal to OCL; antenna (Fig. 1833) with scape about 4.6X as long as broad; funicle segments with F1-F5 slightly longer than broad, F6 quadrate; linear sensilla on all segments; mesoscutum with sculpture shallower than on scutellum (Fig. 1828); scutellum with side and apex smooth and shiny; mid tibial spur slightly shorter than basitarsus; fore wing (Fig. 1831) about 2.6X as long as broad; propodeum with about 20 setae around spiracle; apex of syntergum rounded; ovipositor longer than mid tibia, exserted part about as long as mid tibial spur; gonostylus longer than mid tibial spur. *Male* (length about 1.2-1.4mm): generally very similar to female but for slightly wider frontovertex, higher placement of antenna and structure of antenna (Fig. 1834) and genitalia (Fig. 1830).

Female (holotype): length, including ovipositor, 1.63mm; excluding ovipositor, 1.50mm (AD).

Head generally black, occiput and frontovertex with a moderate, metallic, dark green sheen mixed slightly coppery, coppery purple along occipital margin; scrobal area coppery purple; temple shining metallic coppery and brassy; anterior part of gena coppery and brassy mixed with some violet reflections; frontovertex, gena and interantennal prominence with moderately conspicuous, pale brown setae; antenna (Fig. 1833) with radicle dark brown; scape dark brown in proximal half or so, apical half pale orange; pedicel brown, pale orange ventrally and at extreme apex; flagellum brown, funicle mixed pale orange-brown ventrally; maxillary palpus pale yellow; thorax generally dark brown to black; pronotum with a moderate coppery purple sheen mixed brassy; mesoscutum relatively bright metallic blue-green, mixed dark green, narrowly coppery purple along posterior margin; tegula dark brown with a weak coppery purple sheen; axilla dark purple-brown with a weak coppery purple sheen; scutellum proximally relatively dull coppery purple, distinctly coppery medially in apical 0.5X, apical 0.4X and side strongly shining green

and blue-green, side proximally dark blue, extreme apex mixed copper and metallic dark green; mesoscutum and scutellum clothed with inconspicuous, dark brown setae; metanotum dark purple-brown; mesopleuron very dark brown, with a brassy sheen mixed with some coppery purple; mesosternum dark brown; all coxae dark brown; fore femur dark brown with extreme base and much of apex pale orange, tibia mostly pale orange but broadly mixed orange-brown medially, tarsus pale orange, apical tarsomere brown; mid femur with proximal 0.4X pale yellow, extreme apex pale orange otherwise dark brown, tibia pale orange-brown at base with a subbasal brown band to about 0.3X, remainder pale orange, lightly marked brown externally, spur pale orange, tarsus pale orange, apical tarsomere brown; hind femur dark brown, extreme apices pale orange, tibia dark brown with extreme base pale orange, distal apex orange-brown, tarsus dark brown; wings (Fig 1831) hyaline; propodeum dark brown, with a weak purple and brassy sheen, side mainly with a metallic blue-green, green and coppery sheen with about 20 conspicuous, translucent, silvery setae outside spiracle, extending part way down side of propodeum and towards posterior margin; gaster dark brown, with a distinct coppery purple sheen, dorsal part of Gt1 with a distinct blue-green sheen, side of gaster with a mixed metallic green, brassy and coppery sheen; gonostylus dark brown.

Head about 2.6X as wide as frontovertex, in profile about 1.7X as high as deep; occipital margin sharp, strongly carinate; ocelli forming an angle of about 95°; frontovertex with irregular, moderately deep, polygonal sculpture, in ocellar area of mesh size smaller than eye facet, generally subequal or conspicuously larger in front of anterior ocellus; frontovertex with piliferous punctures shallow and indistinct, about 3 or 4 in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin on to gena; interantennal prominence with a few inconspicuous setae; temple completely smooth adjacent to eye, otherwise with relatively shallow, longitudinally elongate, polygonally reticulate sculpture of relatively large mesh; gena mostly quite smooth but posteriorly with similar sculpture to temple but of smaller mesh; eye reaching occipital margin, clothed with moderately conspicuous setae, each about as long as diameter of facet, separated from scrobal margin by very slightly less than diameter of ocellus, area between eye and scrobe partly with transversely elongate, polygonally reticulate sculpture, completely smooth towards gena; scrobes shallow, more or less ∩-shaped, meeting dorsally, very weakly margined dorsally and laterally; interantennal prominence shallow, dorsally acute, nearly meeting frontovertex; antenna as in Fig. 1833; scape slightly broadened and flattened, about 4.6X as long as broad, dorsal margin straight; funicle with F1-F5 slightly longer than broad, becoming broader and larger distad, F6 quadrate, linear sensilla on all funicle segments; clava hardly enlarged, about as long as F4-F6 combined, outer suture very slightly oblique, sensory area slightly enlarged, but hardly extending along ventral surface giving apex a weakly truncate appearance; malar sulcus absent; clypeal margin with a short, broad, truncate median lobe. Relative measurements: HW 82, HH 73, FV 31.5, POL 14.5, OOL 3.5, OCL 3.5, AOL 8, EL 50, EW 37, MS 28, SL 37, SW 8.

Thorax (Fig. 1828) in dorsal view with pronotum clearly visible behind head, its posterior margin concave, with polygonally reticulate sculpture that is generally similar to that on anterior part of frontovertex; mesoscutum with slightly irregular, polygonally reticulate sculpture that is similar to that on pronotum but of smaller mesh and posteriorly a little deeper and coarser; axilla with transversely elongate, polygonally reticulate to imbricate-reticulate sculpture that is very slightly shallower than that on posterior part of mesoscutum; scutellum dorsally convex, in proximal 0.6X or so with similar sculpture to that on posterior part of mesoscutum, but clearly much coarser and deeper, apical 0.4X completely smooth and shiny, this smooth area hardly extending anteriorly in middle; visible part of mesoscutum about 1.5X as broad as long; scutellum about 1.1X as long as broad, apex not flange-like; fore wing with venation and distribution of setae as in Figs 1831, 1835; costal cell with a single line of setae dorsally in apical 0.5X or so; mid tibial spur slightly shorter than basitarsus; propodeum (Fig. 1828) medially about 0.18X as long as scutellum, with 3 longitudinal carinae medially and some shallow, irregular sculpture; area around spiracle with about 20 setae, these extending part way down side towards hind coxa, clearly carinate posteriorly above hind coxa, this ending in a short, broad, truncate tooth a little way behind spiracle. Relative measurements: FWL 90, FWW 35; HWL 60.5, HWW 14.5.

Gaster with hypopygium reaching about 0.8X to apex; syntergum about 0.7X as long as mid tibia, with apex rounded; ovipositor clearly exserted, the exserted part very nearly as long as mid

tibial spur or 0.2X as long as mid tibia.

Paratype. Clava about 1.1X as broad as F6; mandible with two acute teeth and a truncate upper tooth; hypopygium Fig. 1832; ovipositor Fig. 1829. Relative measurements: OL 58.5, GL 17 [MT 38, MTS 10].

Variation. Females vary in overall length from 1.29-1.68mm, F1 may have no linear sensilla, the propodeum may have 5 or 6 longitudinal carinae medially, otherwise little variation noted.

Male: length 1.16-1.39mm.

Generally, very similar to female but for slightly wider frontovertex, higher placement of antenna and structure of antenna and genitalia. Frontovertex about 0.5X head width; antenna as in Fig. 1834; antennal torulus about 2X its own length from mouth margin, its lower margin about level with lower eye margin; phallobase (Fig. 1830) with relatively short digiti, each about 1.4X as long as broad with a single apical tooth and a short outer seta; apex of aedeagus acute. Relative measurements: HW 77.5, FV 38.5, MT 71, AL 35.5.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Est. Cacao (ACG), 1100m, ii.2000 (J.S. Noyes). Paratypes: **COSTA RICA**, 3♀, **Guanacaste**, SW side Volcan Cacao, Estac. Cacao, 1100m, 1988-1989; 1♀, Guanacaste, Volcán Cacao, Cerro Pedregal, 1000m, ii-iv.1989; 4♀, 22♂, same data as holotype; 1♀, Guanacaste, San Lorenzo, Tienas Morenas, LN287800 427500, iv.1995 (G. Rodriguez); 1♀, **San José**, Zurqui de Moravia, 1600m, iv.1995 (P. Hanson); 2♀, **Puntarenas**, San Vito, Las Cruces, Wilson Bot. Gdns, 8°46'N 82°57'W, 7-19.ii.2007 (C. Hansson). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

COMMENTS. See comments under *pomona* (p. 662) and *gubrana* (p. 660).

This species is named in honour of Terry Nation, creator of the Daleks, an alien species that has terrified children for the past 60 years.

Genus *MENDISA* gen.nov.

Type species*: Mendisa gaia* **sp.nov.** Gender feminine.

Female. Length about 1.3mm.

Body robust, generally dark with a weak to moderate metallic sheen; funicle with pale and dark segments; dorsum of thorax with dark setae; legs generally dark with pale areas; wings hyaline with a small infuscate area below marginal vein; propodeum dark with a weak metallic sheen, side more strongly metallic, some silvery setae near spiracle; gaster dark with a metallic sheen.

Head in profile about 1.7X as high as deep, anteriorly fairly evenly curved from occipital margin to top of scrobes, more curved at top of scrobes and virtually straight to mouth margin, interantennal prominence hardly protuberant; occipital margin strongly carinate; frontovertex about two-fifths head width and with slightly irregular, polygonally reticulate sculpture and sparse, shallow piliferous punctures; ocelli forming a slightly obtuse angle; temple and gena with shallow, longitudinally elongate, polygonally reticulate sculpture; eye virtually reaching occipital margin, naked; scrobes shallow, ∩ -shaped; antenna attached below lower eye margin, slightly closer to mouth; scape strongly broadened and flattened, less than 2X as long as broad, about 0.6X as long as head width; funicle segments slightly longer than broad, gradually becoming slightly broader distally, linear sensilla only on distal segments; clava shorter than funicle, 3-segmented, sutures subparallel, sensory area slightly enlarged, hardly extending along ventral surface giving clava a very slightly obliquely truncate appearance; malar sulcus absent; mouth about 0.4X head width, clypeal margin very slightly convex medially; mandible tridentate, upper tooth vestigial and broadly truncate; palp formula 4-3.

Thorax with pronotum very short; mesoscutum without notaular lines; scutellum with similar sculpture to mesoscutum, but very slightly deeper, extreme apex and side completely smooth; mid tibial spur about as long as basitarsus; fore wing fully developed; about 2.4X as long as broad; costal cell with only 1 line of setae ventrally and a line of setae dorsally in apical half or so; submarginal vein with an apical hyaline break; marginal vein about 3X as long as broad, about as long as stigmal vein and about 2X as long as postmarginal vein; linea calva open; filum spinosum present, consisting of a line of about 4 stouter setae; posterior margin of mesopleuron not reaching level with posterior margin of propodeum, falling short by distance equivalent to about half diameter of propodeal spiracle; propodeum short, with some shallow, irregular sculpture, without a posterolateral tooth behind spiracle; about 10 setae near spiracle, not extending towards hind coxa.

Gaster with hypopygium not reaching apex; paratergites absent; syntergum shorter than mid tibia, apex rounded; ovipositor slightly exserted; ovipositor longer than mid tibia, second valvifer with a subapical seta, proximal part broadly C-shaped; hypopygium W-shaped, mid anterior process short, lateral arms quite long, posterior margin with a moderately deep invagination.

Male. Unknown.

DISTRIBUTION. Known only from Costa Rica, but likely to be more widespread in the Neotropics.

HOSTS. Unknown.

COMMENTS. *Mendisa* may be close to *Dalek* and similar genera (e.g. *Hebynthus*, *Alkonia*, *Raquanus*, etc.) that may form a monophyletic group, along with *Caldencyrtus* (see comments under *Alkonia*, p. 708). It can be separated from other genera in this group by having the scape less than 3X as long as broad, the funicle with dark and pale segments, all longer than broad, the clava shorter than the funicle with a very weakly oblique, truncate apex, the mouth more than one-third head width, the hypopygium W-shaped and the ovipositor longer than the mid tibia.

Mendisa gaia **sp.nov.**
(Figs 1836-1839)

Female (holotype): length, including ovipositor, 1.30mm; excluding ovipositor, 1.20mm (CPD).

Head generally black with a moderate metallic green and coppery purple sheen, a little stronger on temple and gena, slightly brassy on frontovertex; frontovertex, gena and interantennal prominence with inconspicuous, translucent, pale brown setae; antenna (Fig. 1837) with radicle dark brown, mixed dusky, pale orange; scape dark brown with extreme apex white; pedicel dark brown; funicle with F1 white, F2-F4 brown, F5-F6 pale yellow; clava dark brown; maxillary palpus white; thorax generally dark brown to black, pronotum with a moderate coppery purple sheen; mesoscutum relatively bright metallic blue-green, mixed slightly coppery purple behind pronotum and near posterior margin; tegula dark brown with a weak coppery purple sheen; axilla dark purple-brown with a weak coppery purple sheen; scutellum generally relatively dull coppery purple as axilla, slightly coppery towards apex, side and apical 0.3X more strongly shining metallic green mixed coppery; mesoscutum clothed with conspicuous, translucent pale brown setae, scutellum with less conspicuous, dark brown setae; metanotum dark purple-brown with a weak brassy sheen; mesopleuron dark brown, with a weak coppery purple and brassy sheen; mesosternum dark brown; all coxae dark brown; fore femur dark brown, tibia dark brown with extreme base and apical 0.25X pale orange, tarsus orange-brown with apical tarsomere brown; mid femur with proximal 0.5X white, most of apex dark brown, extreme apex white, tibia with base dark brown, apical 0.5X pale orange, spur and tarsus pale orange, apical tarsomere pale orange-brown; hind femur dark brown, tibia dark brown with extreme distal apex dusky pale orange, tarsus pale brown; wings (Fig. 1839) hyaline, fore wing with a very small, infuscate area adjacent to marginal

vein; propodeum dark brown, with a weak purple and brassy sheen, side mainly relatively dull, metallic, dark green about 10 conspicuous, translucent, silvery setae outside spiracle; gaster dark brown, with a distinct coppery purple sheen, dorsal part of Gt1 with a distinct dark blue, green and brassy sheen, side of gaster with a mixed metallic green, brassy and coppery sheen; gonostylus dark brown, extreme apex dusky, pale orange.

Head about 2.3X as wide as frontovertex, without a shallow, oval, depression adjacent to eye margin behind posterior ocellus; ocelli forming an angle of about 95°; frontovertex with slightly irregular, moderately deep, polygonally reticulate sculpture of mesh size generally subequal to eye facet, sculpture between posterior ocellus and occipital margin similar, but slightly irregular; frontovertex with piliferous punctures shallow, but distinct, 4 in front of anterior ocellus and a conspicuous line of 5 along occipital margin, a line of sparse setae along inner eye margin continued along lower eye margin; interantennal prominence with two submedian lines of inconspicuous setae; temple with relatively shallow, longitudinally elongate, polygonally reticulate sculpture of relatively large mesh; gena with similar sculpture to temple but of smaller mesh; eye virtually reaching occipital margin, naked, separated from scrobal margin by about 1.5X diameter of ocellus, area between eye and scrobe with transversely elongate, imbricate-reticulate sculpture; scrobes meeting dorsally, very weakly margined dorsally and laterally; interantennal weak, dorsally rounded, separated from frontovertex, with fine, shallow, polygonally reticulate sculpture; antenna as in Fig. 1837; scape strongly broadened and flattened, about 1.7X as long as broad, dorsal margin slightly convex; funicle with linear sensilla only on F3-F6; clava slightly enlarged, about 1.2X as broad as F6, slightly longer than F4-F6 combined, sutures slightly oblique, sensory area slightly enlarged, but extending little more than 0.1X along ventral surface giving apex a very slight, obliquely truncate appearance; mandible with 2 teeth and a vestigial, broadly truncate, upper tooth. Relative measurements: HW 79, HH 73, FV 34.5, POL 17.5, OOL 5, OCL 4.5, AOL 11, EL 44, EW 34.5, MS 32.5, SL 49, SW 28.5.

Thorax in dorsal view with pronotum hardly visible behind head, its posterior margin clearly concave; pronotum with polygonally reticulate sculpture that is generally of similar mesh size to that on frontovertex but slightly shallower; mesoscutum with fairly regular, polygonally reticulate sculpture that is similar to that on frontovertex, but perhaps a little deeper and coarser; axilla with transversely elongate, polygonally reticulate to imbricate-reticulate sculpture that is very slightly shallower than that on mesoscutum; scutellum dorsally convex, generally with slightly irregular, polygonally reticulate sculpture that is similar to that on mesoscutum but perhaps very slightly deeper, sculpture towards apex and side shallower with extreme apex and side completely smooth and shiny; visible part of mesoscutum about 1.7X as broad as long; scutellum about as long as broad, apex not thin and flange-like; fore wing with venation and distribution of setae as in Figs 1838, 1839; costal cell with a single line of setae dorsally in apical 0.4X or so; propodeum medially about 0.1X as long as scutellum; side of propodeum rounded posteriorly above hind coxa. Relative measurements: FWL 106.5, FWW 43.5; HWL 69.5, HWW 18.

Gaster with hypopygium reaching about 0.7X to apex; syntergum about 0.7X as long as mid tibia; ovipositor (Fig. 1836) slightly exserted, the exserted part about 0.8X as long as mid tibial spur or 0.3X as long as mid tibia. Relative measurements: OL 85, GL 27 [MT 73, MTS 25].

Variation. Only the holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Heredia**, 6km ENE Vara Blanca, 10°11'N 84°07'W, iii.2002 (INBio-OET-ALAS). Holotype in NHMUK.

Genus *HARLARUS* gen.nov.

Type species: *Harlarus titana* **sp.nov.** Gender masculine.

Female. Length about 1.2-1.4mm.

Body robust, generally dark with a weak to moderate metallic sheen; funicle with pale and dark segments; dorsum of thorax with dark setae; legs generally dark with pale areas; wings hyaline; propodeum dark with a weak metallic sheen, side more strongly metallic, some silvery setae near spiracle; gaster dark with a metallic sheen.

Head in profile about 1.7X as high as deep, anteriorly fairly evenly curved from occipital margin to top of scrobes, less curved at top of scrobes and virtually straight to mouth margin, interantennal prominence hardly protuberant; occipital margin carinate; frontovertex slightly more than one-third head width and with fairly regular, polygonally reticulate sculpture and sparse, shallow piliferous punctures; ocelli forming a slightly obtuse angle; temple and gena with shallow, longitudinally elongate, polygonally reticulate sculpture; eye virtually reaching occipital margin, naked; scrobes shallow, Λ -shaped; antenna attached slightly below level of lower eye margin; scape strongly broadened and flattened, less than 2X as long as broad, about 0.5X as long as head width; funicle segments slightly longer than broad, gradually becoming slightly broader distally, linear sensilla on all segments except F1; clava shorter than funicle, 3-segmented, sutures subparallel, sensory area slightly enlarged, extending a little way along ventral surface giving clava a very slightly obliquely truncate appearance; malar sulcus present; mouth less than one-third head width, clypeal margin medially very slightly convex; mandible with one tooth and a broad, upper, slightly concave truncation; palp formula 4-3.

Thorax with pronotum very short; mesoscutum without notaular lines; scutellum with longitudinally elongate sculpture that is conspicuously deeper than sculpture on mesoscutum, apex and side smooth, setae sparse and evenly distributed; mid tibial spur shorter than basitarsus; fore wing fully developed; about 2.4X as long as broad; costal cell with only 1 line of setae ventrally and line of setae dorsally in apical two-fifths or so; submarginal vein with an apical hyaline break; marginal vein about 2X as long as broad, a little shorter than stigmal vein and hardly longer than postmarginal vein; linea calva open; filum spinosum present, consisting of a line of about 5 or 6 stouter peg-like setae; posterior margin of mesopleuron not reaching level with posterior margin of propodeum, falling short by distance equivalent to a little more than diameter of propodeal spiracle; propodeum short, virtually smooth medially and without a posterolateral tooth behind spiracle; about 15 setae near spiracle, extending part way to hind coxa.

Gaster with hypopygium not reaching apex; paratergites absent; syntergum shorter than mid tibia, apex more or less rounded; ovipositor not exserted, shorter than mid tibia, second valvifer with 3 or 4 subapical setae, its proximal part broadly C-shaped; hypopygium weakly W-shaped, posterior, median invagination moderately deep.

Male.Unknown.

DISTRIBUTION. Known only from Costa Rica, but likely to be more widespread in the Neotropics.

HOSTS. Unknown.

COMMENTS. *Harlarus* may be close to *Dalek* and similar genera (e.g. *Hebynthus*, *Alkonia*, *Raquanus*, etc.) that may form a monophyletic group, along with *Caldencyrtus* (see comments under *Alkonia*, p. 708). It can be separated from other genera in this group by having the scape less than 3X as long as broad, the funicle with dark and pale segments, all longer than broad, the clava shorter than the funicle with a weakly oblique, truncate apex, striate sculpture on the scutellum, the hypopygium not W-shaped and the ovipositor shorter than the mid tibia. See also comments under *Sosara* (p. 680).

***Harlarus titana* sp.nov.**
(Figs 1840-1846; Hab. ♀ 274)

Female (holotype): length, 1.28mm (CPD).

Head with occiput shining, metallic green, frontovertex mainly metallic blue-green with a slight purple sheen between posterior ocelli and on occipital margin, face dark coppery purple immediately above scrobes, in scrobal area, on interantennal prominence and on temple and gena, area immediately below eye mixed blue, brassy and purple; mouth margin rainbow-like, narrowly margined purple, coppery, blue, green, brassy and coppery purple; frontovertex, gena and interantennal prominence with very inconspicuous translucent, white setae; antenna (Fig. 1841) with radicle dark brown; scape dark brown with a weak brassy and purple sheen, pale orange at extreme apex; pedicel dark brown, pale orange at apex and ventrally; funicle pale orange, proximal segments a little dusky; clava pale brown; maxillary palpus off-white; pronotum black, generally with a weak green and coppery sheen; propleuron and prosternum black; mesoscutum moderately bright, metallic, blue-green; tegula dark brown with a weak coppery purple sheen; axilla dark purple-brown with a weak brassy sheen; scutellum less shiny than mesoscutum but mixed dark metallic green and blue-green with some coppery purple reflections, side and apex shining dark green and blue-green; mesoscutum, clothed with fairly conspicuous, off-white, translucent setae, scutellum with conspicuous dark brown setae; metanotum dark purple-brown with a weak brassy sheen; mesopleuron dark brown, mainly with a weak brassy and coppery sheen mixed with some green and blue-green; mesosternum dark brown; all coxae dark brown; fore femur dark brown with apices very pale yellow, tibia very pale yellow with a broad, subbasal brown ring, tarsus very pale, dusky yellow, darker towards apex; mid femur very pale yellow at apices otherwise dark brown, tibia very pale yellow with a broad, dark brown, subbasal band, spur and tarsus very pale yellow, distal segments of tarsus slightly darker; hind femur dark brown with extreme apices very pale yellow, tibia dark brown with extreme base very pale yellow and apex pale orange, tarsus dark brown; wings hyaline, but fore wing with a small infuscate area adjacent to stgmal and marginal veins (Fig. 1844); propodeum dark brown with a weak brassy sheen, side with a strong, metallic blue-green sheen, about 15 conspicuous, translucent, silvery setae behind and outside spiracle extending someway down side of propodeum and towards posterior margin; gaster dark brown, with a distinct coppery purple sheen, dorsal part of Gt1 with a strong metallic blue-green sheen, side of gaster with a mixed metallic green, brassy and coppery sheen; gonostylus dark brown.

Head (Fig. 1843) about 2.7X as wide as frontovertex; ocelli forming an angle of about 100°; frontovertex with fairly regular, moderately deep, polygonally reticulate sculpture of mesh size generally subequal to eye facet, piliferous punctures shallow, 8 in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; interantennal prominence with two submedian lines of longer, more conspicuous setae; temple and gena about as shiny as frontovertex, temple and gena with fairly shallow, longitudinally elongate, polygonally reticulate sculpture; eye virtually reaching occipital margin, separated by about 0.5X diameter of facet, with dense, inconspicuous pale setae that are each much shorter than diameter of a facet, separated from scrobal margin by about diameter of ocellus, area between eye and scrobe with transversely elongate, imbricate-reticulate sculpture; scrobes dorsally separated by interantennal prominence, very weakly margined dorsally and laterally; interantennal prominence shallow, dorsally acute and meeting frontovertex, with very shallow, polygonally reticulate sculpture; antenna as in Fig. 1841; scape strongly broadened, only about 1.7X as long as broad; clava about 1.1X as broad as F6, and about as long as F4-F6 combined, sutures very slightly oblique, sensory area, extending about 0.2X along ventral surface of clava; malar sulcus present, indistinct. Relative measurements: HW 90, HH 77, FV 33, POL 19, OOL 2, OCL 3, AOL 11, EL 51, EW 40.5, MS 30, SL 43, SW 26.

Thorax (Fig. 1846) in dorsal view with pronotum short, largely hidden by head; pronotum with similar polygonally reticulate sculpture to that on frontovertex; mesoscutum with slightly deeper, more regular, polygonally reticulate sculpture of smaller mesh; axilla with polygonally reticulate sculpture that is conspicuously shallower than that on mesoscutum; dorsal part of scutellum with longitudinally elongate polygonally reticulate to striate reticulate sculpture that is conspicuously finer and deeper than that on mesoscutum, apex and side almost smooth, but with very shallow,

polygonally reticulate sculpture and relatively shiny; visible part of mesoscutum about 1.7X as broad as long; scutellum dorsally only slightly convex, about as long as broad, apex not thin and flange-like; fore wing with venation and distribution of setae as in Figs 1844, 1845; costal cell with a single line of setae dorsally in apical two-fifths or so; mid tibial spur slightly shorter than basitarsus; propodeum (Fig. 1846) medially about 0.16X as long as scutellum and more or less smooth, side with some shallow, polygonally reticulate sculpture; side of propodeum rounded posteriorly above hind coxa and without a tooth. Relative measurements: FWL 99, FWW 42; HWL 69.5, HWW 19.5.

Gaster with hypopygium reaching about 0.8X to apex; syntergum about 0.6X as long as mid tibia, with apex weakly angular, more or less rounded; ovipositor not exserted.

Paratype. Hypopygium Fig. 1840; ovipositor Fig. 1842. Relative measurements: OL 62, GL 12 [MT 77, MTS 22].

Variation. Females vary in length from 1.24-1.38mm, the dorsal part of the interantennal prominence may not quite reach the frontovertex so that the scrobes shallowly meet dorsally, otherwise very little in material available.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Zurqui de Moravia, 1600m, iii.1990 (P. Hanson). Paratypes: COSTA RICA, 2♀, **San José**, same data as holotype but iv.1991 and iv.1992. Holotype in MZUCR, paratypes in NHMUK.

Genus *RAQUANUS* gen.nov.

Type species: *Raquanus hades* **sp.nov.** Gender masculine.

Female. Length about 1.2-1.4mm.

Body robust, generally dark with a weak to moderate metallic sheen; funicle with unicolourous pale segments; dorsum of thorax with dark setae; legs generally dark with pale areas; wings hyaline, sometimes with a small infuscate area below marginal and stigmal veins; propodeum dark with a weak metallic sheen, side more strongly metallic, some silvery setae near spiracle; gaster dark with a metallic sheen.

Head in profile about 1.7X as high as deep, anteriorly fairly evenly curved from occipital margin to top of scrobes, more strongly curved at top of scrobes and virtually straight to mouth margin, interantennal prominence hardly protuberant; occipital margin carinate; frontovertex about one-third head width and with irregular, polygonally reticulate sculpture and sparse, shallow piliferous punctures; ocelli forming an acute to a slightly obtuse angle; temple and gena with conspicuous, longitudinally elongate, polygonally reticulate sculpture; eye nearly reaching occipital margin, with fairly conspicuous setae; scrobes shallow, ∩ -shaped; antenna attached well below lower eye margin, much closer to mouth margin; scape broadened and flattened, a little less than 3X as long as broad, about 0.4X as long as head width; funicle segments transverse, broader towards apex, linear sensilla only on distal segments; clava shorter than funicle, 3-segmented, sutures subparallel, sensory area slightly enlarged and extending a little way along ventral surface, giving apex of clava a slight, obliquely truncate appearance; malar sulcus absent; mouth about 0.4X head width, clypeal margin convex, very slightly produced medially; mandible with two teeth and a broadly truncate upper tooth; palp formula 4-3.

Thorax with pronotum short; mesoscutum without notaular lines; scutellum convex, with deeper sculpture than mesoscutum, extreme apex and side completely smooth and shiny; mid tibia without a minute elongate invagination on its external surface about mid-way along its length, spur slightly longer than basitarsus; fore wing fully developed; about 2.4X as long as broad; costal

cell with only 1 line of setae ventrally and a line of setae dorsally in apical half or so; submarginal vein with an apical hyaline break; marginal vein about 3X as long as broad, subequal stigmal vein and about 1.5X as long as postmarginal vein; linea calva open; filum spinosum present, consisting of 1-2 lines consisting of a total of about 4-7 peg-like setae; posterior margin of mesopleuron not reaching level with posterior margin of propodeum, falling short by distance equivalent to about half to two-thirds diameter of propodeal spiracle; propodeum short, with some shallow, irregular sculpture posteriorly, side rounded above hind coxa, with a minute posterolateral tooth behind spiracle; about 20 setae near spiracle, not extending part way towards hind coxa.

Gaster with hypopygium not reaching more than about 0.8X to apex; paratergites absent; syntergum shorter than mid tibia, apex weakly angular; ovipositor not exserted, shorter than mid tibia, outer plates narrow, elongate and subtriangular; second valvifer without a subapical seta, proximally knob-like with posterior semicircular sheet virtually absent, outer posterior margin short and almost straight; hypopygium transverse with posterior margin almost semicircular and anterior margin virtually straight with a pair of short anterolateral lobes.

Male. Length about 0.9mm.

Very similar to female but for wider frontovertex, filiform antenna with unsegmented clava and genitalia.

DISTRIBUTION. Known only from Costa Rica, but probably more widespread in the Neotropics.

HOSTS. Unknown.

COMMENTS. The strongly reduced semicircular sheet of the proximal part of the second valvifer (see comments under *Polaszekius*) of the female suggest that *Raquanus* may be closest to *Polaszekius*. However, *Raquanus* has a tridentate mandible with the upper tooth truncate, palp formula 4-3, lacks an elongate invagination on the external surface of the mid tibia, has the ovipositor hidden and the hypopygium is transverse and more or less semicircular. In *Polaszekius* the mandible basically has only one tooth and a broad truncation, the palp formula is 3-3, the mid tibia has a minute, elongate invagination on its external surface, the ovipositor is strongly exserted and the hypopygium is elongate and subtriangular with a trident-like posterior margin. The combination of the obliquely truncate clava, mandibular structure, scutellum with deep sculpture and elongate marginal vein suggest that *Raquanus* may be close *Alkonia* and other genera (e.g. *Hebynthus*, *Alkonia*, *Mendisa*, *Caldencyrtus*, etc., see comments under *Alkonia*, p. 708). It can be distinguished from these genera by having the truncation of the clava not extending as much as one-third along the ventral surface of the clava, having the funicle unicolourous with all segments transverse and the hypopygium bowl-shaped with a weakly concave anterior margin and evenly convex posterior margin.

Raquanus hades **sp.nov.**

(Figs 1847-1852; Hab. ♀ 275)

Female (holotype): length, 1.40mm (CPD).

Head with occiput dull, metallic dark green, frontovertex mainly metallic blue-green mixed purple, face dark coppery purple immediately above scrobes, in scrobal area, on interantennal prominence and on anterior part of gena; temple and posterior part of gena more metallic green; area immediately below lowest part of eye mixed violet, brassy and dull purple; mouth margin dull, metallic green; frontovertex, gena and interantennal prominence with very inconspicuous brown setae; antenna (Fig. 1850) with radicle dark brown; scape dark brown with a weak brassy and purple sheen, pale orange at extreme apex; pedicel dark brown, pale orange at apex and ventrally; funicle pale orange; clava pale brown, proximal segment mixed pale orange; maxillary palpus white; pronotum black, generally with a weak coppery purple sheen; propleuron and prosternum black; mesoscutum moderately bright, metallic dark green, mixed with some brassy reflections, anterior one-fifth or so and posterior margin coppery purple; tegula dark brown with a weak coppery purple sheen; axilla dark purple-brown with a weak coppery and brassy sheen;

scutellum less shiny than mesoscutum but mixed dark metallic green and blue-green with some coppery purple reflections, side and apex shining dark green, blue-green and copper; mesoscutum, clothed with fairly inconspicuous, dark brown setae, scutellum with conspicuous dark brown setae; metanotum dark purple-brown with a weak brassy sheen; mesopleuron dark brown, mainly with a weak purple, brassy and coppery sheen mixed with some dark blue; mesosternum dark brown; all coxae dark brown; fore femur dark brown with apices very pale yellow, tibia largely very pale yellow with a broad, subbasal brown ring, tarsus very dusky yellow, darker towards apex; mid femur very pale yellow at apices otherwise dark brown, tibia white to very pale yellow with a broad, dark brown, subbasal band to about 0.5X, spur and tarsus very pale yellow, distal segments of tarsus slightly darker; hind femur dark brown, tibia dark brown with extreme base white and apex pale orange, tarsus white with two apical tarsomeres pale brown; wings (Fig. 1848) hyaline; propodeum dark brown with a weak brassy sheen, side with a strong, metallic green sheen, at least 20 conspicuous, translucent, silvery setae behind and outside spiracle extending down side of propodeum and towards posterior margin; gaster dark brown, with a distinct coppery purple sheen, dorsal part of Gt1 with a strong metallic blue-green sheen, side of gaster with a mixed metallic green, brassy and coppery sheen; gonostylus dark brown.

Head about 2.7X as wide as frontovertex with a narrow, shiny-bottomed groove adjacent to eye margin extending from level with posterior ocellus about 0.6X to occipital margin; ocelli forming an angle of about 75°; frontovertex shiny, with fairly regular, moderately deep, polygonally reticulate sculpture of mesh size generally subequal to eye facet; frontovertex with piliferous punctures shallow, none in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; interantennal prominence with two submedian lines of inconspicuous setae; temple and gena a little more shiny than frontovertex, temple and gena with conspicuous, longitudinally elongate, polygonally reticulate sculpture of relatively large mesh; eye virtually reaching occipital margin, separated by much less than 0.5X diameter of facet, with conspicuous pale setae that are each about as long as diameter of a facet, separated from scrobal margin by a little more than diameter of ocellus, area between eye and scrobe with transversely elongate, imbricate-reticulate sculpture; scrobes meeting shallowly dorsally, very weakly margined dorsally and laterally; interantennal prominence shallow, dorsally more or less rounded and separated from frontovertex, with very shallow, polygonally reticulate sculpture; antenna as in Fig. 1850; scape broadened and flattened, about 2.9X as long as broad; clava about 1.5X as broad as F6, and slightly shorter than funicle, sutures hardly oblique, sensory area slightly enlarged, extending about 0.3X along ventral surface of clava giving it an obliquely truncate appearance; position of malar sulcus clearly indicated by a change in sculpture; mandible with two acute teeth and a broadly truncate, upper tooth. Relative measurements: HW 84, HH 85, FV 31, POL 18, OOL 2, OCL 5.5, AOL 15, EL 54, EW 40, MS 35, SL 36, SW 12.5.

Thorax (Fig. 1851) in dorsal view with pronotum short, largely hidden by head; pronotum with polygonally reticulate to imbricate-reticulate sculpture that is slightly finer and shallower than that on frontovertex; mesoscutum with similar sculpture to that on frontovertex; axilla with polygonally reticulate sculpture that is slightly coarser that on mesoscutum; scutellum conspicuously convex with polygonally reticulate sculpture that is clearly deeper than that on mesoscutum, cells in middle one-third rounded, laterally longitudinally elongate to striate reticulate, apex and side completely smooth and shiny; visible part of mesoscutum about 1.7X as broad as long; scutellum dorsally only slightly convex, nearly 1.1X as long as broad, apex not thin and flange-like; fore wing with venation and distribution of setae as in Figs 1848, 1852; costal cell with a single line of setae dorsally in apical one-third or so; mid tibial spur slightly longer than basitarsus; propodeum (Fig. 1851) medially about 0.13X as long as scutellum and more or less smooth, side with some shallow, polygonally reticulate sculpture; side of propodeum rounded posteriorly above hind coxa, but with an inconspicuous triangular posterior tooth about one-third way to spiracle. Relative measurements: FWL 92.5, FWW 38.5; HWL 69, HWW 19.

Gaster with hypopygium reaching about 0.8X to apex; syntergum about 0.8X as long as mid tibia, with apex weakly angular; ovipositor not exserted.

Paratype. Hypopygium Fig. 1848; ovipositor Fig. 1847. Funicle with linear sensilla only on F5-F6. Relative measurements: OL 48, GL 17.5 [MT 71, MTS 22].

Variation. Females vary in overall length from 1.24-1.40mm, the interantennal prominence

may be coppery and contrasting with dark metallic green scrobal area, F1-F5 may be slightly dusky, the clava may be entirely brown, the mesoscutum may be mostly metallic green or blue-green, the fore wing may have a very small infuscate area immediately below the marginal vein, the head varies from 2.4-2.7X a wide as the frontovertex, the ocelli may form an angle of 75-95° and the scape varies from 2.6-2.9X as long as broad.

Male: length 0.91mm.

Very similar to female but for wider frontovertex, structure of antenna and genitalia. Head about 2.0X as wide as frontovertex; antenna attached much closer to level of lower eye margin than to mouth margin; scape about 0.6X as long as frontovertex width and 2.5X as long as wide; pedicel about 1.4X as long as wide; flagellum filiform, all funicle segments longer than wide, F1 smallest, about 1.8X as long as wide, F2-F6 subequal in length, becoming very slightly broader distad with F2 about 1.8X as long as broad and F6 about 1.4X as long as broad, all segments clothed in setae, the longest of which is about as long as diameter of segment; clava slightly shorter than F5-F6 combined; genitalia with aedeagus moderately slender, apex narrowly rounded; digitus with a single apical hook.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Zurqui de Moravia, 1600m, vii.1991 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, 1♂, **Guanacaste**, RF Monte Alto, Cerro Romo, 883m, 220700 382545, #65013, 27-29.x.2001 (I. Jiménez), 2♀, **San José**, same data as holotype but viii.1995 and xi.1995; 1♀, **Puntarenas**, Monte Verde [sic] Res. 1.vi.1993 (Michalski). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

Genus *ESPHORA* gen.nov.

Type species: *Esphora cyllene* **sp.nov.** Gender feminine.

Female. Length about 1.0-1.9mm.

Body robust, generally dark with a weak to moderate metallic sheen; funicle with pale and dark segments; dorsum of thorax with dark setae; legs generally dark with pale areas; wings hyaline, sometimes weakly infuscate below marginal vein; propodeum dark with a weak metallic sheen, side more strongly metallic, some silvery setae near spiracle; gaster dark brown with a metallic sheen.

Head in profile about 1.5-1.8X as high as deep, anteriorly fairly evenly curved from occipital margin to top of scrobes, more curved at top of scrobes and virtually straight to mouth margin, interantennal prominence hardly protuberant; occipital margin carinate; frontovertex about one-quarter to slightly more than one-third head width and with slightly irregular, polygonally reticulate sculpture and sparse, shallow piliferous punctures; ocelli forming a slightly acute to slightly obtuse angle; temple and gena with shallow, longitudinally elongate, polygonally reticulate sculpture; eye virtually reaching occipital margin, naked; scrobes shallow, ∩-shaped; antenna attached well below eyes, much closer to mouth margin than to lower eye margin; scape strongly broadened and flattened, less than 2X as long as broad, about 0.5X as long as head width; funicle segments transverse to slightly longer than broad, gradually becoming broader distally, linear sensilla only on distal segments; clava shorter than funicle, 3-segmented, sutures subparallel, not oblique, sensory area slightly enlarged, extending a little way along ventral surface giving clava a slightly obliquely truncate appearance; malar sulcus absent; mouth about 0.4X head width, margin medially weakly to strongly concave; mandible with three teeth, upper tooth truncate; palp formula 4-3.

Thorax with pronotum very short; mesoscutum without notaular lines; scutellum dorsally flat, mostly with fine, polygonally reticulate to longitudinally elongate sculpture that is conspicuously

deeper than sculpture on mesoscutum, extreme sides and apex completely smooth; mid tibial spur longer than basitarsus; fore wing fully developed; about 2.4-2.5X as long as broad; costal cell with only 1 line of setae ventrally and a line of dorsally in apical one-third or so; submarginal vein with an apical hyaline break; marginal vein about 6X as long as broad, 2X stigmal vein and 3X postmarginal vein; linea calva open; filum spinosum present, consisting of a line of about 4 stouter, peg-like setae; posterior margin of mesopleuron not reaching level with posterior margin of propodeum, falling short by slightly less than diameter of propodeal spiracle; propodeum short, virtually smooth medially and without a posterolateral tooth behind spiracle; up to about 10 setae near spiracle, not extending towards hind coxa.

Gaster with hypopygium not reaching apex; paratergites absent; syntergum shorter than mid tibia to about as long, apex angular, sometimes acute; ovipositor slightly exserted; ovipositor longer than mid tibia, second valvifer basally broadly C-shaped; second valvifer with 1 or 2 subapical setae; hypopygium transverse, subrectangular, anteriorly biconcave with moderately long anterolateral projections, posteriorly biconvex with a moderately deep median invagination.

Male. Unknown.

DISTRIBUTION. Known only from Costa Rica, but likely to be more widespread in the Neotropics.

HOSTS. Unknown.

COMMENTS. *Esphora* is probably close to *Dalek* and similar genera (e.g. *Hebynthus*, *Alkonia*, *Raquanus*, *Polaszekius*, etc.) that may form a monophyletic group, along with *Caldencyrtus* (see comments under *Alkonia*, p. 708). It can be separated from other genera in this group by having the scape less than 3X as long as broad, the funicle with dark and light segments and some quadrate or transverse segments, the clava shorter than the funicle with a weakly oblique, truncate apex and the scutellum dorsally flat, with fine, reticulate sculpture of silky appearance, contrasting with the shallow, more shiny, polygonally reticulate sculpture of the mesoscutum. As suggested by the key to genera, it is possibly most similar to *Sosara*. Apart from the structure of the mandible and colouration of the antenna the two genera differ fundamentally in the shape of the hypopygium and structure of the ovipositor.

Key to Costa Rican species of *Esphora*
(Females)

1. Antenna (Figs 1859, 1860) with scape about 1.7-1.9X as long as broad and F3 clearly transverse; fore wing conspicuously infuscate below marginal vein (Fig. 1857); ovipositor hardly exserted, the exserted part not more than 0.5X as long as mid tibial spur, gonostylus not more than 1.3X as long as mid tibial spur .... *cyllene* **sp.nov**.
- Antenna (Fig. 1866) with scape about 2-2.4X as long as broad and F3 longer than broad; fore wing not infuscate below marginal vein (Fig. 1865); ovipositor clearly exserted, the exserted part more than 0.6X as long as mid tibia spur, gonostylus at least about 1.7X as long as mid tibial spur ..... *rhea* **sp.nov.**

***Esphora cyllene* sp.nov.**
(Figs 1853-1860; Hab. ♀ 276)

DIAGNOSIS. *Female* (length about 1.0-1.2mm): fore wing conspicuously infuscate below marginal vein (Fig. 1857); antenna (Figs 1859, 1860) with scape about 1.7-1.9X as long as broad; funicle with F1-F3 strongly transverse, subequal, F4-F6 larger, subquadrate, subequal; ovipositor (Fig. 1856) more than 3X as long as gonostylus and hardly exserted, the exserted part not more than 0.5X as long as mid tibial spur, gonostylus not more than 1.3X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.05mm; excluding ovipositor, 1.01mm (CPD).

Head generally dark brown to black with a weak metallic green and coppery purple sheen, a little stronger on temple and below eye; mouth margin with a hint of dark blue; frontovertex, gena and interantennal prominence with inconspicuous, translucent, pale brown setae; antenna (Fig. 1859) with radicle dark brown; scape dark brown with extreme apex very pale yellow; pedicel dark brown; funicle white with F3-F4 brown, clava dark brown; maxillary palpus white; thorax generally dark brown to black, pronotum with a moderate coppery purple sheen; mesoscutum relatively bright metallic dark green and brassy, mixed slightly coppery behind pronotum and near posterior margin; tegula dark brown with a weak coppery purple sheen; axilla dark purple-brown with a weak coppery purple sheen; scutellum generally relatively dull with a metallic coppery purple and dark green sheen, side and apex strongly shining green and blue-green; mesoscutum clothed with moderately conspicuous, translucent pale brown setae, scutellum with fairly inconspicuous, dark brown setae; metanotum dark purple-brown with a weak brassy sheen; mesopleuron dark brown, mainly with a slight coppery sheen, mixed metallic dark green posteriorly; mesosternum dark brown; all coxae dark brown; fore femur dark brown, tibia dark brown with extreme base and apical 0.25X pale orange, tarsus orange-brown with apical tarsomere brown; mid femur with proximal 0.4X white, apex dark brown, tibia with base dark brown, apical 0.4X white, spur and tarsus white to very pale orange, apical tarsomere pale orange-brown; hind femur with extreme base white, otherwise dark brown, tibia dark brown with extreme distal apex dusky white, tarsus dark brown; wings hyaline, fore wing (Fig. 1854) with a small, infuscate area below marginal vein (Fig. 1857); propodeum dark brown, with a weak purple and brassy sheen, side mainly metallic, dark green but mixed brassy, blue-green and coppery, about 6 or 7 conspicuous, translucent, silvery setae outside spiracle, not extending down side of propodeum; gaster dark brown, with a distinct coppery purple sheen, dorsal part of Gt1 with a distinct blue-green and brassy sheen, side of gaster with a mixed metallic green, brassy and coppery sheen; gonostylus dark brown, extreme apex pale orange.

Head (Fig. 1855) about 3.1X as wide as frontovertex, in profile about 1.5X as high as deep; a somewhat obscure, oval, shallow depression adjacent to eye margin extending from level with posterior ocellus towards occipital margin; ocelli forming an angle of about 70°; frontovertex with slightly irregular, moderately deep, slightly coarse, polygonally reticulate sculpture of mesh size generally very slightly smaller than eye facet, sculpture between posterior ocellus and occipital margin similar, but slightly coarser; frontovertex with piliferous punctures shallow, only 2 in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; interantennal prominence with two submedian lines of inconspicuous setae; temple with relatively shallow, longitudinally elongate, polygonally reticulate sculpture of relatively large mesh; gena with similar sculpture to temple but of smaller mesh; eye virtually reaching occipital margin, naked, separated from scrobal margin by about 1.5X diameter of ocellus, area between eye and scrobe with transversely elongate, imbricate-reticulate sculpture; scrobes shallow, more or less ∩-shaped, meeting dorsally, very weakly margined dorsally and laterally; interantennal prominence shallow, dorsally rounded, separated from frontovertex, with fine, shallow, polygonally reticulate sculpture; antenna as in Fig. 1859; scape strongly broadened and flattened, about 1.7X as long as broad; funicle with segments transverse to very slightly longer than broad, becoming broader and larger distally, F1-F3 subequal and smaller than F4-F6 which are subequal; clava hardly enlarged, only about 1.1X as broad as F6, about as long as F3-F6 combined, sutures not oblique, subparallel, sensory area slightly enlarged, extending about 0.3X along ventral surface giving apex a slightly, obliquely truncate appearance; clypeal margin virtually straight medially; mandible with two teeth and a broadly truncate, upper tooth. Relative measurements: HW 67, HH 60, FV 21, POL 10.5, OOL 1, OCL 5, AOL 9, EL 41, EW 32.5, MS 27.5, SL 35, SW 21.

Thorax (Fig. 1858) in dorsal view with pronotum hardly visible behind head, its posterior margin clearly concave; pronotum with polygonally reticulate sculpture that is generally of similar mesh size to that on frontovertex but clearly shallower; mesoscutum with fairly regular, polygonally reticulate sculpture that is clearly shallower than that on frontovertex; axilla with transversely elongate, polygonally reticulate to imbricate-reticulate sculpture that is of similar depth to that on mesoscutum; scutellum dorsally very flat, generally with slightly longitudinally elongate, polygonally reticulate sculpture that is of finer mesh than that on mesoscutum and

conspicuously deeper, sculpture medially and towards apex of more rounded cells, apex and sides completely smooth and shiny; visible part of mesoscutum about 1.6X as broad as long; scutellum about 1.2X as broad as long, apex not thin and flange-like; fore wing with venation and distribution of setae as in Figs 1854, 1857; costal cell with a single line of setae dorsally in apical 0.3X or so; mid tibial spur longer than basitarsus; propodeum medially about 0.09X as long as scutellum and with some shallow, irregular sculpture; side of propodeum (Fig. 1858) rounded posteriorly above hind coxa and without a tooth. Relative measurements: FWL 76.5, FWW 31; HWL 54.5, HWW 14.

Gaster with hypopygium reaching about 0.5X to apex; syntergum about 0.6X as long as mid tibia, with apex angular, but not acute; ovipositor slightly exserted, the exserted part about 0.3X as long as mid tibial spur or 0.1X as long as mid tibia.

Paratype. Funicle with linear sensilla only on F4-F6; hypopygium Fig, 1853; ovipositor Fig. 1856. Relative measurements: OL 69, GL 20 [MT 57; MTS 20].

Variation. Females vary in length from 1.02-1.24mm, the apical half of the mid tibia may be very pale yellow, the head varies from about 2.6-3.1X as wide as the frontovertex, the ocelli form an angle of about 70-95°; F3 may have linear sensilla, the fore wing varies from about 2.3-2.5X as long as broad and the ovipositor varies from 1.2-1.4X as long as the mid tibia or 3.1-3.5X as long as the gonostylus.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Zurqui de Moravia, 1600m, viii.1995 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes); 1♀, **Heredia**, Vara Blanca, vii-viii.1990 (P. Hanson); 3♀, **San José**, Zurqui de Moravia, 1600m, vii.1991, ii-iv.1993 and i.1996 (P. Hanson); 1♀, **Cartago**, PN Tapanti, 9°45'N 83°47'W, 1200-1500m. 20.iii-10.iv.2000 (C. Hansson, D. Rubí); 1♀, **Puntarenas**, Monteverde, St Luis Valley, 1400m, 17.viii.1986 (L. Masner); 1♀, **Limón**, Valle del Silencio, Send. Ref. a Hoffman, LS 340500 577300, 2460m, TM, #74305, 19.iv-5.vii.2003 (R. González, D. Rubí, R. Delgado, M. Alfaro). Holotype in MZUCR, paratypes in NHMUK and CNC.

Esphora rhea **sp.nov.**

(Figs 1861-1867; Hab. ♀ 277)

DIAGNOSIS. *Female* (length about 1.7-1.9mm): fore wing (Figs 1864, 1865) not infuscate below marginal vein; antenna (Fig. 1866) with scape about 2-2.4X as long as broad; funicle with F1-F2 subequal, quadrate or transverse, F4-F6 longer than broad, gradually increasing in size; ovipositor (Fig. 1861) less than 3X as long as gonostylus, clearly exserted, the exserted part more than 0.6X as long as mid tibia spur, gonostylus at least about 1.7X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.69mm; excluding ovipositor, 1.56mm (CPD).

Head with occiput and frontovertex dull, metallic dark green with some purple reflections, face dark coppery purple immediately above scrobes; temple metallic green mixed coppery; gena coppery purple mixed brassy, position of malar sulcus indicated by a violet and dark blue sheen; area immediately below lowest part of eye violet mixed with some dark blue; scrobes largely coppery purple mixed violet; extreme dorsal part of interantennal prominence dark blue and violet, below this coppery and slightly brassy, area between toruli rainbow-like violet, purple, dark blue, green and brassy, mouth margin coppery mixed dark green; frontovertex, gena and interantennal prominence with very inconspicuous brown setae; antenna (Fig. 1866) with radicle dark brown; scape dark brown with a weak brassy and purple sheen, pale orange at extreme apex; pedicel dark brown; F1-F2 and F5-F6 yellow, F3-F4 and clava dark brown; maxillary palpus white; pronotum black, generally with a weak coppery purple sheen; propleuron and prosternum

black; mesoscutum moderately bright, metallic blue-green, mixed with some green, and purple reflections, posterior margin coppery purple; tegula dark brown with a weak coppery purple sheen; axilla dark purple-brown with a weak coppery and brassy sheen; scutellum mostly similar to axilla but side and apex more strongly metallic dark green, extreme apex and side shining metallic blue-green, mixed coppery purple; mesoscutum, clothed with fairly inconspicuous, dark brown setae, scutellum with conspicuous dark brown setae; metanotum dark purple-brown with a weak brassy sheen; mesopleuron dark brown, mainly with a weak purple, green and coppery sheen; mesosternum dark brown; all coxae dark brown; fore femur dark brown with extreme base pale yellow, tibia dark brown with apical 0.3X pale orange, extreme base dark orange-brown, tarsus dusky pale orange with apical tarsomeres dark brown; mid femur with proximal 0.4X pale yellow, apex dark brown, tibia with proximal half dark brown, apex pale yellow, spur pale yellow, tarsus pale orange; hind femur dark brown, tibia pale orange, apical 0.2X pale orange, tarsus mostly orange-brown with basitarsus pale orange and apical tarsomere dark brown; wings (Fig. 1864) hyaline; propodeum dark brown with a weak brassy sheen, side with a strong, metallic green sheen, about 10 moderately conspicuous, translucent, silvery setae outside spiracle, these not extending down side of propodeum; gaster dark brown, with a distinct coppery purple sheen, dorsal part of Gt1 with a strong metallic blue-green sheen, side of gaster with a mixed metallic green, brassy and coppery sheen; gonostylus dark brown, extreme apex pale orange.

Head (Fig. 1862) about 2.6X as wide as frontovertex, in profile about 1.8X as high as deep; a small, oval, shiny-bottomed depression adjacent to eye margin about midway between posterior ocellus and occipital margin; ocelli forming an angle of about 110°; frontovertex shiny, with fairly regular, moderately deep, polygonally reticulate sculpture of mesh size generally subequal to slightly larger than eye facet, sculpture between posterior ocellus and occipital margin less regular and more transversely elongate; frontovertex with piliferous punctures shallow, 4 in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; interantennal prominence with two submedian lines of inconspicuous setae; temple and gena a little more shiny than frontovertex, with conspicuous, longitudinally elongate, polygonally reticulate sculpture of relatively large mesh; eye virtually reaching occipital margin, separated by much less than 0.5X diameter of facet, with very inconspicuous pale setae, each much shorter than diameter of a facet, separated from scrobal margin by a little more than diameter of ocellus, area between eye and scrobe with transversely elongate, imbricate-reticulate sculpture; scrobes shallow, more or less ∩-shaped, meeting dorsally, very weakly margined dorsally and laterally; interantennal prominence shallow, dorsally rounded and separated from frontovertex, with shallow, polygonally reticulate sculpture; antenna as in Fig. 1866; scape broadened and flattened, about 2.0X as long as broad; funicle with F1-F2 smallest, subequal, subquadrate, F3-F4 larger, subequal, slightly longer than broad, F5-F6 largest, subequal, slightly longer than broad, segments becoming broader distad; clava nearly 1.2X as broad as F6, about as long as F4-F6 combined, sutures hardly oblique, sensory area small, but extending about 0.2X along ventral surface giving apex a rounded or slightly pointed appearance; clypeal margin evenly and strongly concave; mandible with two acute teeth and a broadly truncate, upper tooth. Relative measurements: HW 90.5, HH 80, FV 35, POL 19, OOL 2.5, OCL 5.5, AOL 12, EL 50, EW 40, MS 36, SL 42, SW 21.5.

Thorax (Fig. 1863) in dorsal view with pronotum short, largely hidden by head; pronotum, mesoscutum and axilla with polygonally reticulate to imbricate-reticulate sculpture that is slightly finer and shallower than that on frontovertex; scutellum conspicuously convex, slightly velvety in appearance, with polygonally reticulate sculpture that is clearly deeper than that on mesoscutum, cells in middle one-third rounded, laterally longitudinally elongate to striate reticulate, apex with shallow sculpture, side completely smooth and shiny; visible part of mesoscutum about 1.8X as broad as long; scutellum about as long as broad, apex not thin and flange-like; fore wing with venation and distribution of setae as in Figs 1864, 1865; costal cell with a single line of setae dorsally in apical 0.4X or so; mid tibial spur slightly longer than basitarsus; propodeum medially about 0.1X as long as scutellum and more or less smooth, side with some shallow, polygonally reticulate sculpture; side of propodeum (Fig. 1863) posteriorly rounded above hind coxa and without a tooth. Relative measurements: FWL 119, FWW 49.5; HWL 85, HWW 25.

Gaster with hypopygium reaching about 0.5X to apex; syntergum about as long as mid tibia, with apex acute; ovipositor exserted, the exserted part about 0.7X as long as mid tibial spur or

nearly 0.3X as long as mid tibia.

Paratype. Funicle with linear sensilla only on F3-F6; hypopygium Fig. 1867; ovipositor Fig. 1861). Relative measurements: OL 162, GL 67 [MT 77, MTS 29].

Variation. Females vary in length from 1.65-1.87mm, F2 may be pale yellow or brown and the apex of the scutellum may be virtually completely smooth.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Cartago**, San José, 20km SE Empalme, 2800m, ix.1988 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **Heredia**, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/TN, iii.2012 (INBio-OET-ALAS); 1♀, Heredia, Braulio Carrillo NP, 2500m, Est. Barva, 2500m, viii-ix.1989 (INBio Team); 1♀, **San José**, Cerro de la Muerte, YPT, 5.iv.1985 (L. Masner); 1♀, San José, 5km E Villa Mills, LS 389550 500050, 8-20.i.1996 (A. Picado, B. Gamboa); 3♀, San José, 19km S Empalme, Mirador Quetzal, 9°39'N 83°82'W, 2600m, xii.1999, i.2000 and v.2000 (P. Hanson); 1♀, **Puntarenas**, Est. Altamira, Send. a Casa Coca, LS 331750 574400, 1700m, #84976, 11-20.xi.2005 (D. Rubí). Holotype in MZUCR, paratypes in NHMUK, MZUCR and CNC.

Genus *SOSARA* gen.nov.

Type species: *Sosara geras* sp.nov. Gender feminine.

Female. Length about 1.0-1.2mm.

Body robust, generally dark with a weak to moderate metallic sheen; funicle with unicolourous pale segments; dorsum of thorax with dark setae; legs generally dark with pale areas; wings virtually hyaline, but very weakly infuscate in apical half; propodeum dark with a weak metallic sheen, side more strongly metallic, some long, conspicuous, silvery setae near spiracle; gaster dark with a metallic sheen.

Head in profile about 1.7X as high as deep, anteriorly fairly evenly curved from occipital margin to top of scrobes, more strongly curved at top of scrobes and virtually straight to mouth margin, interantennal prominence hardly protuberant; occipital margin carinate; frontovertex a little more than 0.3X head width and with irregular, polygonally reticulate sculpture and sparse, shallow piliferous punctures; ocelli forming a right angle; temple and gena with shallow, longitudinally elongate, polygonally reticulate sculpture; eye nearly reaching occipital margin, naked; scrobes extremely shallow, virtually absent; antenna attached closer to level of lower eye margin than to mouth margin; scape strongly broadened and flattened, about 1.5X as long as broad, about 0.5X as long as head width; funicle segments quadrate or transverse, broader towards apex, F1 sometimes slightly longer than broad; linear sensilla on most segments; clava much shorter than funicle, 3-segmented, sutures subparallel, sensory area slightly enlarged and extending a little way along ventral surface, giving apex of clava a slight, obliquely truncate appearance; malar sulcus present; mouth about 0.4X head width, clypeal margin emarginate, very slightly produced medially; mandible with one tooth and a very broadly, slightly concave upper truncation; palp formula 4-3.

Thorax with pronotum short; mesoscutum without notaular lines; scutellum convex, with deeper sculpture than mesoscutum, extreme apex and side completely smooth and shiny, subapical setae relatively dense and elongate forming a loose, but distinct tuft; mid tibial spur longer than basitarsus; fore wing fully developed, about 2.8X as long as broad; costal cell with only 1 line of setae ventrally and a line of setae dorsally in apical two-fifths or so; submarginal vein with an apical hyaline break; marginal vein at least about 3X as long as broad, slightly longer than stigmal vein and slightly more than 2X as long as postmarginal vein; linea calva open; filum spinosum present, consisting of 3 or 4 peg-like setae; posterior margin of mesopleuron not reaching level

with posterior margin of propodeum, falling short by distance equivalent to about half to two-thirds diameter of propodeal spiracle; propodeum short, more or less smooth, side with some shallow sculpture, rounded above hind coxa, without a posterolateral tooth behind spiracle; about 20 setae near spiracle, extending part way to posterior margin but not hind coxa.

Gaster with hypopygium not reaching more than about 0.8X to apex; paratergites absent; syntergum shorter than mid tibia, apex weakly angular; hypopygium strongly transverse with posterior margin shallowly biconvex with a very shallow median invagination, anterior margin weakly concave without anterolateral lobes; ovipositor not exserted, shorter than mid tibia, outer plates fairly broad and subtriangular; second valvifer with 2 subapical setae, proximally broadly C-shaped.

Male. Unknown.

HOSTS. Unknown.

DISTRIBUTION. Known only from Costa Rica, but probably more widespread in the Neotropics.

COMMENTS. The combination of the obliquely truncate clava, scutellum with deep sculpture and elongate marginal vein suggest that *Sosara* may be close *Alkonia* and other genera (e.g. *Hebynthus*, *Raquanus*, *Mendisa*, *Caldencyrtus*, etc., see comments under *Alkonia*, p. 708). It can be distinguished from these genera by having the truncation of the clava not extending as much as one-third along the ventral surface of the clava, having the funicle unicolourous with all segments quadrate or transverse, the mandible with one tooth and a broad truncation, the 4-segmented maxillary palp and the strongly transverse hypopygium with a weakly concave anterior margin. *Sosara* is most similar to *Harlarus*, but in *Harlarus* all the funicle segments are clearly longer than broad, the scutellar setae are sparse and evenly distributed so that there is no indication of a subapical tuft, the fore wing is relatively broader and completely hyaline (apart from a small, weakly infuscate area immediately below marginal vein) and the stigmal vein is relatively long, forming a greater angle with the anterior wing margin.

See also comments under *Esphora* (p. 675).

Sosara geras **sp.nov.**

(Figs 1868-1874; Hab. ♀ 278)

Female (holotype): length, 1.11mm (CPD).

Head mainly black; coppery along occipital margin; frontovertex dull, dark metallic green with some weak coppery and brassy reflections; temple dull, dark, metallic green mixed coppery; gena coppery; scrobal area mostly coppery mixed with some dull, dark, metallic green; frontovertex, gena and interantennal prominence with fairly inconspicuous translucent, pale brown setae; antenna (Fig. 1874) with radicle dark brown; scape dark brown with a weak brassy, green and coppery sheen; pedicel brown, pale orange towards apex and ventrally; funicle pale orange; clava pale brown; maxillary palpus off-white; pronotum black generally with a weak brassy, green and coppery purple sheen; propleuron and prosternum black; mesoscutum moderately bright, metallic, dark green coppery purple immediately behind pronotum and narrowly margined coppery purple laterally and posteriorly; tegula dark brown with a weak coppery purple sheen; axilla black with a weak brassy sheen; scutellum medially black with a weak brassy sheen, mixed with a blue-green sheen laterally, side and apex shining dark, green; mesoscutum, clothed with fairly conspicuous, off-white, translucent setae, scutellum with conspicuous dark brown setae; metanotum dark purple-brown with a weak brassy sheen; mesopleuron dark brown, mainly with a weak brassy and purple sheen; mesosternum dark brown; all coxae dark brown; fore femur dark brown, tibia dark brown, apical one-third pale orange, tarsus dusky pale orange, apical segment brown; mid femur white in proximal one-third, apex dark brown, tibia with proximal half dark brown, apical half pale orange, spur pale orange, tarsus dusky pale orange; hind femur with proximal one-quarter white, remainder of leg dark brown; wings virtually hyaline, but fore wing (Fig. 1870) with a small infuscate area adjacent to marginal vein (Fig. 1868) and very weakly infuscate in apical half; propodeum dark brown with a weak brassy and green sheen, side with a strong, metallic green to

blue-green sheen, dorsally mixed coppery and brassy, about 20 conspicuous, long, silvery setae behind and outside spiracle extending about half way to posterior margin; gaster dark brown, with a distinct coppery purple sheen, dorsal part of Gt1 with a strong metallic blue-green sheen, side of gaster anteriorly coppery, otherwise with a mixed metallic green, brassy and coppery sheen; gonostylus dusky pale-orange.

Head (Fig. 1873) about 2.6X as wide as frontovertex; ocelli forming an angle of about 90°; frontovertex shiny, with irregular, moderately deep, polygonally reticulate sculpture of mesh size generally subequal to eye facet; piliferous punctures shallow, no setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; interantennal prominence with two submedian lines of short, inconspicuous setae; temple and gena much more shiny than frontovertex, temple with shallow, longitudinally elongate, polygonally reticulate sculpture of mesh size about 2X diameter of eye facet, sculpture below lowest part of eye, on posterior part of temple and on gena similar but more longitudinally elongate and of slightly smaller mesh size; eye virtually reaching occipital margin, separated by about 0.5X diameter of facet, naked, separated from scrobal margin by about diameter of ocellus, area between eye and scrobe with some conspicuous, polygonally reticulate sculpture towards mid-line; scrobes short, separated by interantennal prominence, very weakly margined dorsally and laterally; interantennal prominence indistinct, dorsally meeting frontovertex, with very shallow, polygonally reticulate sculpture; antenna as in Fig. 1874; scape strongly broadened, only about 1.3X as long as broad; F1 hardly longer than broad, remaining segments quadrate or transverse, segments broader distad; clava about 1.1X as broad as F6, and about as long as F4-F6 combined, sutures very slightly oblique, sensory area slightly enlarged, extending about 0.2X along ventral surface of clava giving it a slightly obliquely truncate appearance; malar suture very distinct immediately below eye. Relative measurements: HW 75, HH 71, FV 29, POL 14.5, OOL 4.5, OCL 6, AOL 9.5, EL 41.5, EW 31, MS 29, SL 35, SW 26.5.

Thorax (Fig. 1869) in dorsal view with pronotum short, largely hidden by head; pronotum with similar polygonally reticulate sculpture to that on temple; mesoscutum with slightly deeper, more regular, polygonally reticulate sculpture of smaller mesh; axilla with polygonally reticulate sculpture that is slightly deeper, more irregular and rougher, than that on mesoscutum; dorsal part of scutellum with similar sculpture to that on mesoscutum, but conspicuously deeper, apex and side completely smooth and shiny; visible part of mesoscutum about 2.2X as broad as long; scutellum dorsally only slightly convex, about as long as broad, apex not thin and flange-like; fore wing with venation and distribution of setae as in Figs 1868, 1870; costal cell with a single line of setae dorsally in apical two-fifths or so; mid tibial spur longer than basitarsus; propodeum medially about 0.14X as long as scutellum and more or less smooth, side with some shallow, polygonally reticulate sculpture; side of propodeum (Fig. 1869) rounded posteriorly above hind coxa, without a posterior tooth. Relative measurements: FWL 92, FWW 33; HWL 61, HWW 14.

Gaster with hypopygium reaching about 0.8X to apex; syntergum about 0.5X as long as mid tibia, with apex angular but not acute; ovipositor not exserted.

Paratype. Funicle with linear sensilla inconspicuous and present only on F2-F6; hypopygium Fig. 1871; ovipositor Fig. 1872. Relative measurements: OL 43, GL 10.5 [MT 65.5, MTS 25.5].

Variation. Females vary in overall length from 0.96-1.22mm, F1 may be conspicuously smaller than F2, otherwise very little in material examined.

Male. Unknown.

HOSTS. Unknown.

DISTRIBUTION. Costa Rica.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Zurqui de Moravia, 1600m, iii.1991 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Cacao (ACG), 1100m, MT/YPT, 26.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Est. Cacao (ACG), 10°55'N 85°30'W, 1100m, 19-20.ii.2005 (J.S. Noyes); 1♀, **Puntarenas**, Est. Altamira, Send. Los Gigantes, LS 321800 572100, 1460m, #62126, iii-iv.2001 (D. Rubí). Holotype in NHMUK, paratypes in MZUCR and NHMUK.

Genus *HEBYNTHUS* gen.nov.

Type species: *Hebynthus solex* **sp.nov.** Gender masculine.

Female. Length about 1.1-2.5mm.

Body robust, generally dark with a weak to moderate metallic sheen; flagellum variable, usually unicolourous dark brown, sometimes paler or bicoloured; palpi white or dark brown; dorsum of thorax with dark setae; tegula dark brown; wings hyaline with a small infuscate area below marginal vein, sometimes apical one-third may be weakly infuscate or the whole wing may be generally infused yellow-brown or very pale brown, venation pale orange, sometimes with apical parts of venation brown, occasionally completely pale orange or very rarely brown; propodeum dark with a weak metallic sheen, side more strongly metallic, some silvery setae near spiracle; gaster dark with a metallic sheen.

Head in profile about 1.7-2.3X as high as deep, anteriorly fairly evenly curved from occipital margin to top of scrobes, then usually forming a slight angle towards mouth margin, sometimes evenly curved from occipital margin to mouth margin, interantennal prominence slightly to clearly protuberant; occipital margin sharp, carinate; frontovertex about 0.15-0.35X head width and with fairly regular, polygonally reticulate sculpture and sparse, shallow piliferous punctures, usually 2-6 setae medially between anterior ocellus and top of scrobes; ocelli forming an angle of about 70-95°; temple and gena with shallow, longitudinally elongate, polygonally reticulate to striate-reticulate sculpture; eye almost always reaching or overreaching occipital margin, naked or conspicuously hairy; scrobes shallow, ∩-shaped, weakly margined dorsally and laterally; antenna attached below lower eye margin, varying from hardly above mouth margin to hardly below lower eye margin; scape about 4.0-7.2X as long as broad, about 0.4-0.6X as long as head width; funicle segments varying from all transverse to mostly longer than broad, segments gradually becoming larger and broader distally, linear sensilla on all segments to only on F5-F6; clava from shorter than funicle to slightly longer, 3-segmented, sutures strongly oblique, sensory area enlarged, extending 0.4-0.7X along ventral surface giving apex a distinct, obliquely truncate appearance; malar sulcus absent or present, distinct; mouth about 0.35-0.4X head width, clypeal margin weakly emarginate, rarely with a weak median lobe; mandible tridentate, upper tooth truncate or rarely rounded; palp formula 4-3.

Thorax with pronotum short, its posterior margin distinctly concave; mesoscutum without notaular lines, with polygonally reticulate to imbricate-reticulate sculpture; scutellum convex, dorsally with polygonally reticulate to striate-reticulate sculpture that is much deeper than sculpture on mesoscutum, side and apex completely smooth and shiny, apex forming a distinct angle, often nearly 90°, with dorsal flat part; mid tibial spur about as long as basitarsus, sometimes distinctly longer; fore wing fully developed, about 2.2-2.8X as long as broad; costal cell mostly with only 1 complete line of setae ventrally, rarely with 2; submarginal vein with an apical hyaline break; marginal vein about 4.7-8.8X as long as broad, about 1.4-2.1X as long as stigmal vein and about 1.3-2X as long as postmarginal vein, stigmal vein about as long as postmarginal vein; linea calva open or partially closed; filum spinosum present, consisting of a line of about 2-4 stouter setae; posterior margin of mesopleuron varying from falling well short of reaching level with posterior margin of propodeum by about 2X diameter of spiracle to about reaching level, but never extending past posterior margin of propodeum; propodeum fairly short, medially with irregular sculpture, side without a carina posteriorly above hind coxa, sometimes with a short angular tooth posterolaterally behind spiracle; about 10-30 setae near spiracle, sometimes extending towards hind coxa.

Gaster with hypopygium not reaching apex; paratergites absent; syntergum shorter than mid tibia, apex acute to narrowly truncate; ovipositor exserted, the exserted part about 0.2-0.8X as long as mid tibial spur; ovipositor slightly longer than mid tibia, second valvifer with no subapical seta or with a single seta , proximal part broadly C-shaped; hypopygium W-shaped, mid anterior process short, lateral arms short to moderately long without a shallow notch on external margin, posterior margin with a shallow invagination.

Male. Length about 0.9-1.4mm.

Generally very similar to female but for slightly wider frontovertex, higher placement of antenna and structure of antenna and genitalia. Frontovertex about 0.25-0.4X head width; antennal torulus about level with lower eye margin; scape about 3.3-4.0X as long as broad; flagellum filiform, all funicle segments about 1.5-2X as long as broad and clothed with setae that are about as long as diameter of segments; phallobase with moderately long digiti, each about 1.9-2.4X as long as broad with a single apical tooth; aedeagus about 0.4-0.5X as long as mid tibia with apex acute.

DISTRIBUTION. Known only from Trinidad & Tobago and Costa Rica, but likely to be more widespread in the Neotropics.

HOSTS. One species has been reared from mealybugs (Hemiptera: Pseudococcidae). It is not known whether it is a primary parasitoid or hyperparasitoid.

COMMENTS. *Hebynthus* may be close to *Dalek* and possibly also *Caldencyrtus* and similar genera (e.g. *Alkonia, Raquanus*, *Mendisa,* etc.) that may form a monophyletic group (see comments under *Alkonia*, p. 708). Females of *Hebynthus* can be separated from those of *Dalek* and the other genera of this group by the combination of having a strong oblique apical truncation on the clava that extends at least one-third along its ventral surface, the clava not as long as the pedicel and funicle combined and the scape at least 4X as long as broad. Females of *Hebynthus* have the frontovertex less than 0.35X head width and the mouth less than 0.4X head width, whilst in *Dalek* the frontovertex is 0.4-0.5X head width and the mouth is more than 0.4X head width. In addition, females of *Hebynthus* usually have the ocelli forming an angle of less than 90°, the eye reaching the occipital margin, the mouth margin emarginate without a convex median lobe, often at least one funicle segment transverse and the fore wing venation almost always yellow or orange. Females of *Dalek* have the ocelli virtually always forming an angle of much more than 90°, the eye never quite reaches the occipital margin, the mouth margin often has a convex median lobe, the funicle segments are usually all longer than broad, with only F6 occasionally quadrate and the fore wing venation is always brown. Finally, in *Hebynthus* the anterior lateral arms of the hypopygium do not have a shallow notch on their outer margin about halfway along their lengths whilst in *Dalek* the anterior arms of the hypopygium have an elongate, shallow notch on their outer margin about half way along their lengths.

Hebynthus is close to *Syrphophagus,* species of both genera having a tridentate mandible with the upper tooth truncate, sharp occipital margin and obliquely truncate clava. *Hebynthus* can be separated from *Syrphophagus* by having deep, coarse, cellular or striate sculpture on the scutellum that contrasts strongly with the shallow imbricate-reticulate or polygonally reticulate sculpture on the mesoscutum. In *Syrphophagus*, the sculpture on the scutellum is usually similar to that on the mesoscutum, but if slightly deeper it is and polygonally reticulate. In addition, the scutellum in *Hebynthus* is quite strongly convex with the posterior one-third, in profile, often forming a distinct angle with the anterior two-thirds and the apex is conspicuously more shiny, often completely smooth and mirror shiny, whereas in *Syrphophagus* the scutellum is flat to moderately and more or less evenly convex with the sculpture reaching the apex.

See also comments under *Prionias* (p. 169).

Key to Costa Rican species of *Hebynthus*
(females)

1. Hind tibia mostly dark brown 2
- Hind tibia completely pale yellow or pale orange 6

2 (1) Funicle (Figs 1877, 1886) with F1-F3 longer than broad; linear sensilla present on F2..3
- Funicle (Figs 1891, 1894, 1903) with at least F2-F3 transverse; linear sensilla absent from F2 4

3 (2) Head (Fig. 1880) not more than about 3X as wide as frontovertex; antenna (Fig. 1877) with F1 conspicuously smaller than F2, pedicel as long as F1 and F2 combined; fore wing (Fig. 1878) generally infused very pale brown, conspicuously infuscate below marginal and stigmal veins, the infuscation extending past apex of stigmal vein; ovipositor clearly exserted, the exserted part more than 0.5X as long as mid tibial spur, gonostylus about 1.5X as long as mid tibial spur .... *kapo* **sp.nov.** (p. 685)

\- Head (Fig. 1882) at least abut 4.5X as wide as frontovertex; antenna (Fig. 1886) with F1 and F2 subequal, pedicel shorter than F1 and F2 combined; fore wing (Fig. 1884) generally infused pale yellow or pale yellow-brown, more strongly so in apical half, without a distinct infuscate area below marginal and stigmal veins; ovipositor hardly exserted, the exserted part not more than 0.25X as long as mid tibial spur; gonostylus about as long as mid tibial spur ..... *maros* **sp.nov.** (p. 687)

4 (2) Scape (Fig. 1891) subcylindrical, more than 5X as long as broad; flagellum not unicolourous, funicle with F1-F5 orange-brown, F6 orange, clava dark brown; mid tibial spur clearly longer than basitarsus, nearly reaching apical margin of second tarsomere ..... *phyrra* **sp.nov.** (p. 689)

\- Scape (Figs 1894, 1903) broadened and flattened, less than 5X as long as broad; flagellum unicolourous dark brown; mid tibial spur about as long as basitarsus or shorter 5

5 (4) Sensory part of clava relatively small (Fig. 1894), not reaching more than 0.4X along ventral surface; fore wing (Fig. 1899) below marginal vein hyaline; malar sulcus absent ..... *cleon* **sp.nov.** (p. 690)

\- Sensory part of clava relatively large (Fig. 1903), at least reaching half way along ventral surface; fore wing (Fig. 1906) with a small infuscate area below marginal vein that extends a little way below apex of stigmal vein; malar sulcus present .... *solex* **sp.nov.** (p. 692)

6 (1) Fore coxa yellow or orange 7

\- Fore coxa brown or mostly brown 8

7 (6) Mid and hind coxae yellow; antenna (Fig. 1913) with scape 6X as long as broad and all funicle segments slightly longer than broad or at least quadrate, linear sensilla on F2-F6; malar sulcus present ..... *himalia* **sp.nov.** (p. 694)

\- Mid and hind coxae brown; antenna (Fig. 1920) with scape about 4X as long as broad and F1-F4 transverse, linear sensilla only on F5-F6; malar sulcus absent .... *cosmus* **sp.nov.** (p. 696)

8 (6) Head (Fig. 1929) at least 6X as wide as frontovertex ..... *menai* **sp.nov.** (p. 698)

\- Head (Figs 1936, 1944, 1948, 1957) not more than 5X as wide as frontovertex 9

9 (8) Fore wing (Figs 1938, 1947) relatively slender, at least 2.5X as long as broad, ventral surface of costal cell with only a single line of setae in distal half; sensory part of clava extending at most about 0.4X along its ventral surface (Figs 1937, 1943); malar sulcus absent 10

\- Fore wing (Figs 1954, 1960) less than 2.5X as long as broad; ventral surface of costal cell with two complete lines of setae; sensory part of clava extending at least about 0.5X as long its ventral surface (Figs 1952, 1959); malar sulcus present 11

10 (9) Funicle with linear sensilla present only on F2-F6, absent from F1; hind coxa completely pale orange ..... *cira* **sp.nov.** (p. 700)

\- Funicle with linear sensilla present on all segments; hind coxa at least partially dark brown ..... *erythrax* **sp.nov.** (p. 702)

11 (9) Hind coxa at least partially dark brown; fore and mid femora completely pale orange; head (Fig. 1948) about 4.5X as wide as frontovertex; scape about 7X as long as broad; mid tibia shorter than ovipositor ..... *callirhoe* **sp.nov.** (p. 704)
- Hind coxa completely pale orange; fore and mid femora partially brown; head (Fig. 1957) about 3.5X as wide as frontovertex; scape about 6X as long as broad; mid tibia a little longer than ovipositor ..... *tamones* **sp.nov.** (p. 706)

***Hebynthus kapo* sp.nov.**
(Figs 1875-1881)

DIAGNOSIS. *Female* (length about 1.3mm): antenna (Fig. 1877) with scape dark brown; flagellum dark brown; all coxae brown, fore coxa with some pale orange; fore and mid legs mostly pale orange, hind leg mostly dark brown; fore wing virtually hyaline but infuscate below marginal and stigmal veins (Figs 1875, 1878); head (Fig. 1880) about 3.0X as wide as frontovertex; malar sulcus present; antenna (Fig. 1877) with scape about 5.4X as long as broad; pedicel nearly as long as F1-F2 combined; funicle with segments slightly longer than broad, F6 quadrate; funicle with linear sensilla on all segments, sometimes absent from F1; sensory part of clava extending about 0.45X along ventral surface; fore wing (Fig. 1878) about 2.4X as long as broad; ventral surface of costal cell with two complete lines of setae; mid tibial spur slightly shorter than basitarsus; ovipositor slightly exserted with exserted part about 0.7X as long as mid tibial spur; gonostylus about 1.5X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.25mm; excluding ovipositor, 1.15mm (CPD).

Head mainly dark brown; frontovertex generally with a dull, dark green sheen, area above scrobes, scrobal area and gena with a coppery purple sheen; temple with a fairly strong brassy and coppery purple sheen; frontovertex, gena and interantennal prominence with fairly inconspicuous dark brown setae; antenna (Fig. 1877), including radicle, dark brown; maxillary palpus pale orange; pronotum black with a coppery purple sheen with some weak green and brassy reflections; propleuron and prosternum dark brown; mesoscutum with an overall, dark blue-green sheen, posterior margin dark brown with a slight purple and brassy sheen; tegula dark brown with a slight brassy and purple sheen; axilla dark brown with a slight purple and brassy sheen; scutellum dark metallic blue, a little coppery towards apex, vertical apex and side very shiny metallic green, mixed slightly brassy and coppery laterally; dorsum of thorax clothed with dark brown setae; metanotum dark brown with a weak brassy and purple sheen; mesopleuron dark brown with a moderate blue and purple sheen; mesosternum dark brown; fore coxa dark orange-brown; fore femur and tibia pale orange margined dark brown, tarsus pale orange-brown, apical tarsomere brown; mid coxa dark brown; mid femur pale orange, slightly dusky along dorsal margin, tibia pale orange with a broad, subbasal, dark brown band, spur and tarsus pale orange, apical tarsomere orange-brown; hind coxa dark brown; extreme base of tibia pale orange, remainder of hind leg dark brown; wings virtually hyaline, but fore wing (Fig. 1878) with a small infuscate area below marginal and stigmal veins (Fig. 1875), venation brown; propodeum dark purple-brown with a weak brassy sheen, a small area posterior to spiracle and side dark metallic blue, about 20 conspicuous pale setae behind and outside spiracle extending most of the way to posterior margin; gaster dark brown, with a fairly strong purple and coppery sheen dorsally weakly mixed brassy, Gt2-Gt3 with a fairly strong coppery sheen medially, side of gaster with distinct metallic green, blue, brassy, purple and coppery reflections, venter slightly duller with mixed green, purple and blue, outer plates relatively dull coppery, purple and blue; gonostylus dark brown, extreme apex pale orange.

Head (Fig. 1880) about 3X as wide as frontovertex, in profile about 1.8X as high as deep, anteriorly fairly evenly curved from occipital margin to mouth margin, weakly angled at top of scrobes, interantennal prominence hardly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 85°; frontovertex (Fig. 1880) slightly shiny, with fairly regular, moderately deep, fine, polygonally reticulate sculpture of mesh size generally subequal to eye facet; frontovertex with piliferous punctures shallow, 3 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; interantennal prominence with two submedian lines of conspicuous long setae; temple and gena more shiny

than frontovertex, with conspicuous, coarse, longitudinally elongate, strigose to striate-reticulate sculpture; eye virtually reaching occipital margin, separated by much less than diameter of facet, with short, inconspicuous setae that are each much shorter than diameter of facet, eye separated from scrobal margin by about 1.5X diameter of ocellus, area between eye and scrobe with transversely elongate, polygonally reticulate sculpture, area below lowest part of eye almost completely smooth; scrobes shallow, narrowly V-shaped, more or less meeting, fairly smooth but with shallow, polygonally reticulate sculpture, weakly margined dorsally and laterally; interantennal prominence weak, dorsally moderately acute, sculpture on interantennal prominence similar to frontovertex; antenna as in Fig. 1877; scape subcylindrical, about 5.4X as long as broad; F1-F5 clearly longer than broad, F6 subquadrate, segments larger and broader distad, linear sensilla present on all funicle segments or absent from F1; clava slightly broadened, about 1.2X as wide as F6, slightly shorter than F3-F6 combined, sutures strongly oblique, sensory area enlarged, extending ventrally about 0.45X length of clava, apex strongly obliquely truncate; malar sulcus absent; clypeal margin weakly emarginate medially; mandible with two teeth and a narrowly truncate upper tooth. Relative measurements: HW 73, HH 70, FV 25, POL 12, OOL 1.5, OCL 3, AOL 9, EL 44, EW 32, MS 30, SL 40.5, SW 7.5.

Thorax (Fig. 1879) in dorsal view with pronotum short, mostly hidden by head; pronotum dorsally with imbricate-reticulate to polygonally reticulate sculpture that is about as deep as that on frontovertex; mesoscutum with polygonally reticulate sculpture that is of similar mesh size and about as deep as that on pronotum; axilla with polygonally reticulate sculpture that is a little finer and shallower than that on mesoscutum; dorsal part of scutellum with regular, polygonally reticulate sculpture that is conspicuously deeper and coarser than that on mesoscutum, vertical apex and side completely smooth and shiny; visible part of mesoscutum about 2.1X as broad as long; scutellum convex and hardly longer than broad; fore wing with venation and distribution of setae as in Figs 1875, 1878; costal cell with a single line of setae dorsally in apical two-fifths, ventral surface with two complete lines of setae; mid tibial spur slightly shorter than basitarsus; propodeum (Fig. 1879) medially about 0.16X as long as scutellum and with a complete median carina and several, incomplete submedian carinae from posterior margin; side of propodeum sharp, but not carinate, posterolaterally with a short, triangular tooth above hind coxa about half way to spiracle. Relative measurements: FWL 111, FWW 45; HWL 78.5, HWW 21.

Gaster with hypopygium (Fig. 1881) reaching about 0.6X to apex; syntergum about 0.6X as long as mid tibia, with apex acute; ovipositor (Fig. 1876) slightly exserted, the exserted part about 0.7X as long as mid tibial spur or about 0.2X mid tibia; gonostylus about 1.5X as long as mid tibial spur. Relative measurements: OL 98, GL 36 [MT 74.5, MTS 24.5].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Limón**, PI Amistad, Valle del Silencio, Zona de Acampar, LS 341250 577200, 2400m, #66672, 4.xi.2001-14.i.2002 (D. Rubí). Holotype in NHMUK.

COMMENTS. *Hebynthus kapo* is similar in some respects to *cira*. Both species have the head about 3X as wide as the frontovertex, the scape about 6X as long as broad, F1 noticeably smaller than F2 and the gonostylus about 1.5X as long the mid tibial spur. In addition to the characters given in the key, *kapo* can be separated from *cira* by having the area below the marginal vein infuscate, the hind leg almost completely dark brown, the head slightly longer than broad in facial view and the fore wing less than 2.5X as long as broad. In *cira,* the fore wing is hyaline, the hind leg is more or less completely pale orange, the head is slightly broader than long in facial view and the fore wing is more than 2.7X as long as broad.

***Hebynthus maros* sp.nov.**
(Figs 1882-1887; Hab. ♀ 279)

DIAGNOSIS. *Female* (length about 1.6mm): antenna (Fig. 1886) with scape dark brown, pale orange ventrally; flagellum dark brown; coxae brown; hind legs mostly dark brown, legs otherwise mostly yellow to pale orange; fore wing (Fig. 1884) virtually hyaline, but weakly suffused pale yellow-brown below marginal vein; head (Fig. 1882) about 4.4-4.5X as wide as frontovertex; malar sulcus present; antenna (Fig. 1886) with scape about 5.5-6.8X as long as broad; pedicel slightly shorter than F1-F2 combined; funicle with segments longer than broad, F6 may be quadrate; funicle with linear sensilla on all segments, sometimes absent from F1; sensory part of clava extending slightly more than 0.5X along ventral surface; fore wing (Fig. 1884) about 2.4-2.6X as long as broad; ventral surface of costal cell with only one complete line of setae; mid tibial spur very slightly shorter than basitarsus; ovipositor slightly exserted with exserted part about 0.2-0.3 X as long as mid tibial spur; gonostylus about as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.58mm; excluding ovipositor, 1.54mm (CPD).

Head mainly black; frontovertex generally with a dull blue and purple sheen, slightly coppery along inner eye margins and above scrobes; area between eye and scrobes with a weak brassy and coppery sheen; temple with a weak brassy and coppery sheen; gena mostly coppery; scrobes and interantennal prominence coppery with some blue and purple reflections, especially between toruli above mouth margin; frontovertex, gena and interantennal prominence with fairly inconspicuous dark brown setae; antenna (Fig. 1886) with radicle dark brown; scape dark brown, ventrally pale orange in proximal two-thirds; pedicel and flagellum dark brown; maxillary palpus pale brown; pronotum black with a mixed coppery and brassy sheen with a few scattered dark blue reflections; propleuron and prosternum dark brown; mesoscutum with an overall, dark blue sheen but mixed with some purple and coppery anteriorly, posterior margin dark brown with a mixed brassy, coppery and purple sheen; tegula dark brown with a slight brassy and purple sheen; axilla dark purple-brown with a slight brassy sheen; scutellum dark metallic blue, vertical apex and side very shiny dark metallic blue-green; dorsum of thorax clothed with dark brown setae; metanotum dark brown with a weak coppery purple sheen; mesopleuron dark brown with a fairly strong purple sheen with some blue, violet, coppery and brassy reflections; mesosternum dark brown; fore coxa dark brown; fore femur dark brown proximally, apical two-fifths or so pale orange, tibia pale orange with small brown, subbasal spot dorsally, tarsus pale orange; mid coxa dark brown; mid femur pale orange, tibia pale orange with a diffuse, brown, subbasal ring, spur and tarsus pale orange; hind coxa dark brown; hind femur pale orange with a broad brown subbasal ring, hind tibia dark brown, orange-brown at apices, tarsus orange-brown; fore wing (Fig. 1884) virtually hyaline, but weakly suffused pale yellow-brown below marginal vein, hind wing hyaline, venation orange; propodeum dark brown with a weak brassy and purple sheen, side dark metallic blue-green and green with about 20 long, conspicuous pale setae outside spiracle extending from anterior margin virtually to posterior margin; gaster dark brown, with a fairly strong purple and coppery sheen dorsally weakly mixed brassy, Gt1 dark, metallic blue, side of gaster with distinct metallic green, blue, brassy, purple and coppery reflections, venter slightly duller with mixed green, purple and blue, outer plates of ovipositor relatively dull coppery, purple and blue; gonostylus dark brown, extreme apex pale orange.

Head (Fig. 1882) sublenticular, about 4.4X as wide as frontovertex, in profile about 2X as high as deep, anteriorly fairly evenly curved from occipital margin to top of scrobes, weakly angled at top of scrobes, interantennal prominence slightly protuberant; clypeal margin weakly emarginate medially; occipital margin sharp, carinate; ocelli forming an angle of about 60°; frontovertex shiny, with fairly regular, moderately deep, polygonally reticulate sculpture of mesh size generally smaller than eye facet; frontovertex with piliferous punctures moderately deep and distinct, 5 setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena more shiny than frontovertex, with conspicuous, coarse, longitudinally elongate, strigose to striate-reticulate sculpture; eye slightly overreaching occipital margin, with fairly conspicuous pale setae that are hardly shorter than diameter of facet, eye

separated from scrobal margin by about 1.5X diameter of ocellus, area between eye and scrobe with relatively, deep and coarse, transversely elongate, polygonally reticulate sculpture; scrobes shallow, narrowly ∩-shaped, meeting, with distinct, polygonally reticulate sculpture, weakly margined dorsally and laterally; interantennal prominence weak, dorsally rounded, sculpture on interantennal prominence similar to frontovertex; antenna as in Fig. 1886; scape subcylindrical, about 5.5X as long as broad; all funicle segments clearly longer than broad, segments broader distad, linear sensilla present on all segments, or absent from F1; clava clearly broadened, very nearly as long as F3-F6 combined, sutures strongly oblique, sensory area enlarged, extending ventrally about 0.5X length of clava, apex strongly obliquely truncate; malar sulcus present, but very inconspicuous; mandible with two acute teeth and a narrowly truncate upper tooth. Relative measurements: HW 85, HH 84, FV 19.5, POL 10, OOL 0.5, OCL 4, AOL 10.5, EL 60, EW 44, MS 27, SL 44, SW 8.

Thorax (Fig. 1885) in dorsal view with pronotum short, mostly hidden by head; pronotum dorsally with imbricate-reticulate to polygonally reticulate sculpture that is slightly shallower than sculpture on frontovertex, and of larger mesh; mesoscutum generally with similar sculpture to that on pronotum; axilla with polygonally reticulate sculpture that is about as deep as that on frontovertex; scutellum clearly convex, dorsal part with conspicuously deeper, coarser and more regular, polygonally reticulate sculpture than on axilla or mesoscutum, vertical apex and side completely smooth and shiny; visible part of mesoscutum about 1.6X as broad as long; scutellum about as long as broad; fore wing with venation and distribution of setae as in Figs 1884, 1887, ventral surface of costal cell with only one complete line of setae; propodeum (Fig, 1885) medially about 0.17X as long as scutellum and with several longitudinal carinae and irregular reticulate sculpture medially, a short, angular tooth present posteriorly a little above mid way between spiracle and base of hind coxa. Relative measurements: FWL 125, FWW 49; HWL 94, HWW 55.5.

Gaster with hypopygium (Fig. 1883) reaching about 0.6X to apex; syntergum about 0.6X as long as mid tibia, with apex narrowly rounded; ovipositor hardly exserted, the exserted part about 0.2X as long as mid tibial spur or less than 0.1X mid tibia; gonostylus about as long as mid tibial spur. Relative measurements: OL 102.5, GL 36 [MT 103].

Variation. Female vary in overall length from 1.58-1.83mm, the head varies from 4.4-4.5X as wide as the frontovertex, the scape varies from 5.5-6.8X as long as broad, the fore wing varies from 2.4-2.6X as long as broad and the exserted part of the ovipositor varies from 0.2-0.3X as long as the mid tibial spur.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Zurqui de Moravia, 1600m, xi.1996 (P. Hanson). Paratypes: **COSTA RICA**, 1♀, **San José**, Zurqui de Moravia, 1600m, x.1995 (P. Hanson); 1♀, **Cartago**, La Cangreja, 9°48'N 85°58'W, 1900m, vii.1991 (P. Hanson, C. Godoy). Holotype and paratypes in NHMUK.

COMMENTS. *Hebynthus maros* is superficially quite similar to *tamones*, both having similar antennal structure, the fore wing weakly infused yellowish, the mid tibial spur shorter than the basitarsus and the ovipositor about as long as the mid tibia. The two species can be separated using the colour of the hind leg and the relative density of the setae on the ventral surface of the costal cell of the hind wing. In *maros* the hind leg is largely brown and the ventral surface of the costal cell has only one complete line of setae whereas in *tamones* the hind leg is pale orange and the ventral surface of the costal cell has two compete lines of setae ventrally. See also comments under *himalia* (p. 696).

***Hebynthus phyrra* sp.nov.**
(Figs 1888-1892)

DIAGNOSIS. *Female* (length about 1.0mm): antenna (Fig. 1891) with scape pale brown, orange apically; funicle brown, mixed orange-brown; coxae dark brown, legs largely brown; fore wing (Fig 1892) hyaline; head about 3.7X as wide as frontovertex; malar sulcus absent; antenna (Fig. 1891) with scape about 5.6X as long as broad; pedicel nearly as long as F1-F3 combined; all funicle segments transverse, distal segments subquadrate; linear sensilla on F3-F6; sensory part of clava extending about 0.4X along ventral surface; fore wing (Fig. 1892) about 2.3X as long as broad; ventral surface of costal cell with only a single complete line of setae; mid tibial spur about 1.3X as long as basitarsus; ovipositor slightly exserted with exserted part about 0.4X as long as mid tibial spur; gonostylus about as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.02mm; excluding ovipositor, 0.96mm (CPD).

Head mainly black; frontovertex with a relatively weak dark green and purple sheen; temple and gena with a mixed weak brassy and coppery sheen; area immediately below eye distinctly green, brassy and coppery; area between eye and scrobe green and coppery; interantennal prominence and scrobes with a metallic coppery purple sheen; frontovertex, gena and interantennal prominence with fairly conspicuous dark brown setae; antenna (Fig. 1891) with radicle dark brown; scape pale brown, orange-brown towards apex and internally; pedicel dark brown, orange-brown ventrally and apically; F1-F5 orange-brown, F6 pale orange, clava brown; maxillary palpus white, terminal segment orange; pronotum black with weak coppery and green reflections; propleuron and prosternum dark brown; mesoscutum slightly dull, metallic blue-green with some weak coppery reflections, posterior margin dark brown with a slight coppery sheen; tegula dark brown with a slight brassy sheen; axilla black with a weak coppery lustre; scutellum black and much duller than mesoscutum, but with weak brassy reflections, sides and apex with a slight blue-green sheen, vertical apex and side, very shiny metallic green mixed with some dark blue and coppery; metanotum dark brown; mesopleuron dark brown with a coppery, brassy and purple sheen; mesosternum dark brown; fore coxa dark brown; fore femur dark brown, tibia pale orange with a broad, subbasal, brown band, tarsus pale orange; mid coxa dark brown; mid femur white basally, but mostly dark brown, tibia white to pale orange, brown at base and with a broad, subbasal brown ring, spur and tarsus pale orange; hind coxa dark brown; hind femur dark brown, extreme base white, tibia dark brown, orange at apex, tarsus pale orange-brown; wings (Fig. 1892) hyaline, venation pale orange; propodeum dark brown with a weak brassy sheen, side metallic blue-green anteriorly, mixed green posteriorly, a group of about 8 or 9 scattered, conspicuous, translucent, white setae anterolateral and posterior to spiracle; gaster dark brown, with a fairly strong purple and coppery sheen dorsally, Gt1 contrasting and strongly metallic blue with some green areas, side of gaster metallic green, blue and coppery reflections, venter slightly duller with mixed green, purple and blue, outer plates of ovipositor relatively dull coppery, purple and blue; gonostylus dark brown.

Head about 3.7X as wide as frontovertex, in profile about 1.7X as high as deep, anteriorly fairly evenly curved from occipital margin to top of scrobes and then virtually straight to mouth margin, with interantennal prominence slightly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 70°; frontovertex slightly shiny, with fairly regular, moderately deep, polygonally reticulate sculpture of mesh size generally subequal to eye facet; frontovertex without setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena more shiny than frontovertex, with much shallower, longitudinally elongate, strigose to striate-reticulate sculpture; eye reaching occipital margin, virtually naked, but with extremely short, inconspicuous setae that are each much shorter than diameter of facet, eye separated from scrobe by about diameter of ocellus, area between eye and scrobe with shallow, transversely elongate, polygonally reticulate sculpture; scrobes shallow, narrowly ∩-shaped, meeting, with distinct polygonally reticulate sculpture, weakly margined dorsally and laterally; interantennal prominence weak, rounded dorsally, with shallow, polygonally reticulate sculpture; antenna as in Fig. 1891; scape subcylindrical, about 5.6X as long as broad; all funicle segments subquadrate, segments larger and broader distad, linear sensilla present only on

F3-F6; clava slightly broadened, nearly as long as funicle, outer suture strongly oblique, sensory area enlarged, extending ventrally about 0.4X length of clava, apex strongly obliquely truncate; malar sulcus absent; clypeal margin hardly emarginate medially; mandible with two acute teeth and a truncate upper tooth. Relative measurements: HW 57.5, HH 56.5, FV 15.5, POL 9.5, OOL 0.5, OCL 2.5, AOL 8.5, EL 37, EW 29.5, MS 23.5, SL 28, SW 5.

Thorax in dorsal view with pronotum short, mostly hidden by head; pronotum dorsally with imbricate-reticulate to polygonally reticulate sculpture that is slightly shallower than sculpture on frontovertex, and of larger mesh; mesoscutum with polygonally reticulate sculpture that is of similar mesh size, but slightly shallower than that on pronotum; axilla with polygonally reticulate sculpture that is slightly deeper than that on pronotum and of slightly larger mesh; dorsal part of scutellum with sculpture similar to that on axilla, but conspicuously deeper and coarser and more regularly polygonal medially to slightly more elongate laterally, vertical apex and side completely smooth and shiny; visible part of mesoscutum about 2.2X as broad as long; scutellum about 1.1X as broad as long; fore wing with venation and distribution of setae as in Figs 1889, 1892; ventral surface of costal cell with only a single complete line of setae; mid tibial spur about 1.3X as long as basitarsus; propodeum medially about 0.1X as long as scutellum, virtually smooth. Relative measurements: FWL 61, FWW 25; HWL 45, HWW 12.

Gaster with hypopygium (Fig. 1890) reaching about 0.6X to apex; syntergum about 0.65X as long as mid tibia, with apex acute; ovipositor (Fig. 1888) slightly exserted, the exserted part about 0.4X as long as mid tibial spur or about 0.16X mid tibia; gonostylus about as long as mid tibial spur. Relative measurements: OL 70, GL 22 [MT 56].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Cartago**, PN Tapanti-Macizo de la Muerte, Send. a Rio Humo, LN 188100 560500, 1400-1500m, xii.1999-i.2000 (M. Alfaro). Holotype in NHMUK.

COMMENTS. *Hebynthus phyrra* is probably closest to *solex* and *cleon* (see comments under *solex*, p. 694)

Hebynthus cleon **sp.nov.**

(Figs 1893-1899; Hab. ♀ 280)

DIAGNOSIS. *Female* (overall length about 1.3mm): antenna (Fig, 1894) with scape dark brown; flagellum dark brown; coxae brown, legs mostly dark brown; fore wing (Fig. 1896) virtually hyaline, but with a very small infuscate area adjacent to marginal vein (Fig. 1899); head (Fig. 1898) about 3.2X as wide as frontovertex; malar sulcus absent; antenna (Fig. 1894) with scape about 4.4X as long as broad; pedicel nearly as long as F1-F3 combined; funicle with F2-F3 transverse, remaining segments quadrate or longer than broad; funicle with linear sensilla on F3-F6 or absent from F3; sensory part of clava extending about 0.4X along ventral surface; fore wing (Fig. 1896) about 2.3X as long as broad; ventral surface of costal cell with only one complete line of setae; mid tibial spur very slightly longer than basitarsus; ovipositor slightly exserted with exserted part about 0.4X as long as mid tibial spur; gonostylus slightly longer than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.26mm; excluding ovipositor, 1.19mm (CPD).

Head mainly black; ocellar area with a dull, dark green sheen mixed coppery purple, remainder of frontovertex, scrobal area, temple and gena with a coppery purple sheen; frontovertex, interantennal prominence and gena with inconspicuous dark brown setae; antenna (Fig. 1894) with

radicle dark brown; scape dark brown; pedicel dark brown, apex orange-brown; flagellum dark brown; maxillary palpus white; thorax generally dark brown to black; pronotum with a coppery sheen; mesoscutum with an overall metallic blue sheen mixed with some coppery and brassy reflections, posterior margin with a coppery purple sheen; tegula dark brown with a slight coppery purple sheen; axilla with a coppery purple sheen; scutellum dorsally virtually matt but very weakly coppery purple, laterally narrowly metallic green, extreme sides and apex shining blue-green mixed brassy and coppery; dorsum of thorax clothed with dark brown setae; metanotum dark coppery purple; mesopleuron with a weak coppery purple lustre; mesosternum dark brown; all coxae dark brown; fore femur dark brown, tibia pale orange with a broad, dark brown, subbasal band, tarsus brown; mid femur dark brown, tibia proximally dark brown, distal 0.6X pale orange, spur pale orange, tarsus dusky pale orange, apical tarsomere brown; hind femur dark brown, tibia dark brown, extreme apex pale orange, tarsus orange brown, apical tarsomere brown; fore wing (Fig. 1896) virtually completely hyaline, but with a very small, extremely weakly infuscate area adjacent to, and not wider than, marginal vein (Fig. 1899); hind wing hyaline, venation orange to pale brown; propodeum dark purple-brown with a weak brassy sheen, side shining metallic green mixed coppery and brassy, about 10 long, conspicuous pale setae outside spiracle extending nearly to posterior margin; gaster dark brown, with a fairly strong purple and coppery sheen dorsally weakly mixed brassy, Gt1 dark, metallic green mixed coppery, more coppery laterally, side of gaster with distinct metallic green, brassy, purple and coppery reflections, venter slightly duller with mixed green, purple and blue, outer plates of ovipositor relatively dull coppery, purple and blue; gonostylus dark brown, extreme apex pale orange.

Head (Fig. 1898) about 3.2X as wide as frontovertex, in profile nearly 2X as high as deep, anteriorly fairly evenly curved from occipital margin to top of scrobes and then nearly straight to mouth margin, interantennal prominence hardly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 95°; frontovertex with fairly regular, moderately deep, polygonally reticulate sculpture of mesh size generally subequal to eye facet; frontovertex with moderately deep, distinct, piliferous punctures, 4 or 5 setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena more shiny than frontovertex, with conspicuous, coarse, longitudinally elongate, strigose to striate-reticulate sculpture; eye slightly overreaching occipital margin, with very inconspicuous pale setae that are clearly shorter than diameter of facet, eye separated from scrobal margin by slightly less than diameter of ocellus, area between eye and scrobe with relatively, deep and coarse, transversely elongate, polygonally reticulate sculpture; scrobes very shallow, narrowly ∩-shaped, meeting, with shallow, polygonally reticulate sculpture, weakly margined dorsally and laterally; interantennal prominence weak, dorsally rounded, sculpture on interantennal prominence much shallower and finer than that on frontovertex; antenna as in Fig. 1894; scape slightly broadened and flattened about 4.4X as long as broad; funicle with F1-F3 subequal, transverse, F4 larger, quadrate, F5-F6 slightly longer than broad, linear sensilla present only on F3-F6 or absent from F3; clava hardly broadened, about 1.2X as wide as F6, as long as F2-F6 combined, sutures strongly oblique, sensory area enlarged, extending ventrally about 0.4X length of clava, apex strongly obliquely truncate; malar sulcus absent; clypeal margin weakly emarginate medially; mandible with three teeth, upper tooth truncate. Relative measurements: HW 69.5, HH 65, FV 22, POL 12, OOL 2, OCL 3, AOL 9, EL 42, EW 34, MS 28, SL 35, SW 8.

Thorax (Fig. 1897) in dorsal view with pronotum short, mostly hidden by head; pronotum dorsally with imbricate-reticulate to polygonally reticulate sculpture that is conspicuously shallower than sculpture on frontovertex; mesoscutum generally with similar sculpture to that on pronotum; axilla with fine, polygonally reticulate sculpture that is about as deep as that on mesoscutum; scutellum hardly convex, dorsal part with regular, slightly longitudinally elongate, polygonally reticulate sculpture that is conspicuously deeper and coarser than on axilla, vertical apex and side completely smooth and shiny; visible part of mesoscutum about 2X as broad as long; scutellum very slightly broader than long; fore wing with venation and distribution of setae as in Figs 1896, 1899; ventral surface of costal cell with only one complete line of setae; mid tibial spur very slightly longer than basitarsus; propodeum (Fig. 1897) medially about 0.1X as long as scutellum and virtually smooth medially. Relative measurements: FWL 105, FWW 46; HWL 80.5, HWW 23.5.

Gaster with hypopygium (Fig. 1895) reaching about 0.6X to apex; syntergum about 0.7X as long as mid tibia, with apex rounded; ovipositor (Fig. 1893) slightly exserted, the exserted part about 0.4X as long as mid tibial spur or about 0.14X mid tibia; gonostylus nearly 1.2X as long as mid tibia spur. Relative measurements: OL 85.5, GL 28.5 [MT 72].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Potrero Grande, Cerro Kasir, LS 349700 566850, 2959m, #59114, vii-viii.2000 (M. Alfaro). Holotype in NHMUK.

COMMENTS. *Hebynthus cleon* is probably closest to *solex* and *phyrra* (see comments under *solex*, p. 694)

***Hebynthus solex* sp.nov.**

(Figs 1900-1908; Hab. ♀ 281, ♂ 282)

DIAGNOSIS. Female (length about 1.1-1.5mm): antenna (Fig. 1903) with scape dark brown, apex largely orange; flagellum dark brown; coxae dark brown; fore and mid femora brown with some orange; hind tibia dark brown; fore wing (Fig. 1907) weakly infuscate below marginal vein (Fig. 1906); head (Fig. 1905) about 3.4X as wide as frontovertex; malar sulcus present; antenna (Fig. 1903) with scape about 4X as long as broad; pedicel about as long as F1-F3 combined; funicle with F2-F3 transverse; linear sensilla on F4-F6; sensory part of clava extending a little more than 0.5X along ventral surface; fore wing (Fig. 1907) about 2.3X as long as broad; ventral surface of costal cell with only a single complete line of setae; mid tibial spur about as long as basitarsus; ovipositor slightly exserted with exserted part about 0.3X as long as mid tibial spur; gonostylus about 0.9X as long as mid tibial spur. *Male* (length about 0.9-1.2mm): antenna (Fig. 1908) with scape about 2.6X as long as broad; funicle segments subequal in size and slightly longer than broad, aedeagus (Fig. 1901) about half as long as mid tibia.

Female (holotype): length, including ovipositor, 1.35mm; excluding ovipositor, 1.30mm (CPD).

Head mainly black; frontovertex with a weak dark blue and purple sheen; area immediately below eye with a relatively strong green and coppery sheen; temple and gena with a weak coppery sheen; scrobal area with a weak purple sheen and a narrow, metallic blue line across top of scrobes; setae on frontovertex, interantennal prominence and gena dark brown; antenna (Fig. 1903) with radicle and scape dark brown, apical one-quarter of scape ventrally pale orange to slightly dusky orange; pedicel and flagellum dark brown; maxillary palpus white; pronotum black with a weak coppery sheen; propleuron and prosternum black; mesoscutum with dark brown setae and shining, metallic blue-green and green with posterior margin dark brown with a weak coppery purple sheen; tegula dark brown; axilla black with a weak coppery and brassy sheen; scutellum with dark brown setae, less shiny than mesoscutum with metallic dark blue and scattered coppery reflections, vertical apex and side very shiny with a mixed green, blue-green, dark blue and coppery sheen; metanotum dark brown; mesopleuron dark brown with a moderate, mixed coppery, purple and blue sheen; mesosternum dark brown; fore coxa dark brown; fore femur dark brown, orange at apices, tibia dark brown, extreme base and apical 0.25X orange, tarsus orange, apical tarsomere brown; mid coxa dark brown; mid femur with proximal 0.4X pale orange to orange, apex dark brown, tibia dark brown in proximal 0.5X, apex orange, spur orange, tarsus slightly dusky orange, apical tarsomere brown; hind coxa, femur and tibia dark brown, hind tarsus brown; wings mostly hyaline, but weakly infuscate below marginal vein (Fig. 1906), submarginal vein pale orange, remainder of venation pale orange-brown; propodeum dark purple-brown, side metallic green, a

group of about 15 conspicuous silvery setae outside spiracle; gaster dark brown, dorsally mainly with a coppery and brassy sheen, Gt1 with a strong metallic blue sheen, Gt2 with a partial, weak blue sheen, syntergum mixed dull green, sides of tergites generally with a mixed blue, coppery and brassy sheen, sternites generally with a weaker coppery and brassy sheen, outer plates of ovipositor with a weak blue sheen; gonostylus dark brown.

Head (Fig. 1905) submenisciform, about 3.4X as wide as frontovertex, in profile about 2X as high as deep, evenly curved from occipital margin to top of scrobes and then forming a slight angle towards mouth margin, with interantennal prominence clearly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 80°; frontovertex slightly shiny, with fairly regular, moderately deep, polygonally reticulate sculpture of mesh size slightly smaller than eye facet; frontovertex with a pair of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena more shiny than frontovertex, with shallower, longitudinally elongate, strigose to striate-reticulate sculpture; eye reaching occipital margin, naked, separated from scrobe by a little less than 1.5X diameter of ocellus; scrobes shallow, narrowly ∩-shaped, hardly meeting, dorsally very smooth, weakly margined dorsally and laterally; interantennal prominence weak, rounded dorsally, with shallow, regular, polygonally reticulate sculpture; antenna as in Fig. 1903; scape slightly broadened and flattened, widest above middle, about 4X as long as broad; funicle segments subquadrate, F2-F3 smallest, transverse, segments larger and broader distad; clava slightly broadened, only slightly shorter than funicle, sensory area slightly enlarged, extending ventrally about 0.6X length of clava, apex strongly obliquely truncate; malar sulcus present, indistinct; clypeal margin weakly emarginate medially; mandible with two acute teeth and a broadly truncate upper tooth. Relative measurements: HW 74, HH 71, FV 22, POL 11.5, OOL 1, OCL 3.5, AOL 8.5, EL 45, EW 33, MS 30, SL 36, SW 9.

Thorax (Fig. 1904) in dorsal view with pronotum short, mostly hidden by head; pronotum dorsally with moderately deep, imbricate-reticulate to polygonally reticulate sculpture that is about as deep as sculpture on frontovertex; mesoscutum with mainly polygonally reticulate sculpture that is perhaps very slightly shallower than that on pronotum; axilla with similar sculpture to mesoscutum; scutellum dorsally with much deeper, polygonally reticulate to striate-reticulate sculpture, vertical side and apex completely smooth and shiny, vertical apex virtually forming a right angle of about 90° with dorsal flat part; visible part of mesoscutum about 2.1X as broad as long; scutellum hardly broader than long; fore wing with venation and distribution of setae as in Figs 1906, 1907, ventral surface of costal cell with only a single complete line of setae; mid tibial spur about as long as basitarsus; propodeum (Fig. 1904) medially about 0.1X as long as scutellum, with conspicuous, irregular, reticulate sculpture. Relative measurements: FWL 81, FWW 36; HWL 60, HWW 18.

Gaster with hypopygium reaching about 0.7X to apex; syntergum about 0.7X as long as mid tibia, with apex narrowly truncate; ovipositor slightly exserted, the exserted part about one-third as long as mid tibial spur or 0.14X mid tibia.

Paratype. Funicle with linear sensilla present only on F4-F6; gonostylus about 0.9X as long as mid tibial spur; hypopygium Fig. 1900; ovipositor Fig. 1902. Relative measurements: OL 73.5, GL 22 [MT 69.5].

Variation. Females vary in overall length from 1.06-1.48mm, very little variation observed in material available although the mesoscutum normally varies from metallic blue to green, whereas in the paratype from Bosque Diría the anterior part of the mesoscutum relatively dull and coppery.

Male: length 0.87-1.21mm.

Generally very similar to female but for structure of head, antenna and genitalia; head about 2.4X as wide as frontovertex, ocelli forming a slightly obtuse angle with posterior ocelli about equidistant from eye and occipital margins; occipital margin strongly carinate; antenna (Fig. 1908) with scape about 2.6X as long as broad; funicle segments subequal in size and slightly longer than broad, clothed in setae that are about as long as diameter of segments; genitalia (Fig. 1901) with a single apical hook on digitus, aedeagus slender with acute apex. Relative measurements: HW 71, FV 29, POL 15, OOL 2.5, OCL 2.5, AOL 8.5, EL 39, EW 29.5, MS 25, SL 23, SW 9; AL 29, MT 58.5.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Cartago**, La Cangreja, 9°48'N 83°58'W, 1950m, iii-v.1992 (P. Hanson, C. Godoy). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, Bosq. Nac. Diriá, LN 239700 361800, 160m, #66713, 18.xi.2001 (Y. Cardenas); 1♀, **Heredia**, 9km NE Vara Blanca, 10°14'N 84°06'W, 1450-1550m, 15/M/TN, ii-iv.2005 (INBio/OET-ALAS): 1♀, Heredia, 6km NE Vara Blanca, 10°11'N 84°07'W, 20/M/NOTN, iv.2002 (INBio-OET-ALAS); 1♀, Heredia, Vara Blanca, i-ii.1990 (P. Hanson); 1♀, San José, Zurqui de Moravia, 1600m, i.1996 (P. Hanson); 20♀, **San José**, Zurqui de Moravia. 1600m, various dates vii.1990-v.1996 (P. Hanson); 1♀, Heredia (error for San José), Zurqui de Moravia, 1600m, 3-4.iv.1996 (L. Masner); 1♀, San José, San Gerardo de Dota, El Manantial, 9°34'N 83°48'W, 2250m, 18-20.ii.2010 (J.S. Noyes); 1♀, **Cartago**, PN Tapanti-Macizo de la Muerte, Torre ICE #31, LN 561800 188500, 1800m, #61067, 9.vii-10.viii.2000 (D. Rubí); 1♀, Cartago, PN Tapanti, Queb. Segunda, Send. Torre ICE #28, LN 192650 560500, 1500m, #52273, iv.1999 (I. Jiménez); 16♀, 12♂, Cartago, PN Tapanti, 1200-1500m, 9°45'N 83°47'W, 1200-1500m, 20.iii-10.iv.2000 (C. Hansson, D. Rubí); 16♀, Cartago, La Cangreja, 9°48'N 83°58'W, 1950m, various dates x.1991-xii.1992 (P. Hanson, C. Godoy); 1♂, Cartago, Genesis II, 4km NE Cañon, 2350m, ii.1995 (P. Hanson); 2♀, **Puntarenas**, Est. Altamira, Cerro Quemado, LS 336200 575560, 2279m, 16.vii-16.viii.2001 and 16.viii-16.ix.2001 (D. Rubí); 5♀, 2♂, Puntarenas, Est. Altamira, Send. a Casa Coca, LS 332800 574250, 1900m, 12.i-12.ii 2001, 12.vii-12.viii.2001 and 12.viii-12.ix.2001 (D. Rubí); 1♂, Puntarenas, Est. Altamira, Send. a Casa Coca, LS 575500 331750, 1700m, #61090, 13.i.2001 D. Rubí); 1♀, Puntarenas, Est. Altamira, Cerro Biolley, LS 332400 572200, 1760m, #62335, 9.iv-9.v.2001 (D. Rubí); 2♀, 1♂, Puntarenas, Est. Altamira, Send. los Gigantes, LS 331700 5722000, 1450m, #54808, ii.2000 (D. Rubí); 4♀, Puntarenas, Est. Altamira, Send. los Gigantes, LS 331800 572100, 1460m, ii.2002 (C. Hansson, D. Rubí); 1♀, Puntarenas, Est. Altamira, 9°03'N 83°00'W, 1450m, ii.2002 (C. Hansson, D. Rubí); 1♂, Puntarenas, San Vito, Las Cruces, Wilson Bot. Gdns, 8°46'N 82°57'W, 1300m, 15-16.ii.2006 (J.S. Noyes); 3♀, **Limón**, P.I.L.A., Valle del Silencio, Alred. d. Refugio, LS 340258 577465, 2480m, #75066, 20-26.ix.2003 (D. Rubí). Holotype in MZUCR, paratypes in NHMUK, MZUCR and USNM.

COMMENTS. *Hebynthus solex* is probably quite close to both *cleon* and *phyrra*. All three species have dark legs, the head about 3X as broad as the frontovertex, relatively short funicle segments with at least F1 and F2 transverse and devoid of linear sensilla and relatively broad fore wings. The three species can be separated using the characters given in the key.

***Hebynthus himalia* sp.nov.**

(Figs 1909-1915; Hab. ♀ 283)

DIAGNOSIS. *Female* (length about 1.2-1.6mm): antenna (Fig. 1913) with scape dark brown, paler apically; funicle pale brown, clava brown; coxae pale orange, legs otherwise more or less pale orange; fore wing (Fig. 1915) virtually hyaline, but weakly suffused pale yellow-brown; head (Fig. 1914) about 5X as wide as frontovertex; malar sulcus present; antenna (Fig. 1913) with scape about 6X as long as broad; pedicel about as long as F1-F2 combined; funicle with segments slightly longer than broad, F6 may be quadrate; linear sensilla only on F2-F6; sensory part of clava extending slightly more than 0.6X along ventral surface; fore wing (Fig. 1915) about 2.4X as long as broad; ventral surface of costal cell with only one complete line of setae; mid tibial spur slightly longer than basitarsus; ovipositor slightly exserted with exserted part about 0.4X as long as mid tibial spur; gonostylus about as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.29mm; excluding ovipositor, 1.19mm (CPD).

Head mainly dark brown; frontovertex generally with a dull, purple and dark green sheen, above scrobes and scrobal area with a coppery sheen; temple and area between eye and scrobes with a fairly strong coppery and metallic green sheen; gena relatively dull coppery purple; frontovertex, gena and interantennal prominence with fairly inconspicuous dark brown setae; antenna (Fig. 1913) with radicle dark brown; scape dark brown, slightly paler orange-brown

towards apex; pedicel dark brown, orange-brown apically and ventrally; funicle pale brown, clava brown; maxillary palpus pale orange; pronotum black with a mixed coppery and green sheen, coppery and brassy on side; propleuron and prosternum dark brown; mesoscutum with an overall, dark blue sheen with a very few green reflections, posterior margin dark brown with a slight coppery purple sheen; tegula dark brown with a slight brassy and purple sheen; axilla dark brown with a slight coppery purple sheen; scutellum dark metallic blue, vertical apex and side very shiny dark metallic blue mixed purple laterally; dorsum of thorax clothed with dark brown setae; metanotum dark brown with a weak coppery purple sheen; mesopleuron dark brown with a fairly strong purple sheen with some blue, violet, coppery and brassy reflections; mesosternum dark brown; fore coxa pale orange; fore femur, tibia and tarsus generally pale orange, femur with dorsal margin brown subapically, tibia with an incomplete, subbasal brown ring, apical tarsomere brown; mid coxa dark brown, dirty white towards apex; mid femur white proximally, pale orange distally, a little dusky dorsally in apical half, mid tibia pale orange, mixed brown in proximal one-third, spur and tarsus pale orange; hind coxa orange; hind femur orange, hind tibia orange brown with faint, incomplete brown rings at about one-third and two-thirds its length, tarsus brown; fore wing (Fig. 1915) virtually hyaline, but weakly suffused pale yellow-brown, hind wing hyaline, venation orange; propodeum dark brown with a weak brassy sheen, side dark metallic blue-green with about 8-10 conspicuous pale setae outside spiracle extending from anterior margin virtually to posterior margin; gaster dark brown, with a fairly strong purple and coppery sheen dorsally weakly mixed brassy, Gt1 dark, metallic blue, side of gaster with distinct metallic green, blue, brassy, purple and coppery reflections, venter slightly duller with mixed green, purple and blue, outer plates of ovipositor relatively dull coppery, purple and blue; gonostylus dark brown, extreme apex pale orange.

Head (Fig. 1914) about 5.2X as wide as frontovertex, in profile about 1.9X as high as deep, anteriorly fairly evenly curved from occipital margin to mouth margin, weakly angled at top of scrobes, interantennal prominence hardly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 50°; frontovertex shiny, with fairly regular, moderately deep, fine, polygonally reticulate sculpture of mesh size generally much smaller than eye facet; frontovertex with piliferous punctures shallow, 2 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena more shiny than frontovertex, with conspicuous, coarse, longitudinally elongate, strigose to striate-reticulate sculpture; eye slightly overreaching occipital margin, virtually naked, but with short, inconspicuous setae that are each much shorter than diameter of facet, eye separated from scrobal margin by about diameter of ocellus, area between eye and scrobe with relatively, deep and coarse, transversely elongate, polygonally reticulate sculpture; scrobes shallow, narrowly ∩-shaped, more or less meeting, with distinct, polygonally reticulate sculpture, weakly margined dorsally and laterally; interantennal prominence weak, dorsally rounded, sculpture on interantennal prominence similar to frontovertex; antenna as in Fig. 1913; scape subcylindrical, about 5.8X as long as broad; all funicle segments clearly longer than broad, segments larger and broader distad; clava clearly broadened, very slightly longer than F3-F6 combined, sutures strongly oblique, sensory area enlarged, extending ventrally about 0.65X length of clava, apex strongly obliquely truncate; malar sulcus present, but very inconspicuous; clypeal margin weakly emarginate medially; mandible with two acute teeth and a truncate upper tooth. Relative measurements: HW 70.5, HH 70, FV 13.5, POL 5.5, OOL 0.5, OCL 4, AOL 7.5, EL 50, EW 38, MS 28, SL 38, SW 6.5.

Thorax (Fig. 1912) in dorsal view with pronotum short, mostly hidden by head; pronotum dorsally with imbricate-reticulate to polygonally reticulate sculpture that is slightly shallower than sculpture on frontovertex, and of larger mesh; mesoscutum with polygonally reticulate sculpture that is of similar mesh size and not deeper than that on pronotum; axilla with polygonally reticulate sculpture that is about as deep as that on frontovertex; dorsal part of scutellum with conspicuously deeper, coarser and more regular, polygonally reticulate sculpture, vertical apex and side completely smooth and shiny; visible part of mesoscutum about 2.1X as broad as long; scutellum about as broad as long; fore wing with venation and distribution of setae as in Figs 1911, 1915, ventral surface of costal cell with only one complete line of setae; propodeum (Fig. 1912) medially about 0.13X as long as scutellum and with several longitudinal carinae and irregular reticulate sculpture medially. Relative measurements: FWL 81.5, FWW 34; HWL 62, HWW 17.5.

Gaster with hypopygium reaching about 0.6X to apex; syntergum about 0.8X as long as mid tibia, with apex acute; ovipositor slightly exserted, the exserted part about 0.4X as long as mid tibial spur or about 0.2X mid tibia.

Paratype. Funicle with linear sensilla present only on F2-F6; gonostylus about as long as mid tibial spur; hypopygium Fig. 1910; ovipositor Fig. 1909. Relative measurements: OL 101, GL 34 [MT 85.5].

Variation. Females vary in length from 1.19-1.55mm, the mesoscutum may be dark, metallic green with weak coppery reflections, the scutellum may be dark metallic blue-green; the hind tibia may be almost completely pale orange with only very weak, incomplete, brown rings, the hind tarsus may be orange and the funicle segments may be subquadrate with F6 quadrate.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, 26 km N San Isidro, 9°30'N 83°43'W, vi-viii.1992 (P. Hanson). Paratypes: COSTA RICA, 1♀, **Heredia**, 6km ENE Vara Blanca, 10°11'N 84°07'W, 2000m, 20/M/TN, iv.2002 (INBio-OET-ALAS); 1♀, Heredia, Vara Blanca, i-ii.1990 (P. Hanson); 3♀, **San José**, Zurqui de Moravia, 1600m, iii.1995 and vi.1995 (P. Hanson); 1♀, San José, 2km W. Empalme, 2300m, i.1995 (P. Hanson); 3♀, San José, 26 km N San Isidro, 9°30'N 83°43'W, 2100m, vi-viii.1992, iv-v.1993 and 11.v.1993 (P. Hanson); 1♀, **Cartago**, PN Tapanti, Torre ICE #31, LN 561800 188500, 1800m, #61071, viii-ix.2000 (D. Rubí); 1♀, Cartago, Cerro de las Vueltes, 9°40'N 83°50'W, 18-20.v.1973 (J. Helava); 1♀, Cartago, La Cangreja, 9°48'N 83¨58'W, viii-ix.1991 (P. Hanson); 1♀, Cartago, PN Tapanti-Macizo de la Muerte, Send. Arboles Caidos, LN 561400 192500, 1500m, #61077, ix-x.2000 (D. Rubí). Holotype in MZUCR, paratypes in NHMUK, MZUCR and CNC.

COMMENTS. *Hebynthus himalia* is fairly similar to *maros*, both species having the fore wing about 2.4-2.5X as long as broad, the head about 4X as wide as the frontovertex, the scape about 6-7X as long as broad, the sensory area of the clava extending at least half way along ventral surface, the ovipositor nearly 3X as long as the gonostylus and the gonostylus about as long as the mid tibial spur. *Hebynthus himalia* differs from *maros* in having the legs completely yellow to pale orange, the head as broad as long and F1 clearly smaller than F2, whilst in *maros* the legs are extensively marked dark brown, the head is slightly broader than long and F1 and F2 are more or less equal.

***Hebynthus cosmus* sp.nov.**

(Figs 1916-1925; Hab. ♀ 284, ♂ 285)

DIAGNOSIS. *Female* (length about 1.0-1.4mm): antenna (Fig. 1920) with scape pale orange; funicle brown mixed orange, clava brown; fore coxa orange, mid and hind coxae dark brown, legs otherwise orange; fore wing (Fig. 1921) hyaline; head (Fig. 1917) about 3.2-3.7X as wide as frontovertex; malar sulcus absent; antenna (Fig. 1920) with scape about 4.3X as long as broad; pedicel slightly longer than F1-F3 combined; funicle with all segments transverse, sometimes F1 quadrate; linear sensilla on F5-F6 only; sensory part of clava extending slightly less than 0.5X along ventral surface; fore wing (Fig. 1921) about 2.2X as long as broad; ventral surface of costal cell with only a single complete line of setae; mid tibial spur about as long as basitarsus; ovipositor slightly exserted with exserted part about 0.4X as long as mid tibial spur; gonostylus slightly shorter than mid tibial spur. *Male* (length about 1.0-1.1): antenna (Fig. 1925) with scape about 3.3-3.7X as long as broad; funicle segments each about 1.5-2X as long as broad, proximal segments slightly smaller, aedeagus (Fig. 1924) slightly more than half a long as mid tibia.

Female (holotype): length, including ovipositor, 1.36mm; excluding ovipositor, 1.29mm (CPD).

Head mainly black with a relatively weak purple and dark green sheen; setae on frontovertex, interantennal prominence and gena dark brown; antenna (Fig. 1920) with radicle dark brown; scape orange, slightly dusky along dorsal margin; pedicel brown, orange towards apex and ventrally; F1-F4 brown, F1 slightly mixed orange, F5-F6 orange, F5 slightly dusky externally; clava brown; maxillary palpus white; pronotum black with a weak coppery and brassy sheen; propleuron and prosternum black; mesoscutum metallic green with some weak coppery reflections, more strongly coppery anteriorly; tegula dark purple-brown with some coppery reflections; axilla black with a very weak dark green and purple sheen; scutellum duller than mesoscutum, but with a moderate dark blue sheen with some coppery reflections, vertical apex and side, very shiny and metallic green mixed coppery; metanotum dark purple-brown, almost black; mesopleuron dark brown with a purple and blue sheen, with some coppery reflections; mesosternum dark brown; fore leg, including coxa, orange; mid coxa dark brown; mid femur proximally white, apex orange, tibia broadly white medially with a subbasal brown ring, otherwise orange, spur and tarsus orange; hind coxa dark brown; hind femur orange, brown towards apex, tibia and tarsus orange; wings (Fig. 1921) hyaline, venation orange; propodeum black with a brassy sheen, side metallic green anteriorly, otherwise coppery and brassy, a group of about 10 translucent, silvery setae anterolateral to spiracle; gaster dark brown, with a fairly strong brassy, coppery and purple sheen dorsally, Gt1 contrasting and strongly metallic green and brassy with some coppery areas, side of gaster brassy and coppery with some green reflections, venter slightly weaker mixed green, purple and blue, outer plates of ovipositor relatively dull coppery, purple and blue; gonostylus dark brown.

Head (Fig. 1917) about 3.7X as wide as frontovertex, in profile about 1.9X as high as deep, fairly evenly curved from occipital margin to top of scrobes, almost straight from top of scrobes to mouth margin, with interantennal prominence slightly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 80°; frontovertex slightly shiny, with fairly regular, moderately deep, polygonally reticulate sculpture of mesh size generally slightly smaller than eye facet; frontovertex with 3 setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena more shiny than frontovertex, with much shallower, longitudinally elongate, strigose to striate-reticulate sculpture; eye reaching occipital margin, naked, separated from scrobe by about diameter of ocellus, area between eye and scrobe with relatively course, transversely elongate, polygonally reticulate sculpture; scrobes very shallow, narrowly ∩-shaped, meeting, virtually smooth, weakly margined dorsally and laterally; interantennal prominence weak, rounded dorsally, with shallow, polygonally reticulate sculpture; antenna as in Fig. 1920; scape slightly broadened and flattened, about 4.3X as long as broad; F1 very slightly longer than broad, F2-F4 transverse, F5-F6 subquadrate, segments larger and broader distad; clava clearly broadened, slightly longer than funicle, sutures strongly oblique, sensory area enlarged, extending ventrally about 0.5X length of clava, apex strongly obliquely truncate; malar sulcus absent; clypeal margin weakly emarginate medially. Relative measurements: HW 72.5, HH 68, FV 19.5, POL 11, OOL 0.5, OCL 3.5, AOL 9.5, EL 46, EW 35.5, MS 27, SL 32, SW 7.5.

Thorax (Fig. 1916) in dorsal view with pronotum short, mostly hidden by head; pronotum dorsally with imbricate-reticulate to polygonally reticulate sculpture that is slightly shallower than sculpture on frontovertex, and of larger mesh; mesoscutum with mainly polygonally reticulate sculpture that is about as deep as that on pronotum; axilla with polygonally reticulate sculpture that is conspicuously deeper than that on mesoscutum and of slightly larger mesh; dorsal part of scutellum with sculpture similar to that on axilla, but slightly deeper and more regularly polygonal medially to more elongate laterally, vertical apex and side completely smooth and shiny; visible part of mesoscutum about 1.5X as broad as long; scutellum hardly broader than long; fore wing with venation and distribution of setae as in Figs 1921, 1923; ventral surface of costal cell with only a single complete line of setae; mid tibial spur about as long as basitarsus; propodeum (Fig. 1916) medially about 0.13X as long as scutellum, virtually smooth, but with a very few shallow, reticulate cells medially. Relative measurements: FWL 72.5, FWW 32; HWL 56, HWW 17.

Gaster with hypopygium reaching about 0.6X to apex; syntergum about 0.65X as long as mid tibia, with apex broadly rounded; ovipositor slightly exserted, the exserted part about 0.4X as long as mid tibial spur or about 0.1X mid tibia.

Paratype. Funicle with linear sensilla present only on F5-F6; mandible with two acute teeth

and a truncate upper tooth; hypopygium Fig. 1919; ovipositor (Fig, 1918) with gonostylus about 0.8X as long as mid tibial spur. Relative measurements: OL 69.5, GL 20 [MT 63].

Variation. Females vary in overall length from 0.97-1.36mm, the paler part of the mid tibia may be pale orange, the hind femur may be completely orange, F1 may be quadrate, F5-F6 may be clearly transverse, the head varies from 3.2-3.7X frontovertex width and the ocellar angle may vary from about 80-90°.

Male: length 1.02-1.09mm.

Generally very similar to female but for colour of antenna and legs, structure of head, antenna and genitalia; scape mixed brown, fore coxa and all femora may be mixed brown, at least hind femur largely brown, hind tibia mostly brown; head (Fig. 1922) about 2.7X as wide as frontovertex, ocelli forming a right angle with posterior ocelli slightly closer to eyes than to occipital margin; antenna (Fig. 1925) with scape about 3.3-3.7X as long as broad; funicle segments each about 1.5-2X as long as broad, proximal segments slightly smaller, clothed in setae that are at least as long as diameter of segments or a little shorter; genitalia (Fig. 1924) with a single apical hook on digitus, aedeagus slender with acute apex. Relative measurements: HW 65, FV 24, POL 12, OOL 1, OCL 2.5, AOL 8, EL 38.5, EW 29, MS 24, SL 23, SW 7; AL 36, MT 65.5.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, Zurqui de Moravia, 1600m, vi.1995 (P. Hanson). Paratypes: COSTA RICA, 2♂, **San José**, Zurqui de Moravia, 1600m, iv.1995 (P. Hanson); 1♀, San José, Zurqui de Moravia, 1600m, xi.1995 (P. Hanson); 1♀, **Cartago**, PN Tapanti, 1200-1500m, 9°45'N 83°47'W, 20.iii-10.iv.2000 (C. Hansson, D. Rubí); 3♀, Cartago, La Cangreja, 9°48'N 83°58'W, 1950m, ii.1992, iii-v.1992 and ix-xii.1992 (P. Hanson, C. Godoy). Holotype in MZUCR, paratypes in MZUCR and NHMUK.

Hebynthus menai sp.nov.

(Figs 1926-1931; Hab. ♀ 286)

DIAGNOSIS. *Female* (length about 1.4-1.8mm): antenna (Fig. 1927) with scape pale orange; funicle pale orange, clava pale brown; all coxae brown; fore and hind tibia pale orange, rest of legs mostly brown; fore wing (Fig. 1928) virtually hyaline but weakly infused pale yellow-brown; head (Fig. 1929) about 5.5-7.0X as wide as frontovertex; malar sulcus present; antenna (Fig. 1927) with scape about 5.5-6.0X as long as broad; pedicel nearly as long as F1-F2 combined; funicle with segments longer than broad, F6 quadrate; funicle with linear sensilla on all segments; sensory part of clava extending nearly 0.7X along ventral surface; fore wing (Fig. 1928) about 2.4X as long as broad; ventral surface of costal cell with only one complete line of setae; mid tibial spur about as long as basitarsus; ovipositor slightly exserted with exserted part about 0.3X as long as mid tibial spur; gonostylus about as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.81mm; excluding ovipositor, 1.74mm (CPD).

Head black with a moderate metallic sheen; occiput with a moderate coppery sheen, occipital margin narrowly metallic dark blue and violet; frontovertex with a moderate metallic sheen, largely dark blue and dark blue-green but with some violet, especially in piliferous punctures and above top of scrobes; temple and gena with a moderate coppery purple sheen; scrobal area mostly with a violet sheen but scrobes and interantennal prominence between toruli metallic dark blue-green; setae on frontovertex, interantennal prominence and gena dark brown; antenna (Fig. 1927) with radicle dark brown; scape pale orange; pedicel pale orange-brown, pale orange towards apex and ventrally; funicle pale orange; clava pale orange-brown; maxillary palpus dark brown; pronotum black with a moderate coppery purple sheen; propleuron and prosternum black; mesoscutum black with a moderate coppery violet sheen; tegula dark brown with a slight coppery purple sheen; axilla black with a slight brassy sheen; scutellum black, proximally with a slight purple sheen

gradually becoming more coppery towards apex, apical two-fifths contrasting metallic dark green with ridges of reticulate sculpture dark purple, apex and side strong metallic dark green mixed coppery; metanotum very dark brown with a slight brassy sheen; mesopleuron dark brown with a moderate coppery sheen mixed with a little metallic dark blue medially; mesosternum dark brown; all coxae dark brown; fore femur dark brown, extreme apex pale orange, tibia and tarsus pale orange; mid femur dark brown, tibia dark brown in proximal half, apex pale orange, spur and tarsus pale orange; hind femur dark brown with apical one-quarter orange, tibia and tarsus pale orange; wings virtually hyaline, but fore wing (Fig. 1928) weakly infused pale yellow-brown; propodeum very dark brown with a slight purple and brassy sheen, side metallic dark blue-green, fairly densely and evenly clothed with conspicuous silvery setae to lowest margin; gaster dark brown, with a fairly strong coppery sheen, TI anteriorly with an extensive strongly metallic dark blue and blue-green sheen, TII in posterior two-thirds or so with a complete rainbow of metallic colours from coppery through yellow to violet, side and venter with moderate to strong areas of metallic dark green and blue-green; gonostylus dark brown.

Head (Fig. 1929) about 6.5X as wide as frontovertex, in profile about 2.1X as high as deep, fairly evenly curved from occipital margin to level with top of scrobes then slightly less strongly curved to mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 46°; frontovertex moderately shiny, with fairly regular, fine, moderately deep, polygonally reticulate sculpture of clearly smaller mesh size than eye facet; frontovertex with 7 setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena about as shiny as frontovertex, with longitudinally elongate, strigose to striate-reticulate sculpture; eye reaching occipital margin, separated from scrobe by about 2X diameter of ocellus, with sparse, inconspicuous, pale setae that are each clearly shorter than diameter of facet; scrobes shallow, more or less ∩-shaped but irregular and slightly constricted about midway between torulus and dorsal margin, narrowly meeting, with sculpture similar to that on frontovertex but generally fairly irregular, dorsally very irregular, weakly margined dorsally and laterally; interantennal prominence distinct, rounded dorsally, with fairly regular, polygonally reticulate sculpture; antenna as in Fig. 1927; scape slender, about 6X as long as broad; funicle with F1-F5 longer than broad, F6 quadrate, segments becoming progressively broader distad; clava about 3.1X as long as broad, about 1.4X as wide as F6, about as long as F3-F6 combined, sutures strongly oblique, sensory area enlarged, extending ventrally about 0.7X length of clava, apex strongly obliquely truncate; malar sulcus present, distinct, quite strongly curved; clypeal margin weakly concave without a median lobe; mandible with two acute teeth and a truncate upper tooth. Relative measurements: HW 156, HH 145, FV 24, POL 15, OOL 0, OCL 10, AOL 22, EL 109, EW 85, MS 47, SL 66, SW 11.

Thorax (Fig. 1930) in dorsal view with pronotum fairly short, mostly hidden by head, with posterior margin medially slightly invaginate; pronotum dorsally with moderately deep, transversely elongate, imbricate-reticulate to polygonally reticulate sculpture that is slightly shallower than sculpture on frontovertex, and of larger mesh; mesoscutum with mainly polygonally reticulate sculpture that is similar to that on frontovertex, but slightly shallower and less well-defined; axilla with polygonally reticulate sculpture that is similar to that that on frontovertex but of slightly larger mesh and less well-defined; scutellum with fairly regular polygonally reticulate sculpture that reaches apex and is clearly deeper and mostly of larger mesh than that on frontovertex, cells slightly larger and more elongate on side and towards apex; visible part of mesoscutum about 1.5X as broad as long; scutellum about as long as broad; fore wing with venation and distribution of setae as in Figs 1926, 1928, ventral surface of costal cell with only one complete line of setae; mid tibial spur about as long as basitarsus; propodeum (Fig. 1930) medially about 0.23X as long as scutellum, fairly smooth, but posterior part with some distinct polygonally reticulate sculpture. Relative measurements: FWL 115, FWW 47.5; HWL 87.5, HWW 24.

Gaster with hypopygium reaching about 0.7X to apex; syntergum about 0.75X as long as mid tibia, with apex acute; ovipositor slightly exserted, the exserted part about 0.3X as long as mid tibial spur or about 0.14X mid tibia

Paratype. Gonostylus about as long as mid tibial spur; hypopygium Fig. 1931. Relative measurements: OL 112, GL 39 [MT 109].

Variation. Females vary in overall length from 1.41-1.81mm, the frontovertex and scrobal

area may be mostly metallic dark purple with metallic, dark blue reflections, the head varies from 5.6-6.5X as wide as the frontovertex with smaller specimens generally having a relatively wider frontovertex and the scape varies from about 5.6-6.0X as long as wide.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 19-20.ii.2016 (J.S. Noyes). Paratypes: **COSTA RICA**, 1♀, **Guanacaste**, PN Bosque Diría, 10°10'N 85°34'W, 200m, 14-15.ii.2011 (J.S. Noyes); 2♀, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 17-18.ii.2011 (J.S. Noyes); 1♀, Puntarenas, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 23-24.ii.2013 (J.S. Noyes); 1♀, Puntarenas, same data as holotype. Holotype in MZUCR, paratypes in NHMUK.

COMMENTS. The species is named in honour of Luis Angel Mena Aguilar, biologist and one of the principal founders of ASEPALECO, a local environmental organisation and owners of Reserva Privada Karen Mogensen and type locality of the new species.

Hebynthus cira sp.nov.

(Figs 1932-1938; Hab. ♀ 287)

DIAGNOSIS. *Female* (length about 1.1mm): antenna (Fig. 1937) with scape pale orange; funicle brown mixed orange, clava brown; fore and mid coxae brown, hind coxa pale orange; fore and mid femora and mid tibia with some brown, legs otherwise mostly pale orange; fore wing (Fig. 1938) hyaline; head (Fig. 1936) about 3.1X as wide as frontovertex; malar sulcus absent; antenna (Fig. 1937) with scape about 6.3X as long as broad; pedicel slightly longer than F1-F2 combined; funicle with segments subquadrate; funicle with linear sensilla on F2-F6; sensory part of clava extending about 0.4X along ventral surface; fore wing (Fig. 1938) about 2.7X as long as broad; ventral surface of costal cell with only one complete line of setae; mid tibial spur slightly shorter than basitarsus; ovipositor slightly exserted with exserted part about 0.8X as long as mid tibial spur; gonostylus about 1.5X as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.07mm; excluding ovipositor, 1.00mm (CPD).

Head mainly very dark brown with a moderate purple sheen with a few weak dark blue reflections; setae on frontovertex, interantennal prominence and gena dark brown; antenna (Fig. 1937) with radicle orange-brown; scape pale orange; pedicel brown, pale orange towards apex and ventrally; funicle brown dorsally and laterally, orange ventrally; clava brown; maxillary palpus pale orange; pronotum black with a slight purple sheen; propleuron and prosternum black; mesoscutum black with a moderately strong purple sheen with a few coppery and dark blue reflections; tegula dark brown; axilla and anterior three-quarters of scutellum black with moderately strong purple sheen, apical one-quarter and side of scutellum with a strong metallic dark blue-green sheen mixed with a little violet; metanotum very dark brown with a slight coppery sheen; mesopleuron dark brown with a weak coppery purple sheen; mesosternum dark brown; fore coxa dark brown; fore femur proximally dark brown, apical one-third or so pale orange, tibia and tarsus pale orange; mid coxa dark brown; mid femur dark brown, pale orange at apex, tibia pale orange with a faint pale brown subbasal band, spur and tarsus pale orange; hind coxa pale orange, hind femur pale orange, slightly dusky dorsally, tibia and tarsus pale orange, apical tarsomere brown; wings (Fig. 1938) hyaline, venation orange to slightly dusky orange; propodeum very dark brown with a slight purple and brassy sheen, side metallic dark green and blue anteriorly, coppery and purple posteriorly, a group of about 5 conspicuous, silvery setae anterolateral to spiracle and on side nearly to posterior margin; gaster dark brown, with a fairly strong brassy, coppery and purple sheen dorsally with some metallic dark blue-green reflections, Gt1 contrasting and strongly

metallic dark blue, with some coppery red and brassy areas anteriorly, side of gaster brassy and coppery with some green reflections, venter slightly weaker mixed green, purple and blue, outer plates of ovipositor relatively dull coppery and blue; gonostylus dark brown.

Head (Fig. 1936) about 3.1X as wide as frontovertex, in profile about 1.7X as high as deep, fairly evenly curved from occipital margin to level with top of scrobes then slightly less strongly curved to mouth margin, interantennal prominence slightly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 75°; frontovertex slightly shiny, with fairly regular, moderately deep, polygonally reticulate sculpture of mesh size slightly smaller than eye facet; frontovertex with 3 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena hardly more shiny than frontovertex, with shallower, longitudinally elongate, strigose to striate-reticulate sculpture; eye reaching occipital margin, separated from scrobe by about 1.5X diameter of ocellus, with conspicuous pale setae that are each about as long as diameter of facet; scrobes shallow, narrowly ∩-shaped, meeting, with sculpture similar to that on frontovertex, weakly margined dorsally and laterally; interantennal prominence weak, rounded dorsally, with shallow, regular, polygonally reticulate sculpture; antenna as in Fig. 1937; scape slender, about 6.3X as long as broad; all funicle segments longer than broad, F6 subquadrate, segments slightly larger and broader distad; linear sensilla only on F2-F6; clava hardly broadened, nearly as long as F2-F6 combined, sutures strongly oblique, sensory area enlarged, extending ventrally about 0.4X length of clava, apex strongly obliquely truncate; malar sulcus absent; clypeal margin weakly concave but with a weak median lobe; mandible with two acute teeth and a truncate upper tooth. Relative measurements: HW 75, HH 73, FV 24.5, POL 12.5, OOL 1, OCL 4, AOL 11, EL 51, EW 38, MS 21, SL 38, SW 6.

Thorax (Fig. 1933) in dorsal view with pronotum short, mostly hidden by head; pronotum dorsally with moderately deep, imbricate-reticulate to polygonally reticulate sculpture that is slightly shallower than sculpture on frontovertex, and of larger mesh; mesoscutum with mainly polygonally reticulate sculpture that is clearly shallower and less well-defined than that on pronotum; axilla with polygonally reticulate sculpture that is conspicuously coarser and deeper than that on frontovertex and of larger mesh; anterior three-quarters of scutellum with sculpture that is about as deep as that on axilla, but more coarse and longitudinally elongate, sculpture of similar cells to axillae medially towards base, but conspicuously more longitudinally elongate laterally and of much larger cells distally, apical one-eighth or so and side completely smooth and shiny; visible part of mesoscutum about 1.8X as broad as long; scutellum about as broad as long; fore wing with venation and distribution of setae as in Figs 1932, 1938; propodeum (Fig. 1933) medially about 0.21X as long as scutellum, virtually smooth, but with a few short, inconspicuous, longitudinal carinae near posterior margin. Relative measurements: FWL 71, FWW 25; HWL 56, HWW 12.

Gaster with hypopygium (Fig. 1935) reaching about 0.4X to apex; syntergum about 0.8X as long as mid tibia, with apex acute; ovipositor (Fig. 1934) clearly exserted, the exserted part about 0.8X as long as mid tibial spur or about 0.25X mid tibia; gonostylus about 1.5X as long as mid tibial spur. Relative measurements: OL 139, GL 53 [MT 115].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, 10km NW Cañas, Mojica, rice, 12-26.ix.2011 (P. Hanson). Holotype in NHMUK.

COMMENTS. As suggested by the key, *Hebynthus cira* is very close to *erythrax*. Apart from the characters given in the key the two species can be separated using a number of characters, most notably the colour of maxillary palpi, the profile of the head, the shape of the mouth margin, the

relative width of the scape, the relative size of the clava and the density of setae on the side of the propodeum. In *cira*, the maxillary palpus is pale orange, the head in profile is about 1.7X as high as deep, the clypeal margin has a weak median lobe, the scape is about 6.3X as long as broad, the clava is nearly as long as F2-F6, the scutellum has very coarse, almost entirely longitudinally elongate striate sculpture and there are only about 5 or so conspicuous, silvery setae on the side of the propodeum. In *erythrax*, the maxillary palpi are dark brown, the head in profile is about 2.2X as high as deep, the clypeal margin is emarginate, the scape is about 7X as long as broad, the clava is slightly shorter than F3-F6 combined, the scutellum has deep, but fairly fine, regular polygonally reticulate sculpture that is a little more elongate laterally and there are about 20 silvery setae on the side of the propodeum. See also comments under *kapo* (p. 686).

***Hebynthus erythrax* sp.nov.**
(Figs 1939-1947; Hab. ♀ 288, ♂ 289)

DIAGNOSIS. *Female* (length about 1.1-1.8mm): antenna (Fig. 1943) with scape pale orange; funicle brown mixed orange, clava brown; coxae dark brown; fore and mid femora brown with some orange; hind tibia pale orange; fore wing (Fig. 1947) hyaline; head (Fig. 1944) about 3.3-4.0X as wide as frontovertex; malar sulcus absent; antenna (Fig. 1943) with scape about 7X as long as broad; pedicel hardly longer than F1-F2 combined; funicle with F1-F5 longer than broad; linear sensilla on all funicle segments; sensory part of clava extending about 0.5X along ventral surface; fore wing (Fig. 1947) about 2.6X as long as broad; ventral surface of costal cell with a single complete line of setae and a second interrupted line; mid tibial spur about as long as basitarsus; ovipositor slightly exserted with exserted part about 0.3X as long as mid tibial spur; gonostylus about 1.1X as long as mid tibial spur. *Male* (length about 0.9-1.4mm): antenna (Fig. 1939) with scape about 3.7-4.0X as long as broad; funicle segments each about 2X as long as broad, proximal segments slightly larger, aedeagus (Fig. 1945) about 0.4X as long as mid tibia.

Female (holotype): length, including ovipositor, 1.44mm; excluding ovipositor, 1.39mm (CPD).

Head mainly black; occipital margin with a weak, metallic dark blue sheen, rest of head with a moderately strong purple sheen with a few dark blue reflections; setae on frontovertex, interantennal prominence and gena dark brown; antenna (Fig. 1943) with radicle dusky orange; scape orange; pedicel brown, orange towards apex and ventrally; funicle brown dorsally and laterally, orange ventrally; clava brown; maxillary palpus dark brown; pronotum black with a slight purple sheen; propleuron and prosternum black; mesoscutum black with a moderately strong purple sheen with a few coppery, green and dark blue reflections; tegula dark brown; axilla and anterior three-quarters of scutellum black with moderately strong purple sheen, posterior part of scutellum black with a more conspicuous coppery sheen mixed with dark blue-green reflections; vertical apex and side very strongly coppery; metanotum black; mesopleuron black with a purple and blue sheen, with some coppery reflections; mesosternum dark brown; fore coxa dark brown; fore femur proximally dark brown, apical one-third or so orange, tibia and tarsus orange; mid coxa dark brown; mid femur dark brown, partially orange at apex, tibia dark brown in proximal 0.4X, remainder pale orange, spur and tarsus orange; hind coxa mainly dark brown, ventrally orange-brown, hind leg otherwise orange, apical tarsomere brown; wings (Fig. 1947) hyaline, venation orange to slightly dusky orange; propodeum black with a brassy sheen, side metallic green anteriorly, coppery posteriorly, a group of about 20 conspicuous silvery setae anterolateral to spiracle and along side nearly to posterior margin; gaster dark brown, with a fairly strong brassy, coppery and purple sheen dorsally, Gt1 contrasting and strongly metallic blue-green, green and brassy with some coppery areas, side of gaster brassy and coppery with some green reflections, venter slightly weaker mixed green, purple and blue, outer plates of ovipositor relatively dull coppery and blue; gonostylus dark brown.

Head (Fig. 1944) submenisciform, about 3.9X as wide as frontovertex, in profile about 2.2X as high as deep, fairly evenly curved from occipital margin to mouth margin, although slightly straighter below top of scrobes with interantennal prominence slightly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 75°; frontovertex slightly shiny, with fairly regular, moderately deep, polygonally reticulate sculpture of mesh size slightly smaller than

eye facet; frontovertex with 2 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena hardly more shiny than frontovertex, with shallower, longitudinally elongate, strigose to striate-reticulate sculpture; eye reaching occipital margin, with conspicuous pale setae that are each a little longer than diameter of facet, separated from scrobe by about 1.5X diameter of ocellus; scrobes shallow, narrowly ∩-shaped, meeting, with sculpture similar to that on frontovertex, weakly margined dorsally and laterally; interantennal prominence weak, rounded dorsally, with shallow, regular, polygonally reticulate sculpture; antenna as in Fig. 1943; scape subcylindrical, about 7X as long as broad; all funicle segments longer than broad, F6 subquadrate, segments slightly larger and broader distad; clava hardly broadened, slightly shorter than F3-F6 combined, sutures strongly oblique, sensory area enlarged, extending ventrally about 0.5X length of clava, apex strongly obliquely truncate; malar sulcus absent; clypeal margin weakly emarginate medially; mandible with two acute teeth and a broadly truncate upper tooth. Relative measurements: HW 89, HH 85, FV 23, POL 14, OOL 0.5, OCL 4.5, AOL 13, EL 61, EW 44, MS 27, SL 42, SW 6.

Thorax (Fig. 1941) in dorsal view with pronotum short, mostly hidden by head; pronotum dorsally with moderately deep, imbricate-reticulate to polygonally reticulate sculpture that is about as deep as sculpture on frontovertex, but of larger mesh; mesoscutum with mainly polygonally reticulate sculpture that is about as deep as that on pronotum; axilla with polygonally reticulate sculpture that is conspicuously deeper than that on mesoscutum and of slightly larger mesh; anterior three-quarters of scutellum with sculpture similar to that on axilla, a little more elongate laterally, sculpture towards apex and side of scutellum slightly deeper and coarser, vertical apex and much of side completely smooth and shiny; visible part of mesoscutum about 1.7X as broad as long; scutellum hardly broader than long; fore wing with venation and distribution of setae as in Figs 1946, 1947, ventral surface of costal cell with a single complete line of setae and a second interrupted line; mid tibial spur about as long as basitarsus; propodeum (Fig. 1941) medially about 0.23X as long as scutellum, virtually smooth, but with 3 or 4 reticulate cells in a line medially and a few along posterior margin. Relative measurements: FWL 78, FWW 29.5; HWL 61, HWW 15.

Gaster with hypopygium reaching about 0.5X to apex; syntergum about 0.75X as long as mid tibia, with apex acute; ovipositor slightly exserted, the exserted part about one-quarter as long as mid tibial spur or a little less than 0.1X mid tibia.

Paratype. Funicle with linear sensilla present on all segments; gonostylus about 1.1X as long as mid tibial spur; hypopygium Fig. 1942; ovipositor Fig. 1940. Relative measurements: OL 94.5, GL 35 [MT 87].

Variation. Females vary in length from 0.95-1.81mm, larger specimens may have the apical one-third of the fore wing appearing to be very slightly darker, the head may vary from about 3.3-4.0X as wide as the frontovertex, in smaller specimens the scutellum may have coarser, more lineolate, reticulate sculpture and may be more evenly curved than in the holotype with the posterior smoother part not being vertical and the propodeum may have a pair of very fine carinae medially instead of linear reticulate cells.

Male: length 0.90-1.41mm.

Generally very similar to female but for colour of hind femur and structure of head, antenna and genitalia; hind femur largely brown; head about 2.2-2.7X as wide as frontovertex, ocelli forming a right angle with posterior ocelli closer to eyes than to occipital margin; antenna (Fig. 1939) with scape about 3.7-4.0X as long as broad; funicle segments each about 2X as long as broad, proximal segments slightly larger, clothed in setae that are about as long as diameter of segments or a little shorter; genitalia (Fig. 1945) with a single apical hook on digitus, aedeagus slender with acute apex. Relative measurements: HW 77, FV 30, POL 15, OOL 2, OCL 4.5, AOL 10, EL 48, EW 36, MS 23, SL 29, SW 7.5; AL 31.5, MT 78.

DISTRIBUTION. Trinidad & Tobago, Costa Rica.

HOSTS. In Trinidad, reared from *Phenacoccus madeirensis* Green (=*grenadensis* Green & Laing) (Hemiptera: Pseudococcidae) on *Tussacia* [sic] *pulchella*? (?=*Justicea pulchella* Sessé & Moc.; Lamiales: Acanthaceae) and *Phenacoccus* Cockerell on tomato (*Solanum lycopersicum* L.; Solanales: Solanaceae).

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Guanacaste**, Est. Cacao (ACG), 10°55'N 85°30'W, 19-20.ii.2005 (J.S. Noyes). Paratypes: **COSTA RICA**, 9♀, 1♂, **Guanacaste**, Santa Rosa NP, various localities and dates 13.viii.1985-18.v.1987 (Janzen, Gauld); 1♀, Guanacaste, Maritza (ACG), 700m, MT/YPT, 20.i-24.ii.1996 (J.S. Noyes); 1♀, Guanacaste, Nandayure, Cerro Azul, LN 214769 397000, 1050m, #72539, 20.x.2002-15.i.2003 (W. Porras); 1♀, Guanacaste, PN Palo Verde, Sector Palo Verde, LN 258450 386600, 40m, #52766, vi.1999 (I. Jiménez); 3♀, Guanacaste, PN Palo Verde, Sect. Palo Verde, Camino a OET,150m E. Estación, LN 260952 385020, 0-50m, 4-14.ix.1999 and 8.xi-9.xii.1999 and 7-17.vi.2000 (I. Jiménez); 2♀, Guanacaste, PN Palo Verde, Est. Palo Verde, LN 259050 388400, 0-10m, x.2000 and xi.2000 (I. Jiménez); 2♀, Guanacaste, PN Palo Verde, Sector Catalina, Fila Catalina, LN 257400 400000, 250m, xii.1999 and i.2000 (I. Jiménez); 1♀, Guanacaste, PN Palo Verde, Campo Aterrizaje, LN 385020 260952, 10m, #58297, 10.vii-9.ix.2000 (I. Jiménez); 3♀, Guanacaste, Santa Cruz, PN Marino las Baulas, 0m, 16.viii.2000 and 20.ix-16.x.2000 (Y. Cárdenas); 11♀, 8♂, Guanacaste, BN Diriá, Ret. Alr. Torre Control de Incendio, LN 238550 358650, 600-700m, 18.x-15.xi.2001 and xii.2001-i.2002 (I. Jiménez); 1♀, **San José**, Tigra Cacao, iii-iv.1990 (P. Hanson); 1♀, San José, San Antonio de Escazu, 1300m, ii.1999 (W. Eberhard); 1♀, San José, Ciudad Colón, xii.1989-i.1990 (L. Fournier); 10♀, **Puntarenas**, Res. Priv. Karen Mogensen, 9°52'N 85°03'W, 305m, 14-15.ii.2003, 23-24.ii.2007, 19-20.ii.2009 and 19-20.ii.2016 (J.S. Noyes); 1♀, Puntarenas, RP Karen Mogensen, Send. Quebr. Perez, LN 205300 429750, 300-400m, #75744, 6.x.2003 (W. Porras); 1♀, Puntarenas, Coto Brus, Sabalito, ZP Las Tablas, LS 597500 317800, 1400m, 6.xii.2000-6.i.2001 (M. Alfaro); 4♀, Puntarenas, Monteverde, 1200-1700m, 2-6.xii.1987 (Génier, Bertrand); 1♀, Puntarenas, Las Alturas, 8°57'N 82°50'W, 1500m, iii.1992 (P. Hanson); 1♂, Puntarenas, Puerto Jiménez, Est. El Tigre, LS 277800 529600, 34m, 7.ii.2002 (J. Azofeifa). Holotype in MZUCR, paratypes in NHMUK, MZUCR, USNM and CNC

Non type material. TRINIDAD & TOBAGO, 1♂, St George, El Tucuche, (west slope), rainforest, 25.vi.1976 (J.S. Noyes); 3♀, St George, St Augustine, Malaise trap, 15.vii-13.viii.1976 (J.S. Noyes); 1♀, St George, St Augustine, Malaise trap, ix.1976 (F.D. Bennett); 1♀, 1♂, Curepe, *Phenacoccus grenadensis*/*Tussacia* [sic] *pulchella*, iv.1979 (F.D. Bennett); 2♀, Curepe, ex mealybug on tomato, 20.x.1979 (F.D. Bennett); 7♀, 2♂, Curepe, ex *Phenacoccus* sp. on tomato, ix.1983 (F.D. Bennett).

Hebynthus callirhoe sp.nov.

(Figs 1948-1954; Hab. ♀ 290)

DIAGNOSIS. *Female* (length about 1.6-2.0mm): antenna (Fig. 1952) with scape orange-brown, dorsal margin dark brown; flagellum dark brown; coxae dark brown, legs otherwise pale orange; fore wing (Fig. 1954) virtually hyaline, but generally infused very pale brown; head (Fig. 1948) about 5X as wide as frontovertex; malar sulcus present; antenna (Fig. 1952) with scape about 7X as long as broad; pedicel about as long as F1-F2 combined; all funicle segments longer than broad; linear sensilla on all funicle segments; sensory part of clava extending about 0.6X along ventral surface; fore wing (Fig. 1954) about 2.4X as long as broad; ventral surface of costal cell with two complete lines of setae; mid tibial spur about as long as basitarsus; ovipositor slightly exserted with exserted part about 0.3X as long as mid tibial spur; gonostylus about as long as mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.98mm; excluding ovipositor, 0.89mm (CPD).

Head mainly black; occipital margin dark metallic green, ocellar area dark metallic blue with purple reflections, piliferous punctures metallic purple; anterior part of frontovertex, scrobal area, temple and gena with a strong purple sheen, some small blue areas on frontovertex and temple partially brassy and coppery; inner orbits narrowly marked metallic blue, especially below; top of scrobes narrowly metallic blue; lower part of inner antennal prominence marked blue between toruli, mouth margin and area around torulus partially marked blue and coppery; frontovertex, gena and interantennal prominence with fairly inconspicuous dark brown setae; antenna (Fig. 1952) with radicle dark brown; scape orange-brown, dorsal margin and apex dark brown; pedicel and flagellum dark brown; maxillary palpus white, terminal segment orange; pronotum black with a mixed purple and green sheen, coppery and brassy on side; propleuron and prosternum dark brown; mesoscutum in some lights with an overall, dark green sheen, but this changing to a

mixture of dark blue and purple in other lights, posterior margin dark brown with a slight coppery purple sheen; tegula dark brown with a slight brassy and purple sheen; axilla with a dark blue and purple sheen; scutellum dark metallic green with some weak coppery reflections, vertical apex and side very shiny metallic green and coppery; dorsum of thorax clothed with dark brown setae; metanotum dark brown with a weak brassy and purple sheen; mesopleuron dark brown with a fairly strong purple sheen with some blue, violet, coppery and brassy reflections; mesosternum dark brown; fore coxa dark brown; fore femur, tibia and tarsus orange, apical tarsomere dark brown; mid coxa dark brown; mid leg mainly orange, but tibia with short dark brown streak externally; hind coxa orange, ventrally mixed brown; hind leg otherwise orange, but apical tarsomere brown; fore wing (Fig. 1954) virtually hyaline, but weakly generally infused very pale brown, hind wing hyaline, venation orange; propodeum dark brown with a weak brassy sheen, side metallic green with about 25 conspicuous pale setae outside spiracle extending from anterior margin virtually to posterior margin; gaster dark brown, with a fairly strong purple and coppery sheen dorsally weakly mixed brassy, side of gaster with distinct metallic green, blue, brassy, purple and coppery reflections, venter slightly duller with mixed green, purple and blue, outer plates of ovipositor relatively dull coppery, purple and blue; gonostylus dark brown, extreme apex pale orange.

Head (Fig. 1948) submenisciform, about 4.6X as wide as frontovertex, in profile about 2.3X as high as deep, anteriorly fairly evenly curved from occipital margin to mouth margin, weakly angled at top of scrobes, interantennal prominence hardly protuberant; occipital margin sharp, carinate; ocelli forming an angle of about 50°; frontovertex shiny, with fairly regular, moderately deep, fine, polygonally reticulate sculpture of mesh size generally much smaller than eye facet; frontovertex with piliferous punctures very distinct, 2 pairs of setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena about as shiny than frontovertex, with conspicuous, coarse, longitudinally elongate, strigose to striate-reticulate sculpture; eye slightly overreaching occipital margin, virtually naked, but with extremely short, inconspicuous setae that are each much shorter than diameter of facet, eye separated from scrobe by about 2X diameter of ocellus, area between eye and scrobe with coarse, relatively deep, transversely elongate, polygonally reticulate sculpture; scrobes shallow, narrowly ∩-shaped, more or less meeting, almost smooth, with shallow sculpture, weakly margined dorsally and laterally; interantennal prominence weak, dorsally rounded, but with a pair of very shallow, submedian ridges either side of a shallow depression that virtually connect it to the frontovertex, sculpture on interantennal prominence similar to frontovertex; antenna as in Fig. 1952; scape subcylindrical, about 7.2X as long as broad; all funicle segments clearly longer than broad, segments larger and broader distad; clava clearly broadened, about as long as F3-F6 combined, sutures strongly oblique, sensory area enlarged, extending ventrally about 0.6X length of clava, apex strongly obliquely truncate; malar sulcus present, but very inconspicuous; clypeal margin weakly emarginate medially; mandible with two acute teeth and a rounded upper tooth. Relative measurements: HW 104, HH 101, FV 22.5, POL 10, OOL 1, OCL 4.5, AOL 12, EL 75.5, EW 52, MS 34, SL 57.5, SW 8.

Thorax (Fig. 1951) in dorsal view with pronotum short, mostly hidden by head; pronotum dorsally with imbricate-reticulate to polygonally reticulate sculpture that is slightly shallower than sculpture on frontovertex, and of larger mesh; mesoscutum with polygonally reticulate sculpture that is of similar mesh size, but slightly deeper than that on pronotum; axilla with polygonally reticulate sculpture that is similar to that on frontovertex but slightly deeper; dorsal part of scutellum with sculpture similar to that on axilla, but conspicuously deeper and coarser and more regularly polygonal medially to slightly more elongate laterally, vertical apex and side completely smooth and shiny; visible part of mesoscutum about 2X as broad as long; scutellum about as broad as long; fore wing with venation and distribution of setae as in Figs 1950, 1954, ventral surface of costal cell with two complete lines of setae; mid tibial spur about as long as basitarsus; propodeum (Fig. 1951) medially about 0.18X as long as scutellum and with several longitudinal carinae and irregular sculpture medially. Relative measurements: FWL 112, FWW 46; HWL 81, HWW 21.

Gaster with hypopygium reaching about 0.7X to apex; syntergum about 0.75X as long as mid tibia, with apex acute; ovipositor slightly exserted, the exserted part about 0.3X as long as mid tibial spur or about 0.14X mid tibia; gonostylus about as long as mid tibial spur.

Paratype. Funicle with linear sensilla present on all segments; hypopygium Fig. 1953;

ovipositor Fig. 1949 . Relative measurements: OL 111.5, GL 38.5 [MT 93.5].

Variation. Females vary in length from 1.60-1.90mm, the scape may be largely dusky orange with dorsal margin broadly brown, the mesoscutum may be uniformly dark metallic green mixed with a fairly strong purple sheen or uniformly blue-green with hardly a purple lustre, all coxae may be brown with apex orange, the head varies from 4.6-5.4X as wide as the frontovertex and the scape varies from about 6.9-7.2X as long as wide.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Cartago**, Madreselva, Los Lagos, LN 184450 550050, 2600m, 7.xi-5.xii.1994 (M.M. Chavarria). Paratypes: **COSTA RICA**, 1♀, **San José**, Cerro Muerte, 16km E Empalme, 2600m, iii-iv.1989 (P. Hanson); 1♀, **Puntarenas**, Est. Altamira, Send. a Casa Coca, LS 332800 574250, 1900m, #65156, 12.ix-12.x.2001 (D. Rubí). Holotype in MZUCR, paratypes in NHMUK.

Hebynthus tamones sp.nov.

(Figs 1955-1961; Hab. ♀ 291)

DIAGNOSIS. *Female* (length about 1.8-2.5mm): antenna (Fig. 1959) with scape pale orange ventrally; flagellum dark brown; fore and mid coxae brown, hind coxa pale orange; fore and mid femora with some brown, legs otherwise mostly yellow to pale orange; fore wing (Fig. 1960) virtually hyaline, but very weakly infused pale orange-brown in at least distal half; head about 3.5X as wide as frontovertex; malar sulcus present; antenna (Fig. 1959) with scape about 6.3X as long as broad; pedicel slightly longer than F1; funicle all segments longer than broad, F6 subquadrate; funicle with linear sensilla on all segments; sensory part of clava extending slightly more than 0.5X along ventral surface; fore wing (Fig. 1960) about 2.4X as long as broad; ventral surface of costal cell with two complete lines of setae; mid tibial spur very slightly shorter than basitarsus; ovipositor slightly exserted with exserted part about 0.2X as long as mid tibial spur; gonostylus slightly longer than mid tibial spur. *Male*: unknown.

Female (holotype): length, including ovipositor, 1.77mm; excluding ovipositor, 1.70mm (CPD).

Head mainly black; frontovertex generally with a dull, dark green sheen mixed purple, area between occipital margin and anterior ocellus with a stronger purple sheen; area between eye and scrobe, scrobal area, temple and gena with a dark coppery purple sheen mixed with some dark blue and dark green areas; frontovertex with inconspicuous dark brown setae, those on gena and interantennal prominence more conspicuous; antenna (Fig. 1959) with radicle pale orange-brown; scape pale orange; pedicel and flagellum dark brown; maxillary palpus dark brown; pronotum black with a mixed coppery and brassy sheen with a few scattered dark blue reflections; propleuron and prosternum dark brown; mesoscutum with an overall, dark blue sheen but mixed with some purple, posterior margin dark brown with a mixed brassy, coppery and purple sheen; tegula dark brown with a slight brassy and purple sheen; axilla dark purple-brown with a slight brassy sheen; scutellum dark metallic blue with some dark coppery purple reflections, vertical apex and side very shiny metallic green with some coppery reflections; dorsum of thorax clothed with dark brown setae; metanotum dark purple-brown with a weak brassy sheen; mesopleuron dark brown, anteriorly with a fairly strong purple and blue sheen with some violet, coppery and brassy reflections, posterior mainly with a coppery and brassy sheen; mesosternum dark brown; fore coxa dark brown; fore femur dark brown proximally, apical half pale orange, tibia and tarsus pale orange; mid coxa dark brown; mid femur brown proximally, apical half pale orange, tibia pale orange with a diffuse, brown, subbasal band, spur and tarsus pale orange; hind leg, including coxa, pale orange; fore wing (Fig. 1960) virtually hyaline, but very weakly infuscate in distal half, hind wing hyaline, venation orange; propodeum dark purple-brown with a weak brassy sheen,

laterally dark metallic blue-green, green, coppery and brassy, side metallic green, about 20 long, conspicuous pale setae outside spiracle extending nearly to posterior margin; gaster dark brown, with a fairly strong purple and coppery sheen dorsally weakly mixed brassy, Gt1 dark, metallic blue, green and coppery laterally, side of gaster with distinct metallic green, brassy, purple and coppery reflections, venter slightly duller with mixed green, purple and blue, outer plates of ovipositor relatively dull coppery, purple and blue; gonostylus dark brown, extreme apex pale orange.

Head (Fig. 1957) sublenticular, about 3.5X as wide as frontovertex, in profile, about 2.2X as high as deep, anteriorly fairly evenly curved from occipital margin to mouth margin, interantennal prominence hardly protuberant occipital margin sharp, carinate; ocelli forming an angle of about 80°; frontovertex shiny, with fairly regular, moderately deep, polygonally reticulate sculpture of mesh size generally slightly smaller than eye facet; frontovertex with piliferous punctures moderately deep and distinct, naked in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena more shiny than frontovertex, with conspicuous, coarse, longitudinally elongate, strigose to striate-reticulate sculpture; eye slightly overreaching occipital margin, with fairly conspicuous pale setae that are a little longer than diameter of facet, eye separated from scrobal margin by about 1.2X diameter of ocellus, area between eye and scrobe with relatively, deep and coarse, transversely elongate, polygonally reticulate sculpture; scrobes very shallow, narrowly ∩-shaped, meeting, with distinct, polygonally reticulate sculpture, weakly margined dorsally and laterally; interantennal prominence weak, dorsally rounded, sculpture on interantennal prominence much shallower and finer than that on frontovertex; antenna as in Fig. 1959; scape subcylindrical, about 6.25X as long as broad; all funicle segments clearly longer than broad, segments broader distad; clava hardly broadened, about 1.2X as wide as F6, slightly longer than F4-F6 combined, sutures strongly oblique, sensory area enlarged, extending ventrally nearly 0.6X length of clava, apex strongly obliquely truncate; malar sulcus present, but very inconspicuous; clypeal margin weakly emarginate medially;; mandible with two acute teeth and a truncate upper tooth. Relative measurements: HW 99, HH 98.5, FV 28, POL 15, OOL 0.5, OCL 6, AOL 11.5, EL 69, EW 48, MS 30, SL 50, SW 8.

Thorax (Fig. 1961) in dorsal view with pronotum short, mostly hidden by head; pronotum dorsally with imbricate-reticulate to polygonally reticulate sculpture that is slightly shallower than sculpture on frontovertex; mesoscutum generally with similar sculpture to that on pronotum; axilla with polygonally reticulate sculpture that is about as deep as that on frontovertex; scutellum clearly convex, dorsal part with regular, slightly longitudinally elongate, polygonally reticulate sculpture that is conspicuously deeper and coarser than on axilla, vertical apex and side completely smooth and shiny; visible part of mesoscutum about 1.9X as broad as long; scutellum about as long as broad; fore wing with venation and distribution of setae as in Figs 1958, 1960, ventral surface of costal cell with two complete line of setae; mid tibial spur very slightly shorter than basitarsus; propodeum (Fig. 1961) medially about 0.21X as long as scutellum and with several longitudinal carinae and irregular reticulate sculpture medially. Relative measurements: FWL 148, FWW 61; HWL 108, HWW 30.

Gaster with hypopygium reaching about 0.6X to apex; syntergum about 0.7X as long as mid tibia, with apex acute; ovipositor hardly exserted, the exserted part about 0.2X as long as mid tibial spur or less than 0.1X mid tibia; gonostylus slightly longer than mid tibial spur.

Paratype. Funicle with linear sensilla present on all segments; hypopygium Fig, 1956; ovipositor Fig. 1955. Relative measurements: OL 117, GL 43 [MT 120].

Variation. Females vary in overall length from 1.77-2.48mm, larger specimens from Manuel Antonio tend to have the fore wing generally infused very pale orange-brown, otherwise very little variation in material examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, Est. Biol. Monteverde, 10°20'N 84°49'W, 1540m, 18-24.ii.2004 (C. Hansson). Paratypes: **COSTA RICA**,1♀, **Puntarenas**, Monteverde, 15-16.vii.1986 (L. Masner); 1♀, same data as holotype; 2♀, Puntarenas, Manuel Antonio, 23-28.viii.1986 (L. Masner). Holotype in MZUCR, paratypes in NHMUK and CNC.

COMMENTS. See comments under *Hebynthus maros* (p. 688).

Genus *ALKONIA* gen.nov.

Type species: *Alkonia tiquanus* sp.nov. Gender masculine.

Female. Length about 1.2mm.

Body generally robust, dark with a weak metallic sheen; funicle unicolourous; dorsum of thorax with dark setae; legs generally pale; wings more or less hyaline; propodeum dark with a weak metallic sheen, side coppery; gaster dark brown with a metallic sheen.

Head in profile about 1.5X as high as deep, anteriorly fairly evenly curved from occipital margin to top of scrobes and then nearly straight to mouth margin, interantennal prominence hardly protuberant; occipital margin carinate; frontovertex about one-quarter head width and with irregular, polygonally reticulate sculpture and distinct piliferous punctures; ocelli forming an acute angle; temple and gena with shallow, longitudinally elongate, polygonally reticulate sculpture; eye reaching occipital margin, with fairly long, conspicuous pale setae, scrobes shallow, ∩-shaped; antenna attached below lower eye margin, about midway between level of lowest eye margin and mouth margin; scape hardly broadened and flattened, about 4X as long as broad, about 0.4X as long as head width; funicle 6-segmented, all segments transverse, gradually becoming broader distally, linear sensilla only on distal funicle segments; clava about as long as pedicel and funicle combined, 3-segmented, sutures strongly oblique, sensory area enlarged, extending along ventral surface of clava giving it a strongly obliquely truncate appearance; malar sulcus absent; mouth about 0.4X head width, margin weakly emarginate medially; mandible tridentate, upper tooth truncate; palp formula 4-3.

Thorax with pronotum short; mesoscutum without notaular lines; scutellum convex, mostly with sculpture arranged in whorls and conspicuously deeper than sculpture on mesoscutum, extreme sides and apex completely smooth; mid tibial spur slightly shorter than basitarsus; fore wing fully developed, about 2.3X as long as broad; costal cell with 2 or 3 lines of setae ventrally and a line of setae dorsally in distal half; submarginal vein with an apical hyaline break; marginal vein about 4X as long as broad, stigmal vein and postmarginal veins subequal; linea calva open; filum spinosum present, consisting of a line of about 4 pegs; posterior margin of mesopleuron not reaching level with posterior margin of propodeum, falling short by distance about equivalent to diameter of propodeal spiracle; propodeum short, virtually smooth medially, without a posterolateral projection behind spiracle, only 2 or 3 setae near spiracle.

Gaster with hypopygium not reaching apex; paratergites absent; syntergum about as long as mid tibia, apex acute; ovipositor more or less hidden; ovipositor longer than mid tibia, semicircular sheet of second valvifer broadly C-shaped; hypopygium not W-shaped, transverse, subrectangular without distinct anterolateral lobes.

Male. Unknown.

DISTRIBUTION. Known only from Costa Rica, but likely to be more widespread in the Neotropics.

HOSTS. Unknown.

COMMENTS. *Alkonia* is probably close to *Dalek* and similar genera (*Hebynthus*, *Elaxis*, *Raquanus*, etc.) that may form a monophyletic group, along with *Caldencyrtus*, that is associated with jumping plant lice (Hemiptera: Psylloidea). This group of genera is characterised by having

a tridentate mandible with the upper tooth developed, but truncate or with 2 upper teeth forming a broad truncation, a convex scutellum (sometimes dorsally flat) with conspicuously deeper sculpture than mesoscutum (excluding *Caldencyrtus*) and often partially smooth and very shiny and fore wing with relatively long marginal and postmarginal veins. It can be separated from other genera in the group by having the scape at least about 4X as long as broad, and the clava about as long as pedicel and funicle combined with a strongly obliquely truncate apex. See also comments under *Dalek* (p. 636), *Elaxis* (p. 711), *Esphora* (p. 675), *Harlarus* (p. 669), *Hebynthus* (p. 683), *Mendisa* (p. 667), *Polaszekius* (p. 533), *Raquanus* (p. 672) and *Sosara* (p. 680).

***Alkonia tiquanus* sp.nov.**
(Figs 1962-1968; Hab. ♀ 292)

Female (holotype): length, including ovipositor, 1.18mm; excluding ovipositor, 1.15mm (CPD).

Head mainly black; vertex generally with a dull, metallic dark green sheen with coppery reflections, some dark blue reflections in ocellar area; scrobal area, temple and gena with a coppery purple sheen; frontovertex, interantennal prominence and gena with fairly conspicuous dark brown setae; antenna (Fig. 1968) with radicle dark orange-brown; scape pale orange; pedicel mostly pale orange, slightly dusky dorsally; funicle pale orange; clava pale orange-brown; maxillary palpus off-white; thorax generally dark brown to black; pronotum with a coppery purple sheen; mesoscutum mostly with a weak metallic dark blue sheen mixed coppery and brassy along sides and posterior margin; tegula dark brown with a slight coppery purple sheen; axilla with a coppery purple sheen; scutellum dorsally with a coppery purple sheen proximally and medially, apically and laterally with a metallic blue-green sheen, extreme sides and apex with a distinct coppery sheen mixed metallic green; dorsum of thorax clothed with dark brown setae; metanotum with a weak purple and brassy sheen; mesopleuron dark brown with a weak coppery purple lustre; mesosternum dark brown; all coxae white, legs otherwise pale orange with femora proximally white and tarsi pale orange-brown; fore wing (Fig. 1966) virtually completely hyaline, but with a small, infuscate area below marginal and stigmal veins (Fig. 1965), hind wing hyaline, venation brown; propodeum dark purple-brown with a weak brassy sheen, side coppery, only 3 or 4 setae outside spiracle; gaster dark brown, with a fairly strong purple and coppery sheen dorsally, mixed with some brassy and metallic blue reflections, T1 with a moderate metallic green and blue-green sheen mixed coppery, more strongly coppery on side; side of gaster with distinct metallic green, brassy, purple and coppery reflections, venter slightly duller with mixed green, purple and blue, outer plates of ovipositor relatively dull coppery, purple and blue; gonostylus dark brown.

Head (Fig. 1964) about 3.9X as wide as frontovertex; ocelli forming an angle of about 65°; frontovertex with irregular, moderately deep, polygonally reticulate sculpture of mesh size generally slightly smaller than eye facet; frontovertex with moderately deep, distinct, piliferous punctures, 10 setae in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; temple and gena slightly more shiny than frontovertex, with shallow, longitudinally elongate, polygonally reticulate sculpture; eye reaching occipital margin, with conspicuous pale setae that are clearly longer than diameter of facet, eye separated from scrobal margin by slightly less than diameter of ocellus, area between eye and scrobe with moderately deep, transversely elongate, polygonally reticulate sculpture; scrobes shallow, ∩-shaped, meeting dorsally, with shallow, polygonally reticulate sculpture, weakly margined dorsally and laterally; interantennal prominence weak, dorsally rounded, sculpture on interantennal prominence much shallower and finer than that on frontovertex; antenna as in Fig. 1968; scape hardly broadened and flattened about 4.1X as long as broad; all funicle segments strongly transverse, gradually becoming broader distally, linear sensilla present only on F6; clava broadened, about 1.4X as wide as F6, about as long as pedicel and funicle combined, sutures strongly oblique, sensory area enlarged, extending ventrally about 0.6X length of clava, apex strongly obliquely truncate. Relative measurements: HW 62, HH 60, FV 16, POL 8.5, OOL 0.5, OCL 3.5, AOL 7, EL 44, EW 36, MS 22, SL 26.5, SW 6.5.

Thorax (Fig. 1962) in dorsal view with pronotum short, mostly hidden by head; pronotum dorsally with imbricate-reticulate to polygonally reticulate sculpture that is about as deep as sculpture on frontovertex; mesoscutum generally with shallower sculpture than on frontovertex

and mostly of larger mesh; axilla with fine, polygonally reticulate sculpture that is about as deep as that on mesoscutum; scutellum convex mostly with polygonally reticulate sculpture arranged in whorls and conspicuously deeper than that on mesoscutum, extreme sides and apex completely smooth; dorsum of thorax clothed in dark brown setae; visible part of mesoscutum about 1.8X as broad as long; scutellum about 1.1X as long as broad; fore wing with venation and distribution of setae as in Figs 1965, 1966; propodeum (Fig. 1962) medially about 0.1X as long as scutellum and virtually smooth medially. Relative measurements: FWL 58.5, FWW 25; HWL 62, HWW 11.

Gaster with hypopygium (Fig. 1967) reaching about 0.5X to apex; syntergum about as long as mid tibia; ovipositor (Fig. 1963) virtually hidden, the exserted part about 0.25X as long as mid tibial spur or less than 0.1X mid tibia; second valvifer with a single subapical seta. Relative measurements: OL 77, GL 25.5 [MT 60.5].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **Puntarenas**, PN Corcovado, Est. Agujas, LS 523600 274500, 600m, #61199, 20.xii.2000-20.1.2001 (J. Azofeifa). Holotype in NHMUK.

Genus *ELAXIS* gen.nov.

Type species: *Elaxis auster* **sp.nov.** Gender: feminine.

Female. Length about 1.2mm.

Body robust, generally dark with a weak to moderate metallic sheen; funicle with pale and dark segments; dorsum of thorax with dark setae; legs generally dark with pale areas; wings hyaline, weakly infuscate adjacent to marginal vein; propodeum dark with a weak metallic sheen, side more strongly metallic, gaster dark brown with a metallic sheen.

Head in profile about 1.7X as high as deep, anteriorly fairly evenly curved from occipital margin to top of scrobes, more curved at top of scrobes and virtually straight to mouth margin, interantennal prominence slightly protuberant; occipital margin carinate; frontovertex about one-third head width and with regular, polygonally reticulate sculpture and distinct piliferous punctures; ocelli forming nearly a right angle; temple and gena with shallow, longitudinally elongate, polygonally reticulate sculpture; eye virtually reaching occipital margin, with fairly inconspicuous setae, scrobes shallow, ∩-shaped; antenna attached near mouth margin, well below lower eye margin; scape strongly broadened and flattened, less than 2X as long as broad, about 0.6X as long as head width; all funicle segments transverse, gradually becoming broader distally, linear sensilla only on distal funicle segments; clava longer than funicle, 3-segmented, sutures strongly oblique, sensory area enlarged, extending along ventral surface of clava giving it a strongly obliquely truncate appearance; malar sulcus absent; mouth about 0.4X head width, margin medially slightly concave; mandible tridentate, upper tooth slightly obliquely truncate; palp formula 4-3.

Thorax with pronotum very short; mesoscutum without notaular lines; scutellum convex, mostly with longitudinally elongate sculpture that is conspicuously deeper than sculpture on mesoscutum, extreme sides and apex completely smooth; mid tibial spur slightly longer than basitarsus; fore wing fully developed; about 2.4X as long as broad; costal cell with only 1 line of setae ventrally and about 6 apical setae dorsally; submarginal vein with an apical hyaline break; marginal vein about 2-3X as long as broad, a little longer than stigmal vein which is a little longer than postmarginal vein; linea calva open; filum spinosum present, consisting of about 5 stouter peg-like setae; posterior margin of mesopleuron not reaching level with posterior margin of propodeum, falling short by distance about equivalent to diameter of propodeal spiracle;

propodeum short, virtually smooth medially and without a posterolateral projection behind spiracle; about 10 setae near spiracle, partly extending down side to hind coxa.

Gaster with hypopygium not reaching apex; paratergites absent; syntergum shorter than mid tibia, apex angular; ovipositor more or less hidden; ovipositor longer than mid tibia, basal part of second valvifer broadly C-shaped; second valvifer without any subapical setae; hypopygium transverse, subrectangular, anterior margin very shallowly biconcave with anterior lateral projections very short, posterior margin shallowly biconvex.

Male. Unknown.

DISTRIBUTION. Known only from Costa Rica, but likely to be more widespread in the Neotropics.

HOSTS. Unknown.

COMMENTS. *Elaxis* is probably close to *Dalek* and similar genera (e.g. *Hebynthus*, *Alkonia*, *Raquanus*, *Polaszekius*, etc.) that may form a monophyletic group, along with *Caldencyrtus* (see comments under *Alkonia*, p. 708). It can be separated from other genera in the group by having the scape less than 3X as long as broad, the funicle with dark and light segments and the clava longer than the funicle with a strongly obliquely truncate apex.

***Elaxis auster* sp.nov.**
(Figs 1969-1975)

Female (holotype): length, 1.22mm (CPD).

Head with occiput dull, metallic green mixed coppery purple; frontovertex dull metallic dark green mixed coppery purple; scrobal area dull coppery purple; area immediately below eye brighter metallic green and violet; temple and gena similar but relatively dull and mixed brassy and coppery; frontovertex, gena and interantennal prominence with inconspicuous brown setae; antenna (Fig. 1969) with radicle dark brown; scape dark brown with extreme apex very pale yellow; pedicel dark brown; funicle white with F3-F4 brown, clava dark brown; maxillary palpus white; thorax generally dark brown to black, pronotum with a moderate coppery purple sheen; mesoscutum relatively bright metallic dark green and blue-green with some brassy and coppery areas; tegula dark brown with a weak coppery purple sheen; axilla dark purple-brown with a weak coppery and brassy sheen; scutellum generally with a relatively dull coppery purple and dark green sheen, side and apex more strongly shining copper and blue-green; mesoscutum clothed with inconspicuous, dark brown setae, scutellum with fairly inconspicuous, dark brown setae; metanotum dark purple-brown with a weak brassy sheen; mesopleuron dark brown, mainly with a weak purple, brassy and coppery sheen; mesosternum dark brown; all coxae dark brown; fore femur dark brown with extreme apices very pale orange, tibia dark brown with extreme base and apical 0.3X pale orange, tarsus orange-brown with apical tarsomere brown; mid femur with proximal 0.4X white, apex dark brown, tibia with extreme base dark brown, a narrow, subbasal white band followed by a broader dark brown band to 0.6X, apex white, spur and tarsus very pale yellow; hind femur with extreme base white, otherwise dark brown, tibia dark brown with apices white, tarsus dusky pale orange, apical tarsomere brown; wings hyaline, fore wing (Fig. 1974) with a small, weakly infuscate patch below marginal vein (Fig. 1975); propodeum dark brown, with a weak purple and brassy sheen, side with a metallic, dark green sheen, about 10 conspicuous, translucent, silvery setae outside spiracle, extending partially down side of propodeum; gaster dark brown, with a distinct coppery purple sheen, dorsal part of Gt1 with a distinct blue-green and brassy sheen, side of gaster with a mixed metallic green, brassy and coppery sheen; gonostylus dark brown.

Head (Fig. 1971) about 2.9X as wide as frontovertex with an elongate, oval, shallow shiny-bottomed depression adjacent to eye margin extending from level with posterior ocellus towards occipital margin; ocelli forming an angle of about 85°; with fairly regular, moderately deep polygonally reticulate sculpture of mesh size generally subequal to eye facet, sculpture between posterior ocellus and occipital margin similar; frontovertex with piliferous punctures shallow, about

4 in front of anterior ocellus, a line of sparse setae along inner eye margin continued along lower eye margin; interantennal prominence with two submedian lines of inconspicuous setae; temple with relatively shallow, longitudinally elongate, polygonally reticulate sculpture of relatively large mesh; gena with similar sculpture to temple but of smaller mesh; eye with pale setae that are slightly shorter than diameter of facet, separated from scrobal margin by about 1.5X diameter of ocellus, area between eye and scrobe with transversely elongate, imbricate-reticulate sculpture; scrobes meeting dorsally, very weakly margined dorsally and laterally; interantennal prominence shallow, dorsally rounded, separated from frontovertex, with fine, shallow, polygonally reticulate sculpture; antenna as in Fig. 1969; scape about 1.6X as long as broad; funicle with linear sensilla only on F5-F6; clava enlarged, about 2.2X as broad as F6, about as long as pedicel and funicle combined, sensory area extending about 0.7X along ventral surface. Relative measurements: HW 81, HH 77, FV 27.5, POL 14, OOL 2, OCL 5, AOL 11.5, EL 50, EW 39, MS 34, SL 45, SW 29.

Thorax (Fig. 1973) in dorsal view with pronotum hardly visible behind head, its posterior margin clearly concave; pronotum with polygonally reticulate sculpture that is generally similar to that on frontovertex but clearly shallower; mesoscutum with fairly regular, polygonally reticulate sculpture that is about as deep as that on frontovertex but with slightly larger mesh; axilla with transversely elongate, polygonally reticulate to imbricate-reticulate sculpture that is of similar depth to that on mesoscutum; scutellum conspicuously convex, generally with longitudinally elongate, polygonally reticulate sculpture that is of finer mesh than that on mesoscutum and conspicuously deeper, apical 0.15X and sides completely smooth and shiny; visible part of mesoscutum about 2.1X as broad as long; scutellum about as long as broad, apex not thin and flange-like; fore wing with venation and distribution of setae as in Figs 1974, 1975; costal cell with a single line of setae dorsally in apical 0.3X or so; propodeum medially about 0.11X as long as scutellum and more or less smooth, side with some shallow, polygonally reticulate sculpture; side of propodeum (Fig. 1973) rounded posteriorly above hind coxa and without a tooth. Relative measurements: FWL 88, FWW 37; HWL 65.5, HWW 18.

Gaster with hypopygium (Fig. 1970) reaching about 0.6X to apex; last tergite about 0.8X as long as mid tibia, with apex angular, but not acute; ovipositor (Fig. 1972) not exserted. Relative measurements: OL 77, GL 21 [MT 66.5, MTS 22].

Variation. Only holotype examined.

Male. Unknown.

DISTRIBUTION. Costa Rica.

HOSTS. Unknown.

MATERIAL EXAMINED.

Type material. Holotype ♀: **COSTA RICA**, **San José**, 26km N San Isidro, 9°30’N 83°43’W, 2100m, iv-v.1993 (P. Hanson). Holotype in NHMUK.

INDEX TO HOSTS MENTIONED IN TEXT

* Costa Rica records
? requires confirmation
! almost certainly incorrect
+ biological control agent
# hyperparasitoid/secondary parasitoid

HEMIPTERA

COCCOIDEA

ACLERDIDAE

unspecified:- *Cheiloneurus elegans* (Dalman)
Aclerda holci Teague:- ?*Cerapterocerus phragmitis* Gordh & Trjapitzin

ASTEROLECANIIDAE

unspecified:- *Lakshaphagus* Mahdihassan

BEESONIIDAE

Limacoccus Bondar:- *Arrhenophagus albitibiae* Girault

CICADELLIDAE

Amblysellus Sleesman:- *#Helegonatopus pseudophanes* Perkins

CEROCOCCIDAE

unspecified:- *Lakshaphagus* Mahdihassan

COCCIDAE

unspecified:- *Cheiloneurus elegans* (Dalman), *Cheiloneurus pulvinariae* Dozier, **Cheiloneurus simus* **sp.nov.**, ?*Coccidaphycus nigricans* Blanchard, *Eusemion* Dahlbom, *Lakshaphagus* Mahdihassan
Ceroplastes Gray:- *Anicetus* Howard, *Anicetus annulatus* Timberlake, *Diversinervus elegans* Silvestri, *Gahaniella californica* Timberlake, *Plagiomerus* Timberlake
Ceroplastes destructor Newstead:- +*Diversinervus elegans* Silvestri
Ceroplastes floridensis Comstock:- *Ammonoencyrtus carolinensis* (Meyer), +*Anicetus beneficus* Ishii & Yasumatsu, +*Anicetus dodonia* Ferrière, +*Anicetus ceroplastis* Ishii, *Gahaniella saissetiae* Timberlake
Ceroplastes giganteus Dozier:- ?*Homalopoda cristata* Howard
Ceroplastes japonicus Green:- *Adelencyrtus bifasciatus* (Ishii)
Ceroplastes rubens Maskell:- *Adelencyrtus bifasciatus* (Ishii), +*Anicetus beneficus* Ishii & Yasumatsu, *Diversinervus elegans* Silvestri,
Ceroplastes sinensis Del Guercio:- +*Anicetus beneficus* Ishii & Yasumatsu, +*Anicetus ohgushii* Tachikawa
Coccus Linnaeus:- *Anicetus annulatus* Timberlake, *Diversinervus elegans* Silvestri, *Gahaniella* Timberlake
Coccus alpinus De Lotto:- *Diversinervus elegans* Silvestri
Coccus pseudomagnoliarum (Kuwana):- +*Anicetus annulatus* Timberlake, +*Diversinervus elegans* Silvestri

Coccus viridis (Green):- *Anicetus annulatus* Timblerake, [+]*Diversinervus* nr *stramineus* Compere, *Gahaniella saissetiae* Timberlake
Differococcus argentinus (Morrison):- *Gahaniella californica* Timberlake
Eucalymnatus Cockerell:- [+]*Anicetus annulatus* Timberlake
Eucalymnatus tessellatus (Signoret):- [+]*Anicetus annulatus* Timberlake
Eulecanium Cockerell:- *Diversinervus elegans* Silvestri
Gascardia destructor Newstead:- [+]*Anicetus communis* Annecke, [+]*Anicetus nyassicus* (Compere), [+]*Anicetus parvus* Compere
Lecanium Burmeister:- *Anicetus annulatus* Timberlake
Mesolecanium nigrofasciatum (Pergande):- *Ammonoencyrtus carolinensis* (Meyer)
Milviscutulus mangiferae (Green):- *Gahaniella saissetiae* Timberlake
Parasaissetia Takahashi:- *Diversinervus elegans* Silvestri, *Gahaniella* Timberlake, *Plagiomerus* Timberlake
Parasaissetia nigra (Nietner):- [+]*Diversinervus smithi* Compere, [+]*Diversinervus elegans* Silvestri, *Gahaniella saissetiae* Timberlake
Parthenolecanium Šulc:- *Gahaniella* Timberlake
Parthenolecanium corni (Bouché):- *Gahaniella californica* Timberlake
Pulvinaria Targioni Tozzetti:- *Anicetus* Howard, *Anicetus annulatus* Timberlake, *Diversinervus elegans* Silvestri, *Gahaniella* Timberlake
Pulvinaria psidii Maskell:- *Diversinervus elegans* Silvestri
Pulvinaria urbicola Cockerell:- *Gahaniella saissetiae* Timberlake, [+]*Diversinervus elegans* Silvestri
Saissetia Deplanche:- *Anicetus* Howard, *Anicetus annulatus* Timberlake, *Diversinervus elegans* Silvestri, *Gahaniella* Timberlake, *Plagiomerus* Timberlake
Saissetia coffeae (Walker):- ***Cheiloneurus dipsas* sp.nov.**, *Gahaniella californica* Timberlake, *Gahaniella saissetiae* Timberlake
Saissetia miranda (Cockerell & Parrott):- *Diversinervus elegans* Silvestri
Saissetia oleae (Olivier):- [+]*Anicetus annulatus* Timberlake, [+]*Diversinervus cervantesi* (Girault), *Gahaniella saissetiae* Timberlake,?*Pseudhomalopoda prima* Girault
Toumeyella cubensis (Heidel & Köhler):- *Gahaniella saissetiae* Timberlake

DIASPIDIDAE

undetermined:- !*Anicetus* Howard
Acutaspis morrisonorum Kosztarab:- *Pseudhomalopoda prima* Girault
Acutaspis paulista (Hempel):- *Neococcidencyrtus drysus* Noyes
Aonidiella Berlese & Leonardi:- *Plagiomerus* Timberlake
Aonidiella aurantii (Maskell):- *Adelencyrtus bifasciatus* (Ishii), *Arrhenophagus chionaspidis* Aurivillius, [+]*Comperiella bifasciata* (Howard), *Pseudhomalopoda prima* Girault
Aonidiella citrina (Coquillett):- !*Anicetus annulatus* Timberlake, [+]*Comperiella bifasciata* (Howard)
Aonidiella inornata McKenzie:- [+]*Comperiella bifasciata* (Howard)
Aonidiella orientalis (Newstead):- *Adelencyrtus bifasciatus* (Ishii), *Arrhenophagus chionaspidis* Aurivillius, *Comperiella lemniscata* Compere & Annecke), *Plagiomerus bangaloriensis* Shafee, Alam & Agarwal
Aspidiella sacchari (Cockerell) :- *Adelencyrtus chionaspidis* (Howard)
Aonidiella taxus Leonardi:- *Pseudhomalopoda prima* Girault
Aspidiotus Bouché:- *Arrhenophagus chionaspidis* Aurivillius, *Plagiomerus* Timberlake
Aspidiotus destructor Signoret:- [+]*Comperiella bifasciata* (Howard), [+]*Comperiella unifasciata* Ishii, *Pseudhomalopoda prima* Girault
Aspidiotus nerii Bouché:- *Coccidencyrtus ochraceipes* Gahan
Aulacaspis Cockerell:- *Arrhenophagus chionaspidis* Aurivillius, *Arrhenophagus albitibiae* Girault, *Plagiomerus* Timberlake
Aulacaspis takari Takagi:- *Adelencyrtus chionaspidis* (Howard)
Aulacaspis tegalensis (Zehntner):- *Adelencyrtus chionaspidis* (Howard)

Aulacaspis yasumatsui Takagi:- *Arrhenophagus chionaspidis* Aurivillius
Chionaspis Signoret:- *Arrhenophagus chionaspidis* Aurivillius, *Arrhenophagus albitibiae* Girault
Chrysomphalus aonidum (Linnaeus):- [+]*Comperiella bifasciata* (Howard), *Pseudhomalopoda prima* Girault
Chrysomphalus bifasciculatus Ferris:- [+]*Comperiella bifasciata* (Howard)
Chrysomphalus dictyospermi (Morgan):- *Arrhenophagus chionaspidis* Aurivillius, [+]*Comperiella bifasciata* (Howard), *Comperiella lemniscata* Compere & Annecke
Clavaspis MacGillivray:- *Plagiomerus* Timberlake
Comstockaspis perniciosa (Comstock):- [+]*Coccidencyrtus pallipes* (Chumakova), [+]*Coccidencyrtus shutovae* (Trjapitzin), [+]*Comperiella bifasciata* (Howard)
Crenulaspidiotus lahillei (Lizer y Trelles):- *Neococcidencyrtus* Compere
Diaspidiotus Berlese:- *Arrhenophagus chionaspidis* Aurivillius
Diaspis Costa:- *Arrhenophagus chionaspidis* Aurivillius, **Plagiomerus peruviensis* (Girault)
Diaspis boisduvalii Signoret:- *Coccidencyrtus ochraceipes* Gahan, [+]*Plagiomerus* ?*hospes* Timberlake, **Plagiomerus peruviensis* (Girault)
Diaspis bromeliae (Kerner):- *Coccidencyrtus ochraceipes* Gahan, *Plagiomerus hospes* Timberlake
Diaspis coccois (Lichtenstein):- *Coccidencyrtus ochraceipes* Gahan, [+]*Plagiomerus* ?*hospes* Timberlake
Diaspis echinocacti (Bouché):- *Neococcidencyrtus crouzelae* De Santis, *Plagiomerus bangaloriensis* Shafee, Alam & Agarwal, [+]*Plagiomerus diaspidis* Crawford, [+]*Plagiomerus ?hospes* Timberlake
Duplachionaspis divergens (Green):- *Adelencyrtus chionaspidis* (Howard)
Duplachionpasis graminella (Borchsenius):- *Adelencyrtus chionaspidis* (Howard)
Duplachionaspis sansevieriae Williams:- *Adelencyrtus odonaspidis* Fullaway
Duplaspidiotus tesseratus (Grandpré & Charmoy):- *Arrhenophagus chionaspidis* Aurivillius, *Homalopoda cristata* Howard
Dynaspidiotus britannicus (Newstead):- *Arrhenophagus chionaspidis* Aurivillius
Epidiaspis zygophylli (Borchsenius):- *Neococcidencyrtus* Compere
Fiorinia Targioni Tozzetti:- *Arrhenophagus chionaspidis* Aurivillius, *Arrhenophagus albitibiae* Girault
Froggattiella penicillata (Green):- *Caenohomalopoda* Tachikawa
Furchadaspis zamiae (Morgan):- *Neococcidencyrtus* Compere
Gannaspis glomerata (Green):- *Adelencyrtus chionaspidis* (Howard), *Adelencyrtus bifasciatus* (Ishii)
Hemiberlesia Cockerell:- *Arrhenophagus chionaspidis* Aurivillius, *Plagiomerus* Timberlake
Hemiberlesia lataniae (Signoret):- *Adelencyrtus bifasciatus* (Ishii), *Plagiomerus bangaloriensis* Shafee, Alam & Agarwal
Hemiberlesia rapax (Comstock):- [+]*Comperiella bifasciata* (Howard), *Neococcidencyrtus crouzelae* De Santis
Lepidosaphes Shimer:- *Adelencyrtus chionaspidis* (Howard), *Adelencyrtus bifasciatus* (Ishii), *Neococcidencyrtus* Compere
Lepidosaphes beckii (Newman):- *Pseudhomalopoda prima* Girault
Lindingaspis setiger (Maskell):- *Adelencyrtus bifasciatus* (Ishii)
Lopholeucaspis japonica (Cockerell):- ![]*Anicetus annulatus* Timberlake
Melanaspis smilacis (Comstock):- *Neococcidencyrtus* Compere
Odonaspis graminis Bremner:- *Adelencyrtus odonaspidis* Fullaway
Odonaspis ruthae Kotinsky:- *Adelencyrtus chionaspidis* (Howard), *Adelencyrtus odonaspidis* Fullaway
Odonaspis saccharicaulis (Zehnter):- *Adelencyrtus odonaspidis* Fullaway
Odonaspis secreta (Cockerell):- *Caenohomalopoda* Tachikawa, *Homalopoda cristata* Howard
Pinnaspis Cockerell:- *Adelencyrtus bifasciatus* (Ishii), *Arrhenophagus chionaspidis* Aurivillius, *Arrhenophagus albitibiae* Girault
Pinnaspis aspidistrae Signoret:- *Arrhenophagus chionaspidis* Aurivillius
Pseudaonidia duplex (Cockerell) :- *Adelencyrtus bifasciatus* (Ishii)
Pseudaonidia trilobitiformis (Green) :- *Adelencyrtus bifasciatus* (Ishii)

Pseudaulacaspis MacGillivray:- *Arrhenophagus chionaspidis* Aurivillius, *Arrhenophagus albitibiae* Girault
Pseudaulacaspis cockerelli (Cooley):- *Arrhenophagus albitibiae* Girault, ?*Prochiloneurus modestus* (Timberlake)
Pseudaulacaspis eugeniae (Maskell):- *Arrhenophagus albitibiae* Girault
Pseudaulacaspis pentagona (Targioni Tozzetti):- *Arrhenophagus albitibiae* Girault, +*Comperiella bifasciata* (Howard)
Pseudaulacaspis rubra (Green):- +*Coccidencyrtus sankarani* (Subba Rao)
Pudasis newsteadi (Leonardi):- *Neococcidencyrtus* Compere
Unaspis MacGillivray:- *Arrhenophagus chionaspidis* Aurivillius
Unaspis yanonensis (Kuwana):- !*Anicetus annulatus* Timberlake

ERIOCOCCIDAE

Rhizococcus greeni (Newstead):- *Adelencyrtus subapterus* (Kurdjumov)

KERIIDAE

unspecified:- ?*Coccidaphycus nigricans* Blanchard, *Lakshaphagus* Mahdihassan
Paratachardina silvestri (Mahdihassan):- *Ammonoencyrtus carolinensis* (Meyer)

KERMESIDAE

unspecified:- #*Cheiloneurus elegans* (Dalman)

KUWANIIDAE

unspecified:- *Lakshaphagus* Mahdihassan

LECANODIASPIDIDAE

unspecified:- *Lakshaphagus* Mahdihassan
Lecanodiaspis dendrobii (Douglas):- *Anisophleps alternata* Fidalgo

MONOPHLEBIDAE

unspecified:- ?*Coccidaphycus nigricans* Blanchard
Crypticerya Cockerell:- *Gahaniella* Timberlake
Crypticerya montserratensis (Riley & Howard):- *Homosemion bennetti* Annecke;
Icerya purchasi:- +*Homosemion bennetti* Annecke, *Iceromyia flavifrons* Noyes

ORTHEZIIDAE

Orthezia Bosc d'Antic:- *#*Cheiloneurus nasica* **sp.nov.,** *Gahaniella californica* Timberlake

PSEUDOCOCCIDAE

unspecified:- !*Adelencyrtus chionaspidis* (Howard), *Lakshaphagus* Mahdihassan,?*Plagiomerus* Timberlake, #*Prochiloneurus* Silvestri
Antonina graminis (Maskell):- !*Adelencyrtus odonaspidis* Fullaway, #*Cheiloneurus tainus* Trjapitzin & Triapitsyn
Antonina phragmitis Borchsenius:- *Mahencyrtus* Masi
Brevennia rehi (Lindinger):- *Mahencyrtus* Masi
Chaetococcus phragmitis (Marchal):- *Mahencyrtus* Masi
Ferrisia virgata (Cockerell):- ?*Diversinervus elegans* Silvestri

Heterococcus nudus (Green):- *Mahencyrtus* Masi
Nipaecoccus nipae (Maskell):- *#*Cheiloneurus nasica* **sp.nov.**, *#*Prochiloneurus dactylopii* (Howard)
Nipaeoccus vastator (Newstead):- !*Arrhenophagus chionaspidis* Aurivillius
Phenacoccus Cockerell:- *Hebynthus erythrax* **sp.nov.,** *#Prochiloneurus modestus* (Timberlake); *#Prochiloneurus dactylopii* (Howard)
Phenacoccus cevalliae Cockerell - *#Cheiloneurus compressicornis* Ashmead
Phenacoccus hordei (Lindeman):- *Coccidencyrtus phenacocci* Ferrière
Phenacoccus indicus (Avasthi & Shafee):- ?*Plagiomerus bangaloriensis* Shafee, Alam & Agarwal
Phenacoccus madeirensis Green:- *Hebynthus erythrax* **sp.nov.,** *#Prochiloneurus dactylopii* (Howard)
Phenacoccus solani Ferris:- *#Cheiloneurus compressicornis* Ashmead
Planococcus Ferris:- ?*Gahaniella saissetiae* Timberlake
Planococcus citri (Risso):- *#Prochiloneurus modestus* (Timberlake)
Pseudococcus Westwood:- !*Caenohomalopoda shikokuensis* (Tachikawa)
Pseudococcus maritimus (Ehrhorn):- *#Prochiloneurus modestus* (Timberlake)
Trionymus copiosus (Borchsenius):- *Mahencyrtus* Masi
Trionymus perrisii (Signoret):- *Mahencyrtus* Masi
Trionymus radicum (Danzig):- *Mahencyrtus* Masi

ALEYRODOIDEA

ALEYRODIDAE

Aleurocanthus woglumi Ashby:- ?*Pseudhomalopoda prima* Girault
Aleurodicus dipersus Russell:- !*Arrhenophagus albitibiae* Girault
Aleurothrixus Quaintance & Baker:- *Plagiomerus* Timberlake

PSYLLOIDEA

APHALARIDAE

Ctenarytaina eucalypti (Maskell):- [+]*Psyllaephagus pilosus* Noyes
Glycaspis brimblecombei Moore:- [+]*Psyllaephagus bliteus* Riek

CALOPHYIDAE

Calophya Löw:- ?*Psyllaephagus tyche* Noyes & Hanson
Mastigmas Enderlein:- *Psyllaephagus trioziphagus* (Howard)
Mastigmas ernsti (Schwarz):- *Psyllaephagus trioziphagus* (Howard)

LIVIIDAE
Katacephala Crawford:- *Cercobelus godoyae* Noyes & Hanson
Psyllopsis Löw:- *Cercobelus* jugaeus (Walker)
Tuthillia cognata Brown & Burkhart:- *Arianus* Noyes

PSYLLIDAE

unspecified:- *Sectiliclava* Hoffer (adults), *Trechnites* Thomson
Cacopsylla Ossiannilson:- *Prionomitus tiliaris* (Dalman)
Cacopsylla americana (Crawford):- *Prionomitus mitratus* (Dalman)
Cacopsylla cratraegi (Schrank):- *Prionomitus mitratus* (Dalman)
Cacopsylla melanoneura (Förster):- *Prionomitus mitratus* (Dalman)
Cacopsylla peregrina (Förster):- *Prionomitus mitratus* (Dalman)
Cacopsylla pyri (Linnaeus):- *Prionomitus mitratus* (Dalman)

Cacopsylla pyricola (Förster):- [+]*Prionomitus mitratus* (Dalman), *Prionomitus tiliaris* (Dalman), [+]*Trechnites insidiosus* Crawford, [+]*Trechnites* ?*sadkai* Guerrieri & Noyes
Cacopsylla pyrisuga (Förster):- *Prionomitus mitratus* (Dalman)
Ceanothia Heslop-Harrison:- *Prionomitus mitratus* (Dalman)
Ceanothia essigi (Jensen):- *Prionomitus mitratus* (Dalman)
Ceanothia insolita (Tuthill):- *Prionomitus mitratus* (Dalman)
Euglyptoneura fuscipennis (Crawford):- *Prionomitus mitratus* (Dalman)
Euglyptoneura. minuta (Crawford):- *Prionomitus mitratus* (Dalman)
Euglyptoneura. robusta (Crawford):-*Prionomitus mitratus* (Dalman)
Euphalerus certus Tuthill:- *Psyllaephagus othrys* Noyes & Hanson
Gryopsylla clypeata Brown & Hodkinson:- ***Caldencyrtus meresmo* sp.nov.**
Heteropsylla Crawford:- *Psyllaephagus yaseeni* Noyes
Heteropsylla cubana (Crawford):- *Psyllaephagus yaseeni* Noyes
Heteropsylla curta Muddiman, Hodkison & Hollis:- ?*Psyllaephagus yaseeni* Noyes
Livilla Curtis:- *Prionomitus tiliaris* (Dalman)
Livilla retamae (Puton):- *Prionomitus mitratus* (Dalman)
Livilla variegata (Löw):- *Prionomitus mitratus* (Dalman)
Pexopsylla cercocarpi Jensen:- *Prionomitus mitratus* (Dalman)
Psylla Geoffroy:- *Prionomitus mitratus* (Dalman)
Russelliana solanicola Tuthill:- !*Adelencyrtus odonaspidis* Fullaway

TRIOZIDAE

unspecified:- ?**Dalek orthia* **sp.nov**., **Dalek pleione* **sp.nov.**, *Trechnites* Thomson
Hemitrioza Crawford:- **Psyllaephagus korus* **sp.nov.**
Leuronota flavipennis Brown & Hodkinson:- *Dalek* gen.nov.
Neolithus White & Hodkinson:- *Psyllaephagus creusa* Noyes & Hanson
Trichochermes magna (Laing):- ?*Psyllaephagus ufens* Noyes & Hanson
Trioza Förster:- *Psyllaephagus trioziphagus* (Howard), *Psyllaephagus epulo* Noyes & Hanson
Trioza Förster *magnoliae* group:- **Caldencyrtus acamas* Noyes & Hanson, **Caldencyrtus antander* Noyes & Hanson, **Caldencyrtus mitchelli* Noyes & Hanson
Trioza diospyri (Ashmead):- *Psyllaephagus trioziphagus* (Howard)
Triozoida limbata (Enderlein)**:-** ?**Dalek arax* **sp.nov.**, *Psyllaephagus gyces* Noyes & Hanson

FULGOROIDEA

DELPHACIDAE

Megamelus Fieber:- #*Helegonatopus pseudophanes* Perkins

DIPTERA

CECIDOMYIIDAE

unspecified:- *Cheiloneurus elegans* (Dalman)

SYRPHIDAE

Baccha Fabricius:- #*Helegonatopus pseudophanes* Perkins
?*Ocyptamus* Macquart:- (#)*Helegonatopus pseudophanes* Perkins

COLEOPTERA

COCCINELLIDAE

unspecified:- ?*Prochiloneurus* Silvestri

HYMENOPTERA

DRYINIDAE

Gonatopus Ljungh:- *Helegonatopus pseudophanes* Perkins
Gonatopus ashmeadi Kieffer:- *Helegonatopus pseudophanes* Perkins
Gonatopus cavazzuttii Olmi:- *Helegonatopus pseudophanes* Perkins
Haplogonatopus crucianus Olmi:- *Helegonatopus pseudophanes* Perkins
Haplogonatopus vitiensis Perkins:- *Helegonatopus pseudophanes* Perkins
Pseudogonatopus flavus Olmi:- *Helegonatopus pseudophanes* Perkins
Tetrodontochelys peculiaris (Brues):- *Cheiloneurus cupreicollis* Ashmead

ENCYRTIDAE

Acerophagus alexte Noyes:- **Cheiloneurus nasica* **sp.nov.,** **Prochiloneurus dactylopii* (Howard)
Anagyrus yuccae (Coquillett):- *Prochiloneurus modestus* (Timberlake)
Blastothrix Mayr:- *Eusemion* Dahlbom
Metaphycus Mercet:- *Eusemion* Dahlbom
Trichomasthus Thomson:- *Eusemion* Dahlbom
Zarhopalus corvinus (Girault):- *Prochiloneurus modestus* (Timberlake)

LEPIDOPTERA

PSYCHIDAE

Psyche ?*crassiorella* (Bruand):- ?*Cercobelus jugaeus* (Walker)

ORTHOPTERA

unspecified:- *Cheiloneurus aliphera* **sp.nov.** (eggs)

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NOTES ON IMAGES

The images included in the following pages are of two types:
Figures (abbreviated Fig. or Figs) are of slide-mounted body parts. These are presented in greyscale.
Habitus (abbreviated Hab.) are of whole specimens, usually from the lateral aspect. These are presented in colour.

Plates are designed to be used in PDF format. This allows body parts to be viewed at a magnification of up to 4X and habitus images at up to 14X without loss of resolution.

All images are enhanced and occasionally reconstructed from damaged body parts, but all are accurate and a fair representation of the specimens involved. The original raw, high-resolution images will be made available for examination via the Data Portal of the Natural History Museum, London (https://data.nhm.ac.uk/search). These will also include additional images of type material not used in this publication.

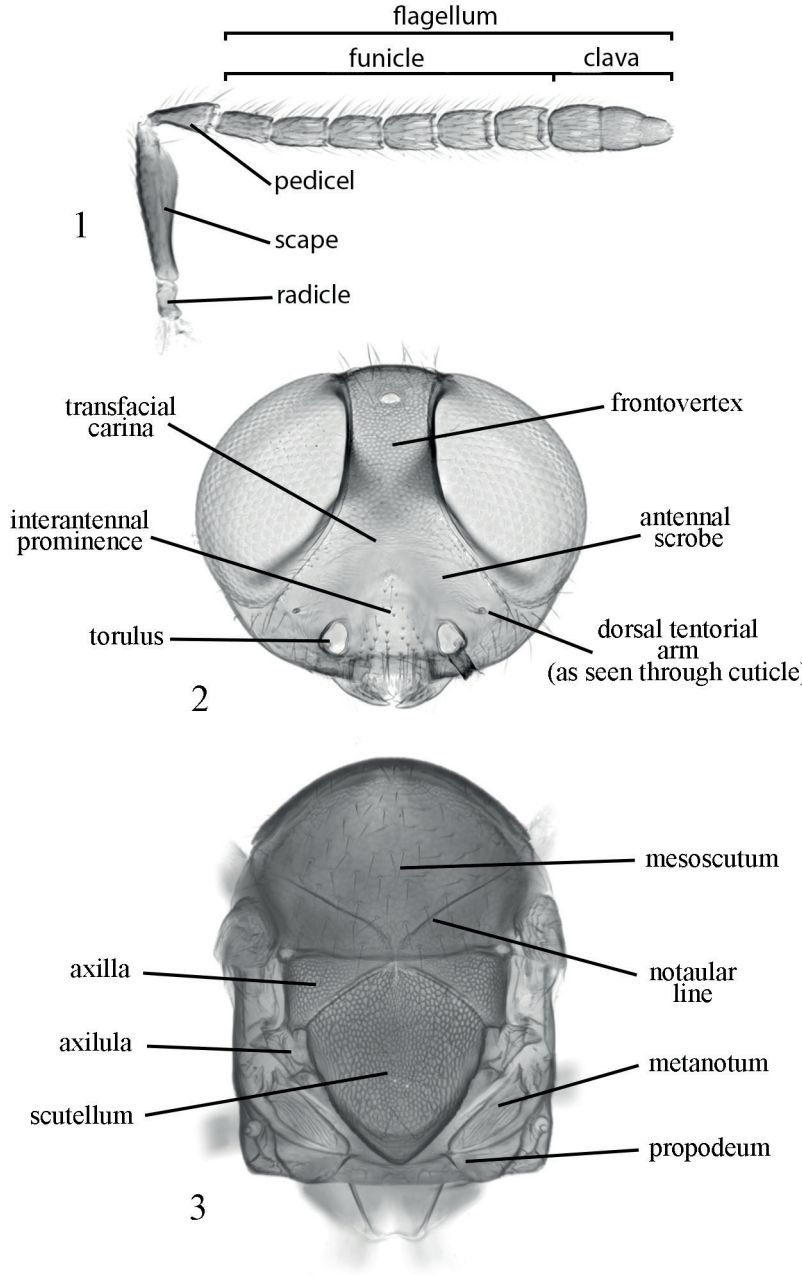
Symbols and abbreviations

 - the number within the oval indicates the estimated total rotation of the flagellum in degrees.

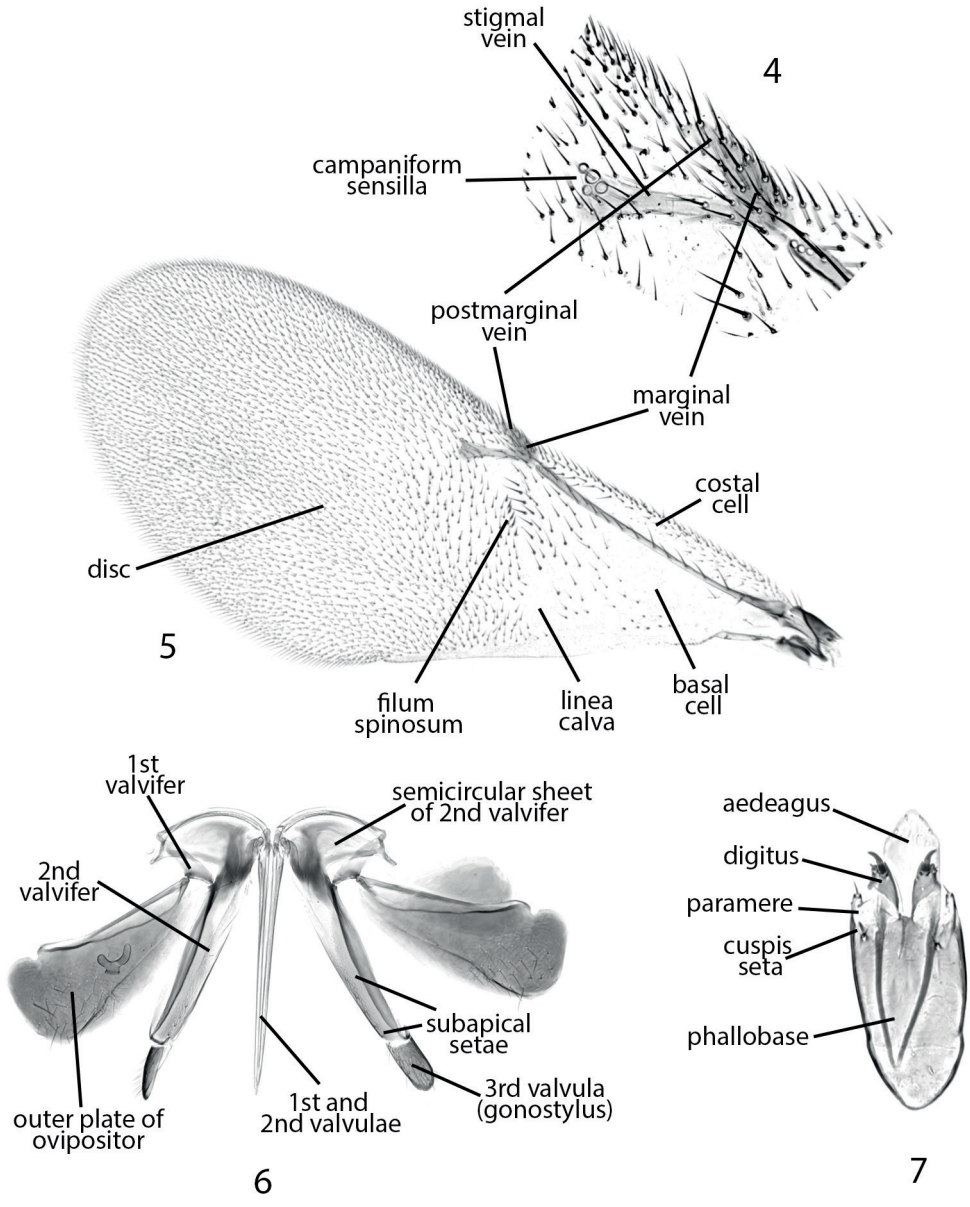
The **bar-line** at the bottom left of each colour image represents 0.5mm.

HT – image(s) from holotype.

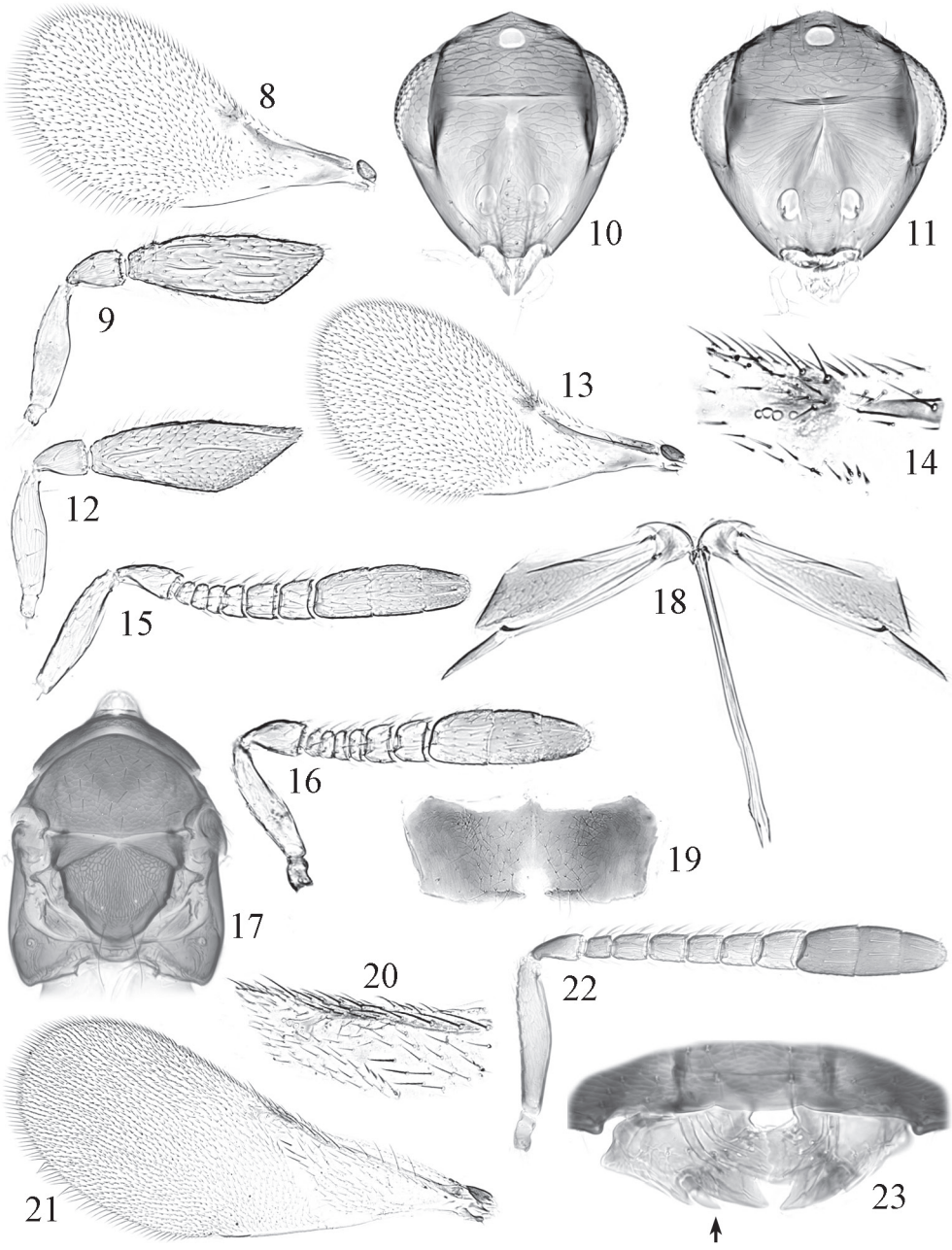
All images are from the females except those indicated by a male (♂) symbol.



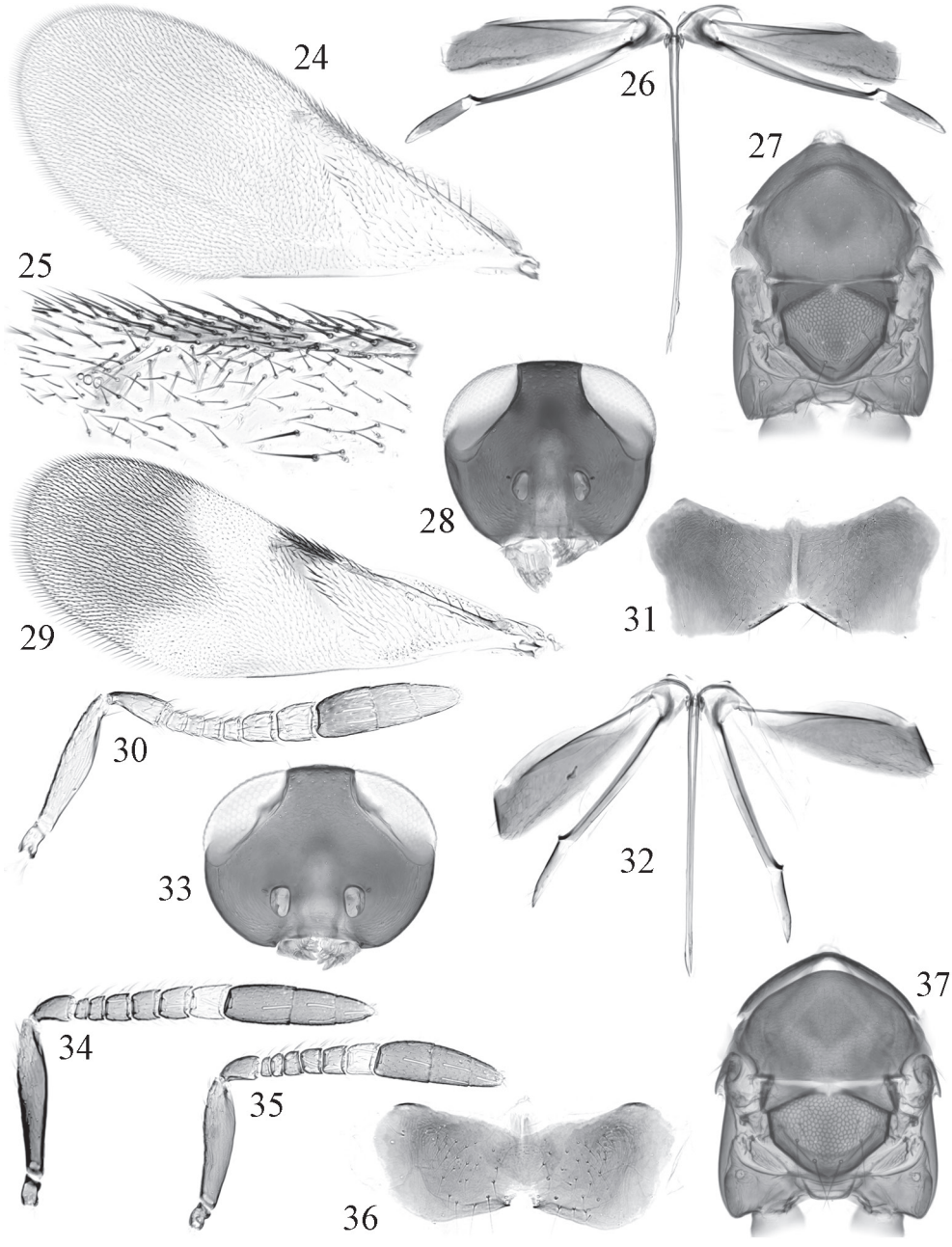
Figs 1-3. (1) *Caldencyrtus antander*, antenna; (2) *Ludesia amalthea*, head, facial view; (3) *Trechnites merops*, mesosoma, dorsal view.



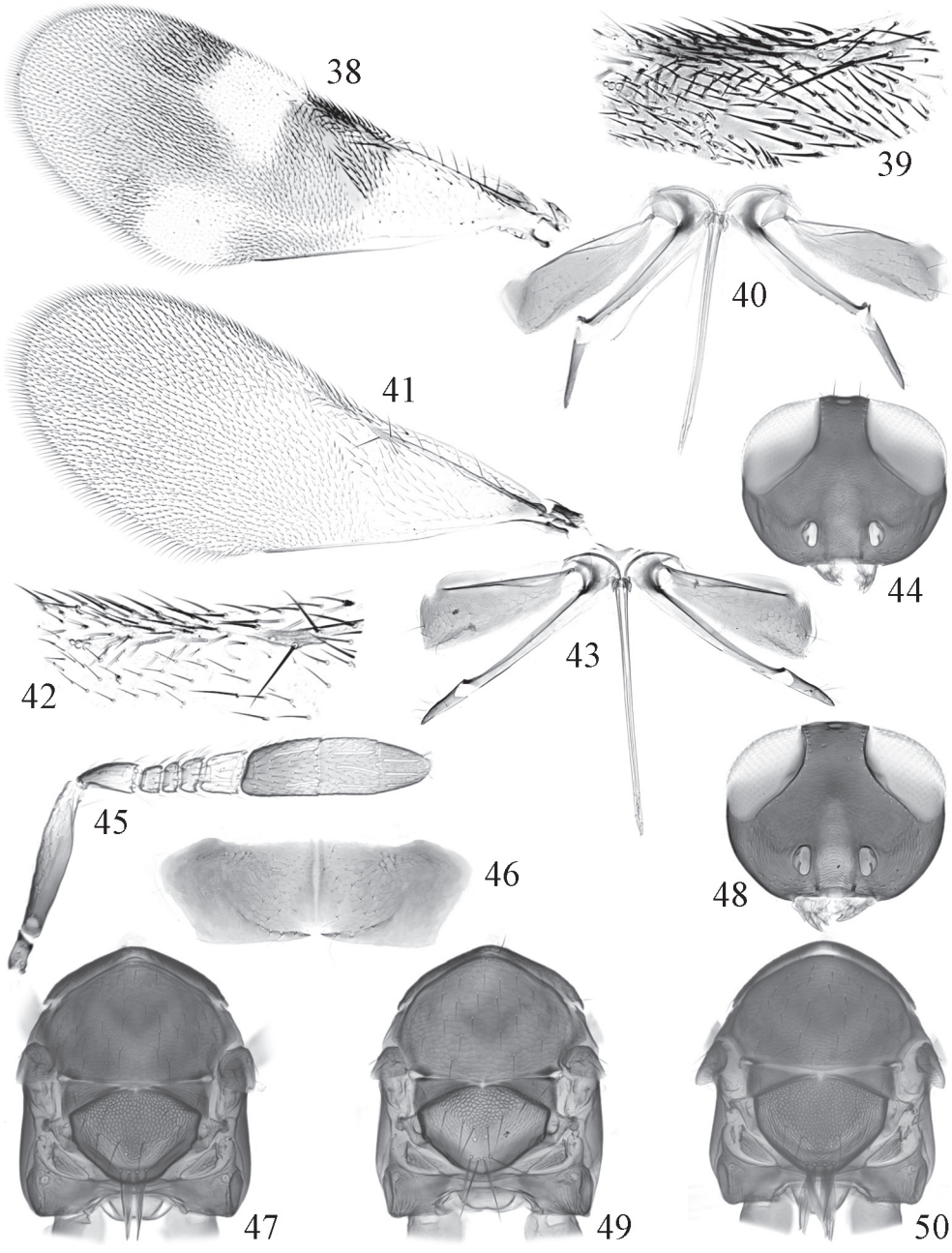
Figs 4-7. *Psyllaephagus alexion* – (4) apex of fore wing venation; (5) fore wing; (6) *Psyllaephagus creusa*, ovipositor; (7) *Protyndarichoides nigriceps*, genitalia, ♂.



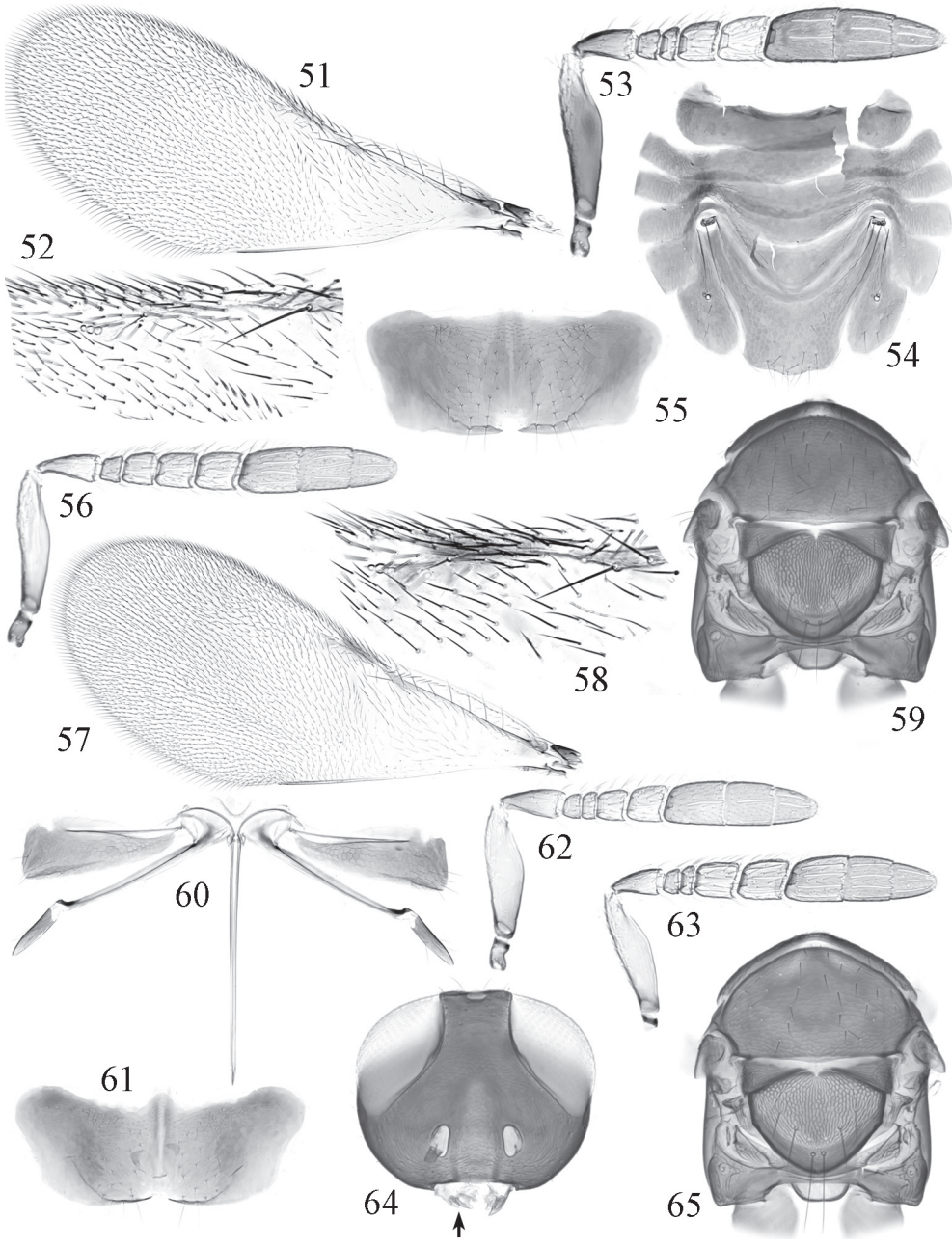
Figs 8-23. ***Arhenophagus chionaspidis*** – (8) fore wing; (9) antenna; (10) head, facial view. ***Arrhenophagus albitibiae*** – (11) head, facial view; (12) antenna; (13) fore wing; (14) fore wing venation. ***Adelencyrtus chionaspidis*** – (15) antenna, larger specimen; (16) antenna, smaller specimen; (17) mesosoma, dorsal view; (18) ovipositor; (19) hypopygium; (20) fore wing venation; (21) fore wing**.** ***Adelencyrtus plocus*** (HT) – (22) antenna; (23) mandibles, ventral peg arrowed.



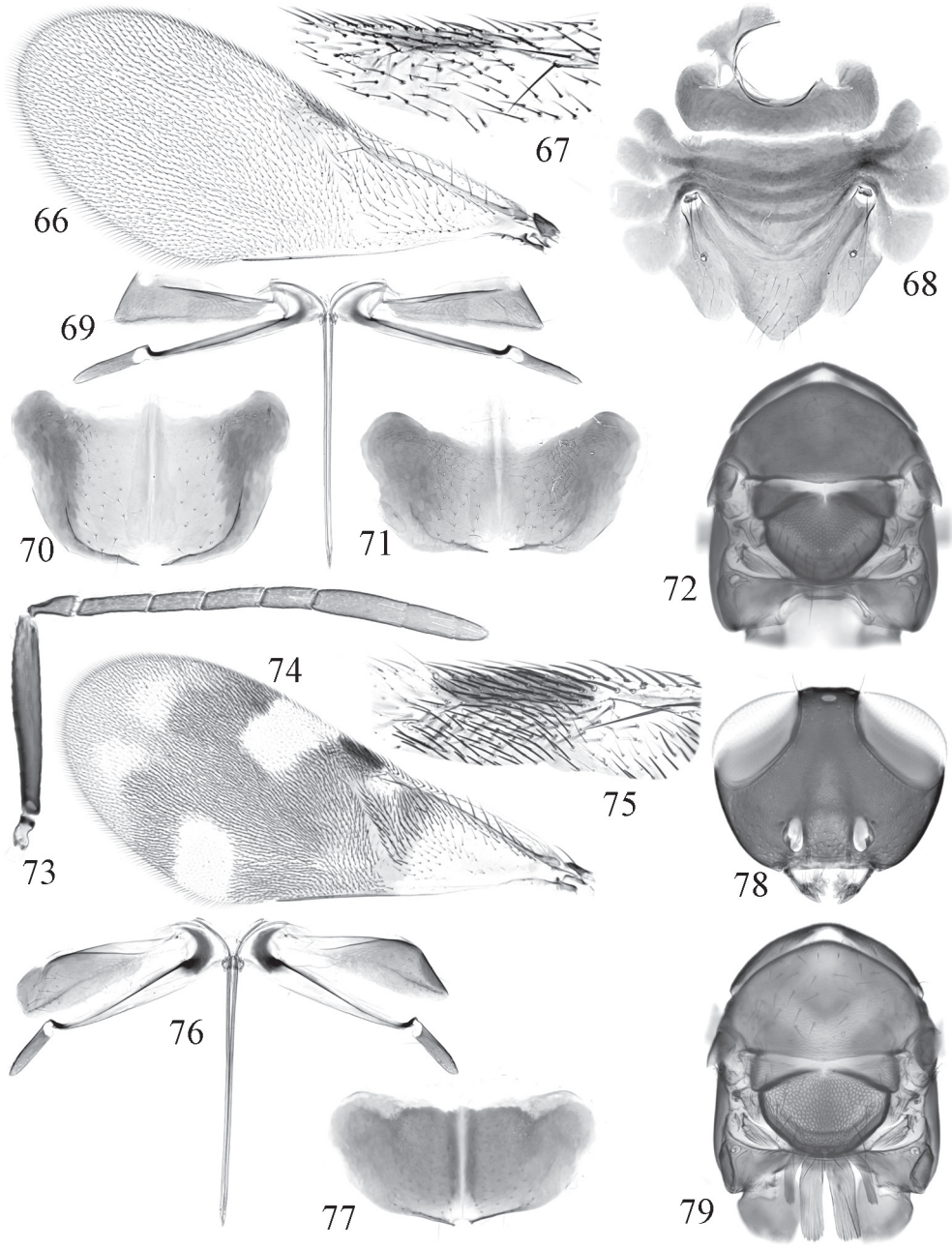
Figs 24-37. ***Adelencyrtus plocus***, HT – (24) fore wing; (25) fore wing venation; (26) ovipositor. ***Adelencyrtus odonaspidis*** – (27) mesosoma, dorsal view; (28) head facial view; (29) fore wing; (30) antenna; (31) hypopygium; (32) ovipositor. ***Adelencyrtus bifasciatus*** – (33) head facial view; (34) antenna, larger specimen; (35) antenna, smaller specimen; (36) hypopygium; (37) mesosoma, dorsal view.



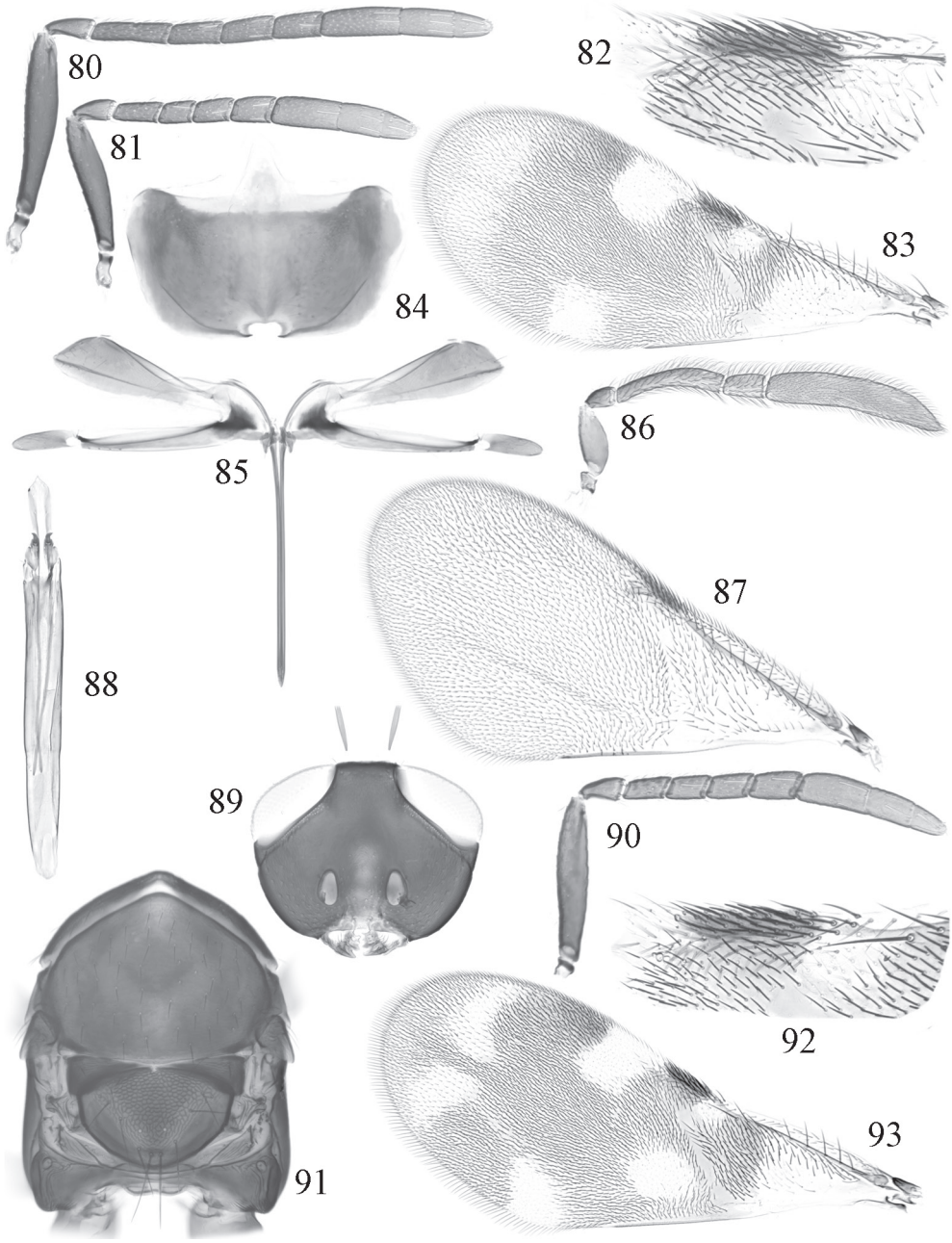
Figs 38-50. ***Adelencyrtus bifasciatus*** – (38) fore wing; (39) fore wing venation; (40) ovipositor. ***Plagiomerus bangaloriensis*** – (41) fore wing; (42) fore wing venation; (43) ovipositor; (44) head, facial view; (45) antenna; (46) hypopygium; (47) mesosoma, dorsal view. ***Plagiomerus hospes*** – (48) head, facial view; (49) mesosoma, dorsal view, smaller specimen; (50) mesosoma, dorsal view, larger specimen.



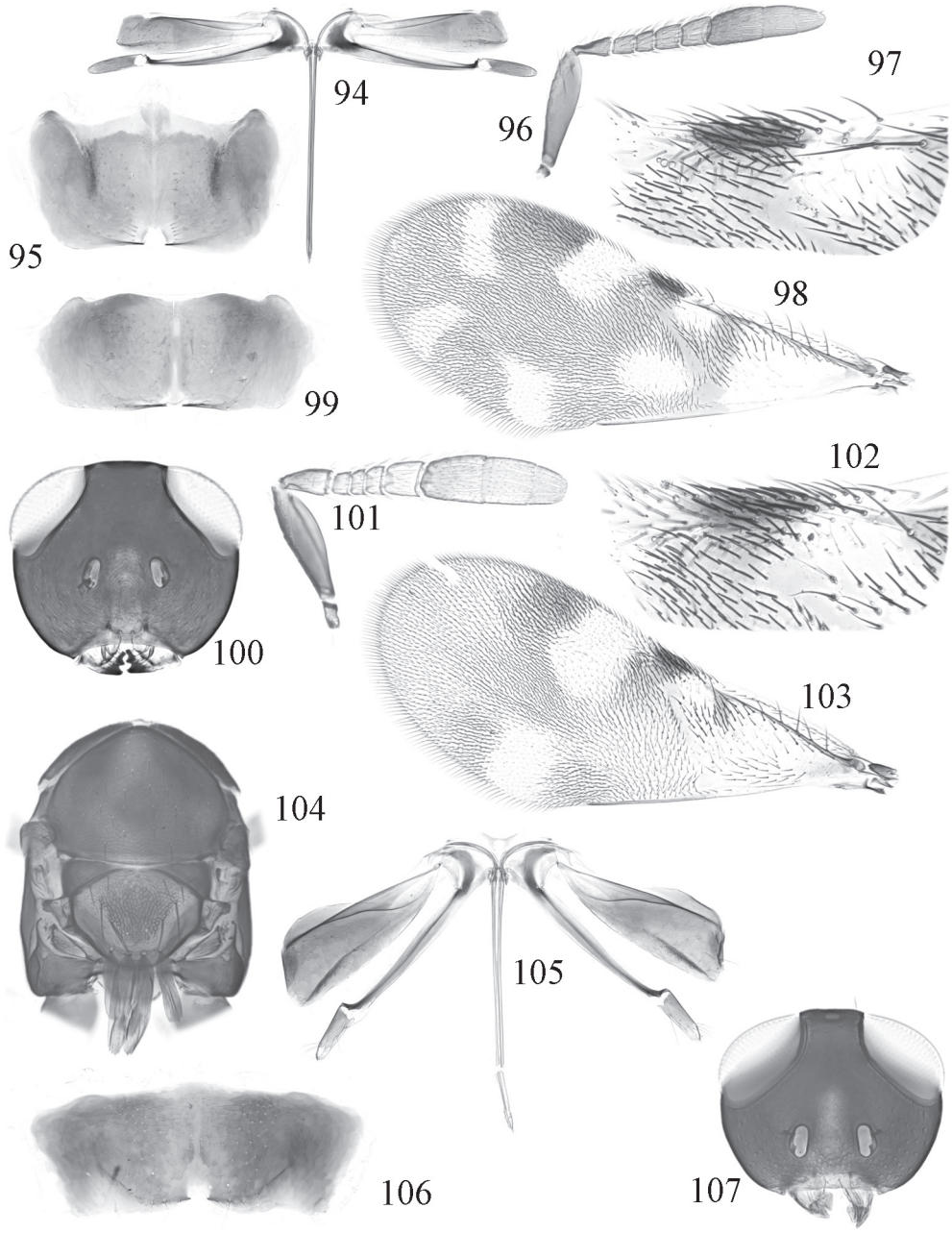
Figs 51-65. ***Plagiomerus hospes*** – (51) fore wing; (52) fore wing venation; (53) antenna; (54) gastral tergites; (55) hypopygium. ***Plagiomerus calabes*** – (56) antenna; (57) fore wing; (58) fore wing venation; (59) mesosoma, dorsal view; (60) ovipositor; (61) hypopygium. ***Plagiomerus peruviensis*** – (62) antenna, variant; (63) antenna, variant; (64) head, facial view, ventral mandibular peg arrowed; (65) mesosoma, dorsal view.



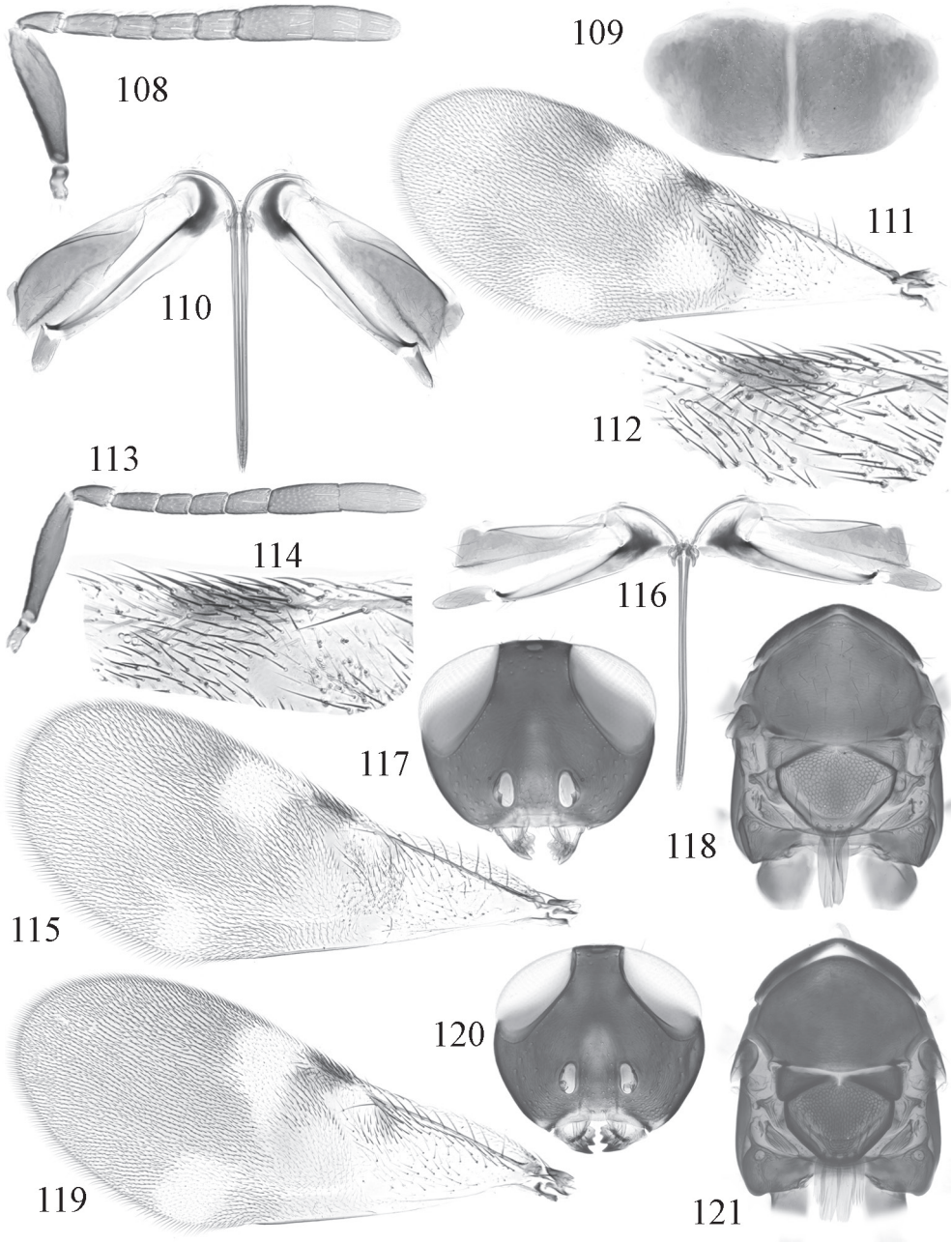
Figs 66-79. ***Plagiomerus peruviensis*** – (66) fore wing; (67) fore wing venation; (68) gastral tergites; (69) ovipositor; (70) hypopygium, variant; (71) hypopygium, variant. ***Homalopoda onothrix*** – (72) mesosoma, dorsal view; (73) antenna; (74) fore wing; (75) apex of fore wing venation; (76) ovipositor; (77) hypopygium. ***Homalopoda aesira*** – (78) head, facial view; (79) mesosoma, dorsal view.



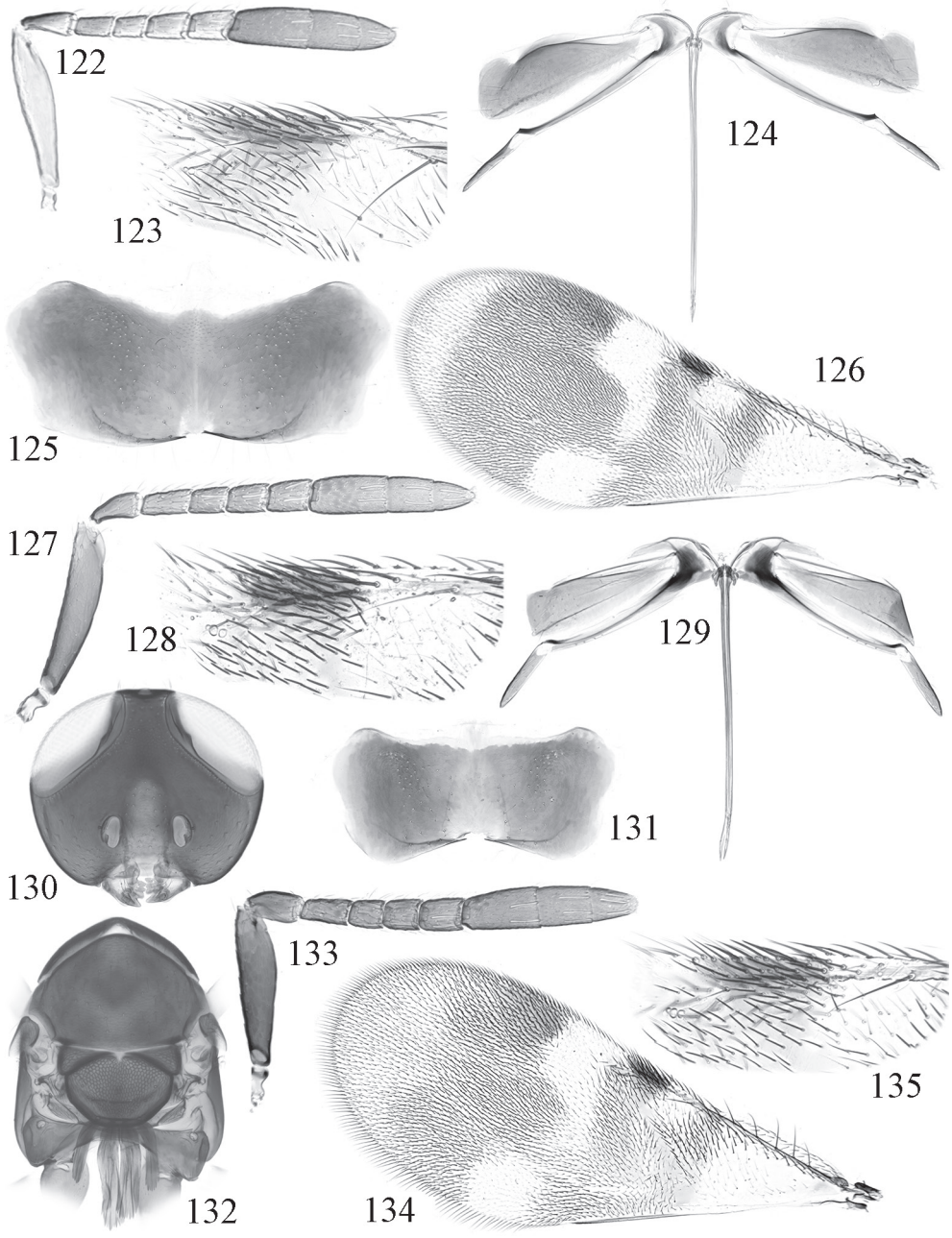
Figs 80-93. ***Homalopoda aesira*** – (80) antenna, variant; (81) antenna, variant; (82) apex of fore wing venation; (83) fore wing; (84) hypopygium; (85) ovipositor; (86) antenna, ♂; (87) fore wing, ♂; (88) genitalia, ♂. ***Homalopoda cristata*** – (89) head, facial view, showing scale-like setae inserted on occipital margin (detached); (90) antenna; (91) mesosoma, dorsal view; (92) apex of fore wing venation; (93) fore wing.



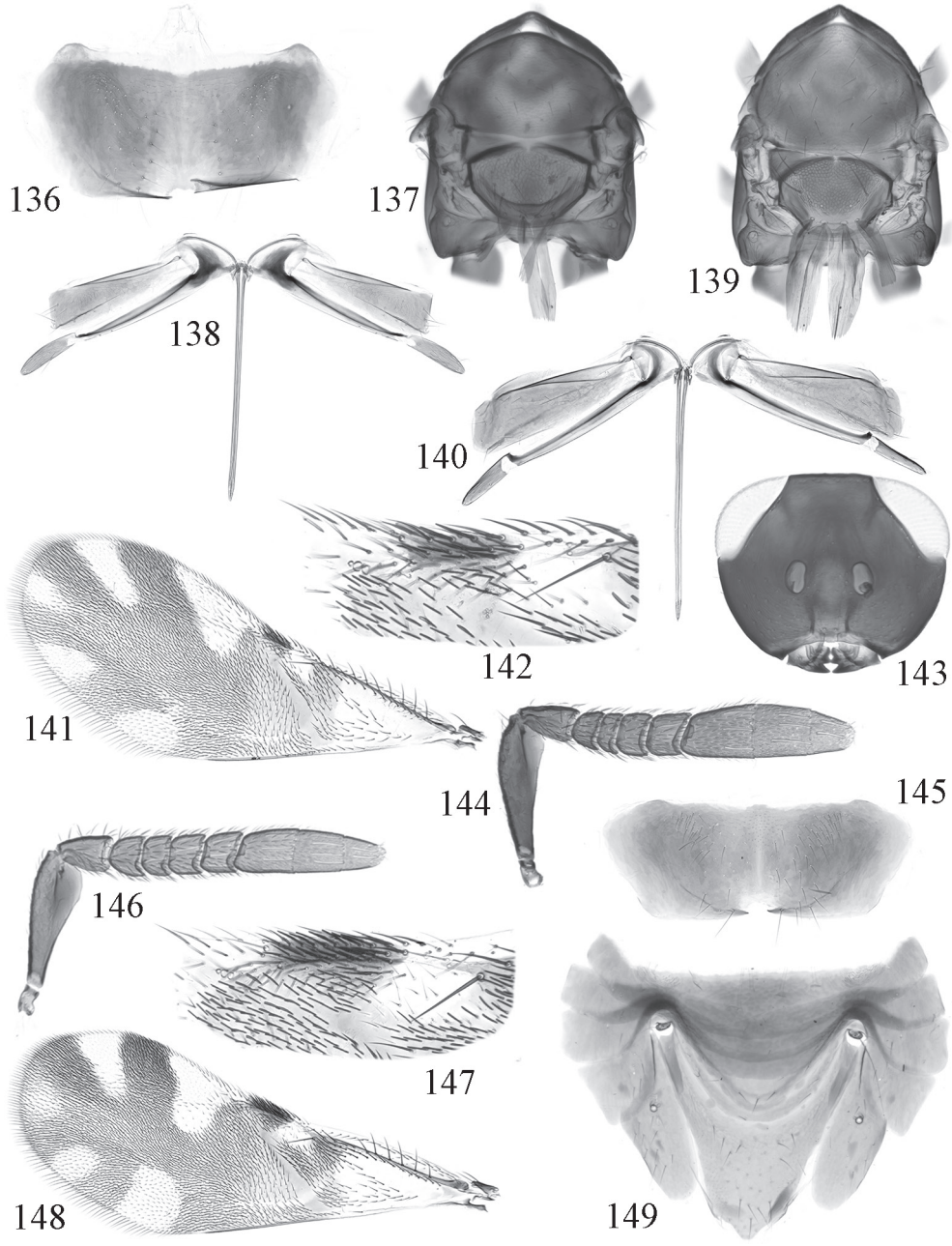
Figs 94-107. ***Homalopoda cristata*** – (94) ovipositor; (95) hypopygium. ***Homalopoda rehdera*** – (96) antenna; (97) apex of fore wing venation; (98) fore wing. (99) hypopygium. ***Homalopoda aibeus*** – (100) head, facial view (reconstructed); (101) antenna; (102) apex of fore wing venation; (103) fore wing; (104) mesosoma, dorsal view; (105) ovipositor; (106) hypopygium. ***Homalopoda beatriz*** – (107) head, facial view.



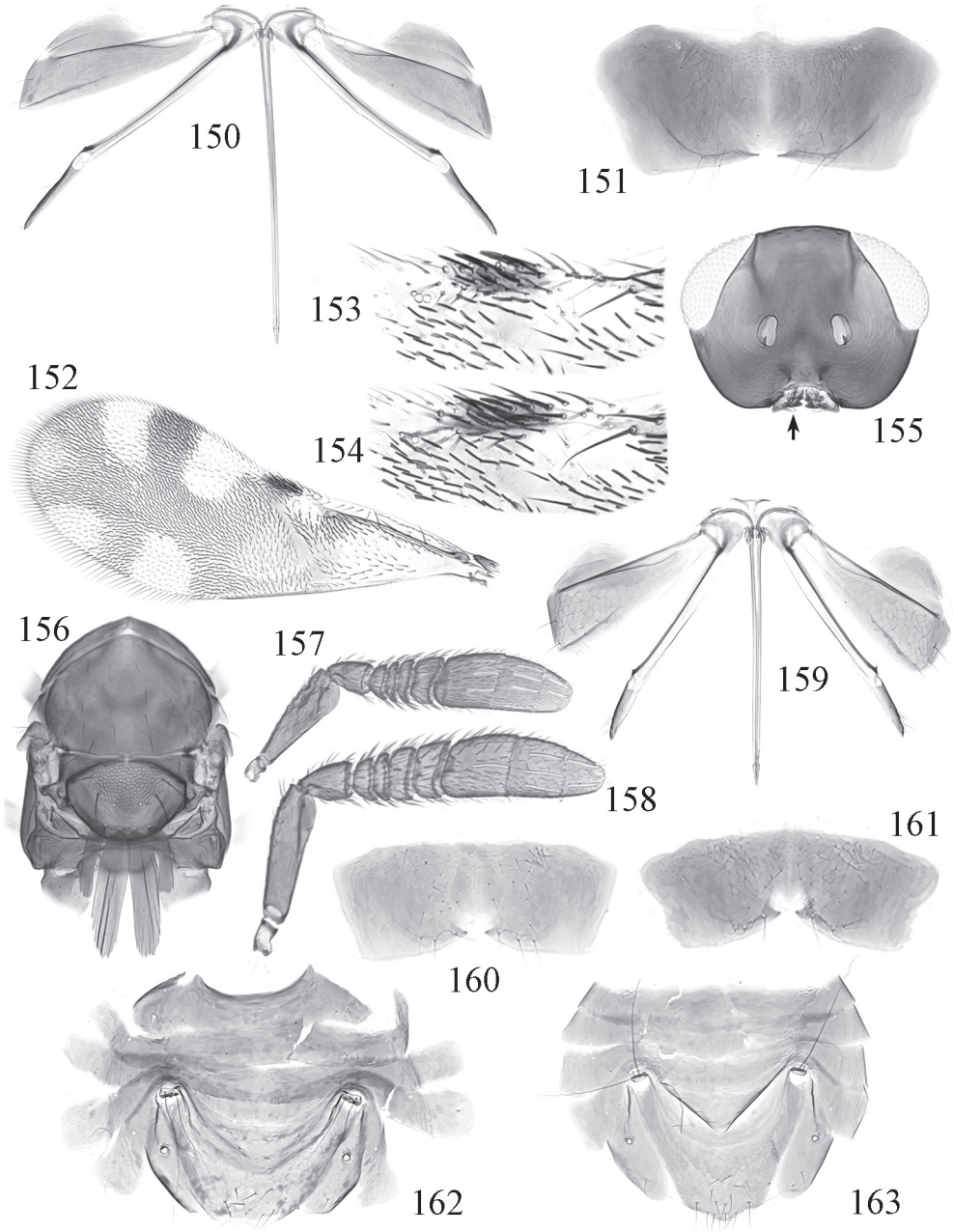
Figs 108-121. ***Homalopoda beatriz*** – (108) antenna; (109) hypopygium; (110) ovipositor; (111) fore wing; (112) apex of fore wing venation. ***Homalopoda carpha*****,** HT – (113) antenna; (114) apex of fore wing venation; (115) fore wing; (116) ovipositor; (117) head, facial view); (118) mesosoma, dorsal view. ***Homalopoda baunos*****,** HT – (119) fore wing; (120) head, facial view; (121) mesosoma, dorsal view.



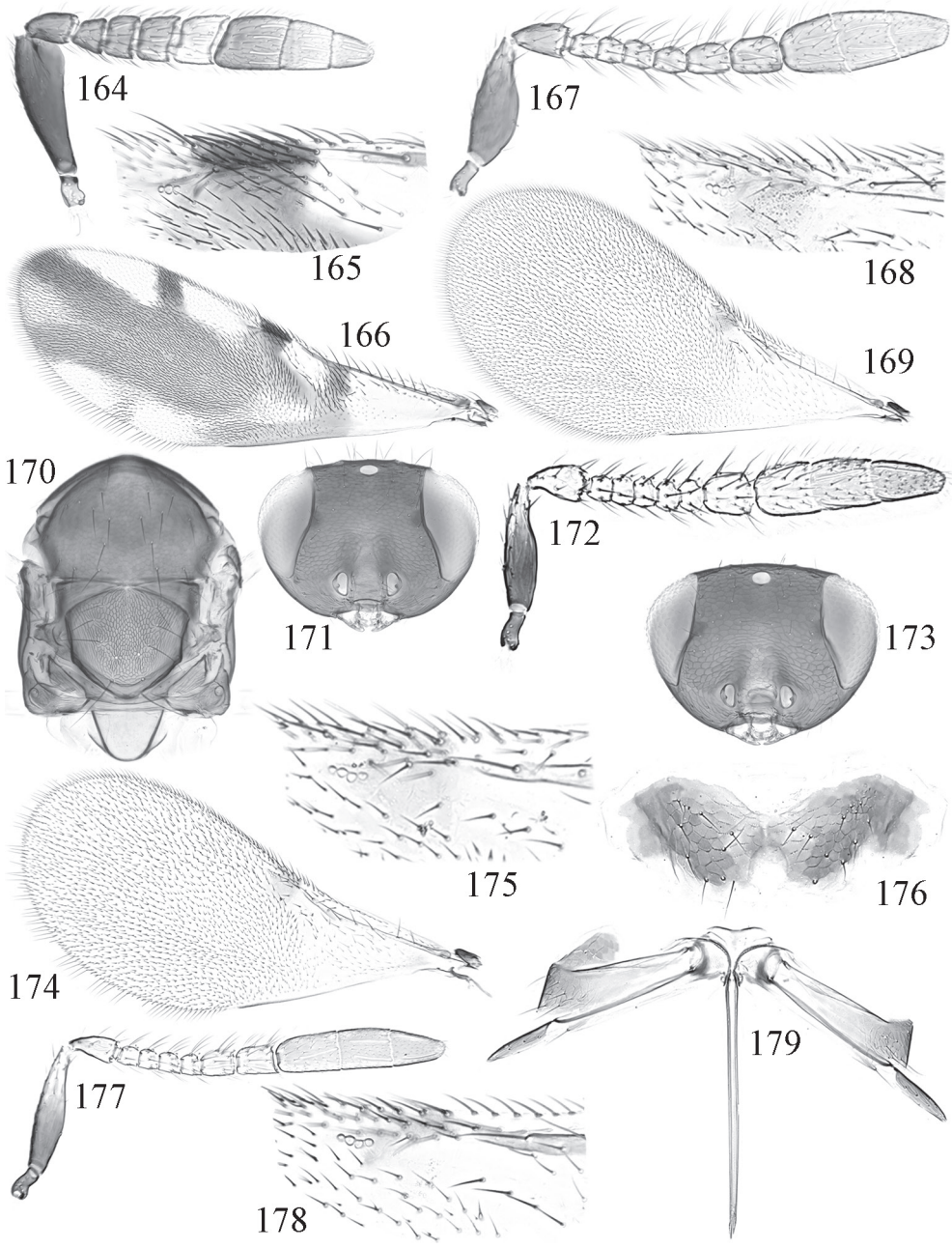
Figs 122-135. ***Homalopoda baunos***, HT – (122) antenna; (123) apex of fore wing venation; (124) ovipositor; (125) hypopygium. ***Homalopoda opsis*** – (126) fore wing; (127) antenna; (128) apex of fore wing venation; (129) ovipositor; (130) head, facial view; (131) hypopygium; (132) mesosoma, dorsal view. ***Homalopoda donatos*** – (133) antenna; (134) fore wing; (135) apex of fore wing venation.



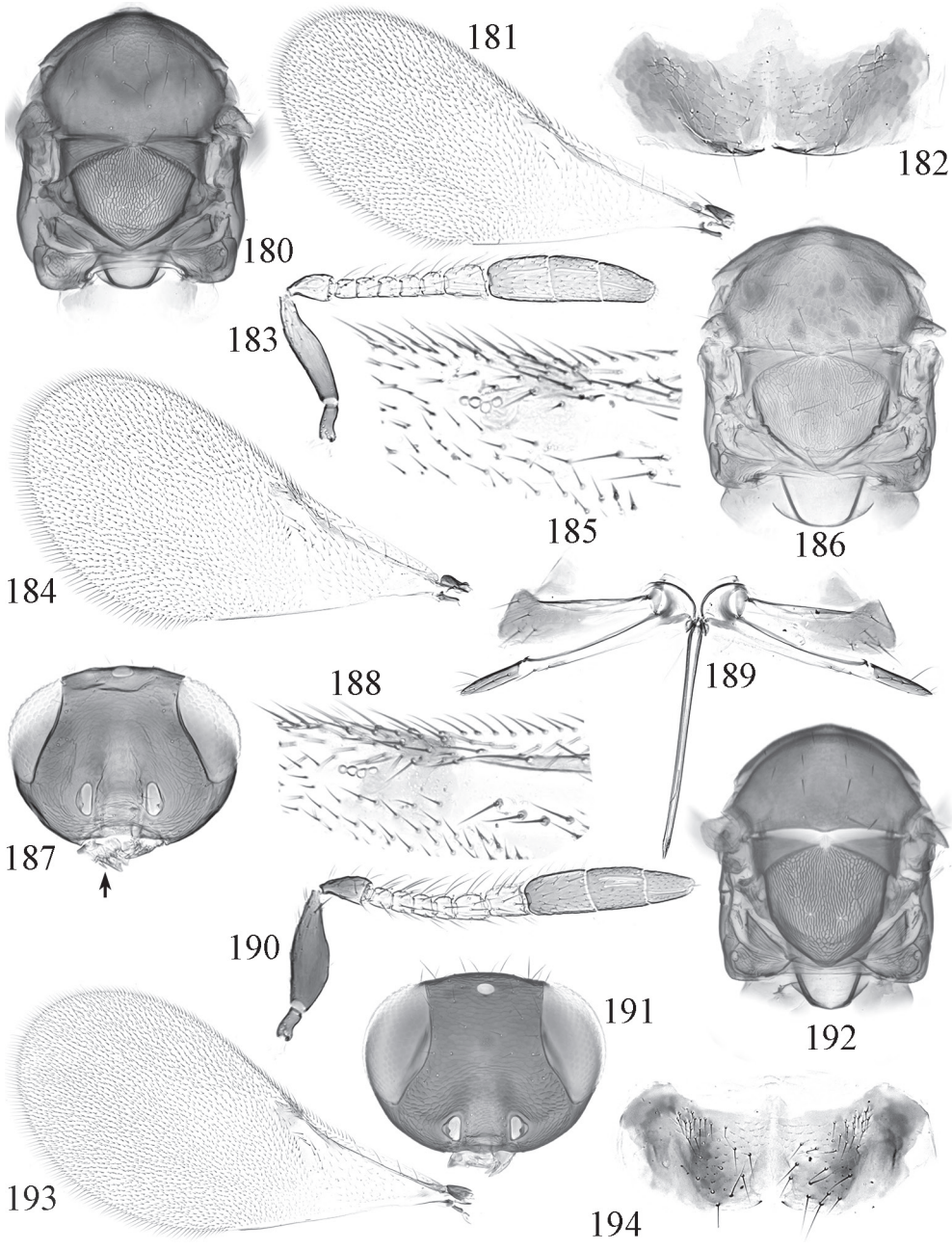
Figs 136-149. ***Homalopoda donatos*** – (136) hypopygium; (137) mesosoma, dorsal view; (138) ovipositor. ***Pseudhomalopoda tapura***, HT – (139) mesosoma, dorsal view; (140) ovipositor; (141) fore wing; (142) apex of fore wing venation; (143) head, facial view; (144) antenna; (145) hypopygium. ***Pseudhomalopoda festa*** – (146) antenna; (147) apex of fore wing venation; (148) fore wing; (149) apical gastral tergites.



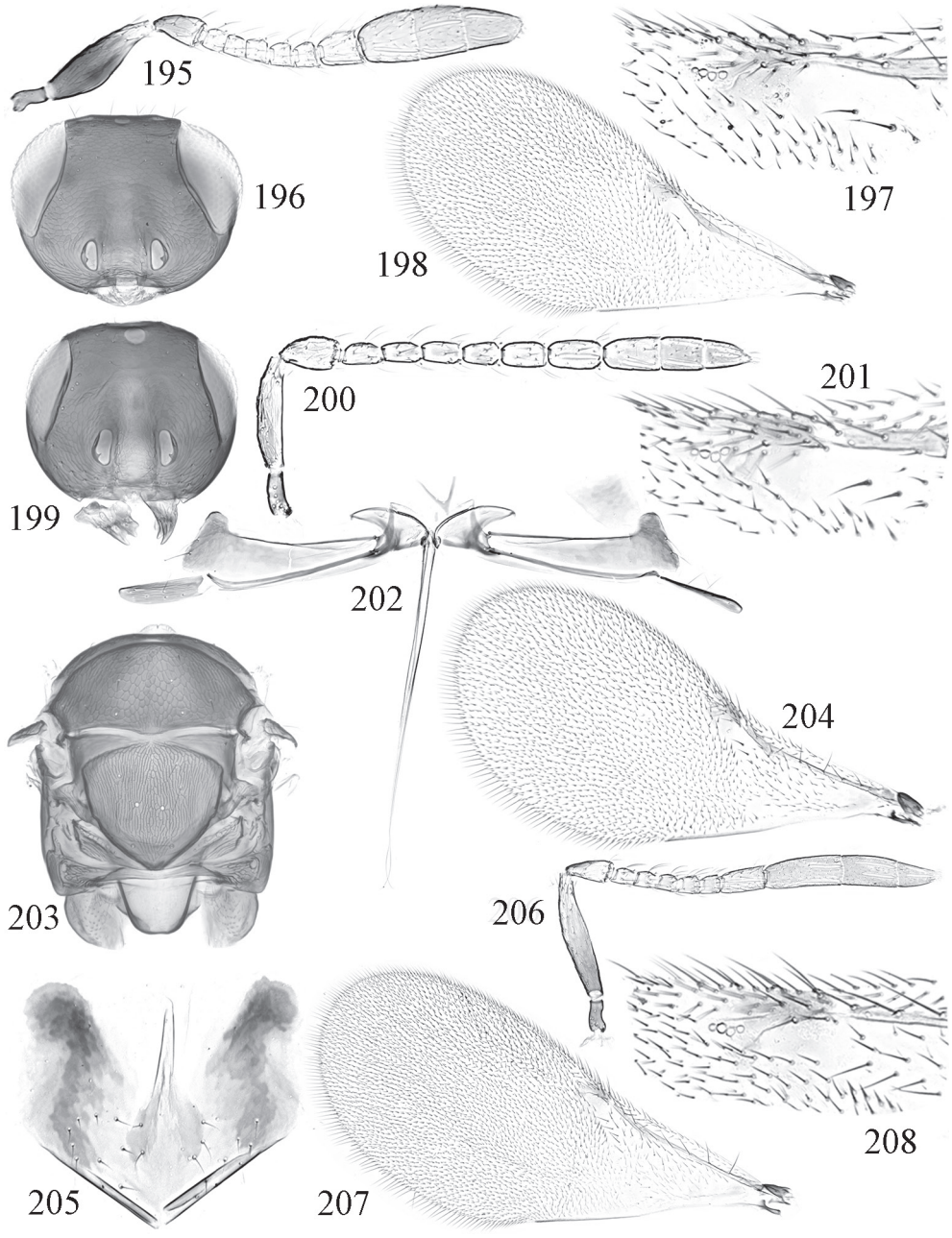
Figs 150-163. ***Pseudhomalopoda festa*** – (150) ovipositor; (151) hypopygium. ***Pseudhomalopoda prima*** – (152) fore wing; (153) apex of fore wing venation, variant; (154) apex of fore wing venation, variant; (155) head, facial view; (156) mesosoma, dorsal view; (157) antenna, small specimen; (158) antenna large specimen; (159) ovipositor; (160) hypopygium, variant; (161) hypopygium, variant; (162) gastral tergites, variant; (163) apical gastral tergites, variant.



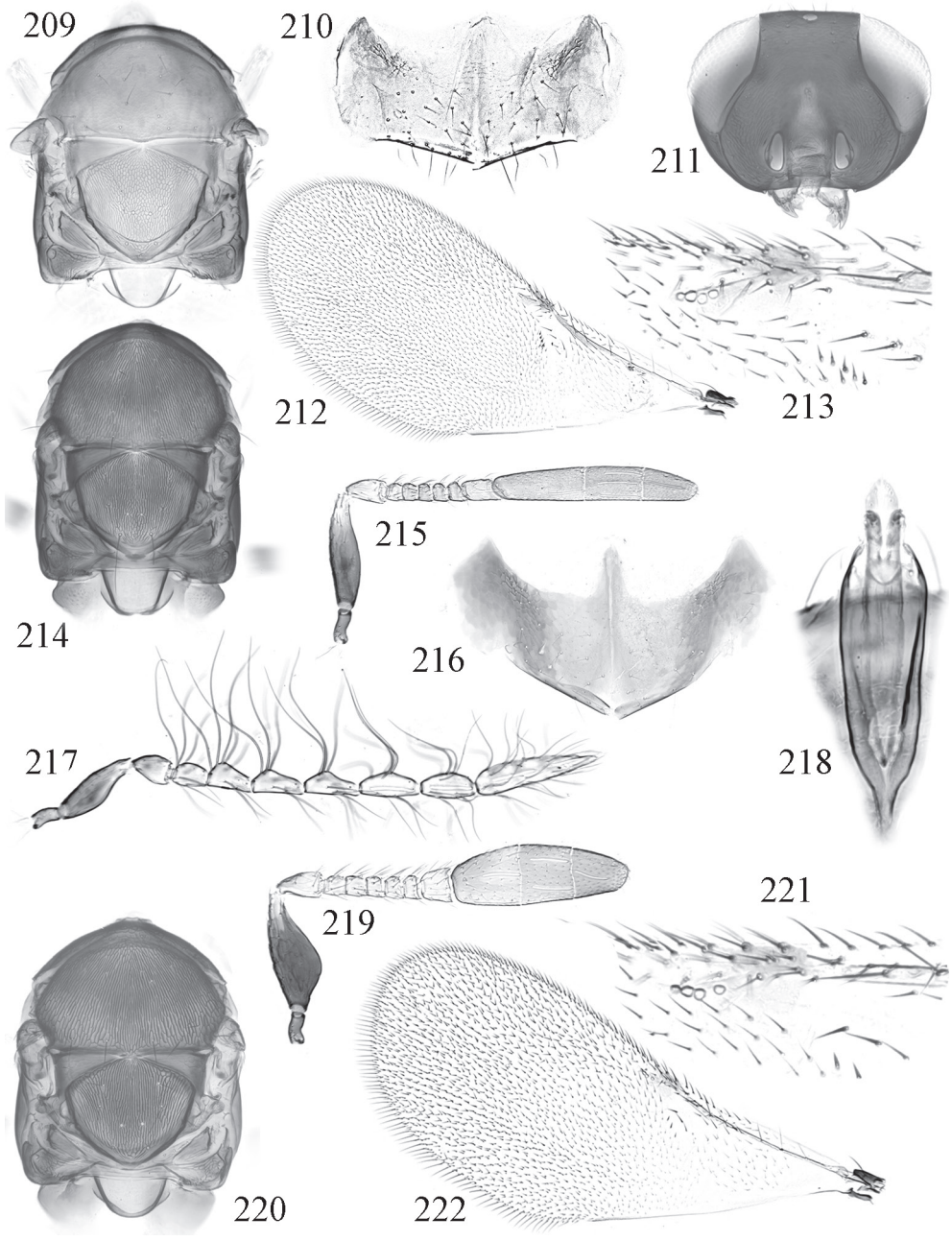
Figs 164-179. ***Caenohomalopoda guamensis*** – (164) antenna; (165) apex of fore wing venation; (166) fore wing. ***Coccidencyrtus pomadus***, HT – (167) antenna; (168) apex of fore wing venation; (169) fore wing; (170) mesosoma, dorsal view; (171) head (modified). ***Coccidencyrtus viviana***, HT – (172) antenna; (173) head, facial view; (174) fore wing; (175); apex of fore wing venation; (176) hypopygium (restructured). ***Coccidencyrtus aries*** – (177) antenna; (178) apex of fore wing venation; (179) ovipositor.



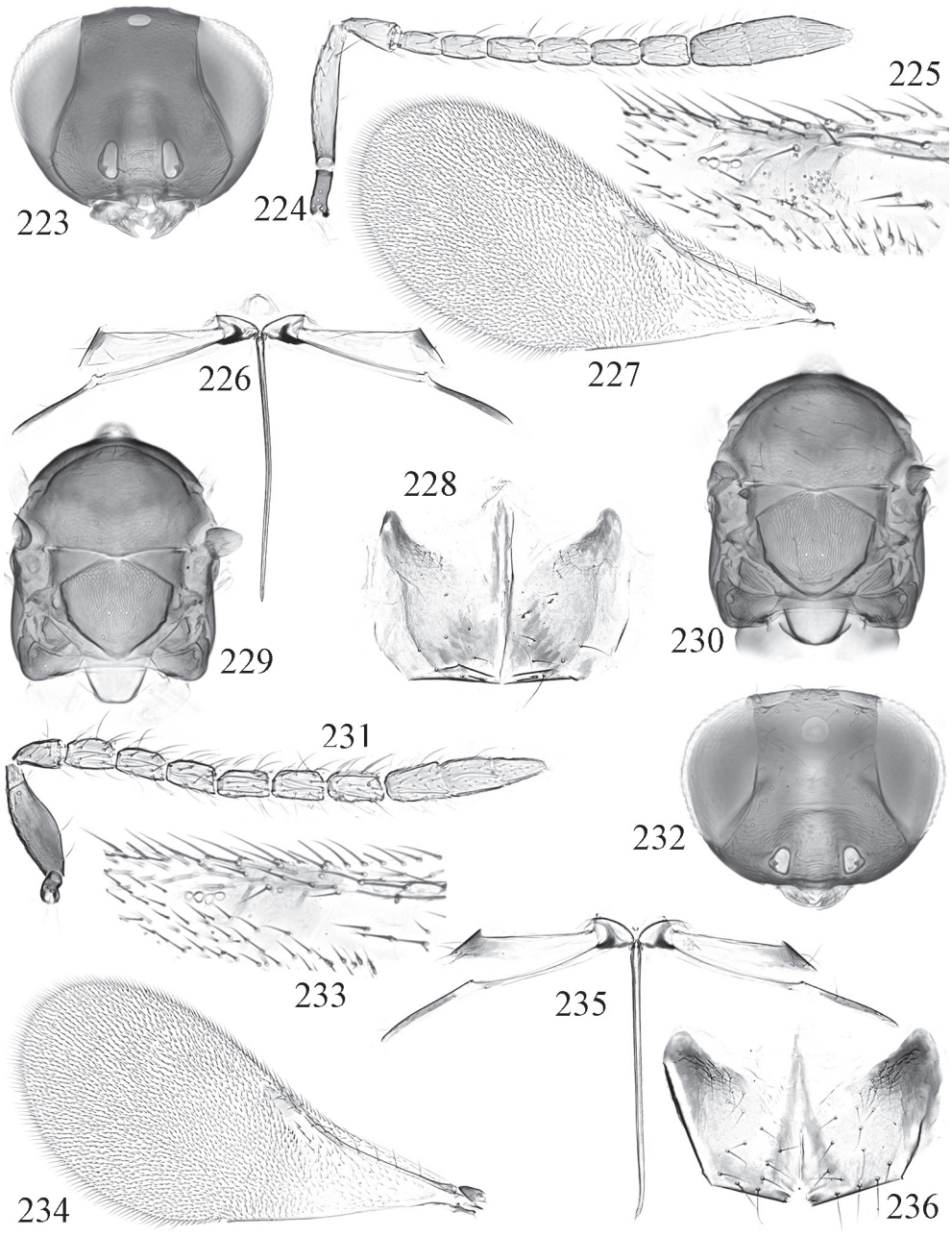
Figs 180-194. ***Coccidencyrtus aries*** – (180) mesosoma, dorsal view; (181) fore wing. ***Coccidencyrtus gowanus*** – (182) hypopygium; (183) antenna; (184) fore wing; (185) apex of fore wing venation; (186) mesosoma, dorsal view; (187) head, facial view, ventral mandibular peg arrowed. ***Coccidencyrtus reshan*** – (188) apex of fore wing venation; (189) ovipositor; (190) antenna; (191) head, facial view; (192) mesosoma, dorsal view; (193) fore wing; (194) hypopygium.



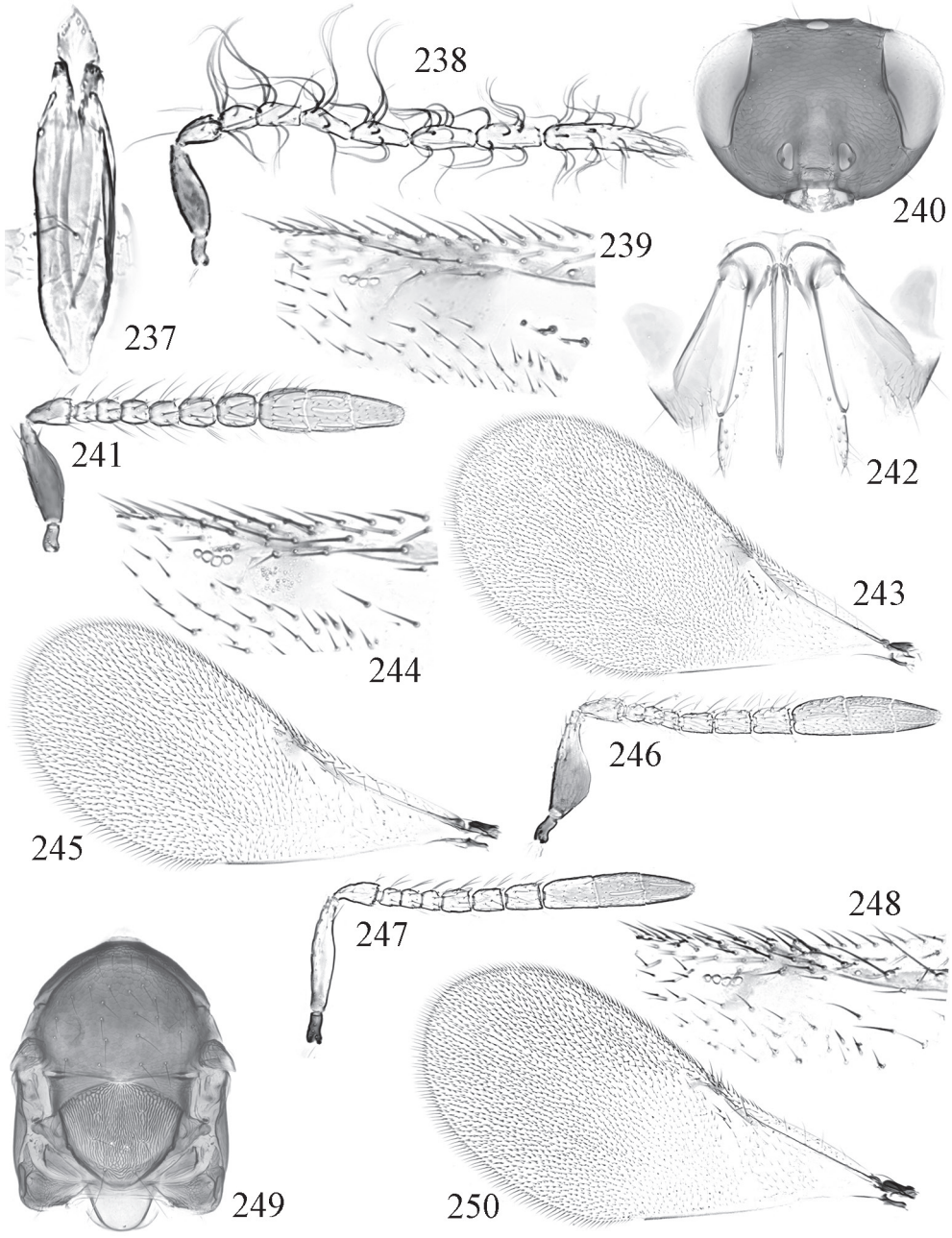
Figs 195-208. ***Coccidencyrtus juno*** – (195) antenna; (196) head, facial view; (197) apex of fore wing venation; (198) fore wing. ***Coccidencyrtus chenoa***, HT – (199) head, facial view; (200) antenna; (201) apex of fore wing venation; (202) ovipositor; (203) mesosoma, dorsal view; (204) fore wing; (205) hypopygium (posterior margin slightly curled inwards). ***Coccidencyrtus procris*** – (206) antenna; (207) fore wing; (208) apex of fore wing venation.



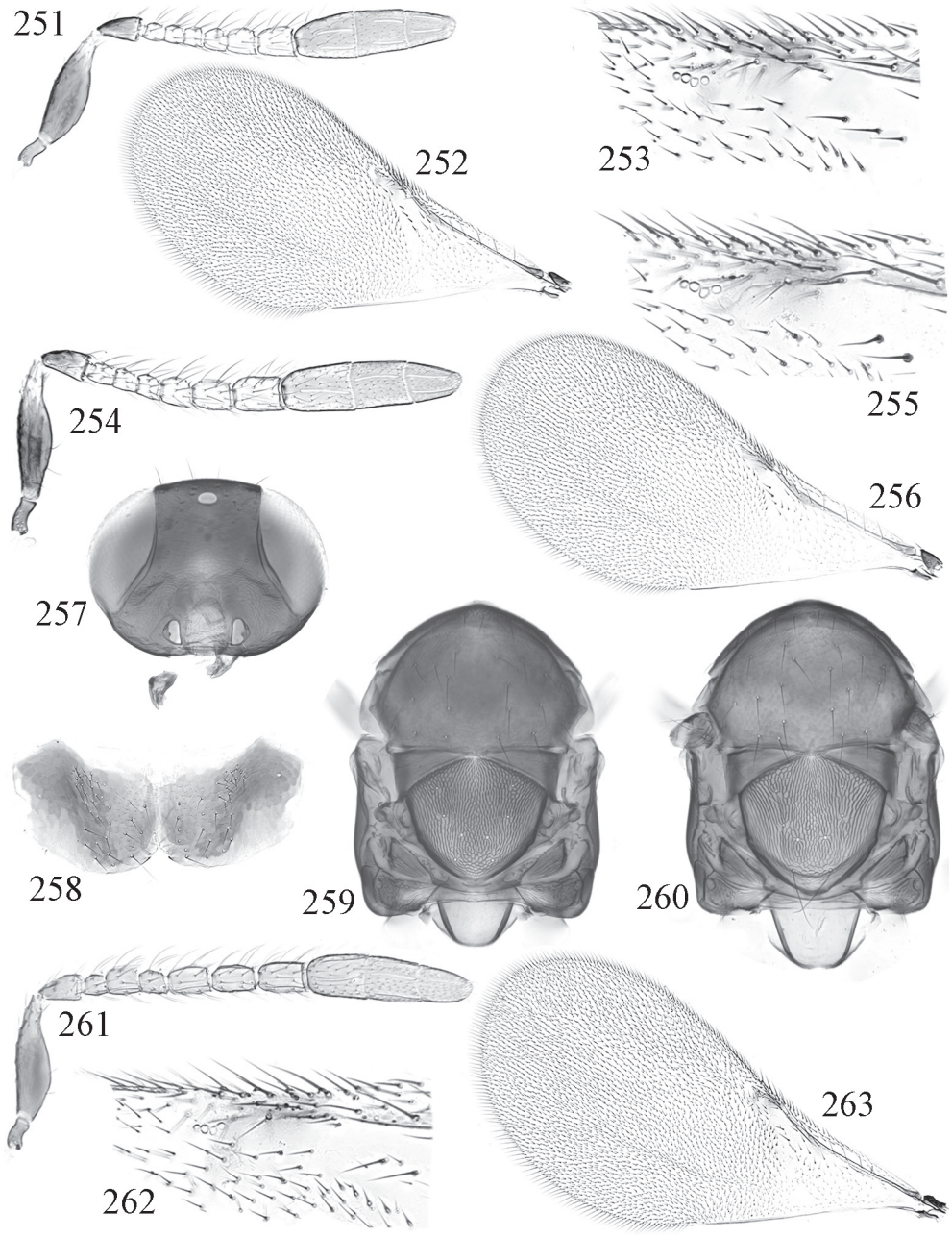
Figs 209-222. ***Coccidencyrtus procris*** – (209) mesosoma, dorsal view; (210) hypopygium (posterior margin slightly curled inwards). ***Coccidencyrtus umbro*** – (211) head, facial view; (212) fore wing; (213) apex of fore wing venation; (214) mesosoma, dorsal view); (215) antenna; (216) hypopygium (posterior margin partially curled inwards); (217) antenna, ♂; (218) genitalia, ♂. ***Coccidencyrtus cyathus*** – (219) antenna; (220) mesosoma, dorsal view; (221) apex of fore wing venation; (222) fore wing.



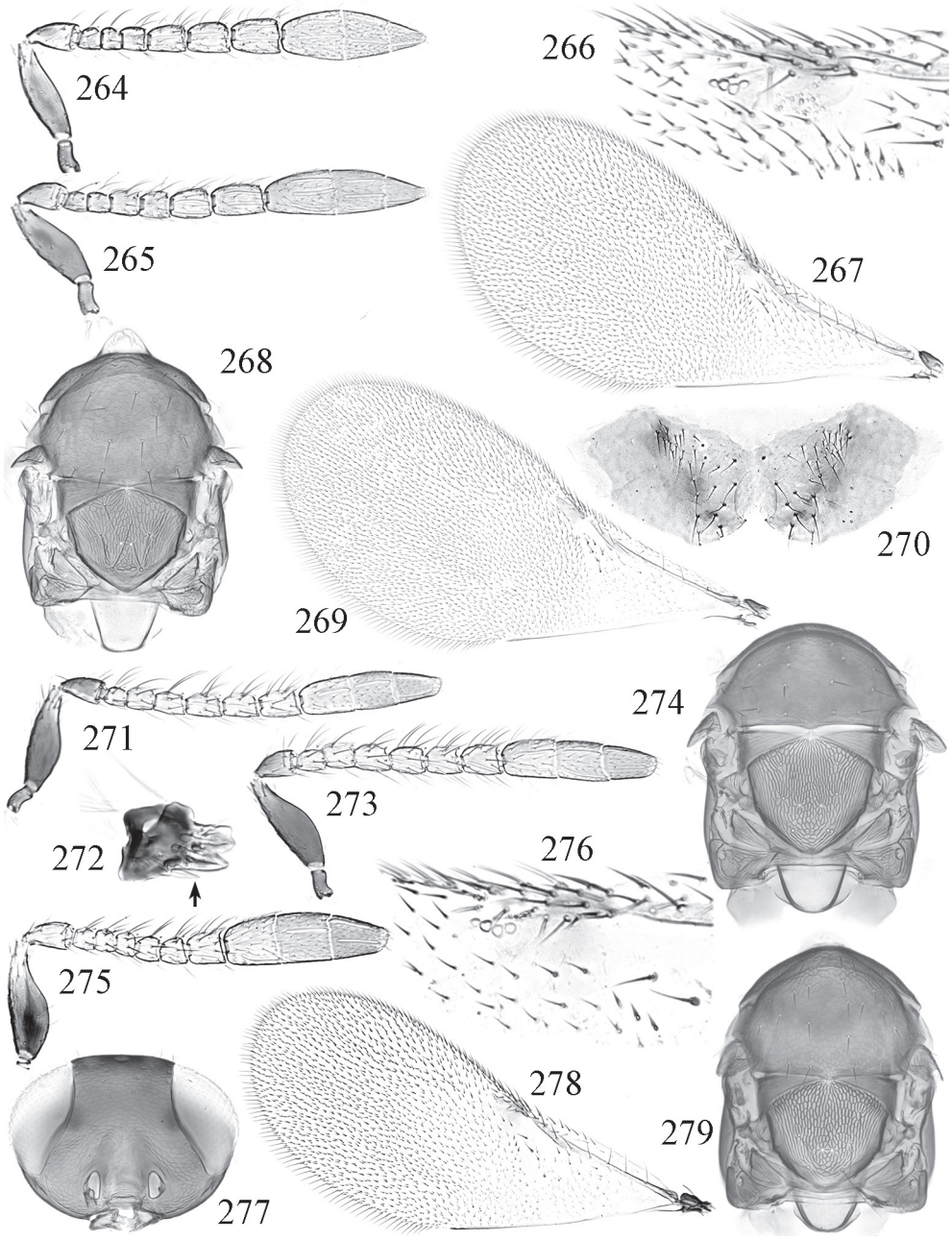
Figs 223-236. ***Coccidencyrtus xero***, HT – (223) head, facial view; (224) antenna; (225) apex of fore wing venation; (226) ovipositor; (227) fore wing; (228) hypopygium (posterior margin partially curled inwards); (229) mesosoma, dorsal view. ***Coccidencyrtus xylomus*** – (230) mesosoma, dorsal view; (231) antenna; (232) head, facial view; (233) apex of fore wing venation; (234) fore wing; (235) ovipositor; (236) hypopygium (posterior margin slightly curled inwards).



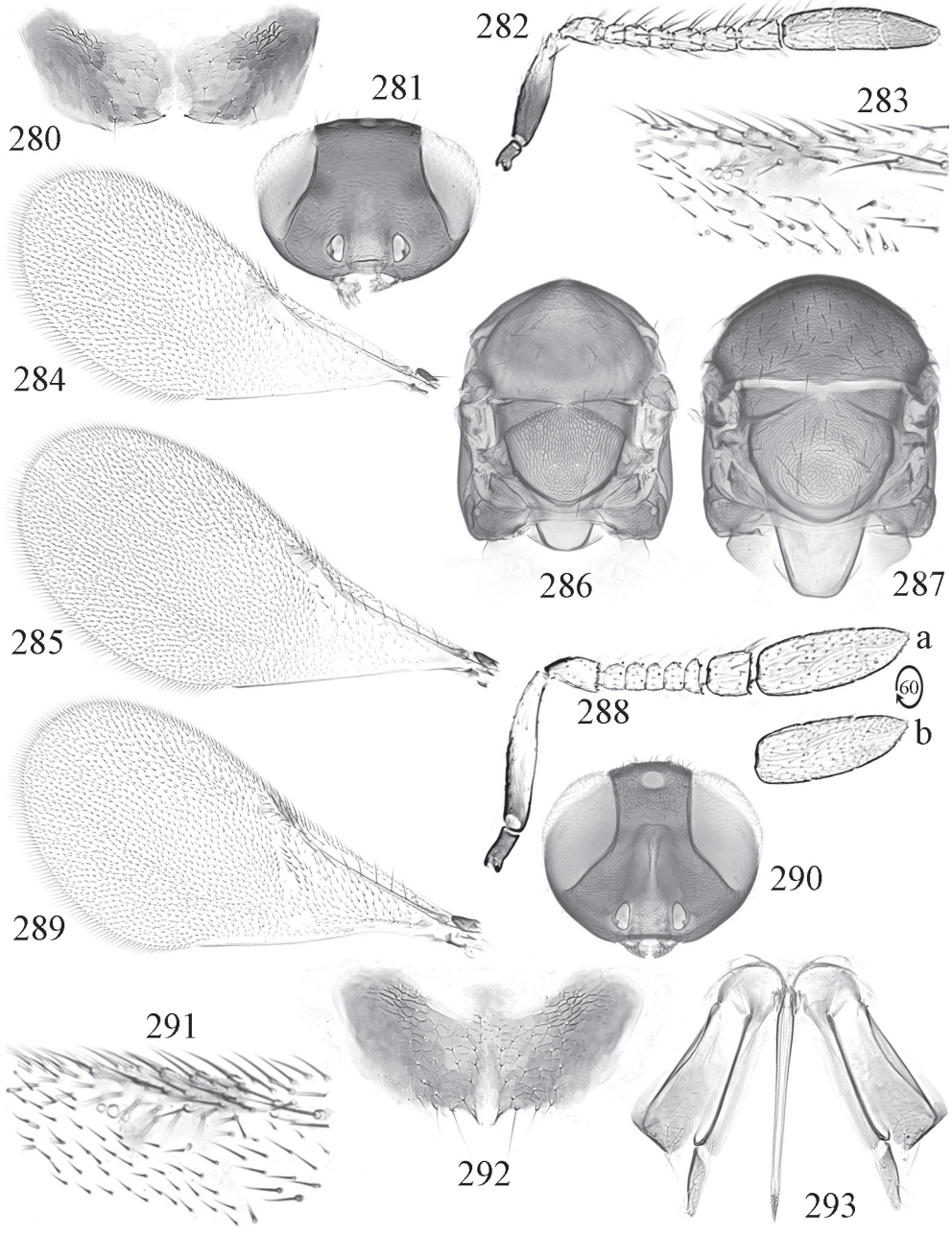
Figs 237-250. ***Coccidencyrtus xylomus*** – (237) genitalia, ♂; (238) antenna, ♂. ***Coccidencyrtus jacintha***, HT – (239) apex of fore wing venation; (240) head, facial view); (241) antenna; (242) ovipositor; (243) fore wing. ***Coccidencyrtus sivan***, HT – (244) apex of fore wing venation; (245) fore wing; (246) antenna. ***Coccidencyrtus ochraceipes*** – (247) antenna; (248) apex of fore wing venation; (249) mesosoma, dorsal view; (250) fore wing.



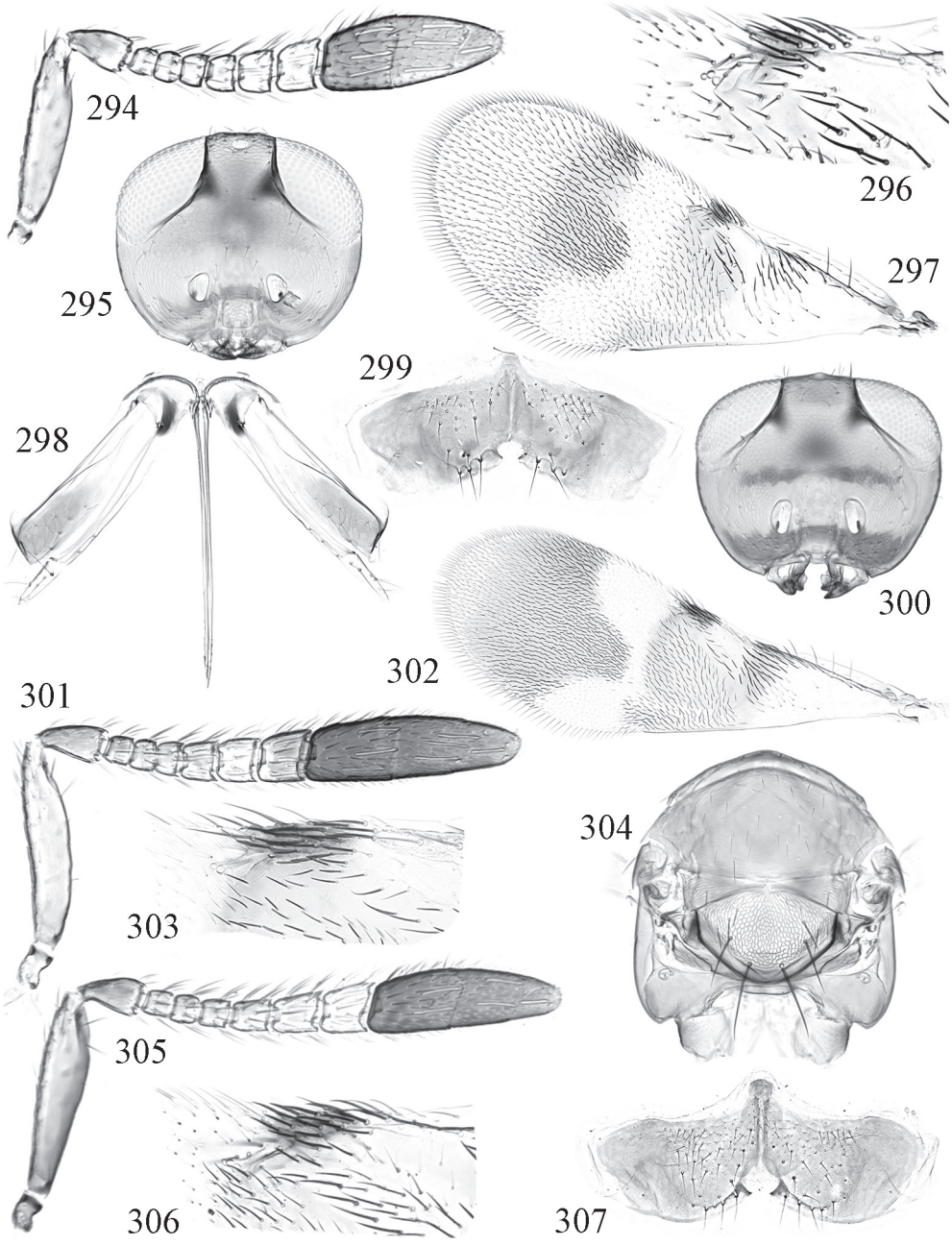
Figs 251-263. ***Coccidencyrtus quebrus*** – (251) antenna; (252) fore wing; (253) apex of fore wing venation. ***Coccidencyrtus fescus***, HT – (254) antenna; (255) apex of fore wing venation; (256) fore wing; (257) head, facial view; (258) hypopygium; (259) mesosoma, dorsal view. ***Coccidencyrtus tristeryx***, HT – (260) mesosoma, dorsal view; (261) antenna; (262) apex of fore wing venation; (263) fore wing.



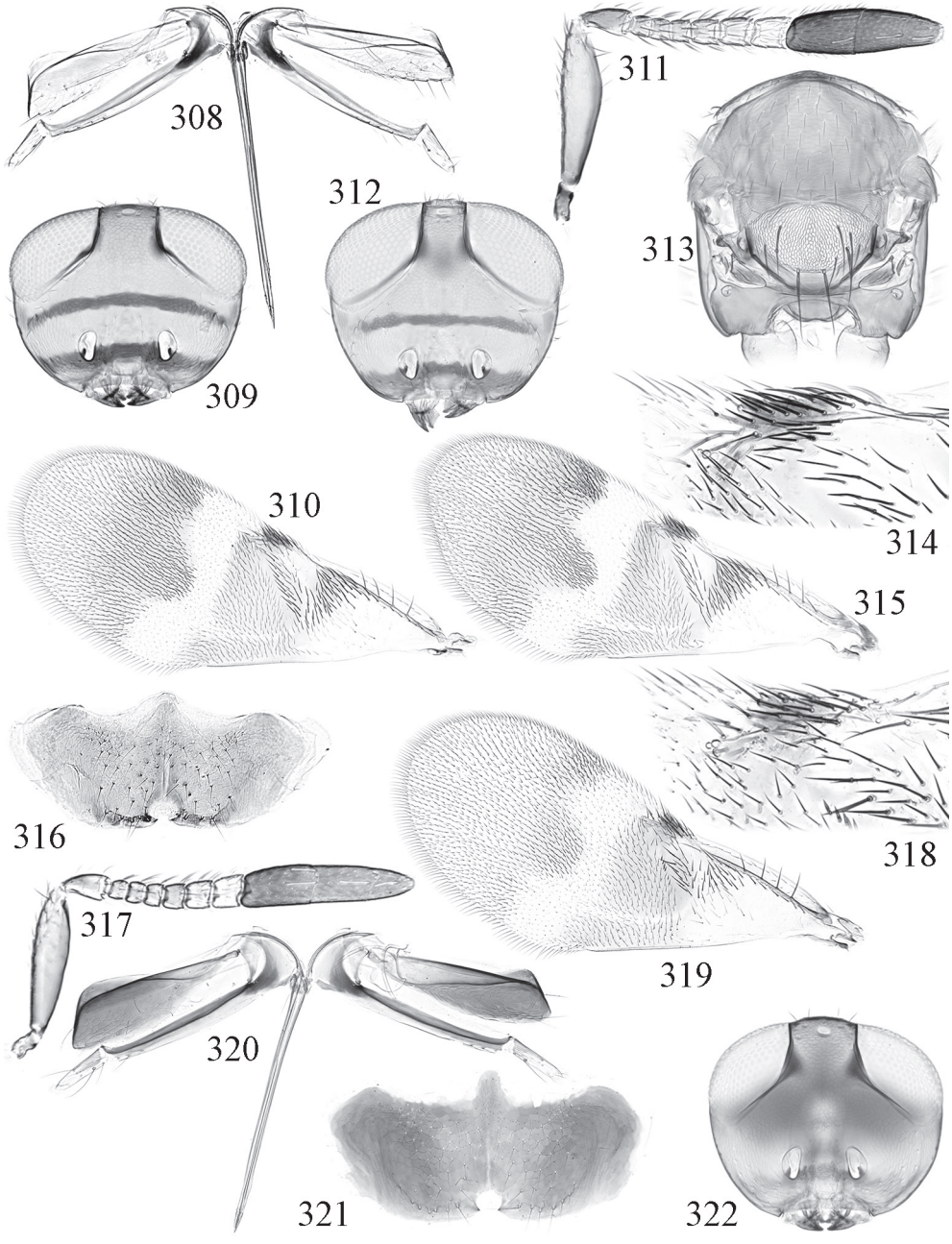
Figs 264-279. ***Coccidencyrtus matias*** – (264) antenna; (265) antenna, non type; (266) apex of fore wing venation; (267) fore wing; (268) mesosoma, dorsal view. ***Coccidencyrtus harpales*** – (269) fore wing; (270) hypopygium; (271) antenna; (272) mandible, showing ventral mandibular peg (arrowed); (273) antenna, variant; (274) mesosoma, dorsal view. ***Coccidencyrtus solivus***, HT – (275) antenna; (276) apex of fore wing venation; (277) head, facial view (restructured); (278) fore wing; (279) mesosoma. dorsal view.



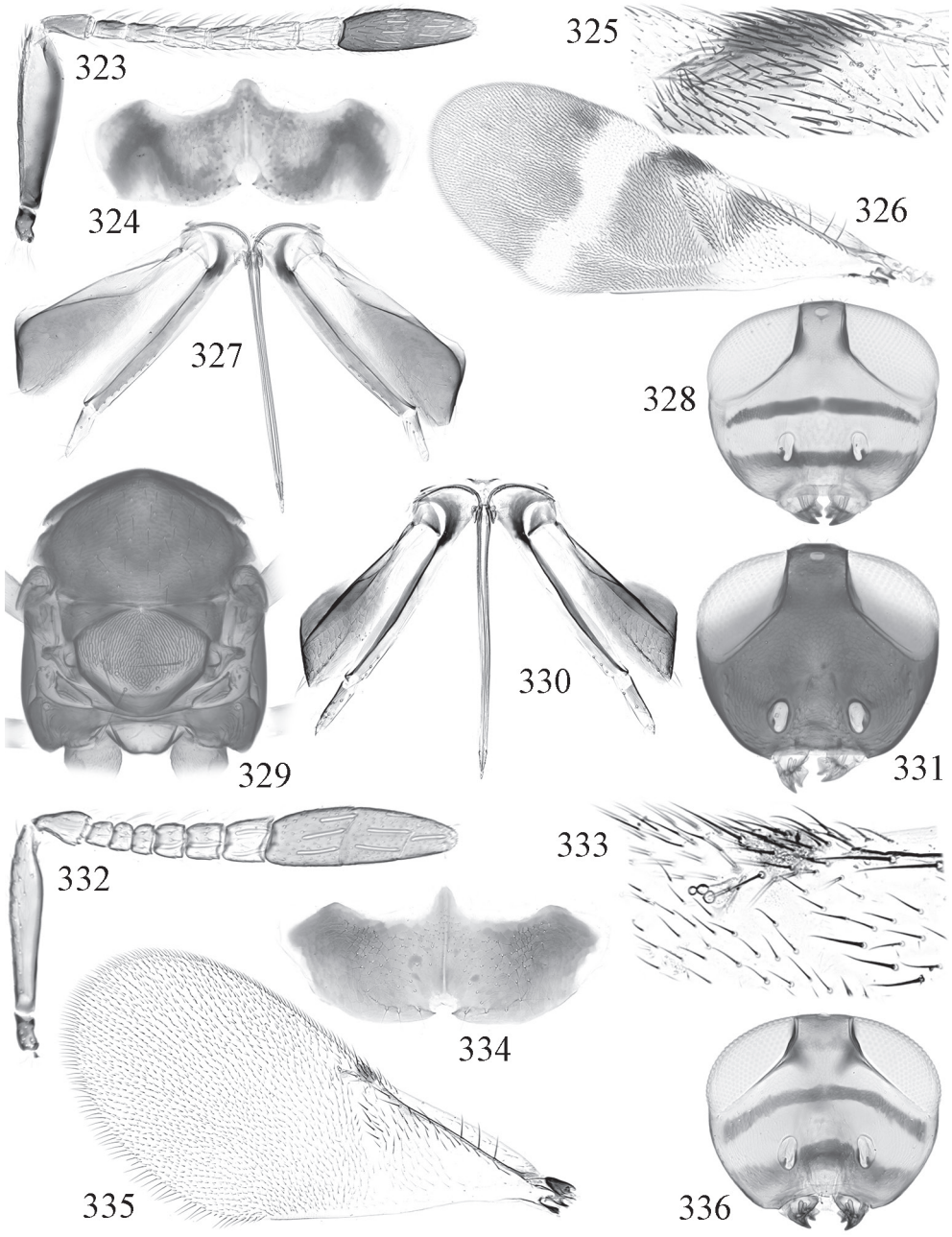
Figs 280-293. ***Coccidencyrtus solivus***, HT – (280) hypopygium. ***Coccidencyrtus thuryus*** – (281) head, facial view; (282) antenna; (283) apex of fore wing venation; (284) fore wing, smaller specimen; (285) fore wing; (286) mesosoma, dorsal view. ***Quetsira tinthrax*** – (287) mesosoma, dorsal view; (288) antenna (a, outer aspect of clava; b, inner aspect of clava); (289) fore wing; (290) head, facial aspect; (291) apex of fore wing venation; (292) hypopygium; (293) ovipositor.



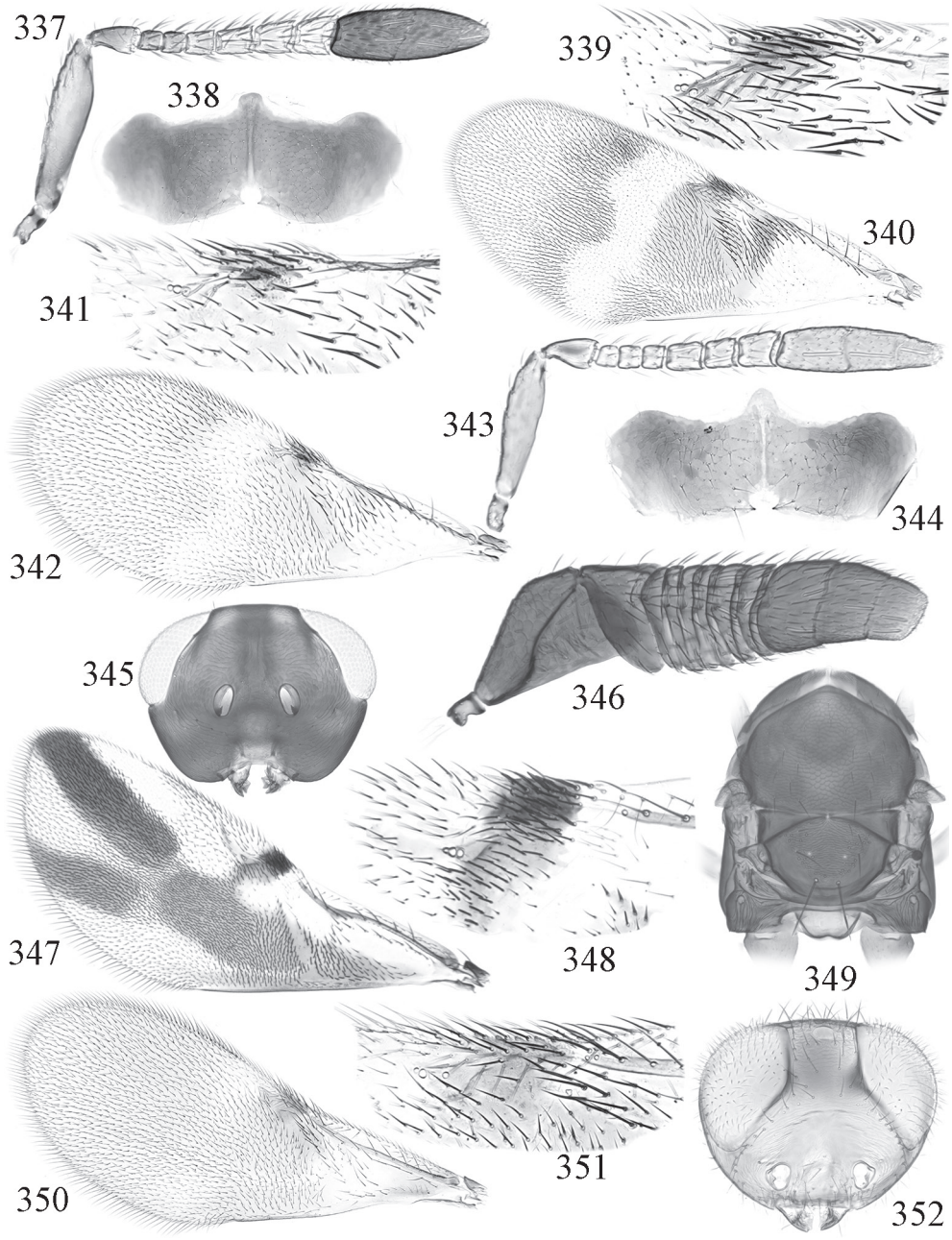
Figs 294-307. ***Neococcidencyrtus mansua*** – (294) antenna; (295) head, facial aspect; (296) apex of fore wing venation; (297) fore wing; (298) ovipositor; (299) hypopygium. ***Neococcidencyrtus grias***, HT – (300) head, facial aspect; (301) antenna; (302) fore wing; (303) apex of fore wing venation. ***Neococcidencyrtus drysus*** – (304) mesosoma. dorsal view; (305) antenna; (306) apex of fore wing venation; (307) hypopygium.



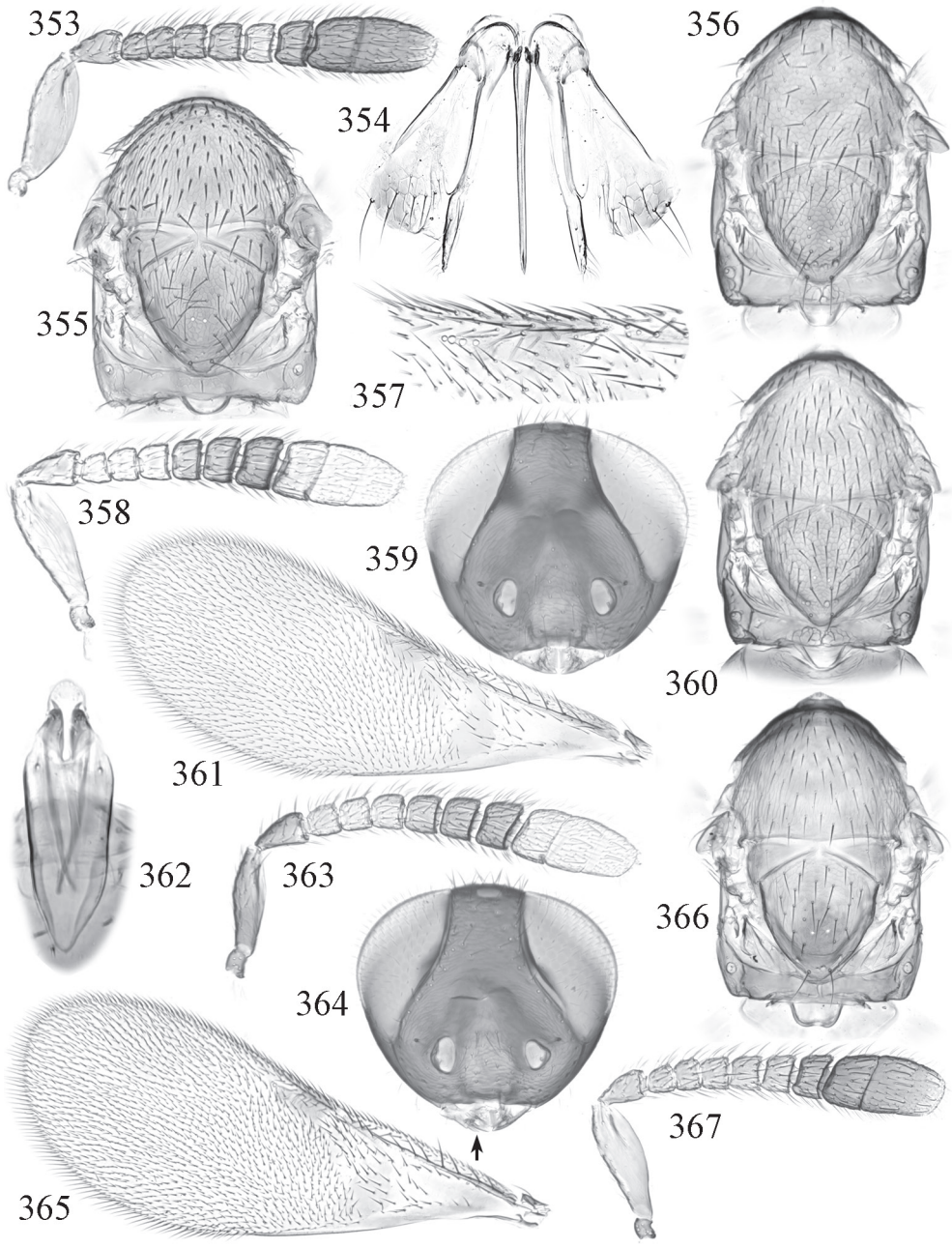
Figs 308-322. ***Neococcidencyrtus drysus*** – (308) ovipositor; (309) head, facial view; (310) fore wing. ***Neococcidencyrtus cyclope***, HT – (311) antenna; (312) head, facial view; (313) mesosoma, dorsal view); (314) apex of fore wing venation; (315) fore wing (apex slightly distorted); (316) hypopygium. ***Neococcidencyrtus hilaria***, HT – (317) antenna; (318) apex of fore wing venation; (319) fore wing; (320) ovipositor; (321) hypopygium; (322) head.



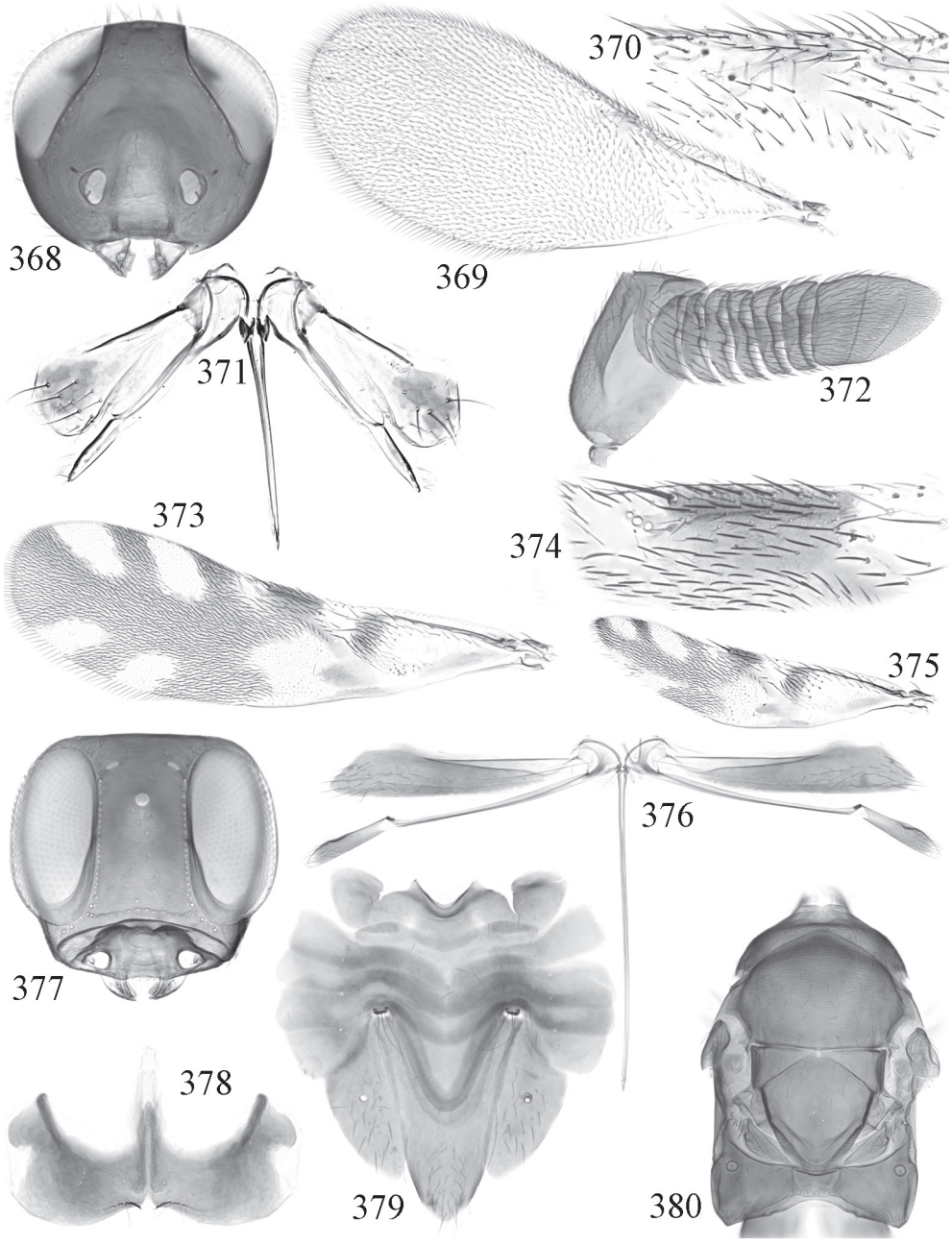
Figs 323-336. ***Neococcidencyrtus orion***, HT – (323) antenna; (324) hypopygium; (325) apex of fore wing venation; (326) fore wing; (327) ovipositor; (328) head, facial view. ***Neococcidencyrtus crouzelae*** – (329) mesosoma. dorsal view; (330) ovipositor; (331) head, facial view; (332) antenna; (333) apex of fore wing venation; (334) hypopygium; (335) fore wing. ***Neococcidencyrtus dracaenus***, HT – (336) head, facial view.



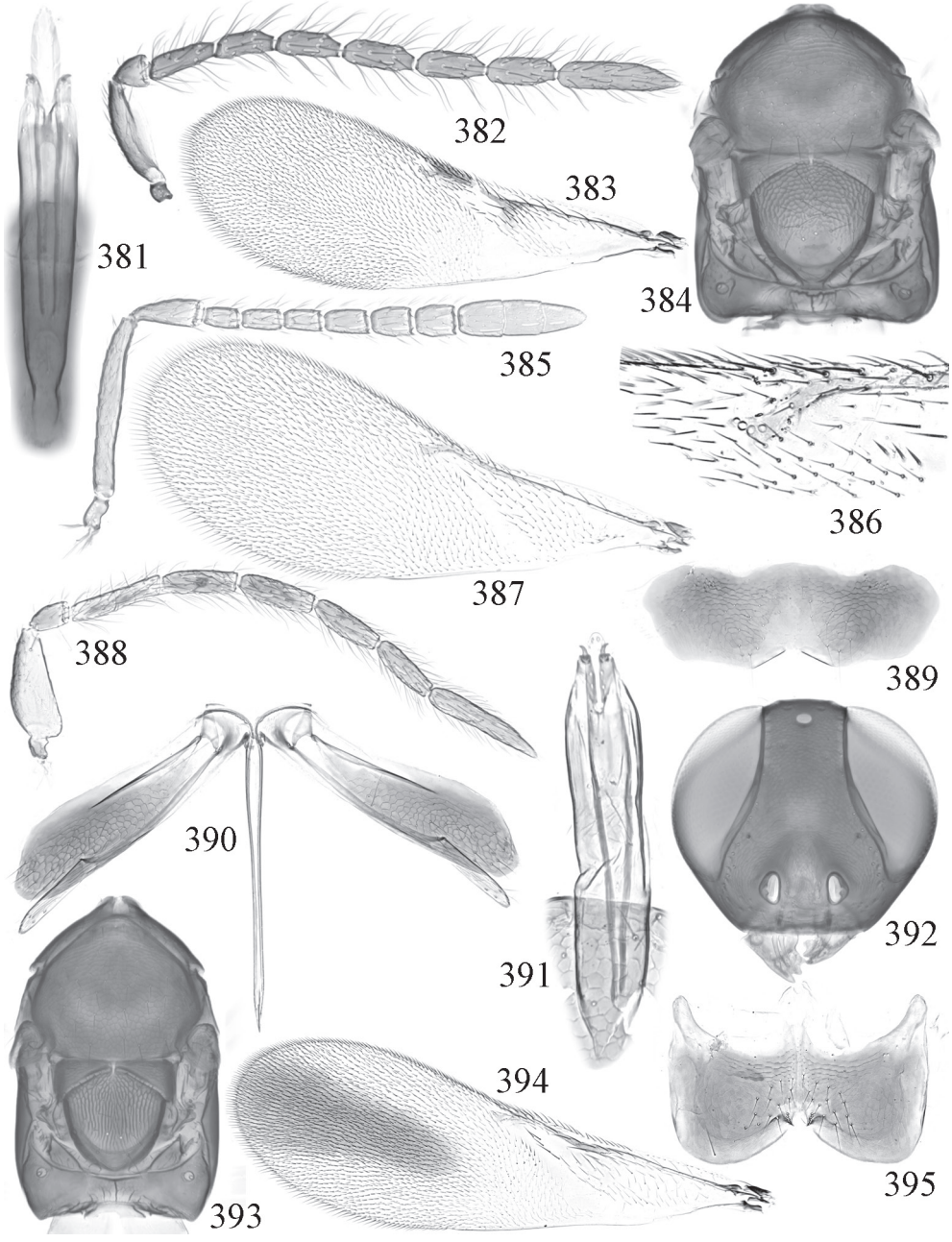
Figs 337-352. ***Neococcidencyrtus dracaenus***, HT – (337) antenna; (338) hypopygium; (339) apex of fore wing venation; (340) fore wing. ***Neococcidencyrtus plinthus***, HT – (341) apex of fore wing venation; (342) fore wing; (343) antenna; (344) hypopygium. ***Comperiella lemniscata*** – (345) head; (346) antenna; (347) fore wing; (348) apex of fore wing venation; (349) mesosoma, dorsal view. ***Orixia demos*** – (350) fore wing; (351) apex of fore wing venation; (352) head, facial view.



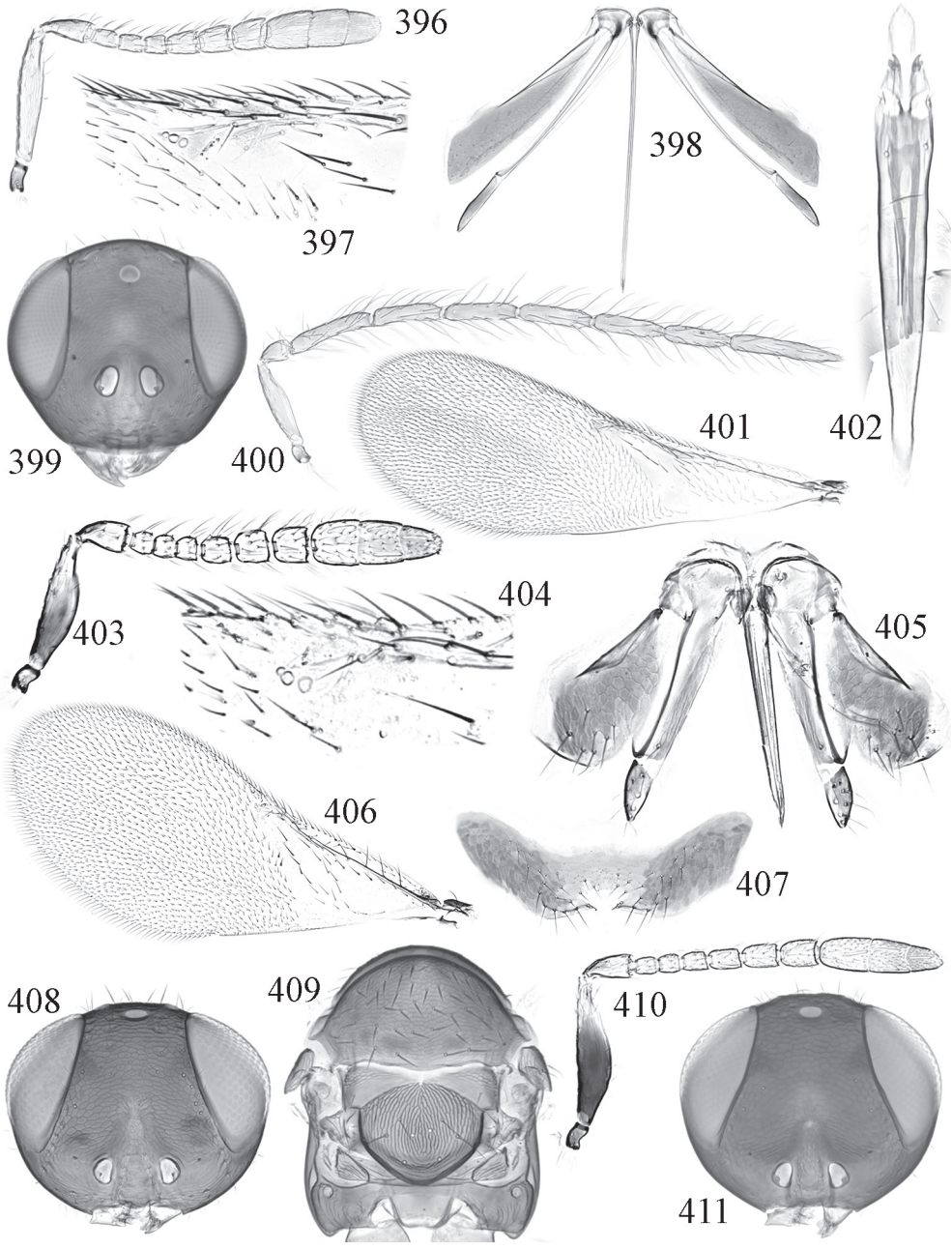
Figs 353-367. ***Orixia demos*** – (353) antenna; (354) ovipositor; (355) mesosoma, dorsal view. ***Orixia philotes*** – (356) mesosoma, dorsal view; (357) apex of fore wing venation; (358) antenna; (359) head, facial view; (360) mesosoma, dorsal view, ♂; (361) fore wing; (362) genitalia, ♂; (363) antenna, ♂; (364) head, facial view, ventral mandibular peg arrowed, ♂; (365) fore wing, ♂. ***Orixia sirus***, HT – (366) mesosoma, dorsal view; (367) antenna.



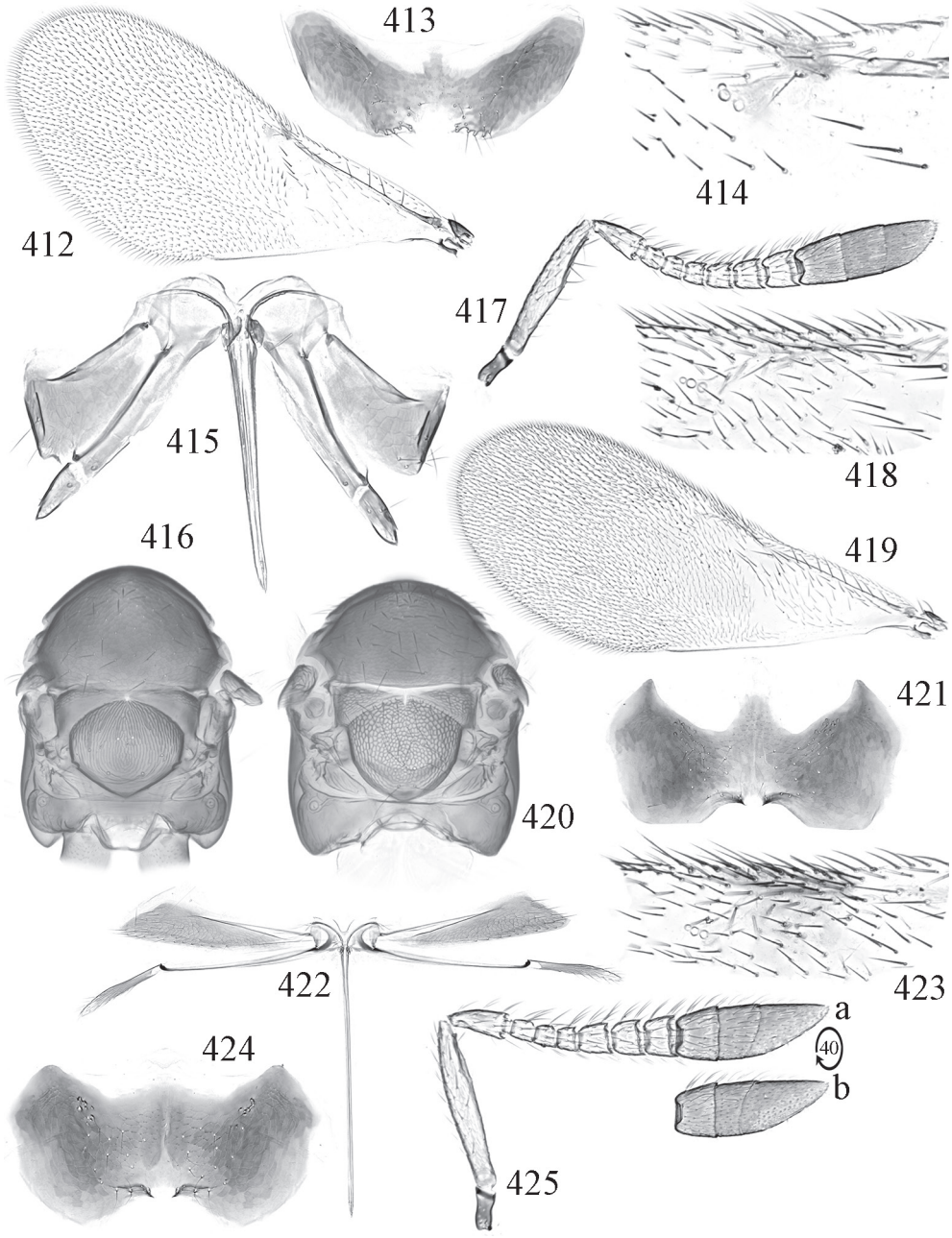
Figs 368-380. ***Orixia sirus***, HT – (368) head, facial view; (369) fore wing; (370) ovipositor. ***Cerapterocerus phragmitis*** – (372) antenna; (373) fore wing, macropterous form; (374) apex of fore wing venation, macropterous form; (375) fore wing, brachypterous form; (376) ovipositor; (377) head, facial view; (378) hypopygium; (379) gastral tergites; (380) mesosoma, dorsal view.



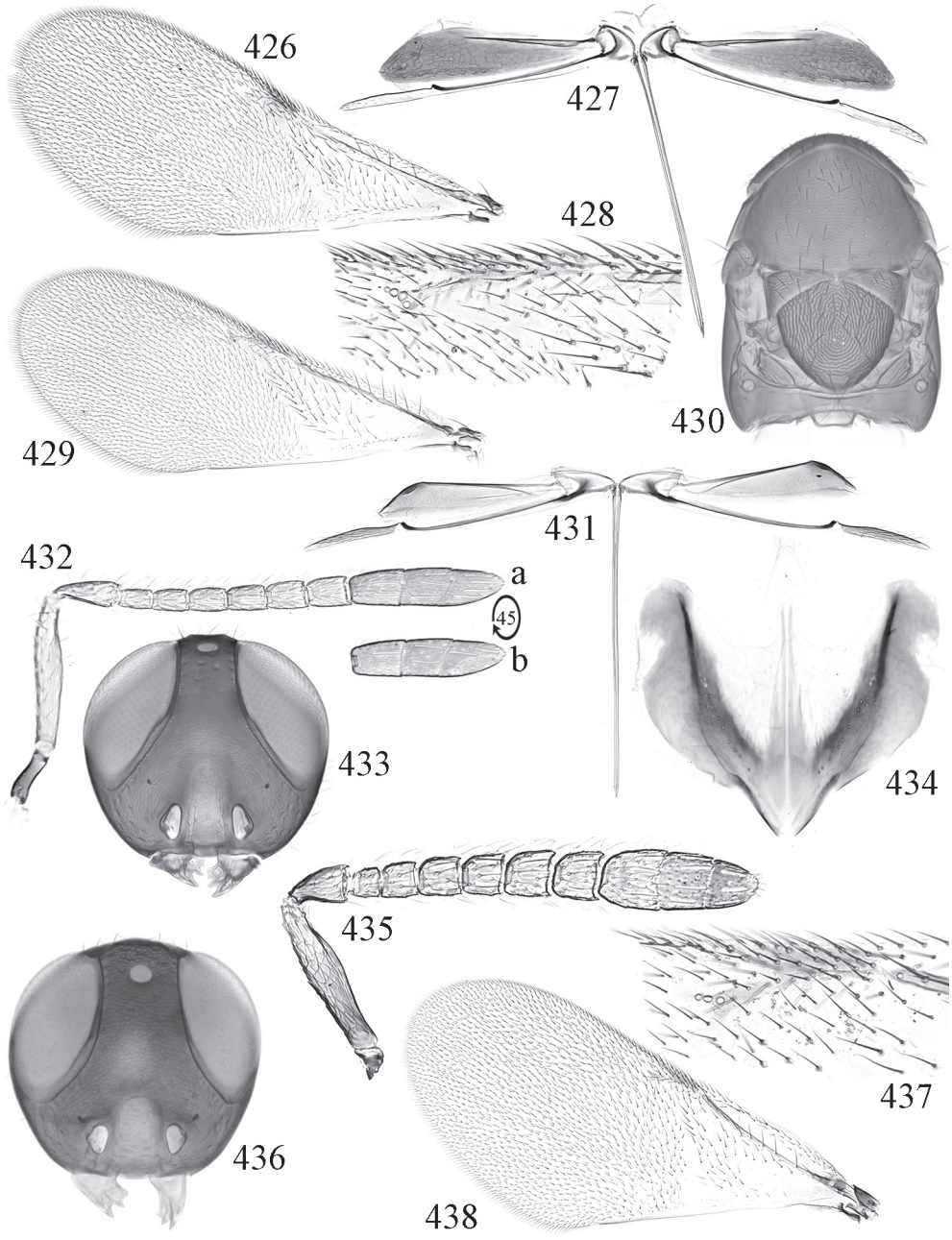
Figs 381-395. ***Cerapterocerus phragmitis*** – (381) genitalia, ♂; (382) antenna, ♂; (383) fore wing, ♂. ***Helegonatopus pseudophanes*** – (384) mesosoma, dorsal view; (385) antenna; (386) apex of fore wing venation; (387) fore wing; (388) antenna, ♂; (389) hypopygium; (390) ovipositor; (391) genitalia, ♂. ***Mahencyrtus nitidus*** – (392) head, facial view; (393) mesosoma, dorsal view; (394) fore wing; (395) hypopygium.



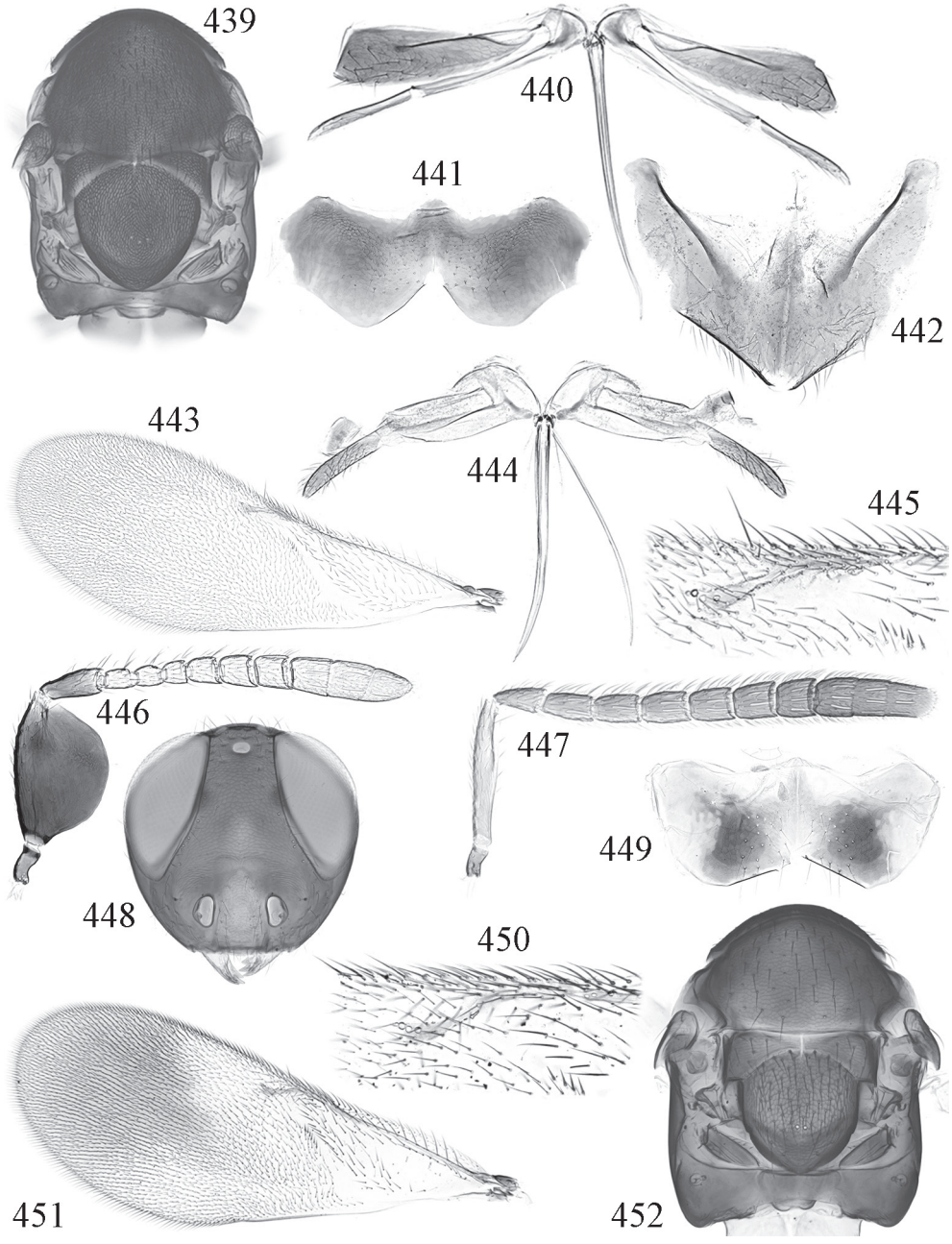
Figs 396-411. ***Mahencyrtus nitidus*** – (396) antenna; (397) apex of fore wing venation; (398) ovipositor; (399) head, facial view, ♂; (400) antenna, ♂; (401) fore wing, ♂; (402) genitalia, ♂. ***Tico sinabelus*** – (403) antenna; (404) apex of fore wing venation; (405) ovipositor; (406) fore wing; (407) hypopygium; (408) head, facial view; (409) mesosoma, dorsal view. ***Tico ryaspis*** – (410) antenna; (411) head, facial view.



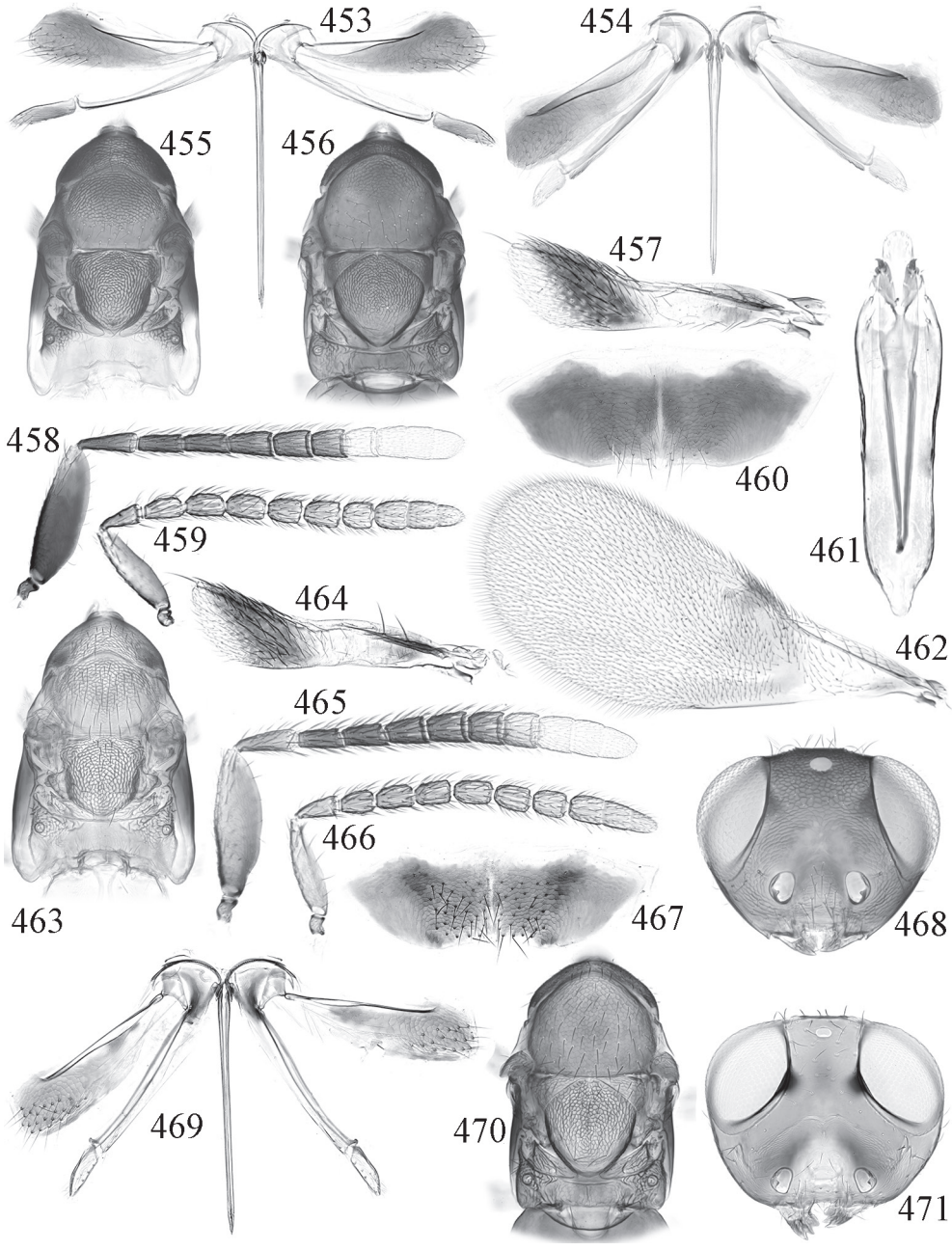
Figs 412-425. ***Tico ryaspis*** – (412) fore wing; (413) hypopygium; (414) apex of fore wing venation; (415) ovipositor; (416) mesosoma, dorsal view. ***Georynus aitne*** – (417) antenna; (418) apex of fore wing venation; (419) fore wing; (420) mesosoma, dorsal view; (421) hypopygium; (422) ovipositor. ***Georynus dionysus***, HT – (423) apex of fore wing venation; (424) ovipositor; (425) antenna (a, outer aspect of clava; b, inner aspect of clava).



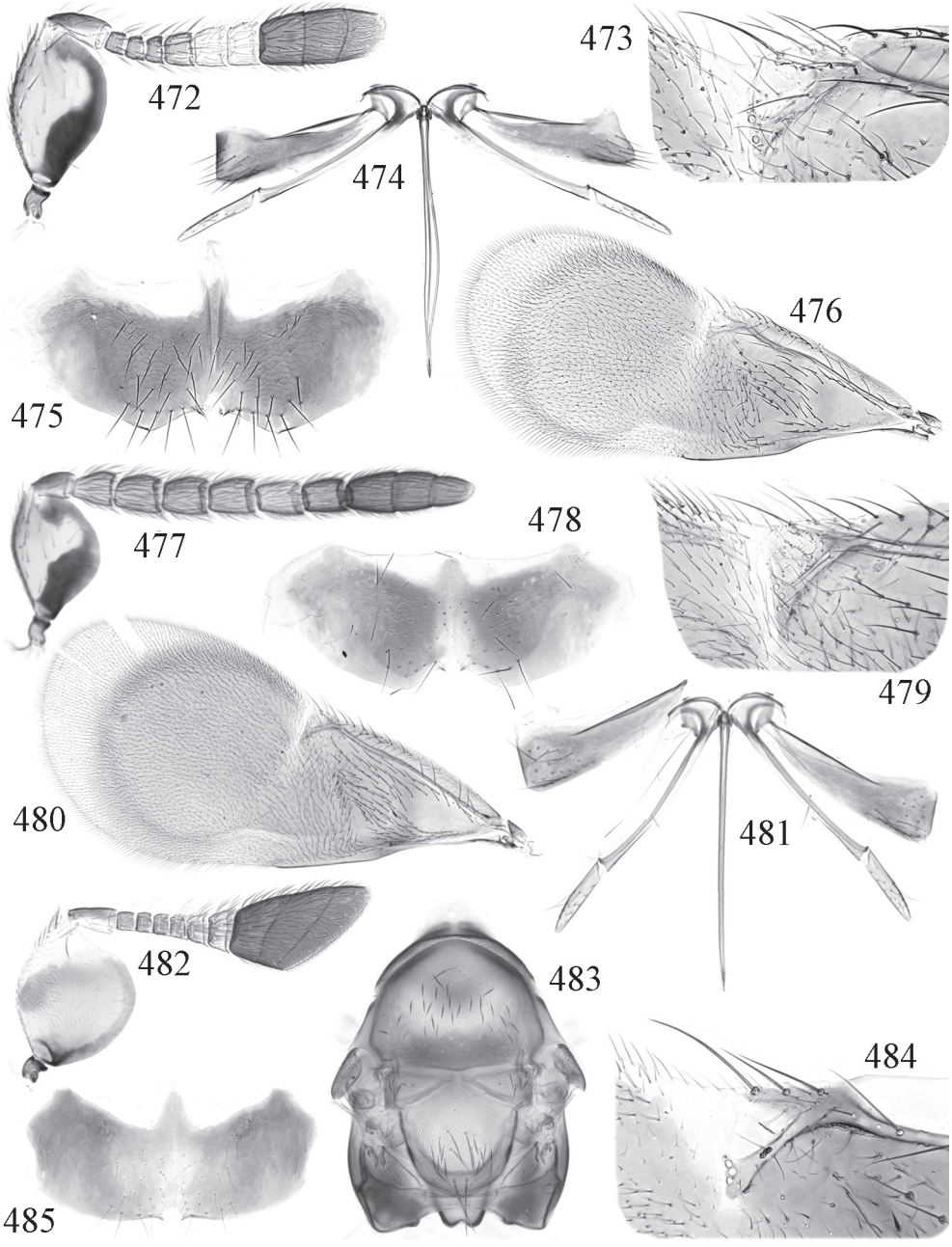
Figs 426-438. ***Georynus dionysus***. HT – (426) fore wing; (427) ovipositor. ***Prionias nodutus*** – (428) apex of fore wing venation, HT; (429) fore wing, HT; (430) mesosoma, dorsal view, HT; (431) ovipositor, HT; (432) antenna (a, outer aspect of clava; b, inner aspect of clava), HT; (433) head, facial aspect, HT; (434) hypopygium. ***Strigenia laras***, HT – (435) antenna; (436) head, facial view; (437) apex of fore wing venation; (438) fore wing.



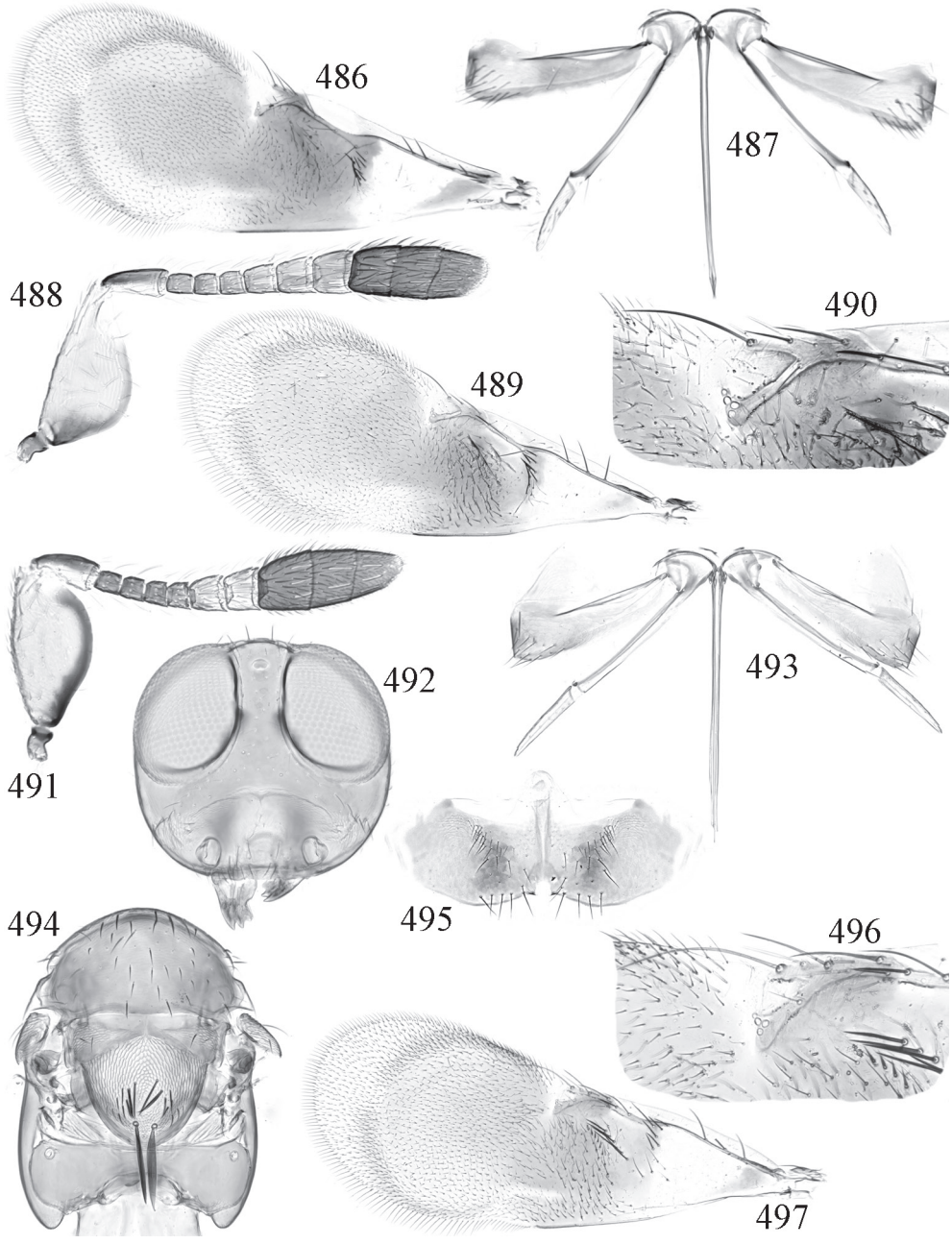
Figs 439-452. ***Strigenia laras***, HT – (439) mesosoma, dorsal view; (440) ovipositor; (441) hypopygium. ***Stadima moros*** – (442) hypopygium; (443) fore wing; (444) ovipositor; (445) apex of fore wing venation; (446) antenna. ***Oodia japetus***, HT – (447) antenna; (448) head, facial view; (449) hypopygium; (450) apex of fore wing venation; (451) fore wing (reconstructed); (452) mesosoma, dorsal view.



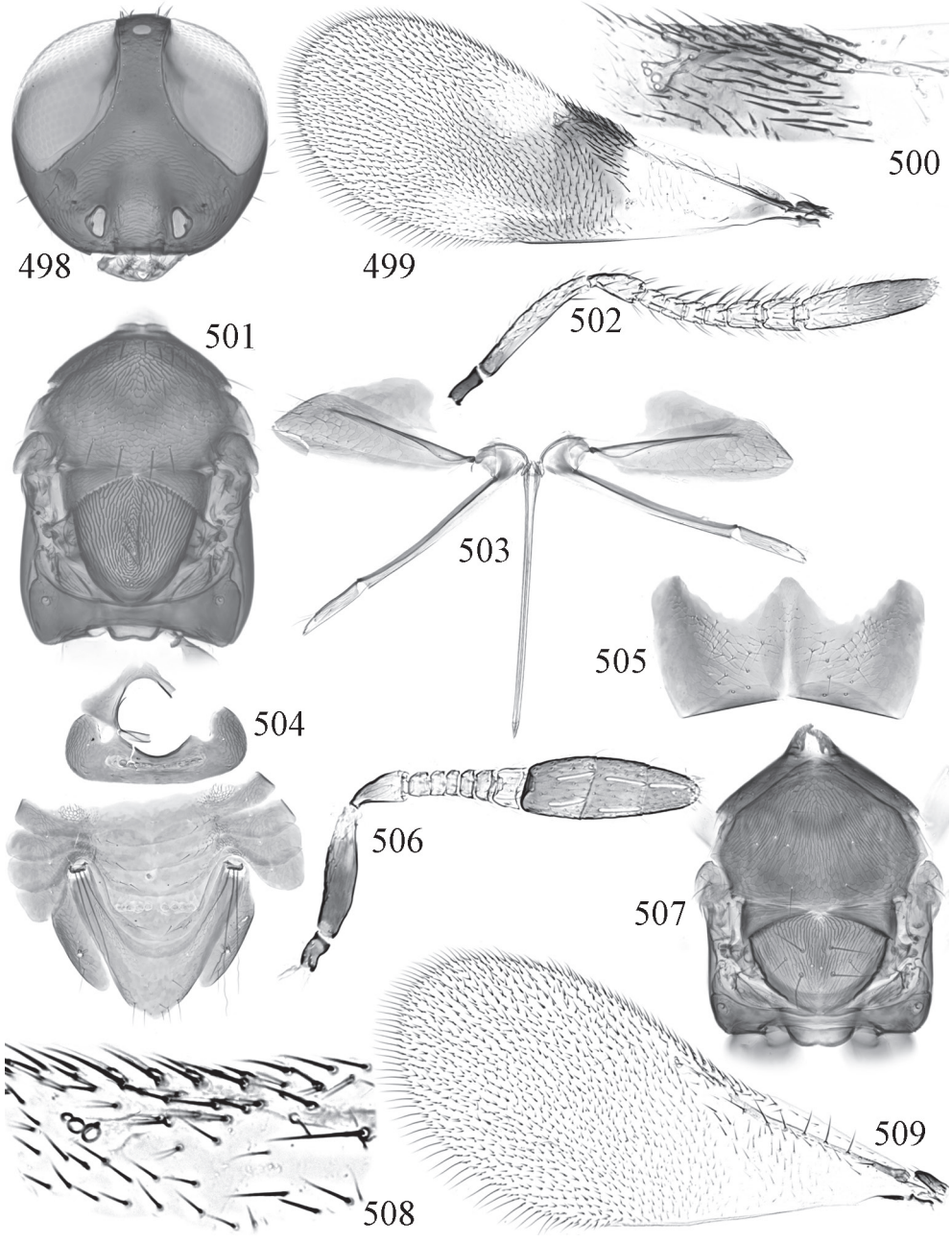
Figs 453-471. ***Oodia japetus***, HT – (453) ovipositor. ***Ludesia hemera*** – (454) ovipositor; (455) mesosoma, dorsal view; (456) mesosoma, dorsal view, ♂; (457) fore wing; (458) antenna; (459) antenna, ♂; (460) hypopygium; (461) genitalia, ♂; (462) fore wing, ♂. ***Ludesia amalthea*** – (463) mesosoma, dorsal view; (464) fore wing; (465) antenna; (466) antenna, ♂; (467) hypopygium; (468) head, facial view, ♂; (469) ovipositor; (470) mesosoma, dorsal view, ♂. ***Angebra praxadike*** – (471) head, facial view.



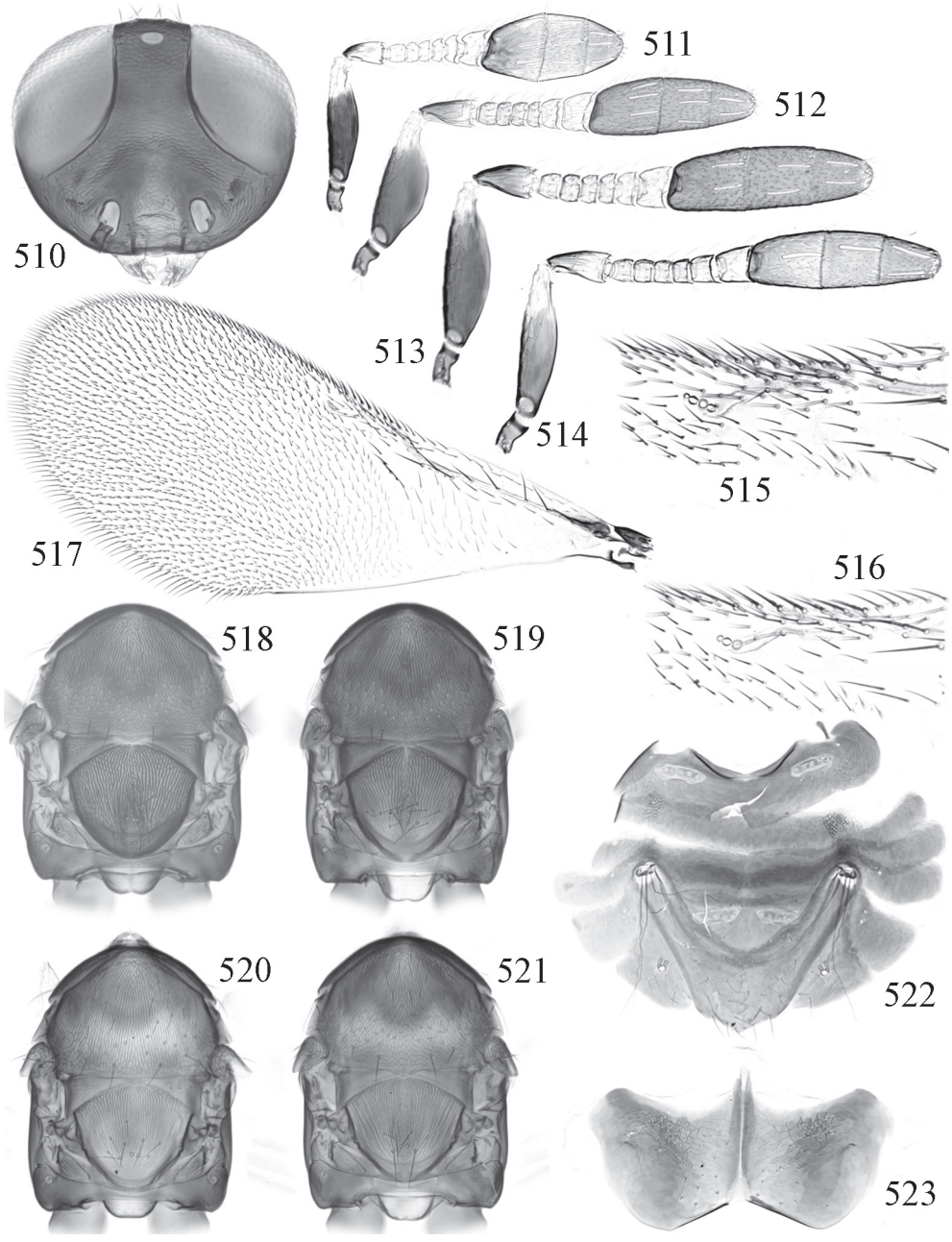
Figs 472-485. ***Angebra praxadike*** – (472) antenna; (473) apex of fore wing venation; (474) ovipositor; (475) hypopygium; (476) fore wing. ***Angebra harpalyke*** – (477) antenna; (478) hypopygium; (479) apex of fore wing venation; (480) fore wing; (481) ovipositor. ***Anisophleps aoedis***, HT – (482) antenna; (483) mesosoma, dorsal view; (484) apex of fore wing venation; (485) hypopygium.



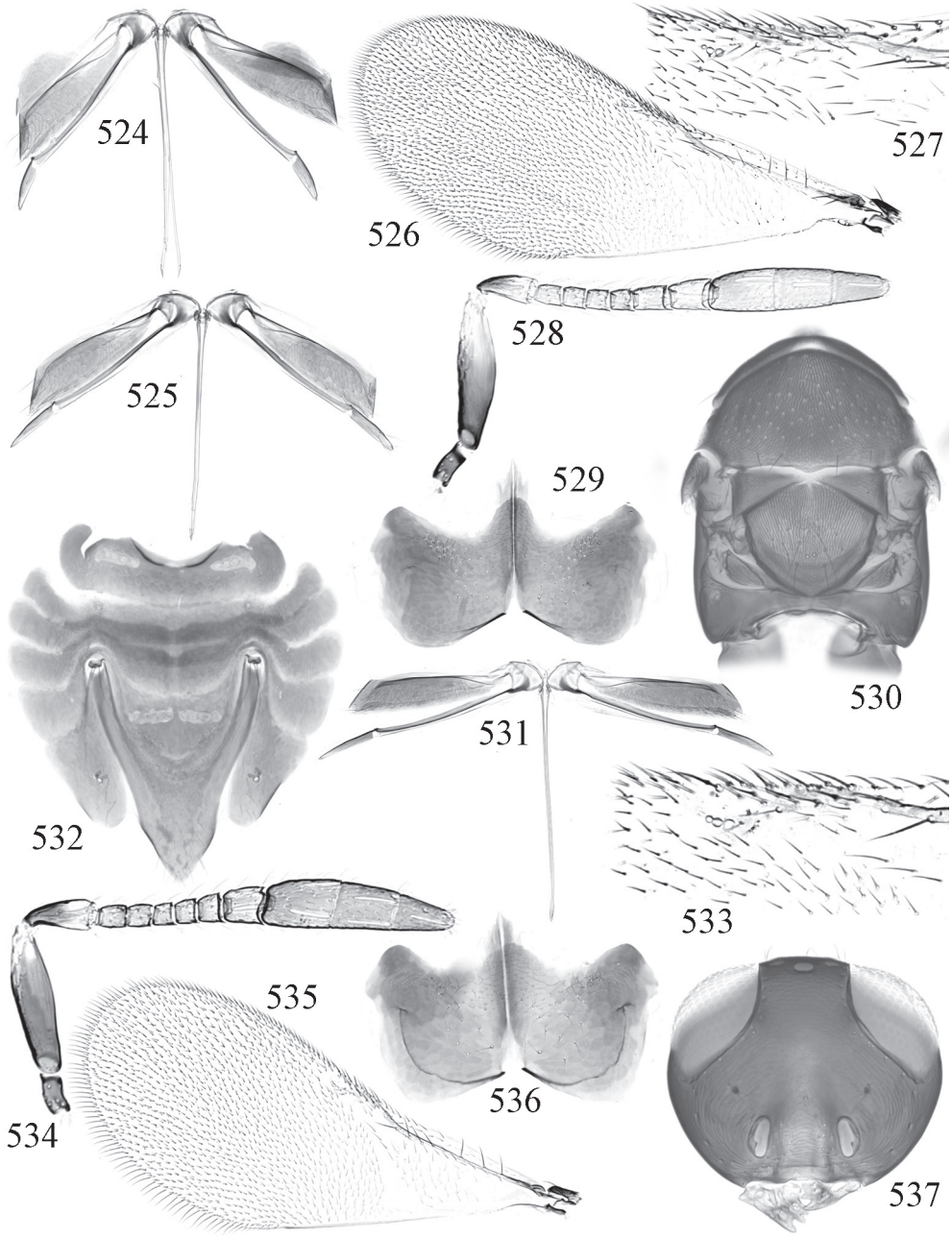
Figs 486-497. ***Anisophleps aoedis***, HT – (486) fore wing (composite of left and right wings); (487) ovipositor. ***Anisophleps carpo*** – (488) antenna; (489) fore wing; (490) apex of fore wing venation. ***Lakshaphagus arnulfoi***, HT – (491) antenna; (492) head, facial view; (493) ovipositor (restructured); (494) mesosoma, dorsal view; (495) hypopygium (restructured); (496) apex of fore wing venation; (497) fore wing.



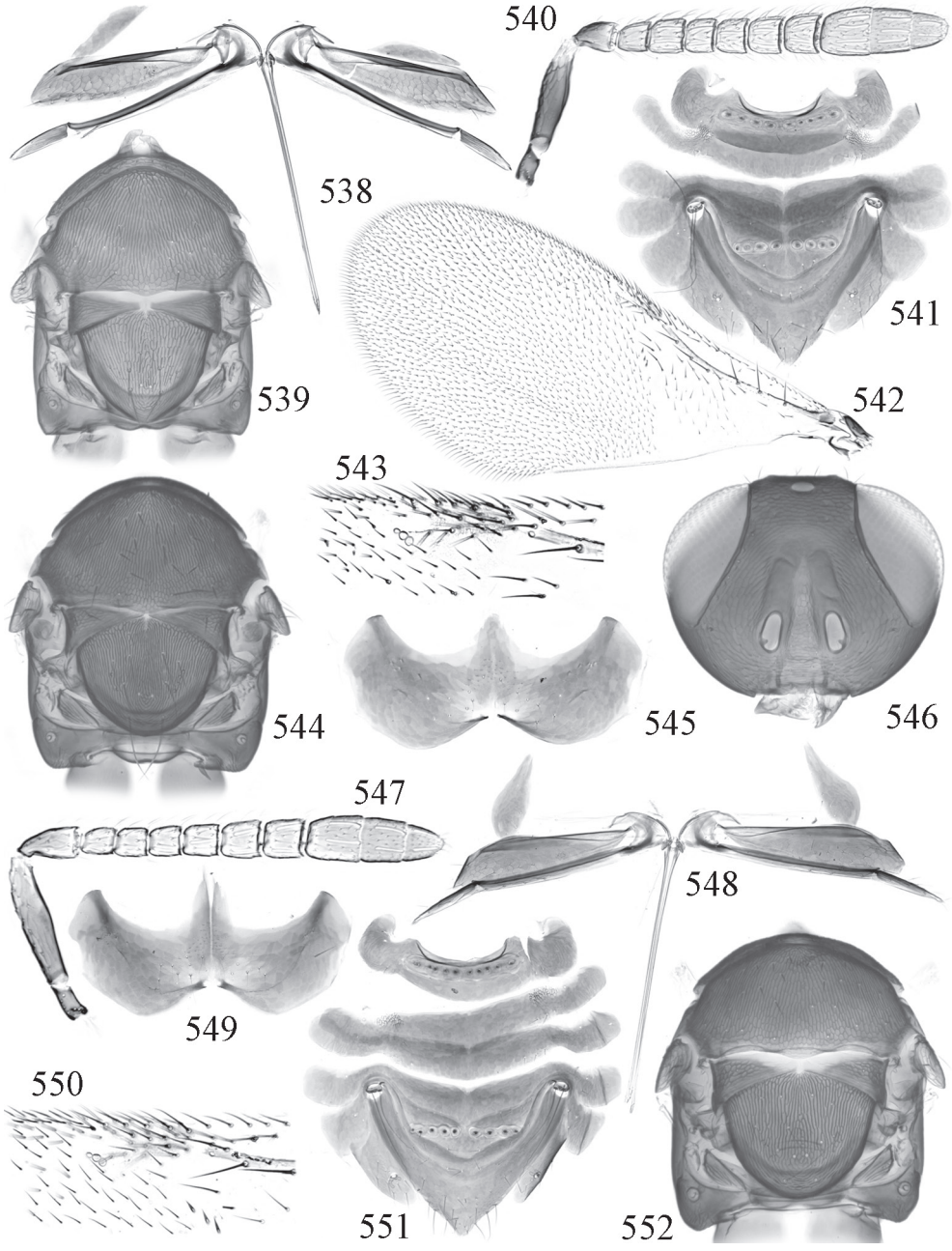
Figs 498-509. ***Cheiloneurus magnolia*** – (498) head, facial view (modified); (499) fore wing; (500) apex of fore wing venation; (501) mesosoma, dorsal view; (502) antenna; (503) ovipositor; (504) gastral tergites, showing "glands" on Gt1 and Gt5; (505) hypopygium (posterior margin partly folded inwards). ***Cheiloneurus vitara***, HT – (506) antenna; (507) mesosoma, dorsal view; (508) apex of fore wing venation; (509) fore wing.



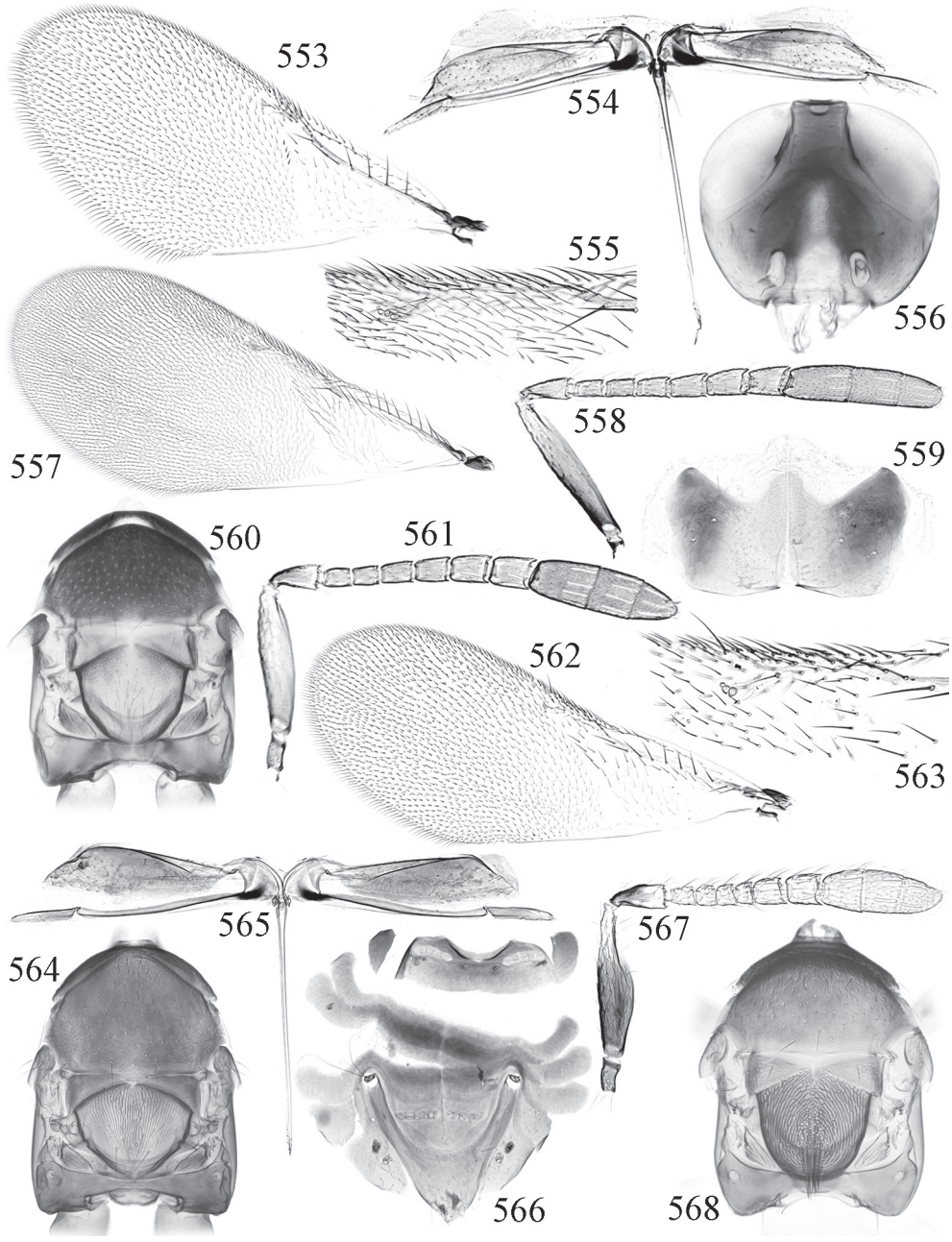
Figs 510-523. ***Cheiloneurus argentipes*** – (510) head, facial view; (511) antenna, variant (clava collapsed); (512) antenna, variant; (513) antenna, variant; (514) antenna, variant; (515) apex of fore wing venation, larger specimen; (516) apex of fore wing venation, smaller specimen; (517) fore wing; (518) mesosoma, dorsal view, variant; (519) mesosoma, dorsal view, variant; (520) mesosoma, dorsal view, variant; (521) mesosoma, dorsal view, variant; (522) gastral tergites showing "glands" on Gt1 and Gt5; (523) hypopygium.



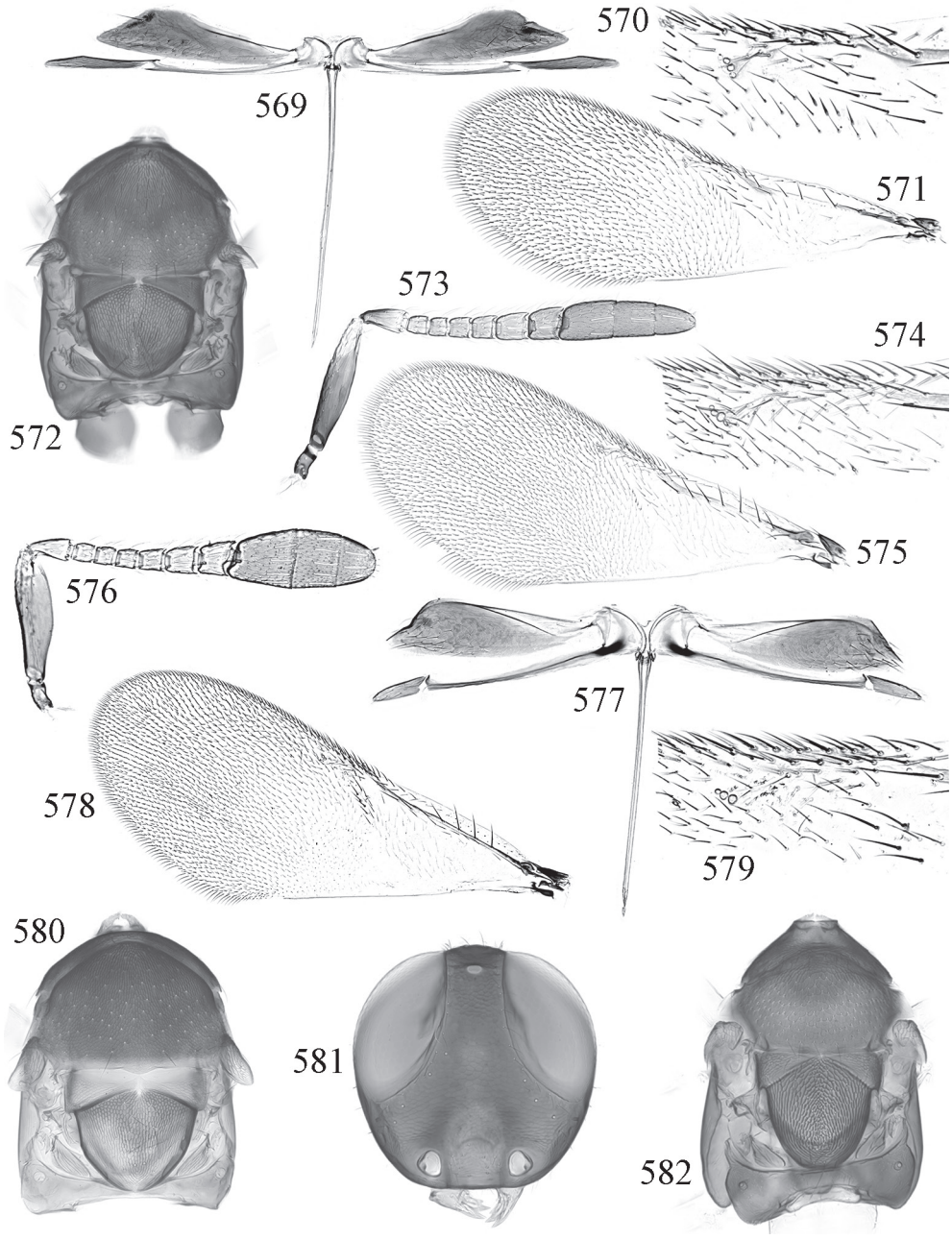
Figs 524-537. ***Cheiloneurus argentipes*** – (524) ovipositor, variant; (525) ovipositor, variant. ***Cheiloneurus sophocles***, HT – (526) forewing; (527) apex of fore wing venation; (528) antenna; (529) hypopygium; (530) mesosoma, dorsal view; (531) ovipositor; (532) gastral tergites showing "glands" on Gt1 and Gt5. ***Cheiloneurus carita***, HT – (533) apex of fore wing venation; (534) antenna; (535) fore wing; (536) hypopygium; (537) head, facial view.



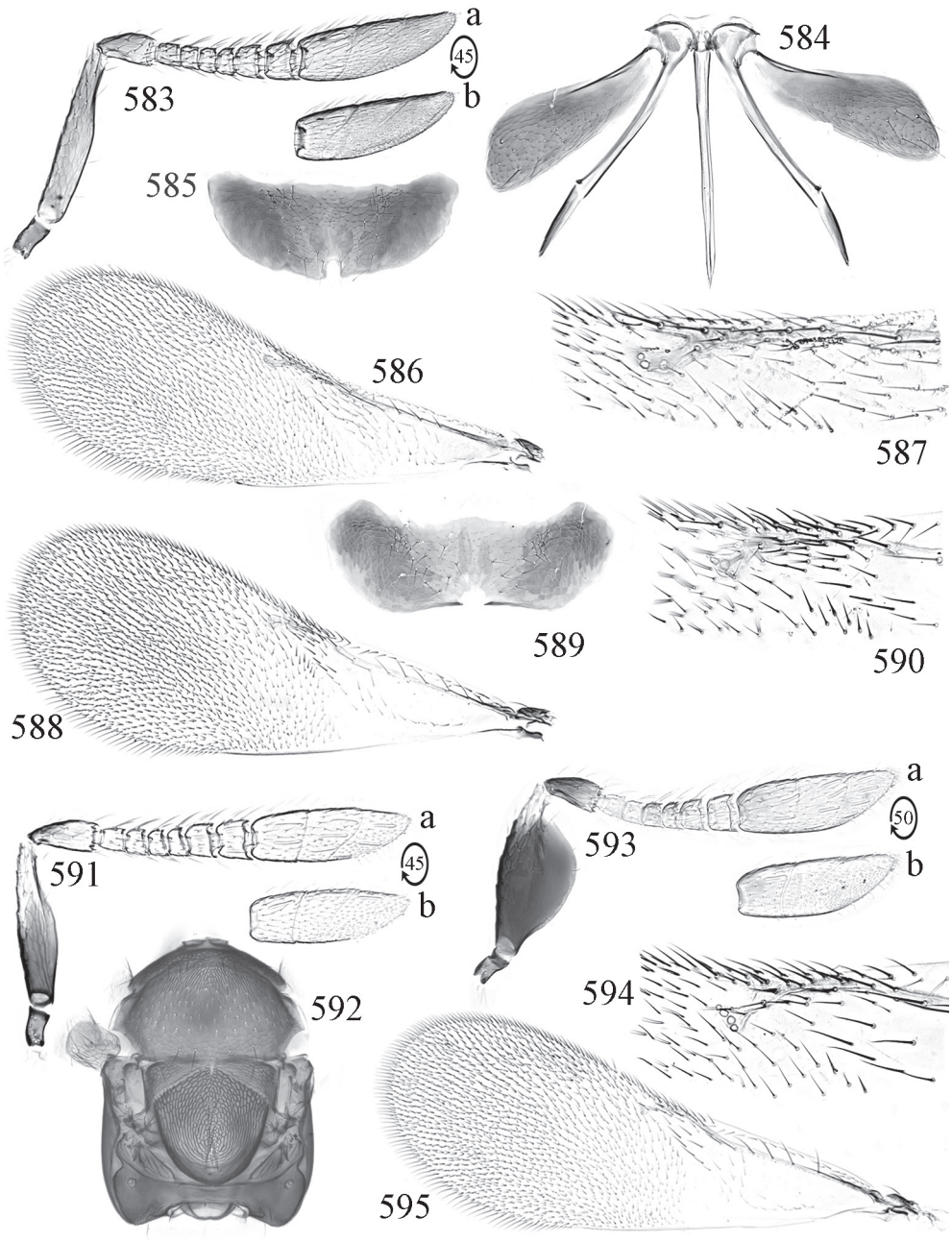
Figs 538-552. ***Cheiloneurus carita***, HT – (538) ovipositor; (539) mesosoma, dorsal view. ***Cheiloneurus epytus*** – (540) antenna; (541) gastral tergites, showing "glands" on Gt1 and Gt5; (542) fore wing; (543) apex of fore wing venation; (544) mesosoma, dorsal view; (545) hypopygium; (546) head, facial view. ***Cheiloneurus danessa***, HT – (547) antenna; (548) ovipositor; (549) hypopygium; (550) apex of fore wing venation; (551) gastral tergites showing "glands" on Gt1 and Gt5; (552) mesosoma, dorsal view.



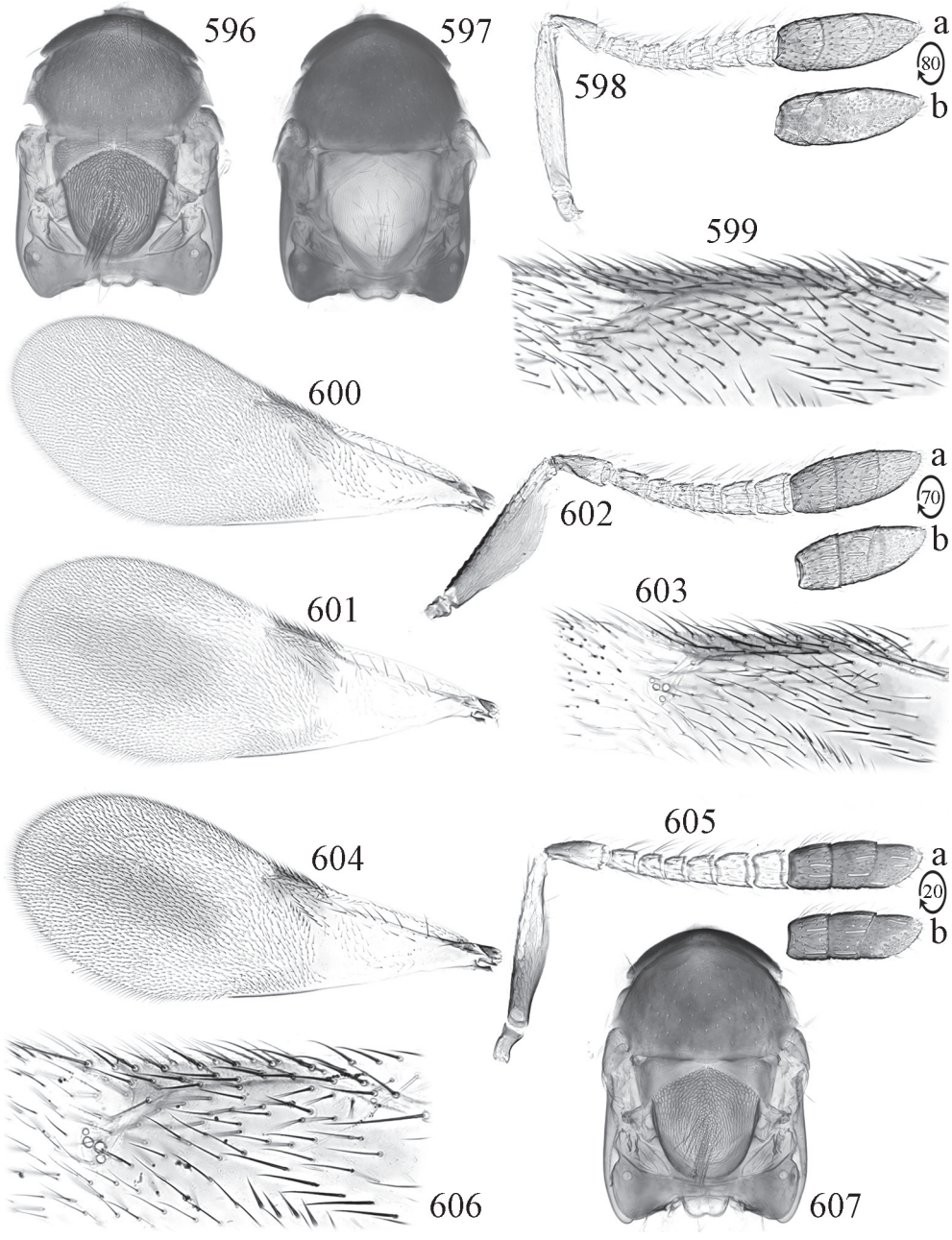
Figs 553-568. ***Cheiloneurus danessa***, HT – (553) fore wing. ***Cheiloneurus idris*** – (554) ovipositor; (555) apex of fore wing venation; (556) head, facial view; (557) fore wing; (558) antenna; (559) hypopygium; (560) mesosoma, dorsal view. ***Cheiloneurus socrates***, HT – (561) antenna; (562) fore wing; (563) apex of fore wing venation; (564) mesosoma, dorsal view; (565) ovipositor; (566) gastral tergites showing "glands" on Gt1 and Gt5. ***Cheiloneurus roellus***, HT – (567) antenna; (568) mesosoma, dorsal view.



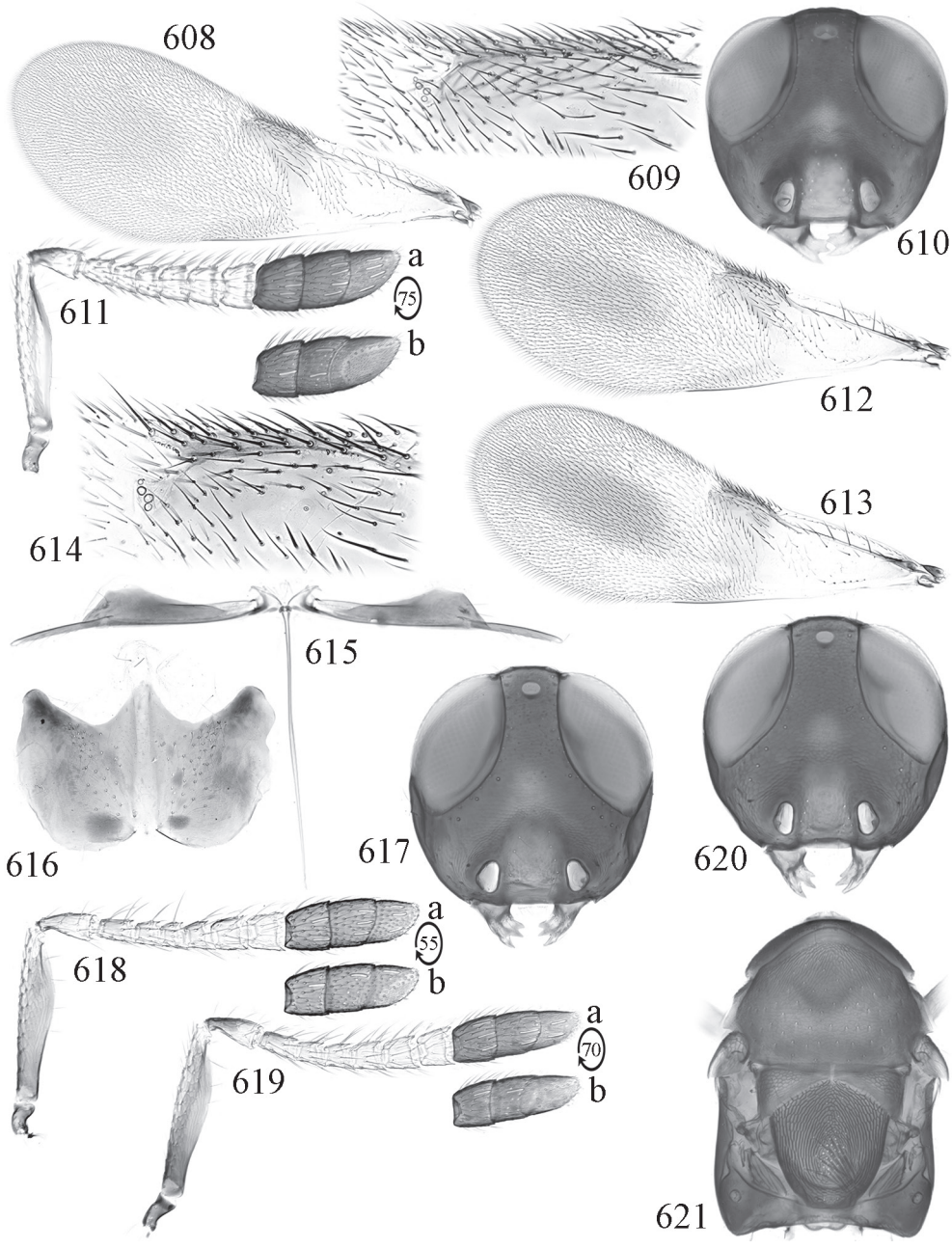
Figs 569-582. ***Cheiloneurus roellus***, HT – (569) ovipositor; (570) apex of fore wing venation; (571) fore wing. ***Cheiloneurus dalycera*** – (572) mesosoma, dorsal view; (573) antenna; (574) apex of fore wing venation; (575) fore wing. ***Cheiloneurus ection***, HT – (576) antenna (clava slightly collapsed); (577) ovipositor; (578) fore wing; (579) apex of fore wing venation; (580) mesosoma, dorsal view. ***Cheiloneurus parvus*** – (581) head, facial view (reconstructed); (582) mesosoma, dorsal view.



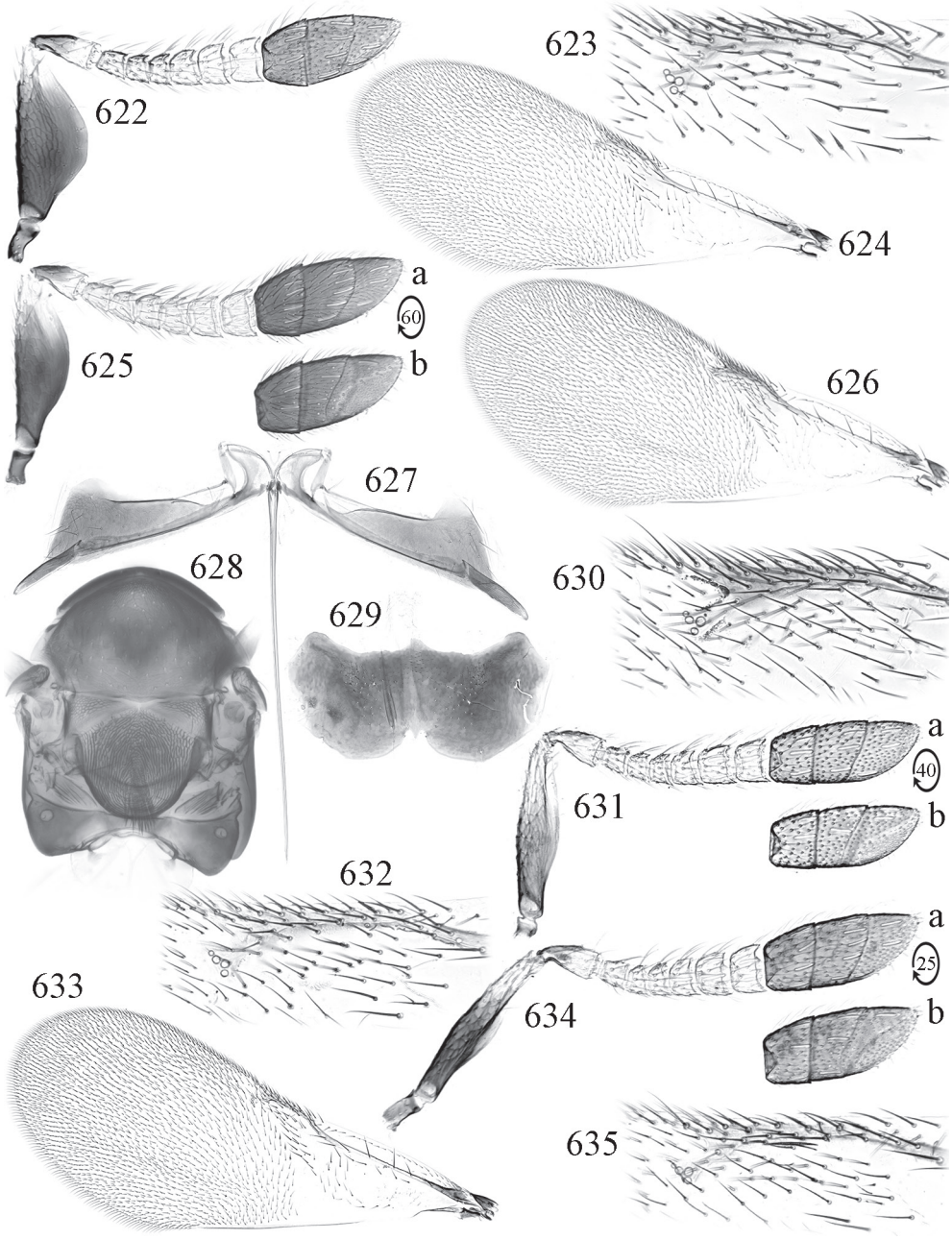
Figs 583-595. ***Cheiloneurus parvus*** – (583) antenna (a, outer aspect of clava; b, inner aspect of clava); (584) ovipositor; (585) hypopygium; (586) fore wing; (587) apex of fore wing venation. ***Cheiloneurus semis*** – (588) fore wing; (589) hypopygium; (590) apex of fore wing venation; (591) antenna (a, outer aspect of clava; b, inner aspect of clava); (592) mesosoma, dorsal view. ***Cheiloneurus catreta*** – (593) antenna (a, outer aspect of clava; b, inner aspect of clava); (594) apex of fore wing venation; (595) fore wing.



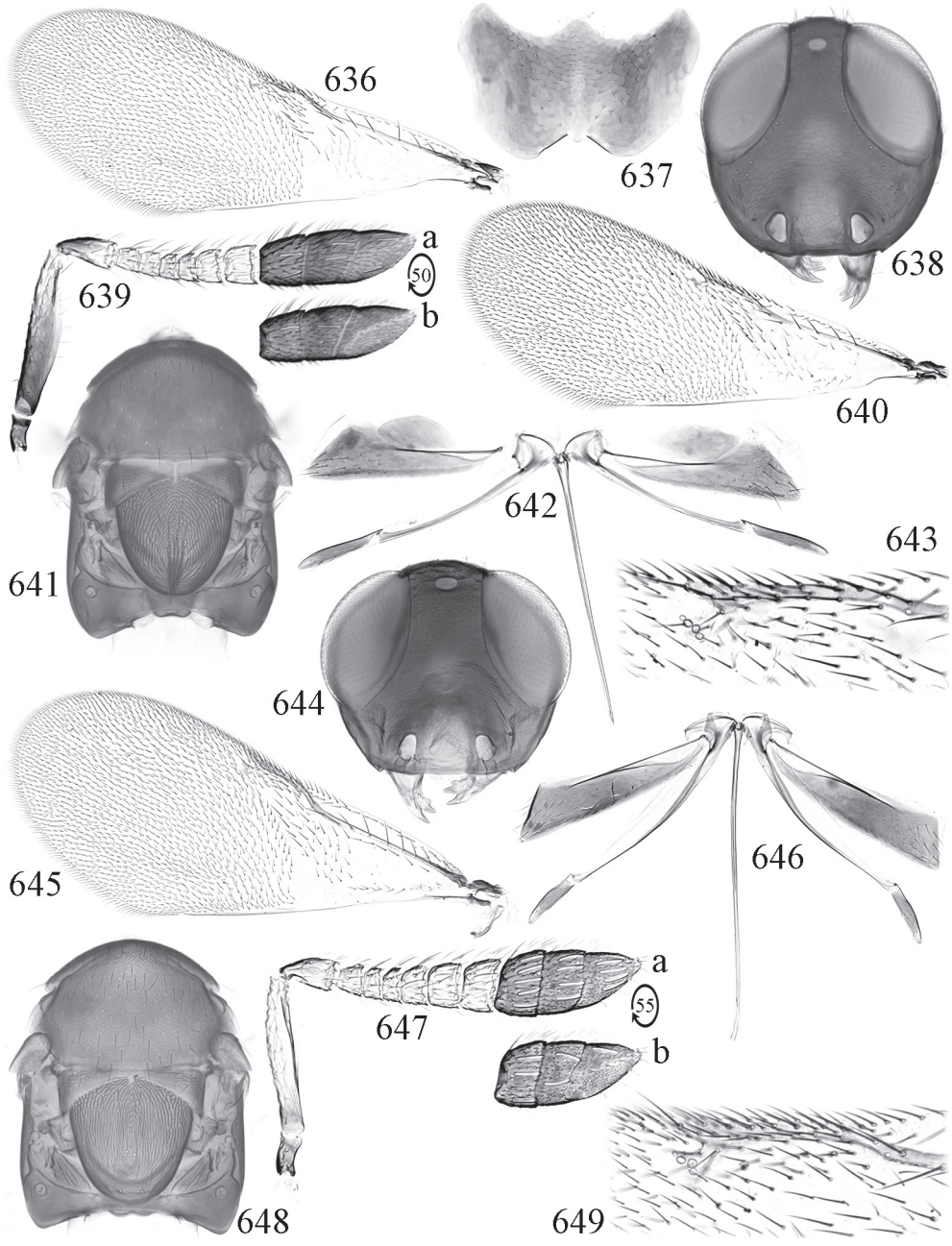
Figs 596-607. ***Cheiloneurus catreta*** – (596) mesosoma, dorsal view. ***Cheiloneurus herndonia***, HT – (597) mesosoma, dorsal view; (598) antenna (a, outer aspect of clava; b, inner aspect of clava); (599) apex of fore wing venation; (600) fore wing. ***Cheiloneurus exeres*** – (601) fore wing; (602) antenna (a, outer aspect of clava; b, inner aspect of clava); (603) apex of fore wing venation. ***Cheiloneurus fidenas*** – (604) fore wing; (605) antenna (a, outer aspect of clava; b, inner aspect of clava); (606) apex of fore wing venation; (607) mesosoma, dorsal view.



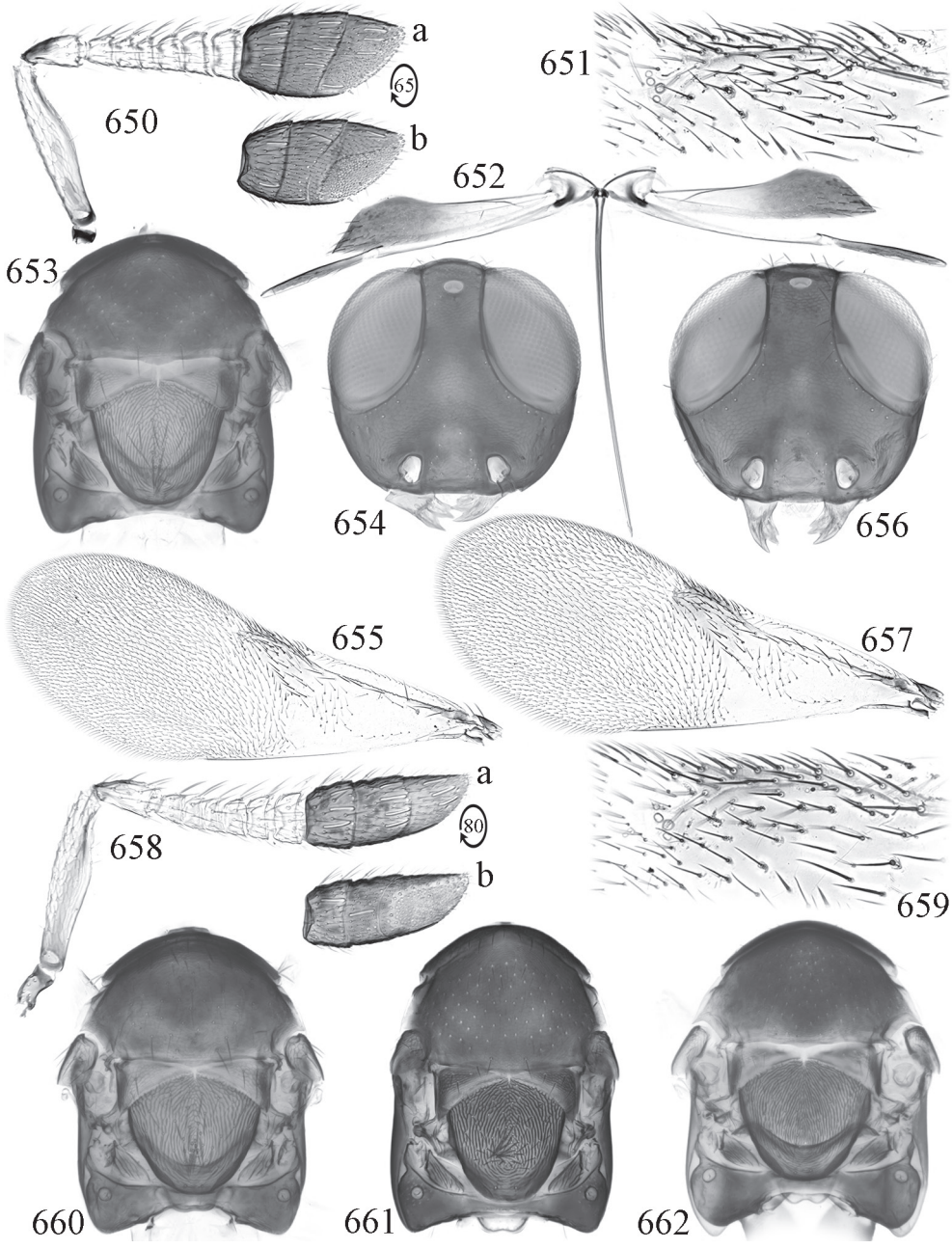
Figs 608-621. ***Cheiloneurus miklo*** – (608) fore wing; (609) apex of fore wing venation; (610) head, facial view; (611) antenna (a, outer aspect of clava; b, inner aspect of clava). ***Cheiloneurus lamus*** – (612) fore wing, variant; (613) fore wing, variant; (614) apex of fore wing venation; (615) ovipositor; (616) hypopygium; (617) head, facial view; (618) antenna, variant (a, outer aspect of clava; b, inner aspect of clava); (619) antenna, variant (a, outer aspect of clava; b, inner aspect of clava). ***Cheiloneurus varablus***, HT – (620) head, facial view; (621) mesosoma, dorsal view.



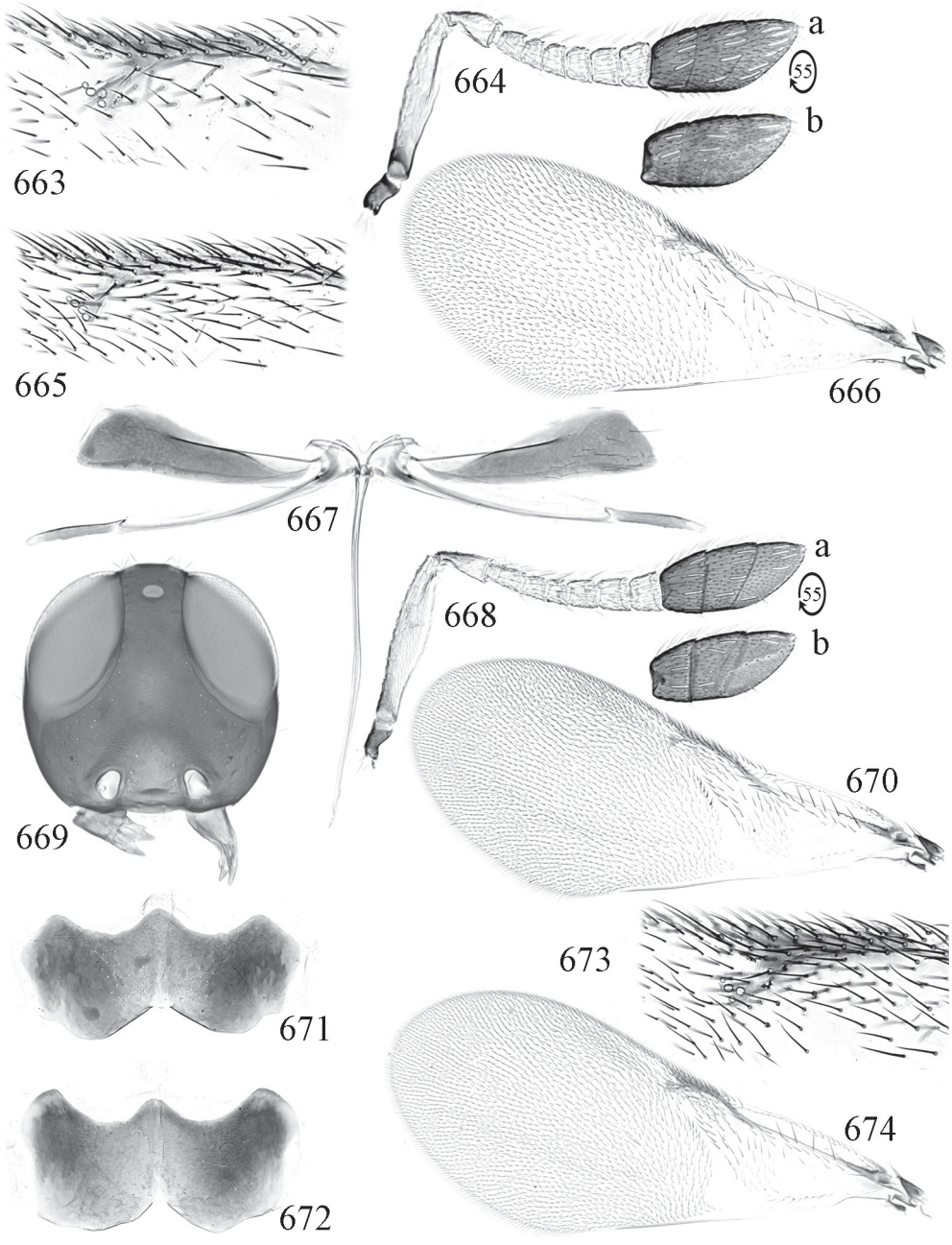
Figs 622-635. ***Cheiloneurus varablus***, HT – (622) antenna (clava slightly collapsed); (623) apex of fore wing venation; (624) fore wing. ***Cheiloneurus myndus*** – (625) antenna (a, outer aspect of clava; b, inner aspect of clava); (626) fore wing; (627) ovipositor; (628) mesosoma, dorsal view; (629) hypopygium; (630) apex of fore wing venation. ***Cheiloneurus rosea*** – (631) antenna (a, outer aspect of clava; b, inner aspect of clava); (632) apex of fore wing venation; (633) fore wing. ***Cheiloneurus salome***, HT – (634) antenna; (635) apex of fore wing venation.



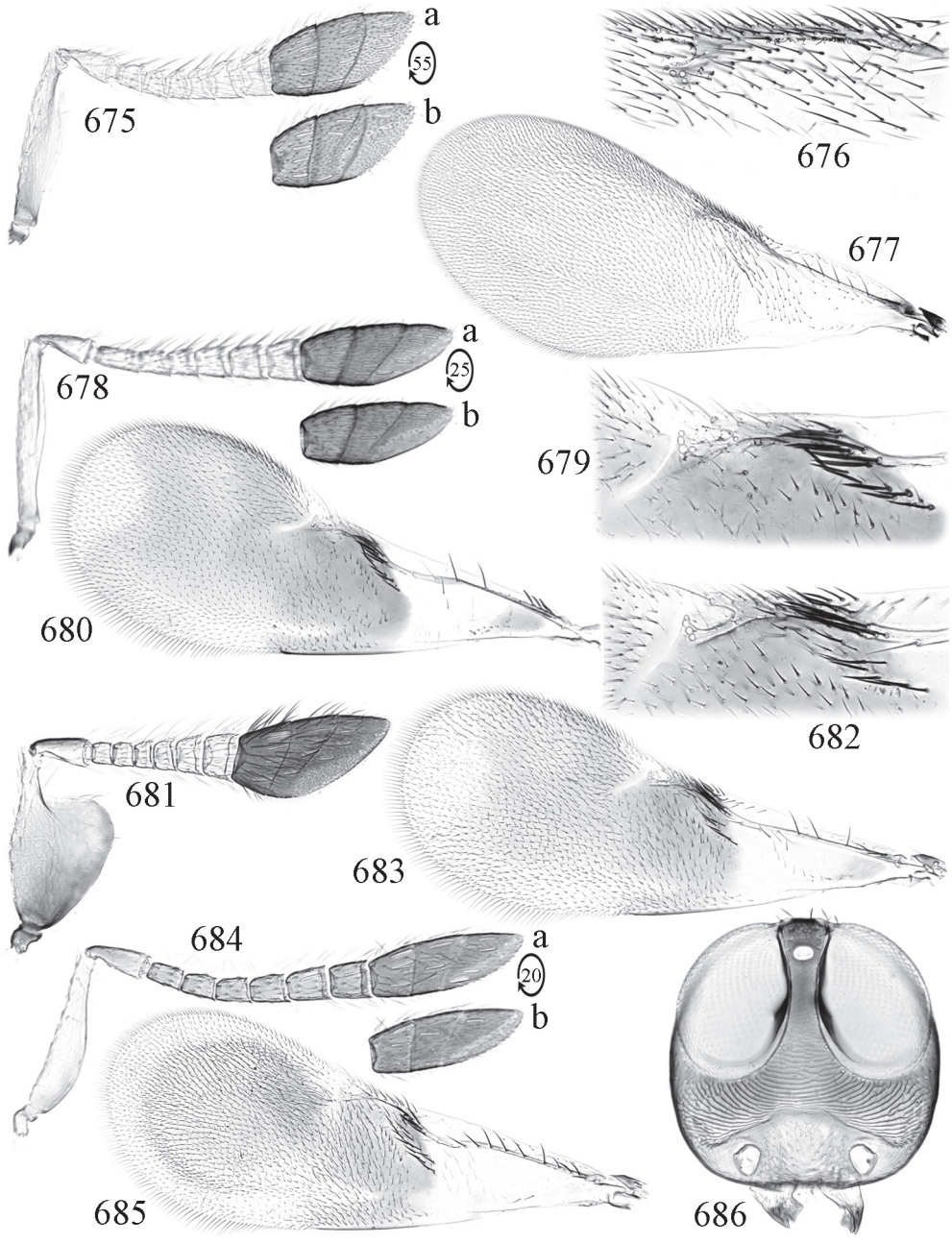
Figs 636-649. ***Cheiloneurus salome***, HT – (636) fore wing. ***Cheiloneurus loresa***, HT – (637) hypopygium; (638) head, facial view; (639) antenna (a, outer aspect of clava; b, inner aspect of clava); (640) fore wing; (641) mesosoma, dorsal view; (642) ovipositor; (643) apex of fore wing venation. ***Cheilonerus onestas*** – (644) head, facial view; (645) fore wing; (646) ovipositor; (647) antenna (a, outer aspect of clava; b, inner aspect of clava); (648) mesosoma, dorsal view; (649) apex of fore wing venation.



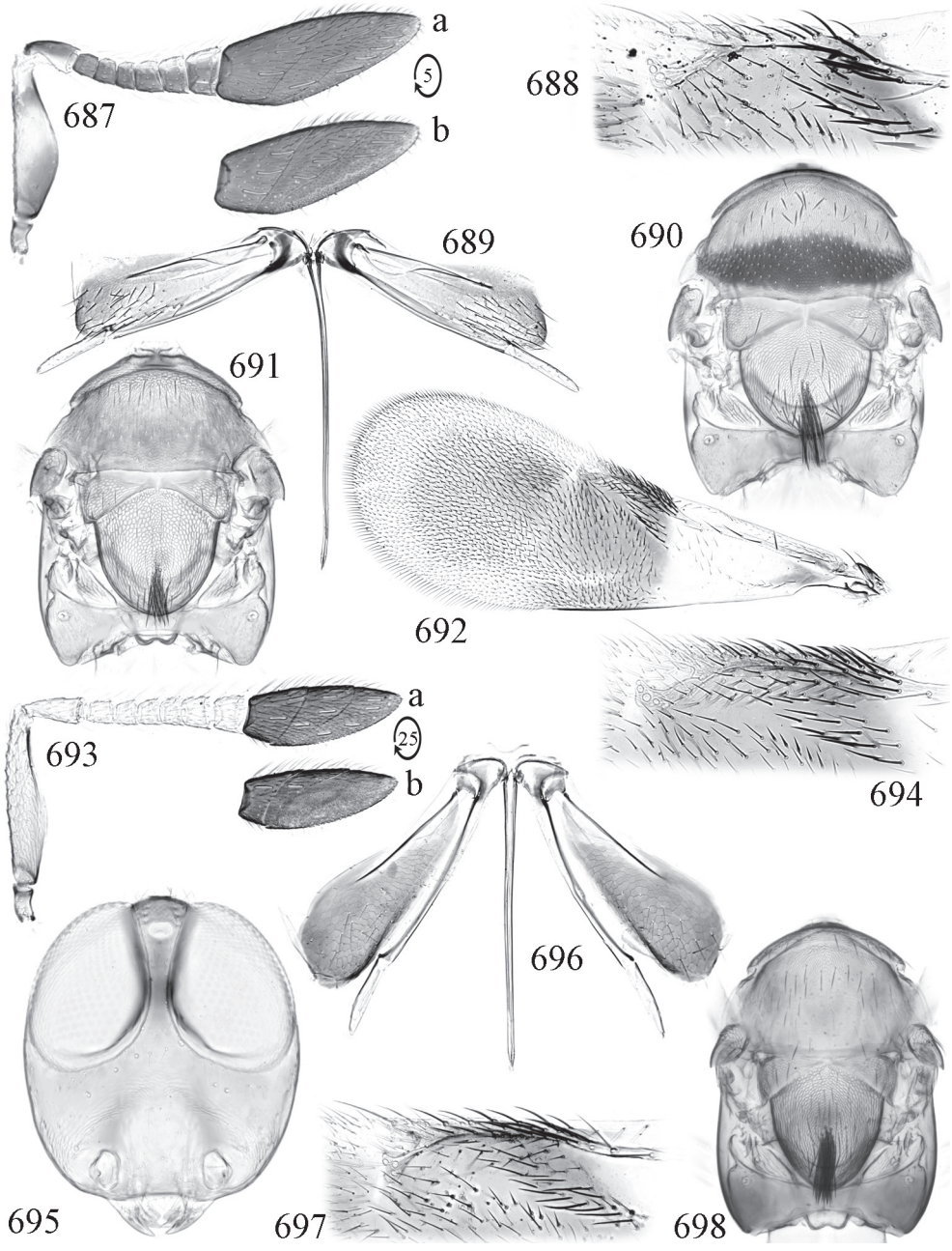
Figs 650-662. ***Cheiloneurus mirabel***, HT – (650) antenna (a, outer aspect of clava; b, inner aspect of clava) (clava slightly collapsed); (651) apex of fore wing venation; (652) ovipositor); 653) mesosoma, dorsal view; (654) head, facial view; (655) fore wing. ***Cheiloneurus mantua*** – (656) head, facial view; (657) fore wing; (658) antenna (a, outer aspect of clava; b, inner aspect of clava); (659) apex of fore wing venation; (660) mesosoma, dorsal view. ***Cheiloneurus hamadryas*** – (661) mesosoma, dorsal view, variant; (662) mesosoma, dorsal view, variant.



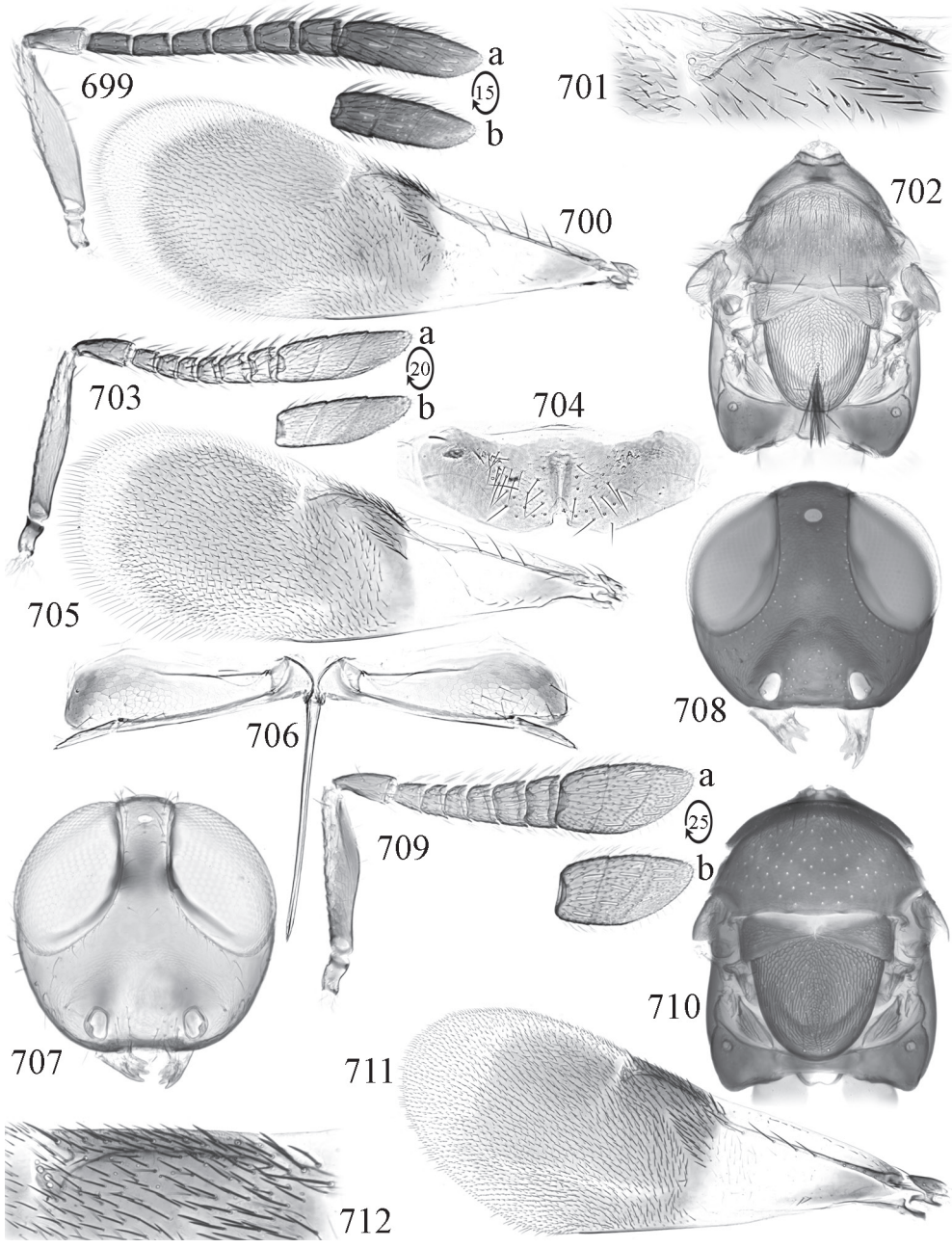
Figs 663-674. ***Cheiloneurus hamadryas*** – (663) apex of fore wing venation, variant; (664) antenna (a, outer aspect of clava; b, inner aspect of clava); (665) apex of fore wing venation, variant; (666) fore wing, variant; (667) ovipositor; (668) antenna, variant; (669) head, facial view; (670) fore wing, variant; (671) hypopygium, variant; (672) hypopygium, variant. ***Cheiloneurus mardor***, HT – (673) apex of fore wing venation; (674) fore wing.



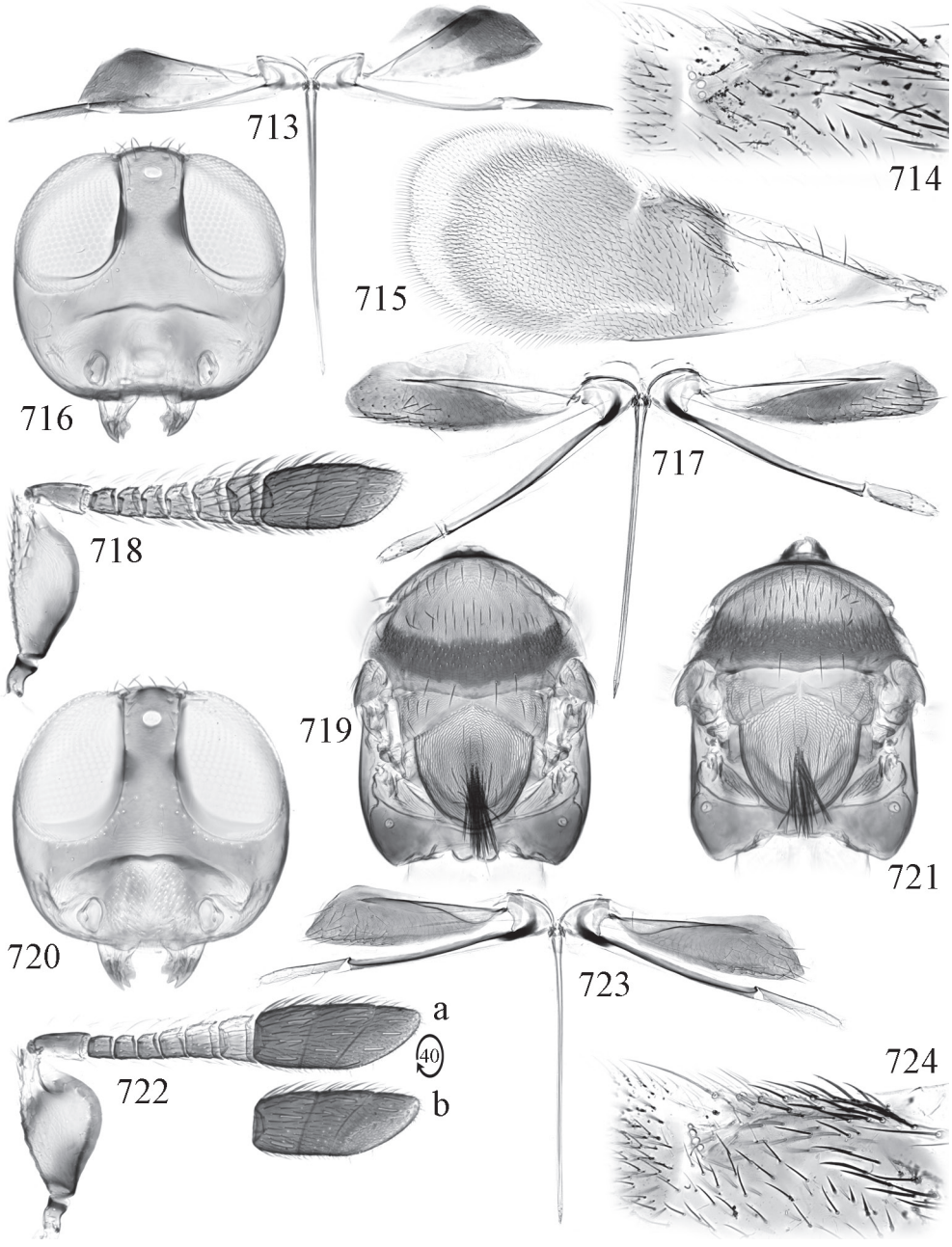
Figs 675-686. ***Cheiloneurus mardor***, HT – (675) antenna. ***Cheiloneurus extillus***, HT – (676) apex of fore wing venation; (677) fore wing; (678) antenna (a, outer aspect of clava; b, inner aspect of clava) (reconstructed). ***Cheiloneurus racidia*** – (679) apex of fore wing venation; (680) fore wing; (681) antenna. ***Cheiloneurus miranda*** – (682) apex of fore wing venation; (683) fore wing; (684) antenna (a, outer aspect of clava; b, inner aspect of clava) (reconstructed). ***Cheiloneurus scolopax*** – (685) fore wing; (686) head, facial view.



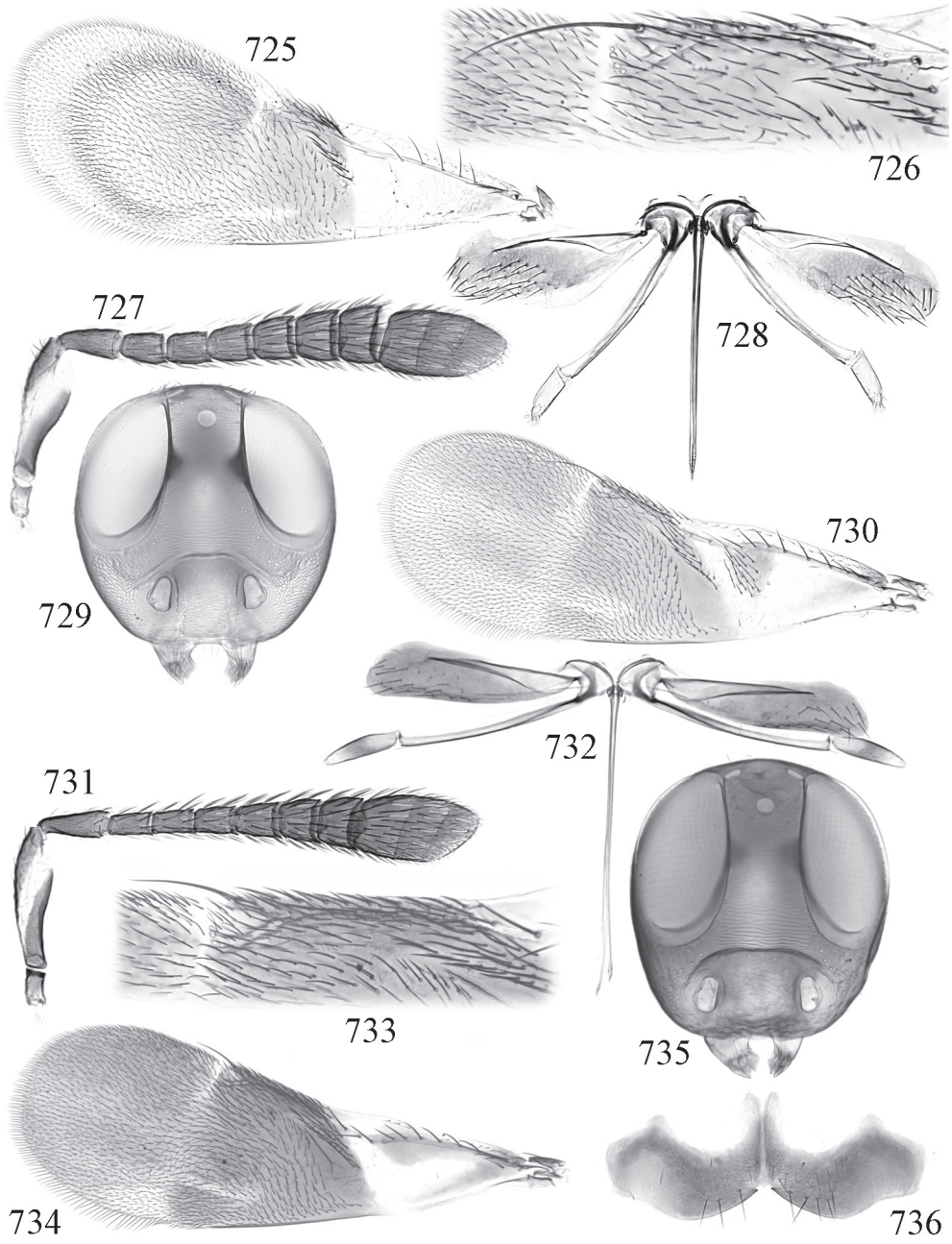
Figs 687-698. ***Cheiloneurus scolopax*** – (687) antenna (a, outer aspect of clava; b, inner aspect of clava); (688) apex of fore wing venation;(689) ovipositor; (690) mesosoma, dorsal view. ***Cheiloneurus genys*** – (691) mesosoma, dorsal view; (692) fore wing; (693) antenna (a, outer aspect of clava; b, inner aspect of clava); (694) apex of fore wing venation; (695) head, facial view); (696) ovipositor. ***Cheiloneurus fabius*** – (697) apex of fore wing venation; (698) mesosoma, dorsal view.



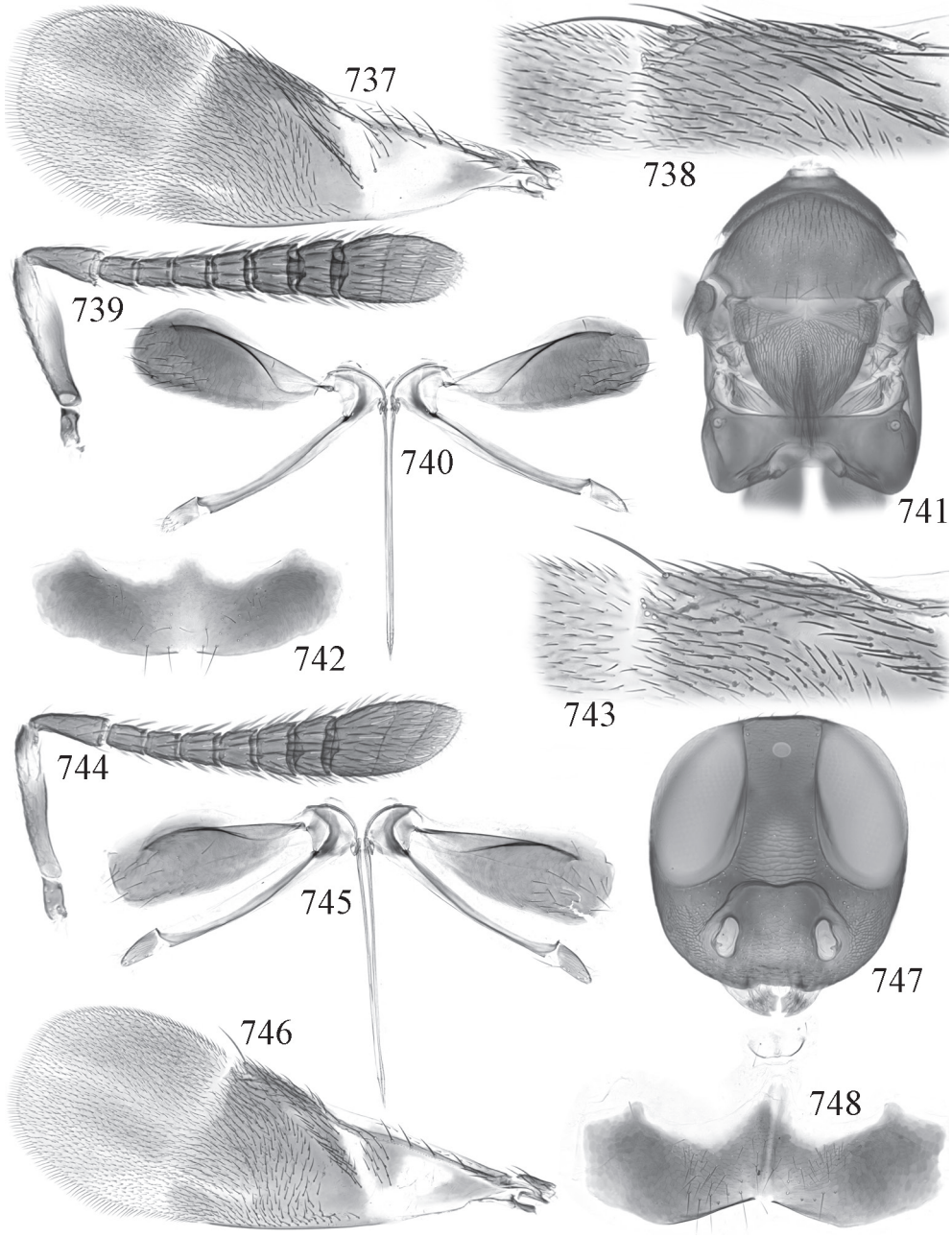
Figs 699-712. ***Cheiloneurus fabius*** – (699) antenna (a, outer aspect of clava; b, inner aspect of clava); (700) fore wing. ***Cheiloneurus nintra*** – (701) apex of fore wing venation; (702) mesosoma, dorsal view; (703) antenna (a, outer aspect of clava; b, inner aspect of clava); (704) hypopygium; (705) fore wing; (706) ovipositor; (707) head, facial view. ***Cheiloneurus santaros***, HT – (708) head, facial view; (709) antenna (a, outer aspect of clava; b, inner aspect of clava) (restructured); (710) mesosoma, dorsal view; (711) fore wing; (712) apex of fore wing venation.



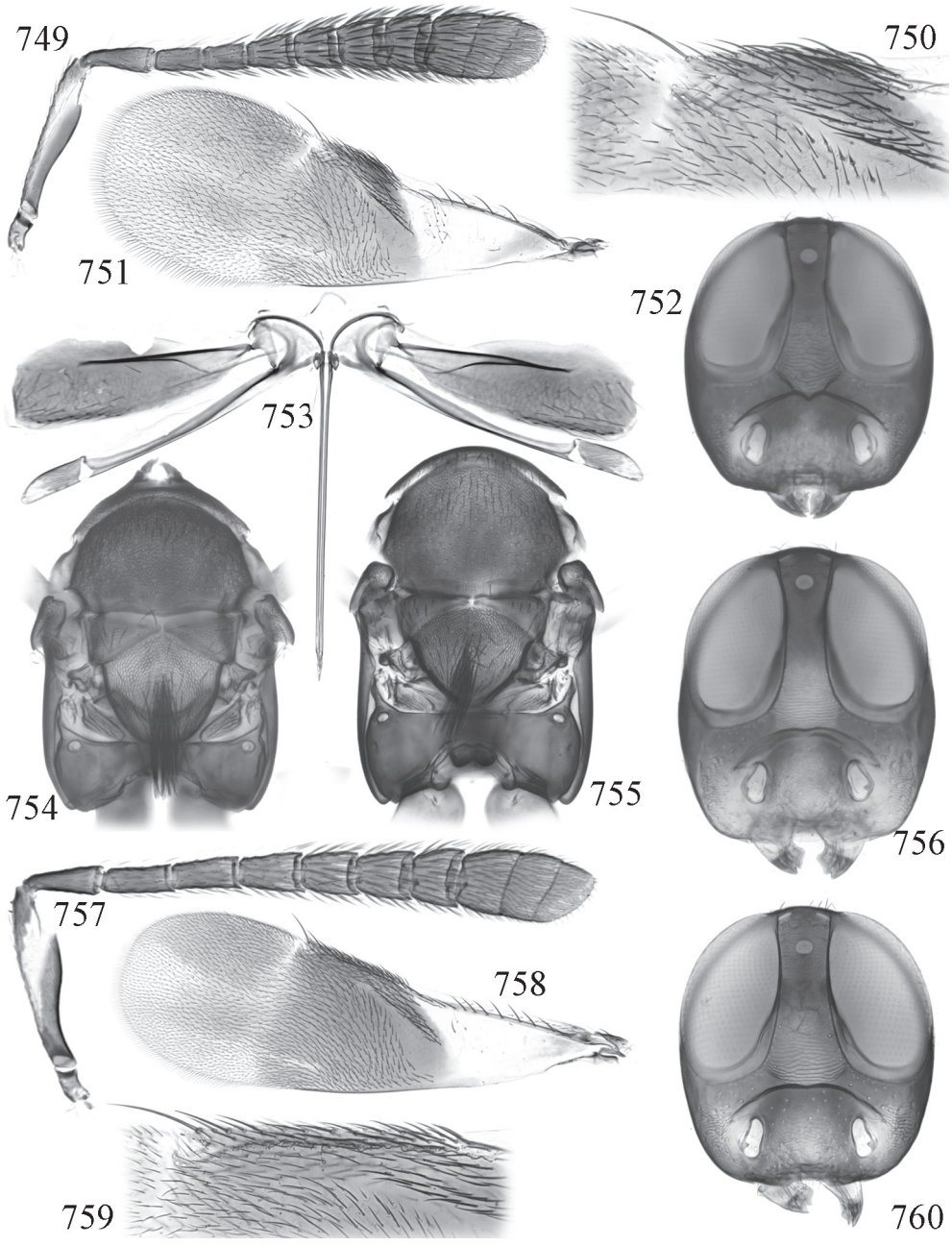
Figs 713-724. ***Cheiloneurus santaros***, HT – (713) ovipositor. ***Cheiloneurus simus*** – (714) apex of fore wing venation; (715) fore wing; (716) head, facial view; (717) ovipositor; (718) antenna; (719) mesosoma, dorsal view. ***Cheiloneurus marcius***, HT – (720) head, facial view; (721) mesosoma, dorsal view; (722) antenna (a, outer aspect of clava; b, inner aspect of clava); (723) ovipositor; (724) apex of fore wing venation.



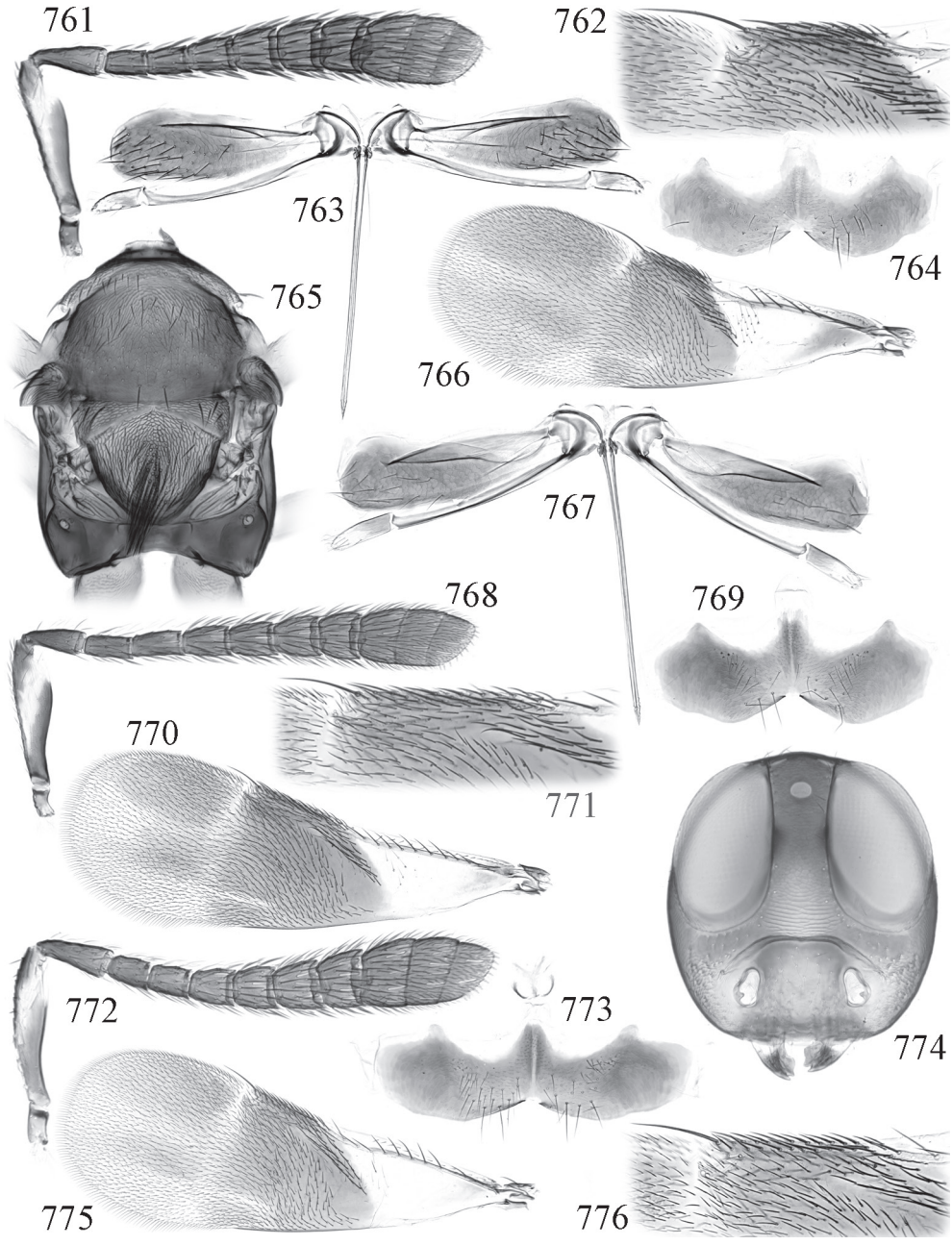
Figs 725-736. ***Cheiloneurus marcius***, HT – (725) fore wing. ***Cheiloneurus castalia*** – (726) apex of fore wing venation; (727) antenna; (728) ovipositor; (729) head, facial view; (730) fore wing. ***Cheiloneurus dipsas*** – (731) antenna; (732) ovipositor; (733) apex of fore wing venation; (734) fore wing. ***Cheiloneurus medusa*** – (735) head, facial view; (736) hypopygium.



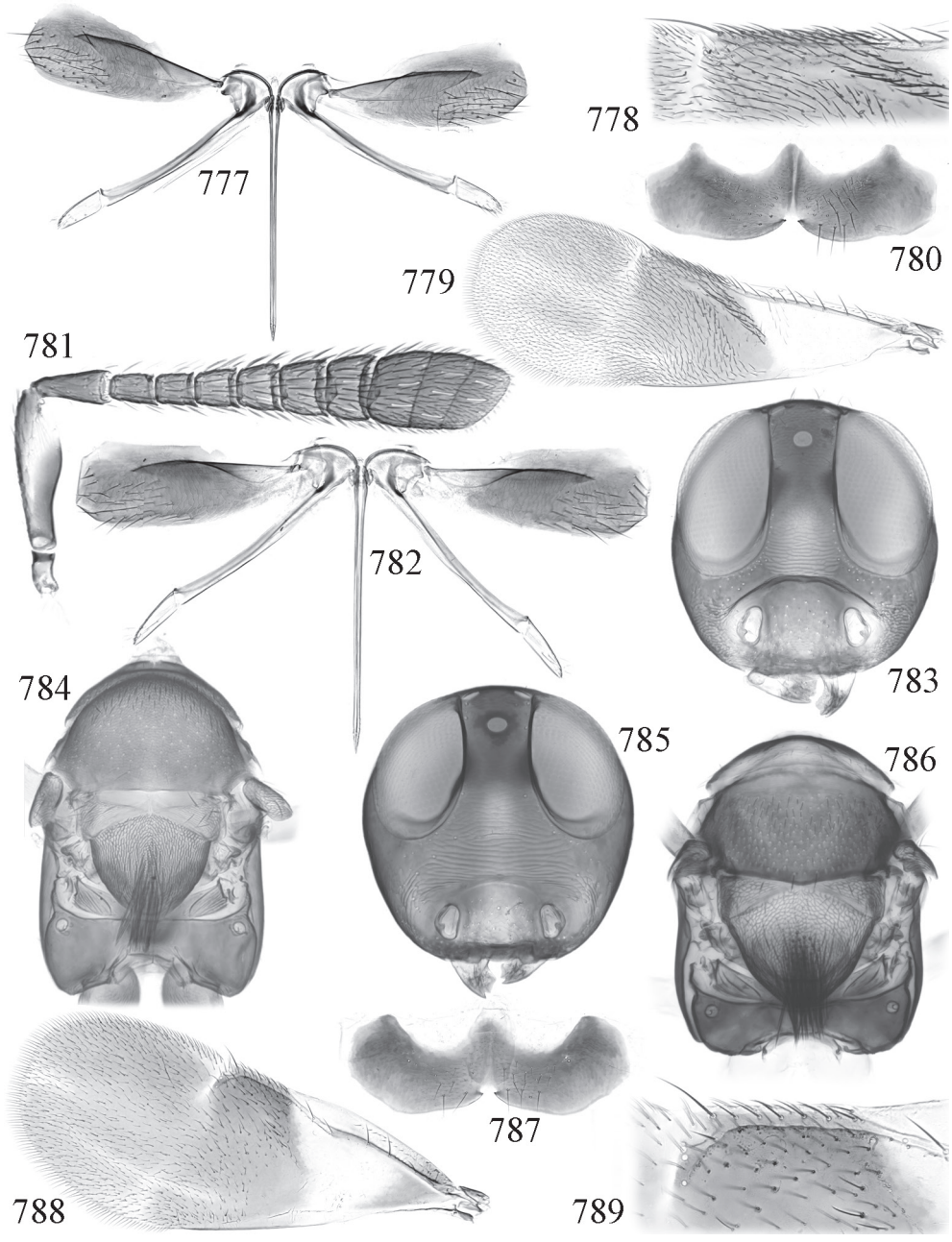
Figs 737-748. ***Cheiloneurus medusa*** – (737) fore wing; (738) apex of fore wing venation; (739) antenna; (740) ovipositor; (741) mesosoma, dorsal view. ***Cheiloneurus amadeus***, HT – (742) hypopygium; (743) apex of fore wing venation; (744) antenna; (745) ovipositor; (746) fore wing; (747) head, facial view. ***Cheiloneurus grimus***, HT – (748) hypopygium.



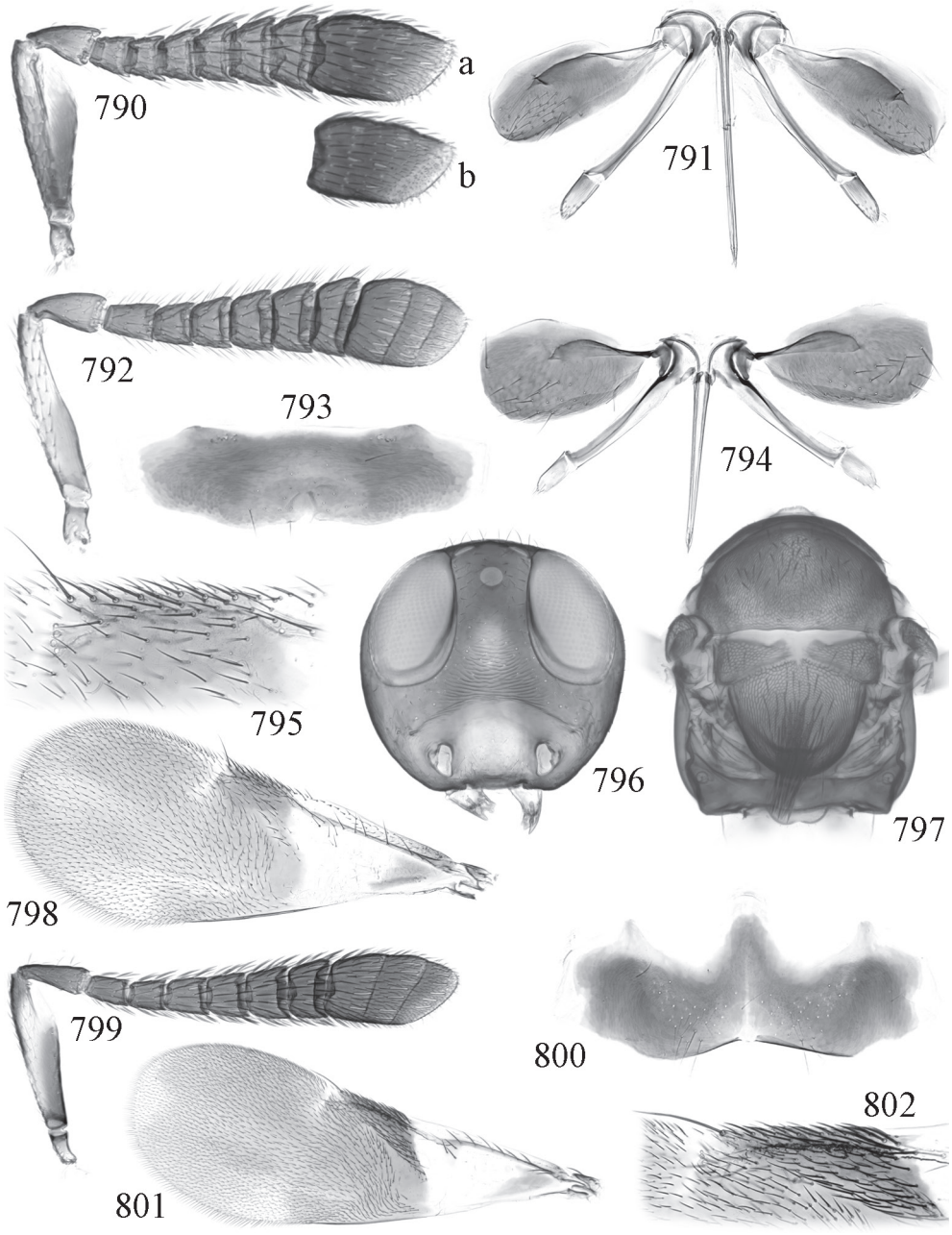
Figs 749-760. ***Cheiloneurus grimus***, HT – (749) antenna; (750) apex of fore wing venation; (751) fore wing; (752) head (restructured), facial view; (753) ovipositor; (754) mesosoma, dorsal view. ***Cheiloneurus herxius***, HT – (755) mesosoma, dorsal view; (756) head, facial view; (757) antenna; (758) fore wing; (759) apex of fore wing venation. ***Cheiloneurus seius*** – (760) head, facial view.



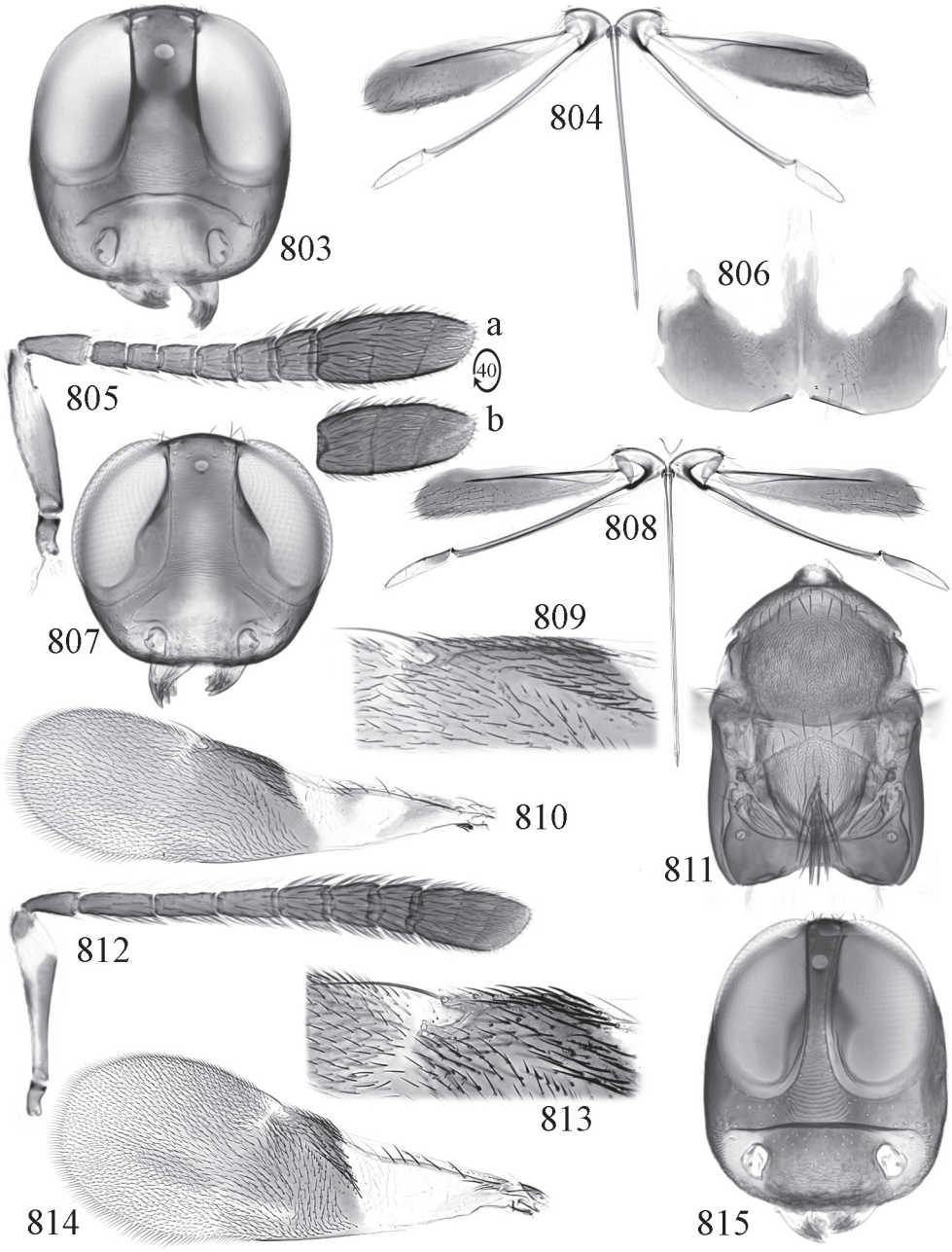
Figs 761-776. ***Cheiloneurus seius*** – (761) antenna; (762) apex of fore wing venation; (763); ovipositor; (764) hypopygium; (765) mesosoma, dorsal view; (766) fore wing. ***Cheiloneurus moloch***, HT – (767) ovipositor; (768) antenna; (769) hypopygum; (770) fore wing; (771) apex of fore wing venation. ***Cheiloneurus poeana*** – (772) antenna; (773) hypopygium; (774) head, facial view; (775) fore wing; (776) apex of fore wing venation.



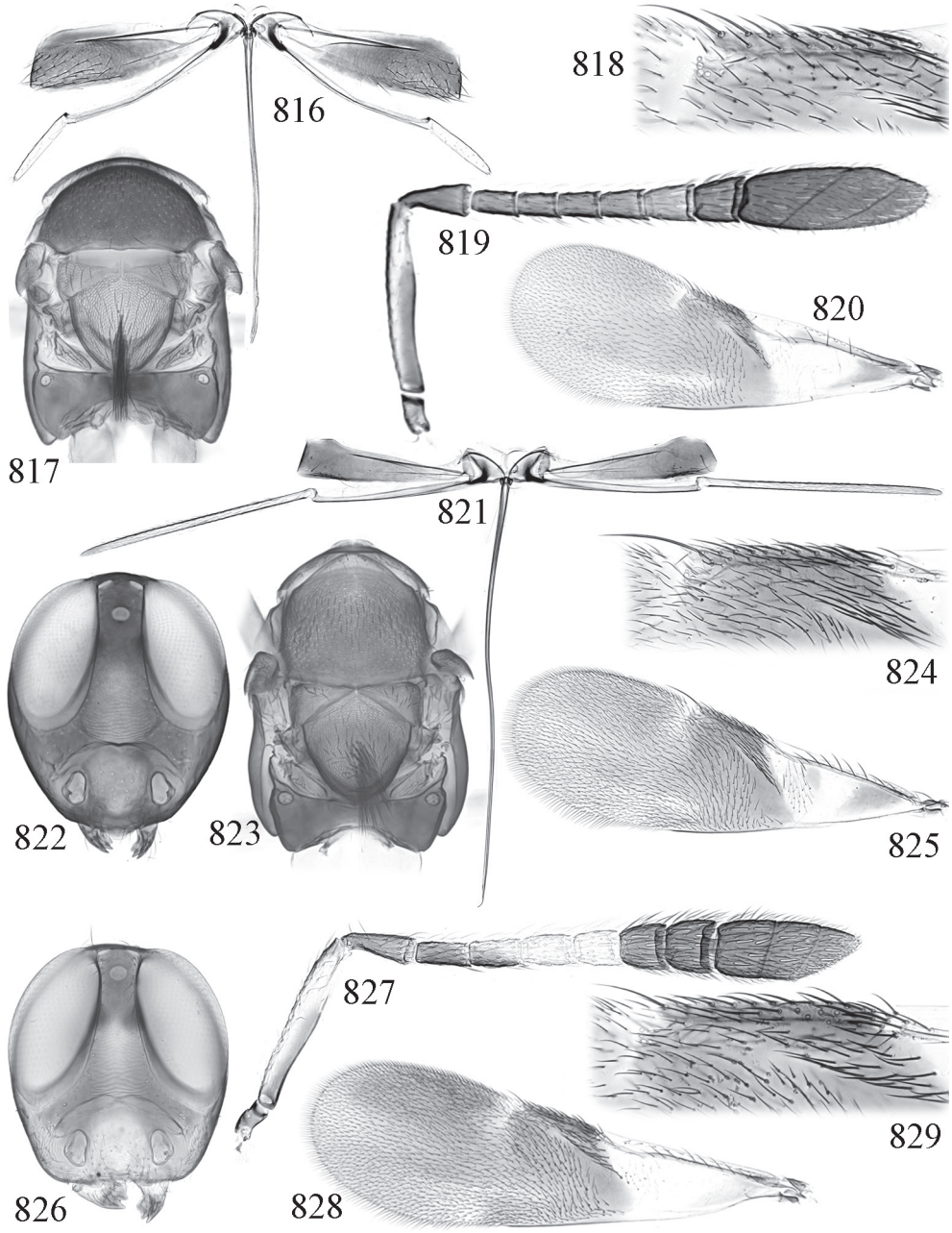
Figs 777-789. ***Cheiloneurus poeana*** – (777) ovipositor. ***Cheiloneurus oshtan*** – (778) apex of fore wing venation; (779) – fore wing; (780) hypopygium; (781) antenna; (782) ovipositor; (783) head, facial view; (784) – mesosoma, dorsal view. ***Cheiloneurus munda*** – (785) head, facial view; (786) mesosoma, dorsal view; (787) hypopygium; (788) fore wing; (789) apex of fore wing venation.



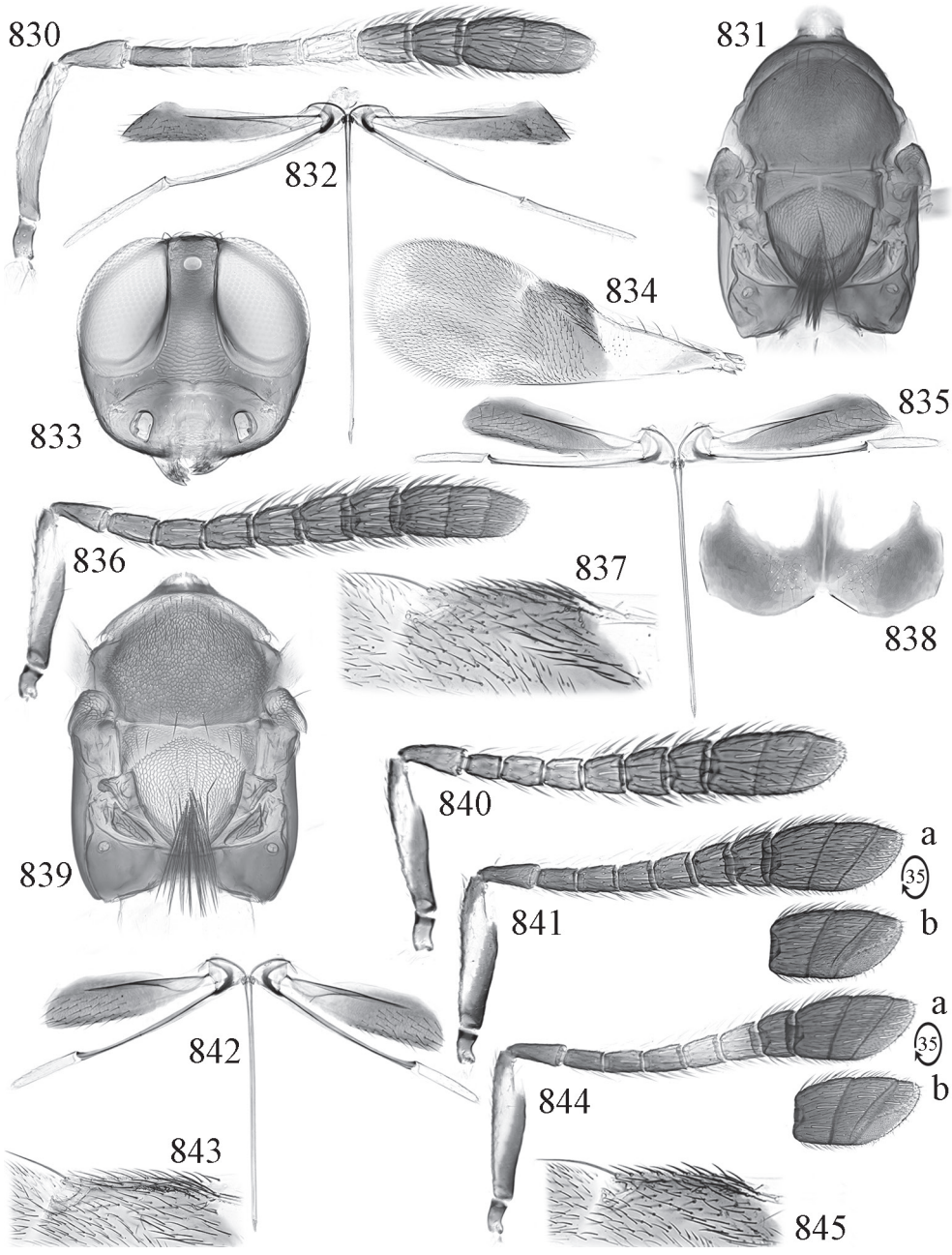
Figs 790-802. ***Cheiloneurus munda*** – (790) antenna; (791) ovipositor. ***Cheiloneurus varus***, HT - (792) antenna; (793) hypopygium; (794) ovipositor; (795) apex of fore wing venation; (796) head, facial view (restructured); (797) mesosoma, dorsal view (restructured); (798) fore wing. ***Cheiloneurus iphigenes*** – (799) antenna; (800) hypopygium; (801) fore wing; (802) apex of fore wing venation.



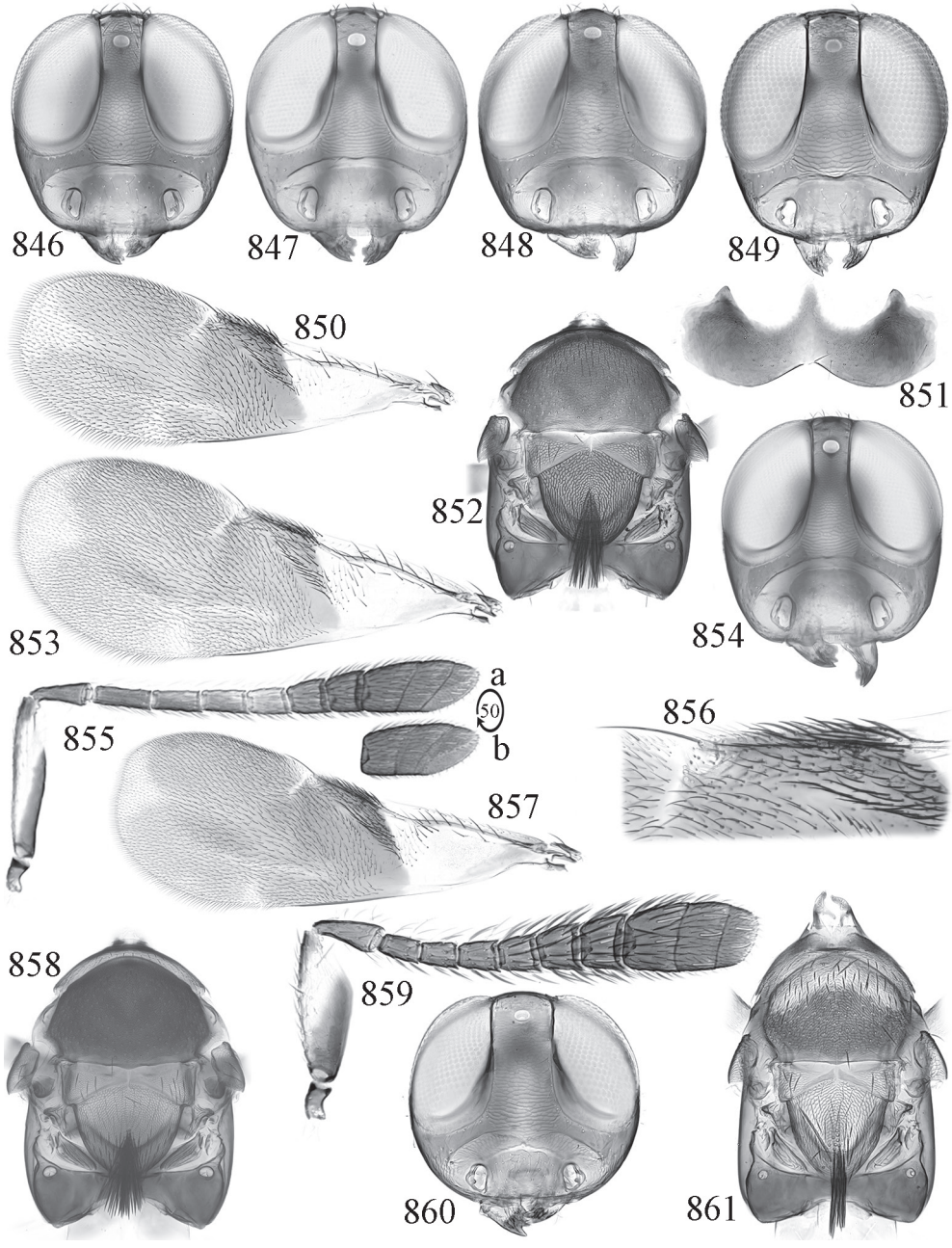
Figs 803-815. ***Cheiloneurus iphigenes*** – (803) head, facial view; (804) ovipositor. ***Cheiloneurus solon*** – (805) antenna (a, outer aspect of clava; b, inner aspect of clava); (806) hypopygium; (807) head, facial view; (808) ovipositor; (809) apex of fore wing venation; (810) fore wing; (811) mesosoma, dorsal view. ***Cheiloneurus pometia***, HT – (812) antenna; (813) apex of fore wing venation; (814) fore wing; (815) head, facial view.



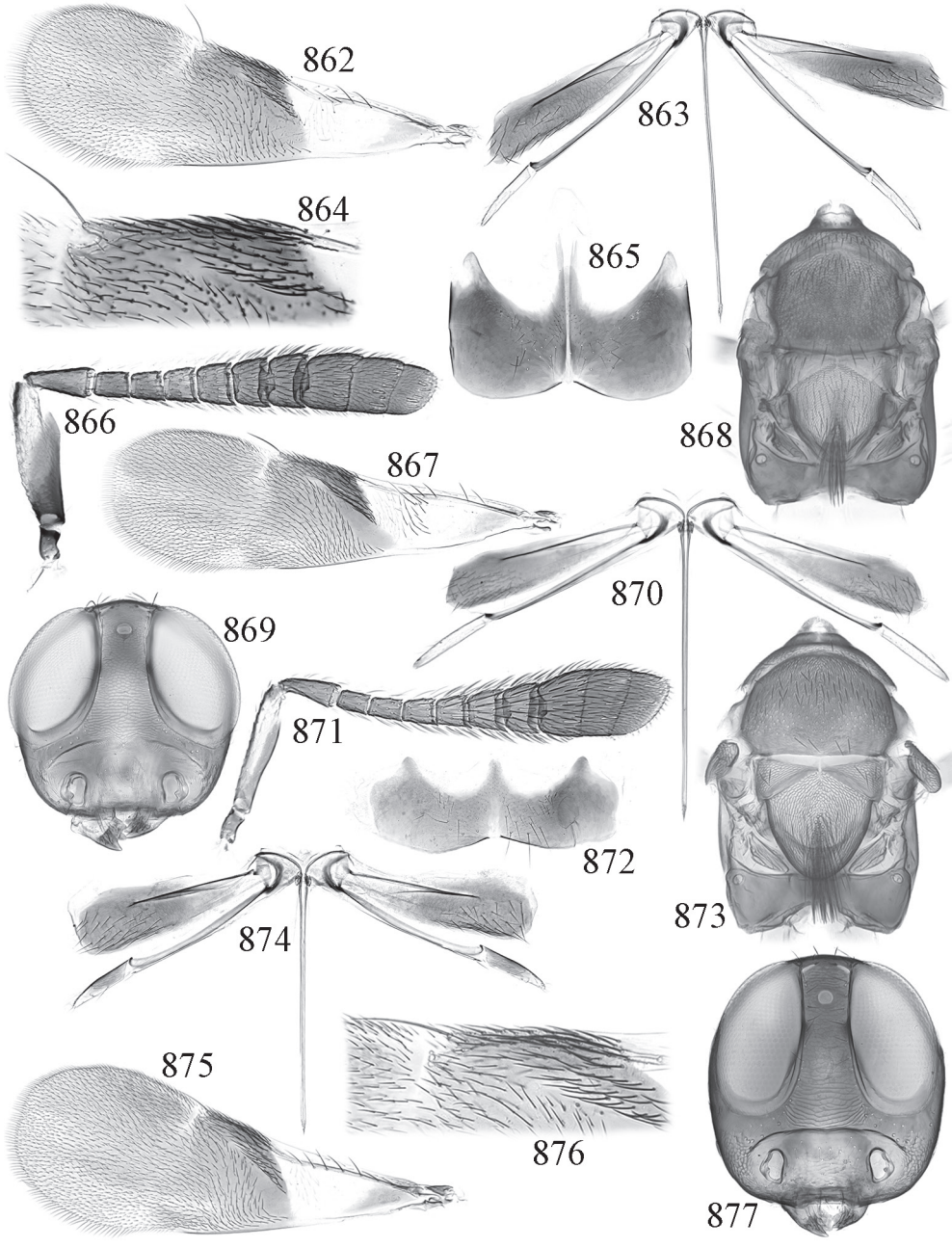
Figs 816-828. ***Cheiloneurus pometia*** – (816) ovipositor; (817) mesosoma, dorsal view. ***Cheiloneurus genua*** – (818) apex of fore wing venation; (819) antenna; (820) fore wing; (821) ovipositor; (822) head, facial view; (823) mesosoma, dorsal view. ***Cheiloneurus goldus*** – (824) apex of fore wing venation; (825) fore wing; (826) head, facial view; (827) antenna. ***Cheiloneurus aliphera*** – (828) fore wing; (829) apex of fore wing venation.



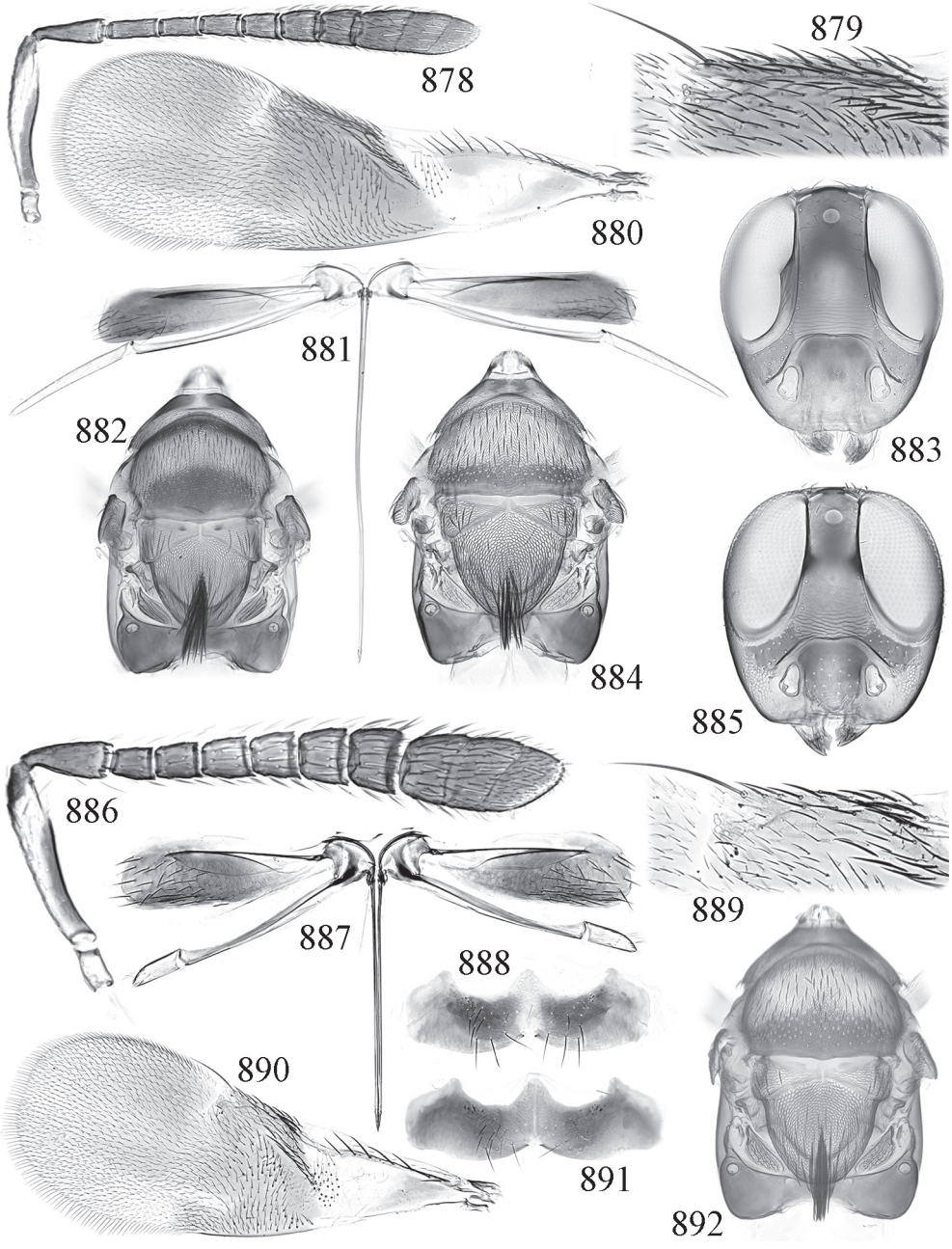
Figs 830-845. ***Cheiloneurus aliphera*** – (830) antenna; (831) mesosoma, dorsal view; (832) ovipositor. ***Cheiloneurus mago***, HT – (833) head, facial view; (834) fore wing; (835) ovipositor; (836) antenna; (837) apex of fore wing venation; (838) hypopygium; (839) mesosoma, dorsal view. ***Cheiloneurus mckenziei*** – (840) antenna, variant; (841) antenna (a, outer aspect of clava; b, inner aspect of clava); (842) ovipositor; (843) apex of fore wing venation, variant; (844) antenna, variant (a, outer aspect of clava; b, inner aspect of clava); (845) apex of fore wing venation.



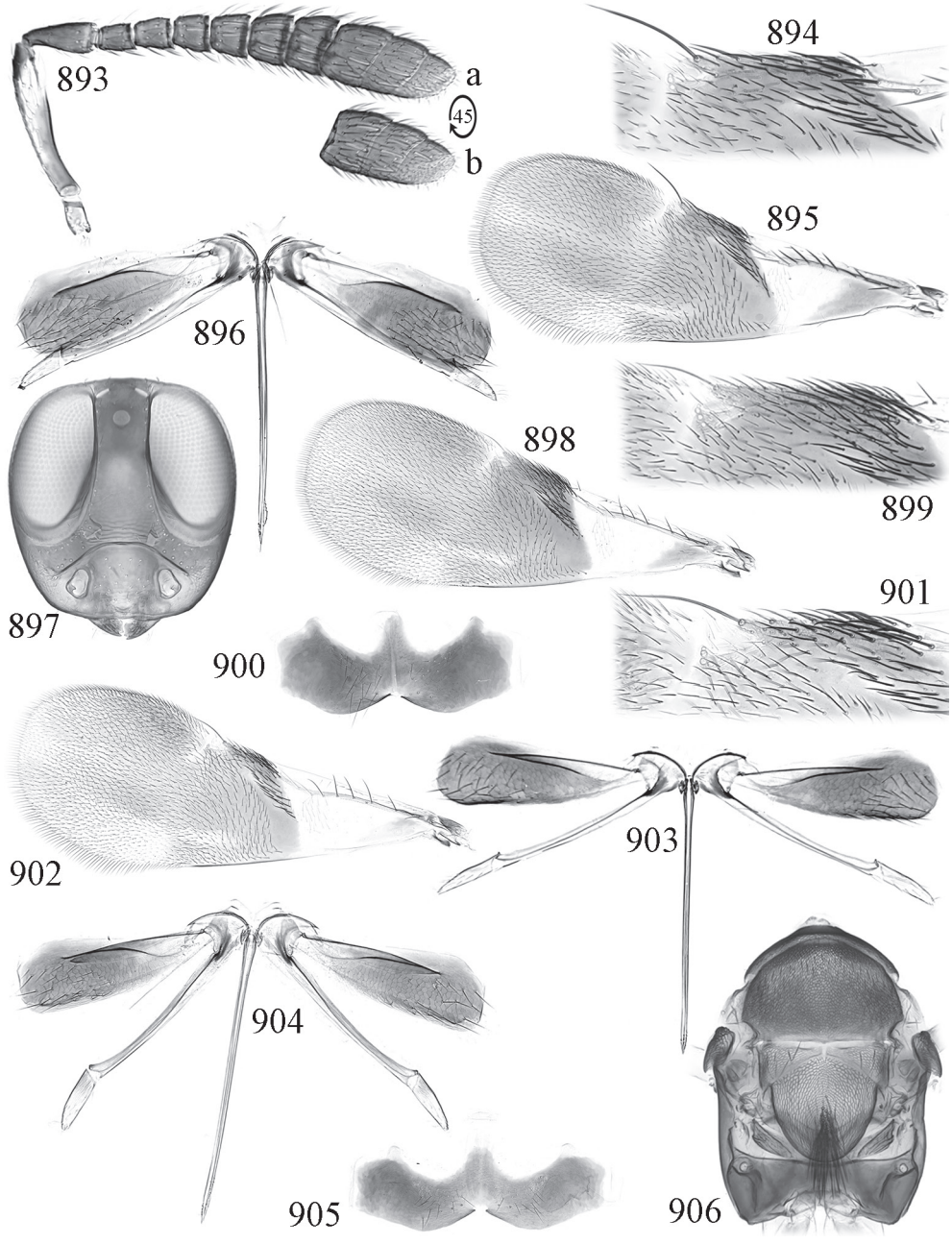
Figs 846-861. ***Cheiloneurus mckenziei*** – (846) head, facial view, variant; (847) head, facial view, variant; (848) head, facial view; (849) head, facial view, variant; (850) fore wing; (851) hypopygium; (852) mesosoma, dorsal view; (853) fore wing, larger specimen. ***Cheiloneurus origo*** – (854) head, facial view; (855) antenna (a, outer aspect of clava; b, inner aspect of clava); (856) apex of fore wing venation; (857) fore wing; (858) mesosoma, dorsal view. ***Cheiloneurus argos***, HT – (859) antenna; (860) head, facial view; (861); mesosoma, dorsal view.



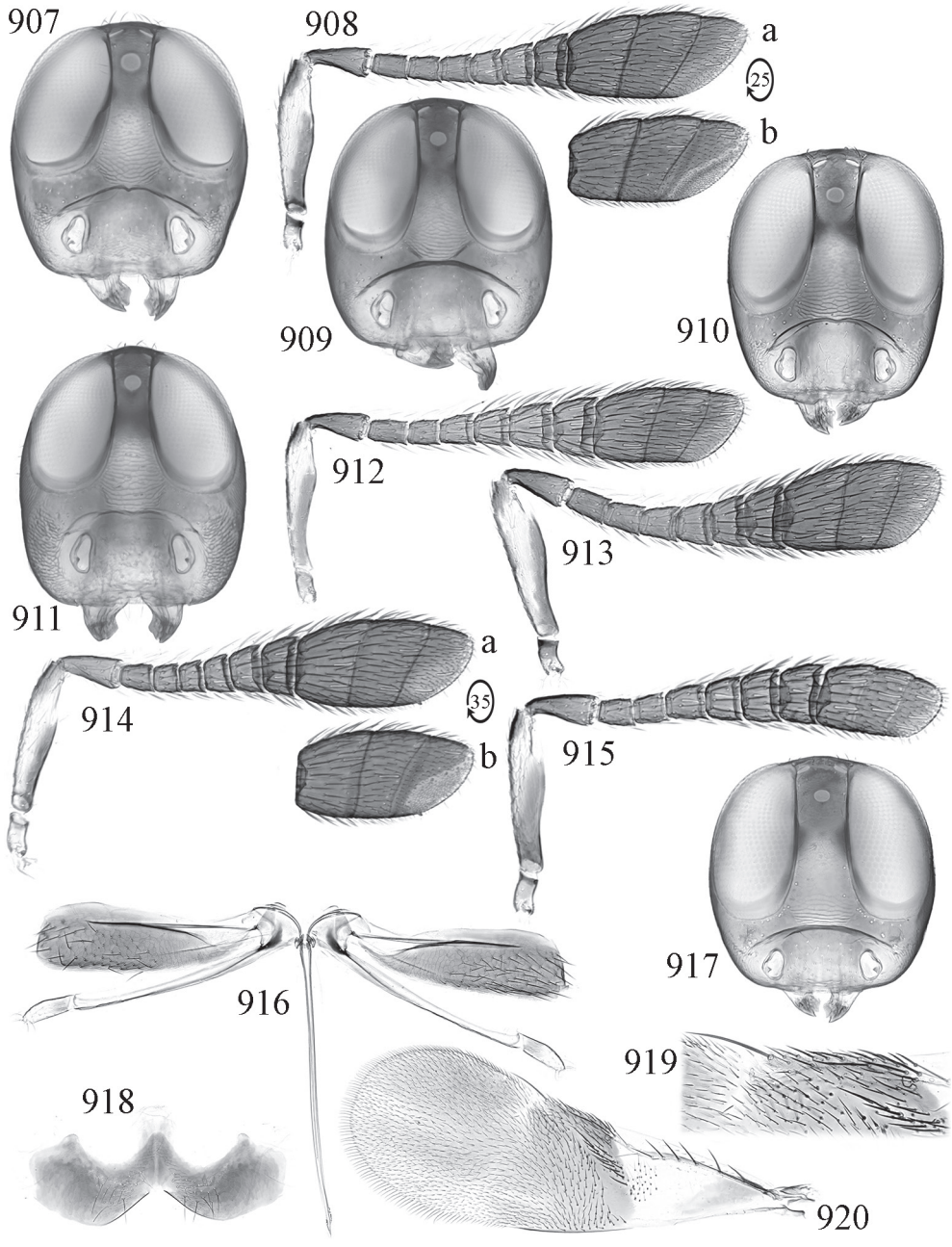
Figs 862-877. ***Cheiloneurus argos***, HT – (862) fore wing; (863) ovipositor; (864) apex of fore wing venation; (865) hypopygium. ***Cheiloneurus feritas*** – (866) antenna; (867) fore wing; (868) mesosoma, dorsal view; (869) head, facial view; (870) ovipositor. ***Cheiloneurus paean***, HT – (871) antenna; (872) hypopygium; (873) mesosoma, dorsal view; (874) ovipositor; (875) fore wing; (876) apex of fore wing venation; (877) head, facial view.



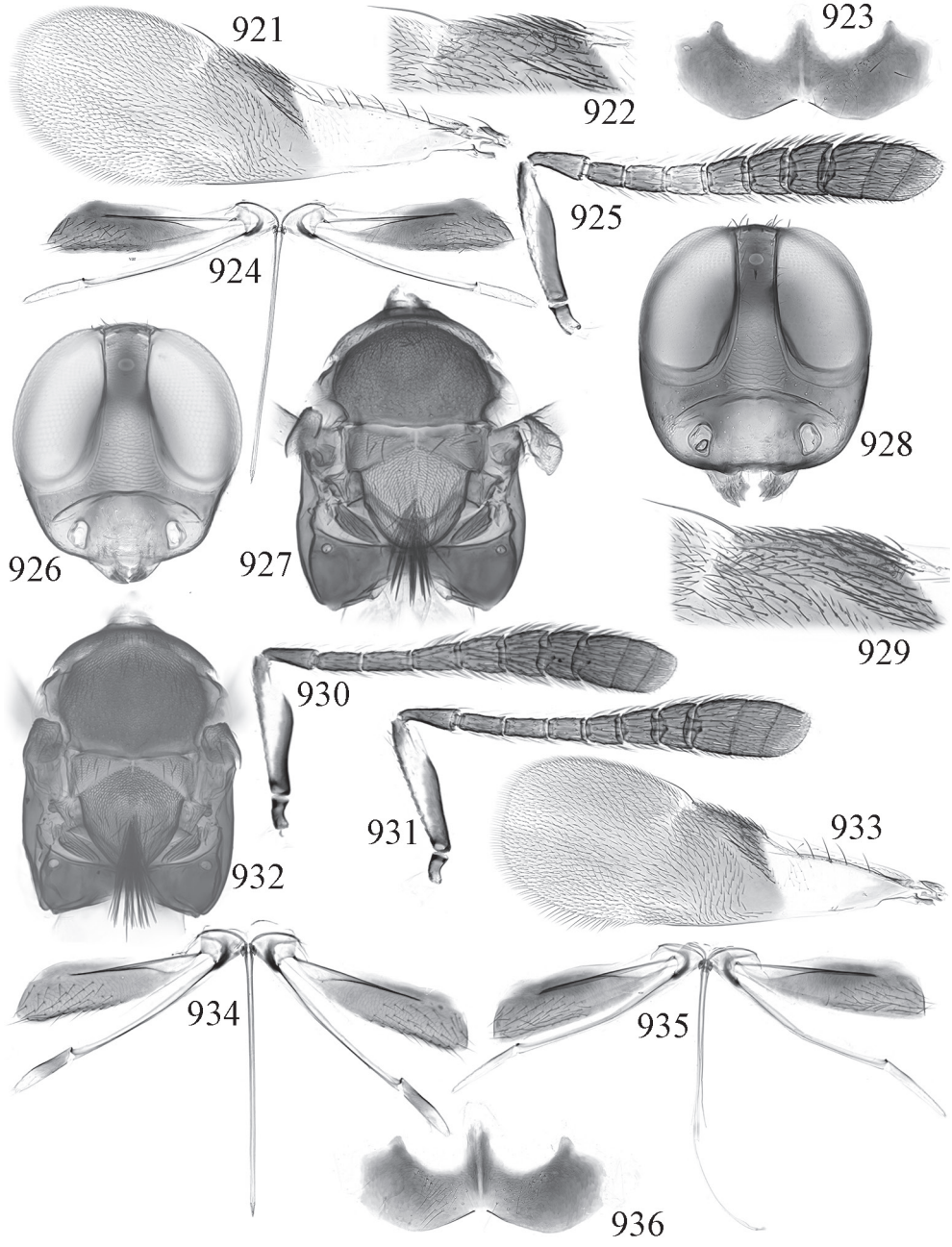
Figs 878-892. ***Cheiloneurus bion*** – (878) antenna, HT; (879) apex of fore wing venation; (880) fore wing, HT; (881) ovipositor, HT; (882) mesosoma, dorsal view, HT; (883) head, facial view, HT. ***Cheiloneurus zephyrus*** – (884) mesosoma, dorsal view; (885) head, facial view; (886) antenna; (887) ovipositor; (888) hypopygium; (889) apex of fore wing venation; (890) fore wing. ***Cheiloneurus pherus*** – (891) hypopygium; (892) mesosoma, dorsal view.



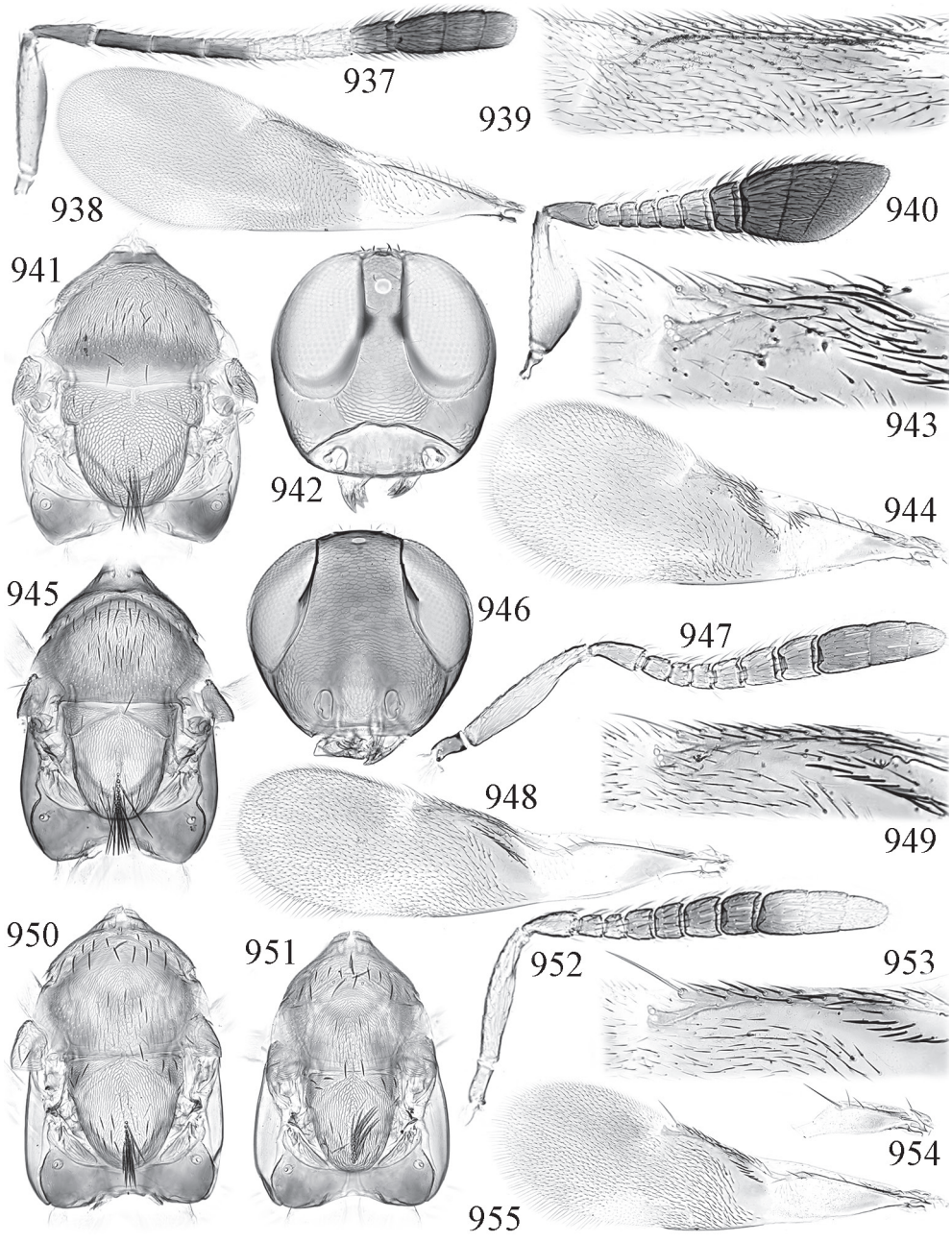
Figs 893-906. ***Cheiloneurus pherus*** – (893) antenna (a, outer aspect of clava; b, inner aspect of clava); (894) apex of fore wing venation; (895) fore wing; (896) ovipositor; (897) head, facial view. ***Cheiloneurus lydia*** – (898) fore wing; (899) apex of fore wing venation; (900) hypopygium; (901) apex of fore wing venation, variant; (902) fore wing, variant; (903) ovipositor; (904) ovipositor, variant; (905) hypopygium, variant; (906) mesosoma, dorsal view.



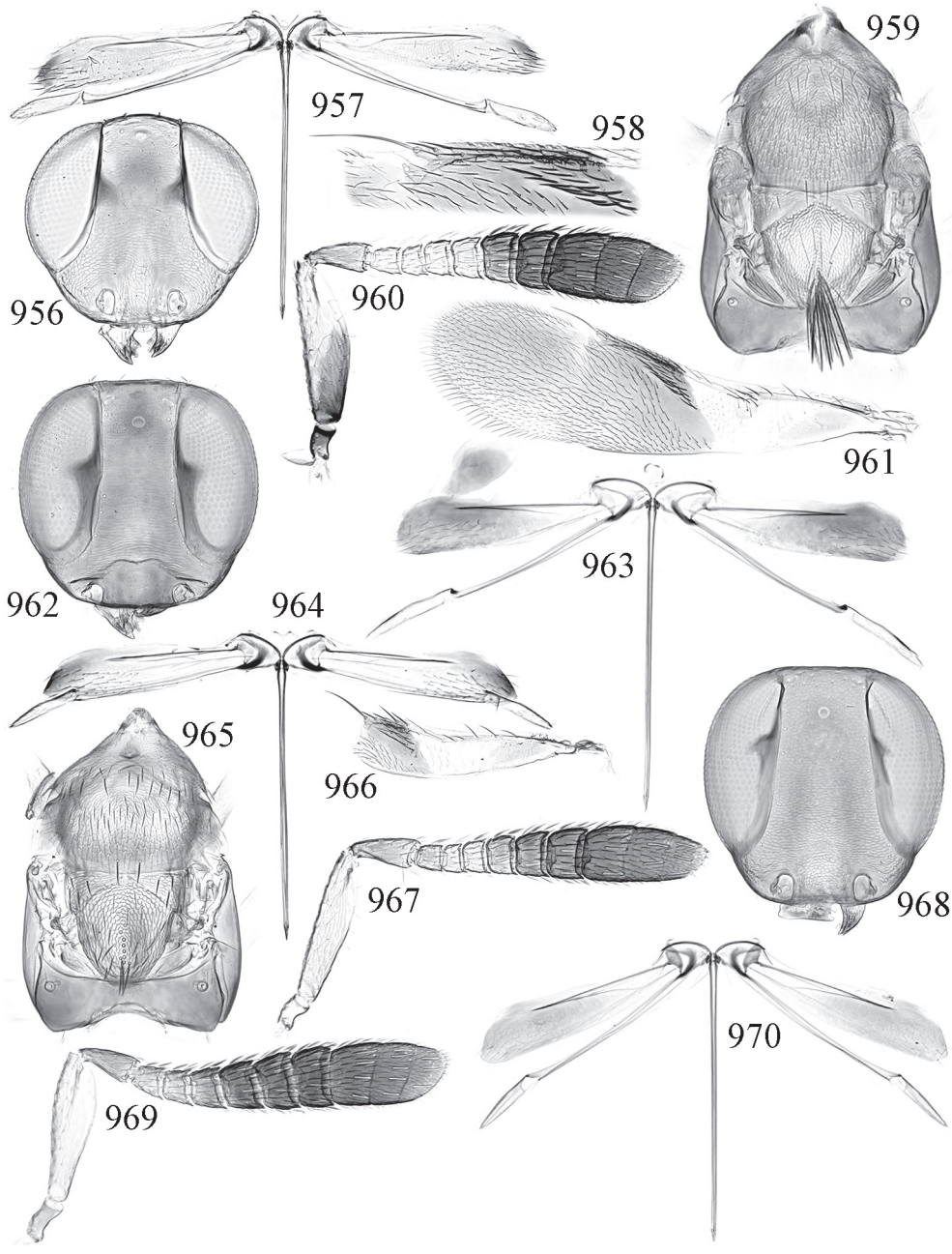
Figs 907-919. ***Cheiloneurus lydia*** – (907) head, facial view; (908) antenna (a, outer aspect of clava; b, inner aspect of clava); (909) head, facial aspect, variant; (910) head, facial aspect, variant; (911) head, facial aspect, variant; (912) antenna, variant; (913) antenna, variant; (914) antenna (a, outer aspect of clava; b, inner aspect of clava), variant (slightly modified). ***Cheiloneurus parnisa*** – (915) antenna; (916) ovipositor; (917) head, facial view; (918) hypopygium; (919) apex of fore wing venation; (920) fore wing.



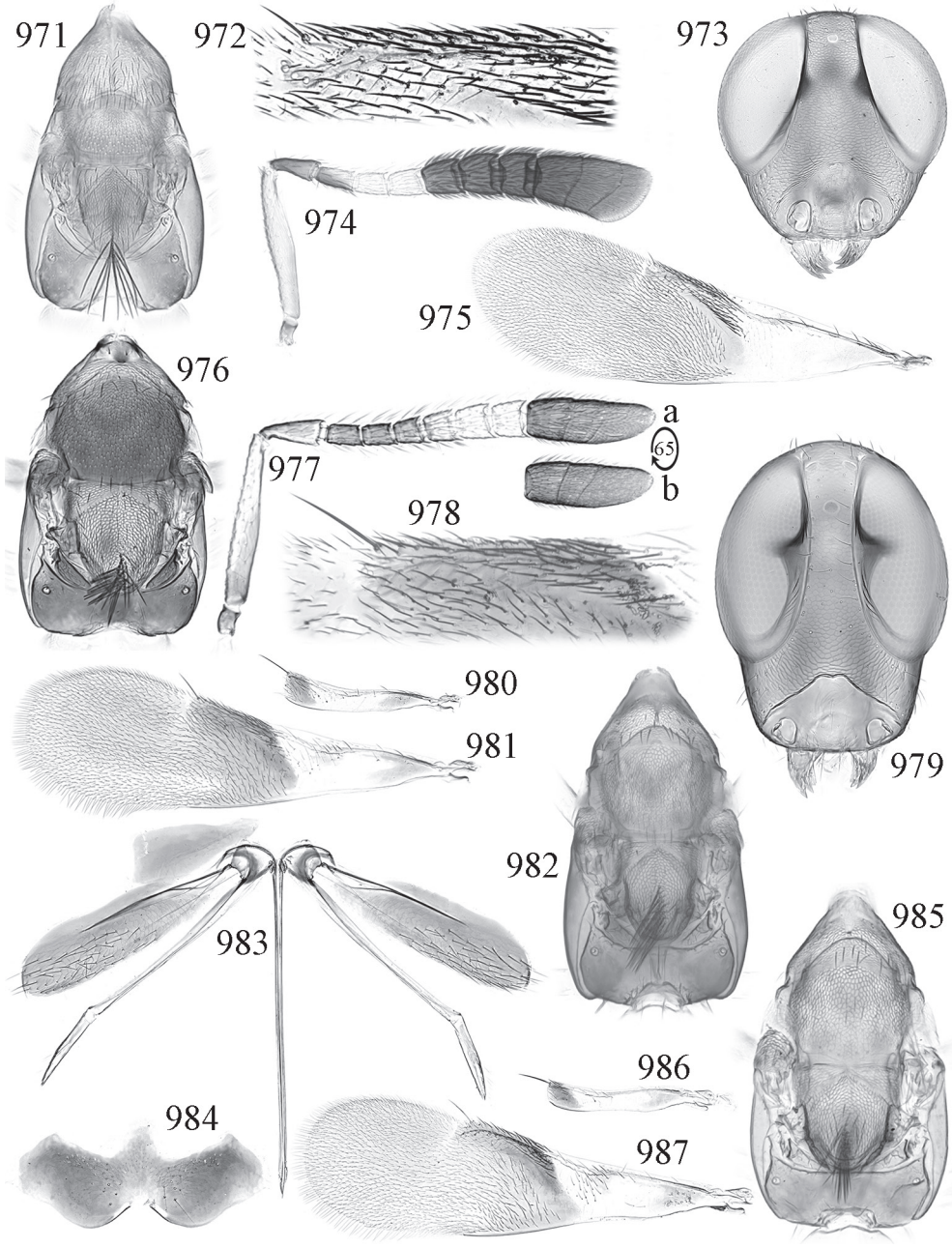
Figs 921-936. ***Cheiloneurus horocles*** – (921) fore wing; (922) apex of fore wing venation; (923) hypopygium; (924) ovipositor; (925) antenna; (926) head, facial view; (927) mesosoma, dorsal view. **Cheiloneurus longisetaceus** – (928) head, facial view; (929) apex of fore wing venation; (930) antenna, variant; (931) antenna, variant; (932) mesosoma, dorsal view; (933) fore wing; (934) ovipositor, variant; (935) ovipositor, variant; (936) hypopygium.



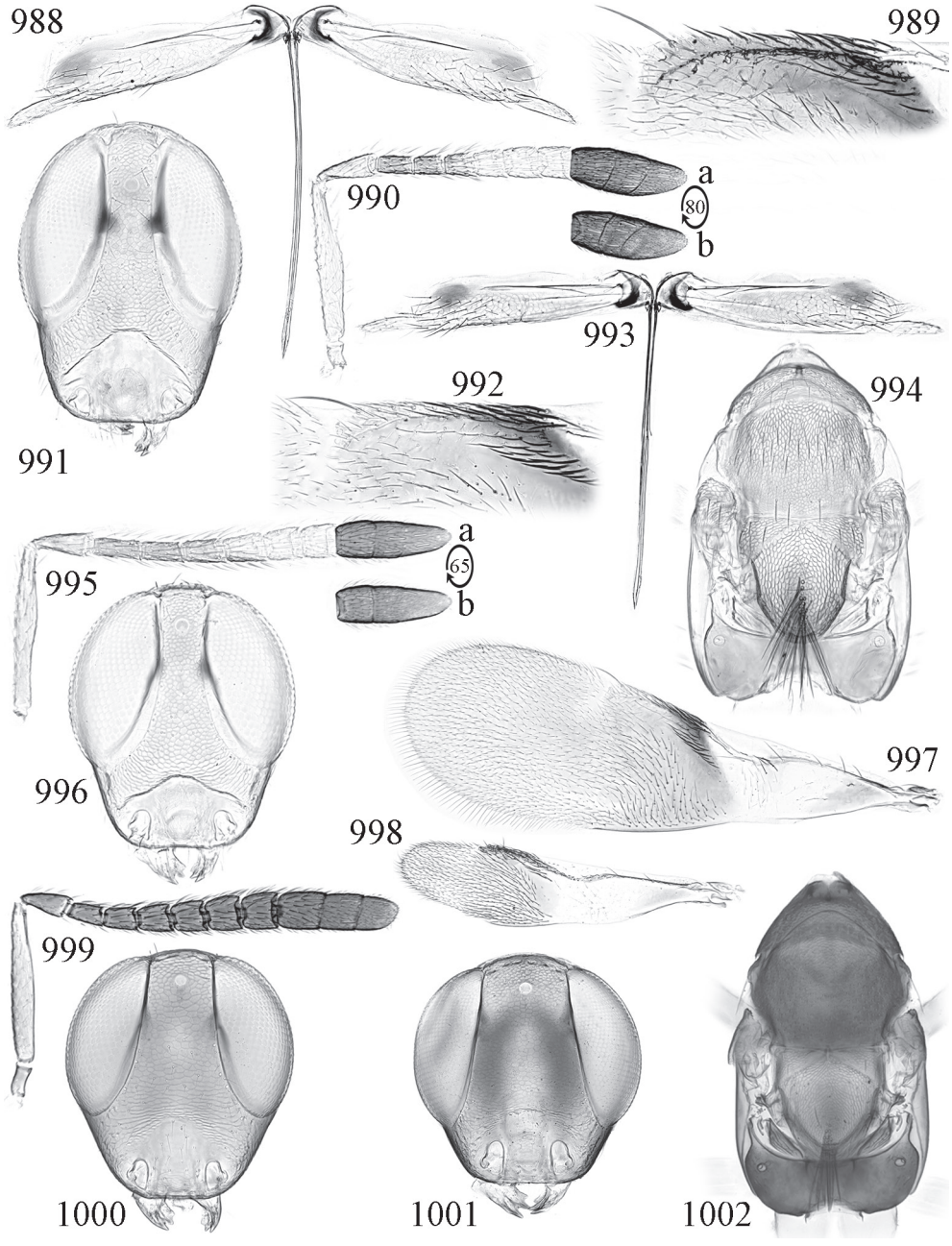
Figs 937-955. ***Cheiloneurus numida*** – (937) antenna; (938) fore wing; (939) apex of fore wing venation. ***Cheiloneurus aunes*** – (940) antenna, HT; (941) mesosoma, dorsal view, HT; (942) head (restructured); (943) apex of fore wing venation, HT; (944) fore wing, HT. ***Cheiloneurus elegans*** – (945) mesosoma, dorsal view; (946) head, facial view; (947) antenna; (948) fore wing; (949) apex of fore wing venation. ***Cheiloneurus tainus*** – (950) mesosoma, dorsal view, macropterous form; (951) mesosoma, dorsal view, brachypterous form; (952) antenna; (953) apex of fore wing venation, macropterous form; (954) fore wing, brachypterous form; (955) fore wing, macropterous form.



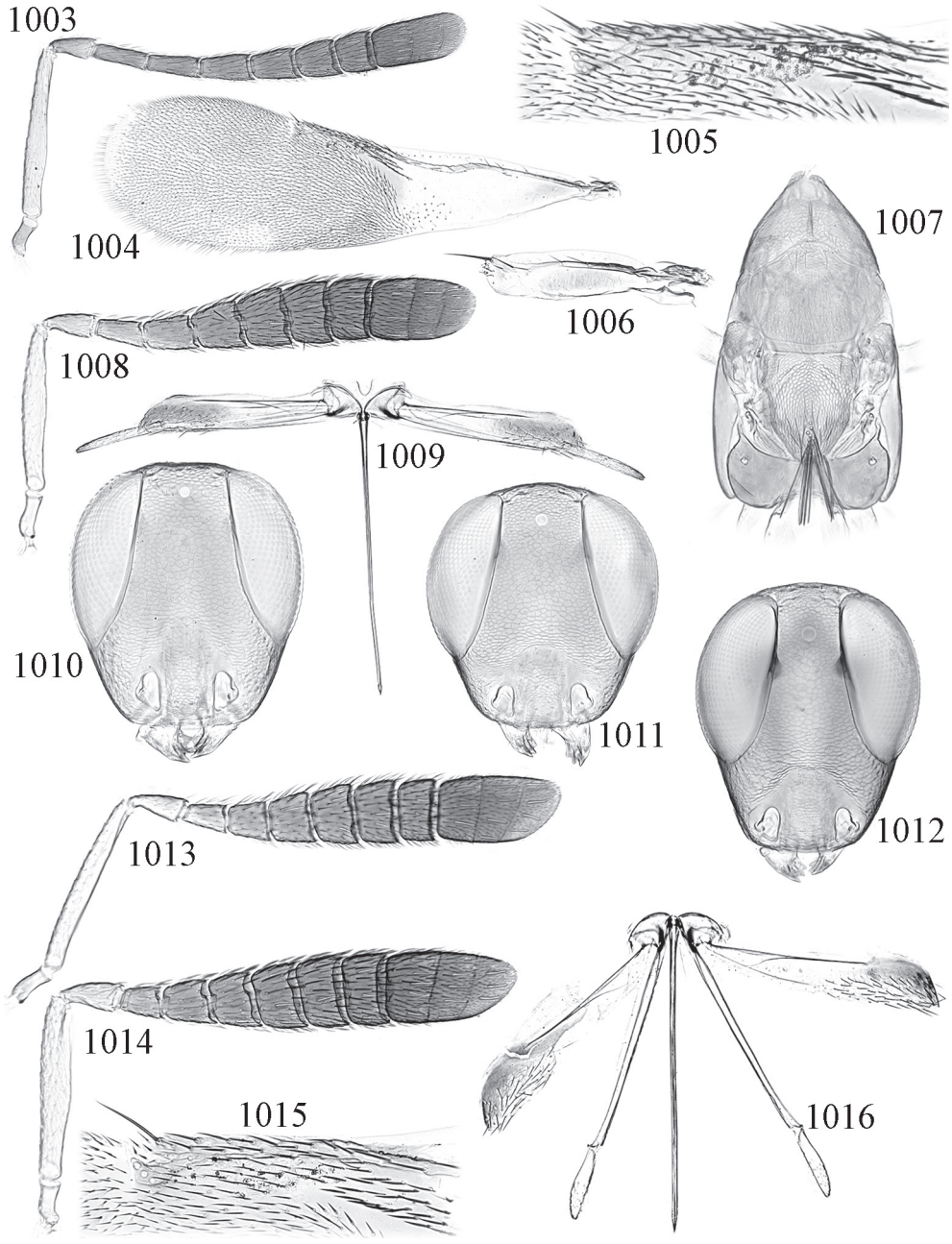
Figs 956-970. ***Cheiloneurus tainus*** – (956) head, facial view; (957) ovipositor. ***Cheiloneurus leda*** – (958) apex of fore wing venation; (959) mesosoma, dorsal view; (960) antenna; (961) fore wing; (962) head, facial view; (963) ovipositor. ***Cheiloneurus luceres*** – (964) ovipositor; (965) mesosoma, dorsal view; (966) fore wing; (967) antenna. ***Cheiloneurus perses*** – (968) head, facial view; (969) antenna; (970) ovipositor.



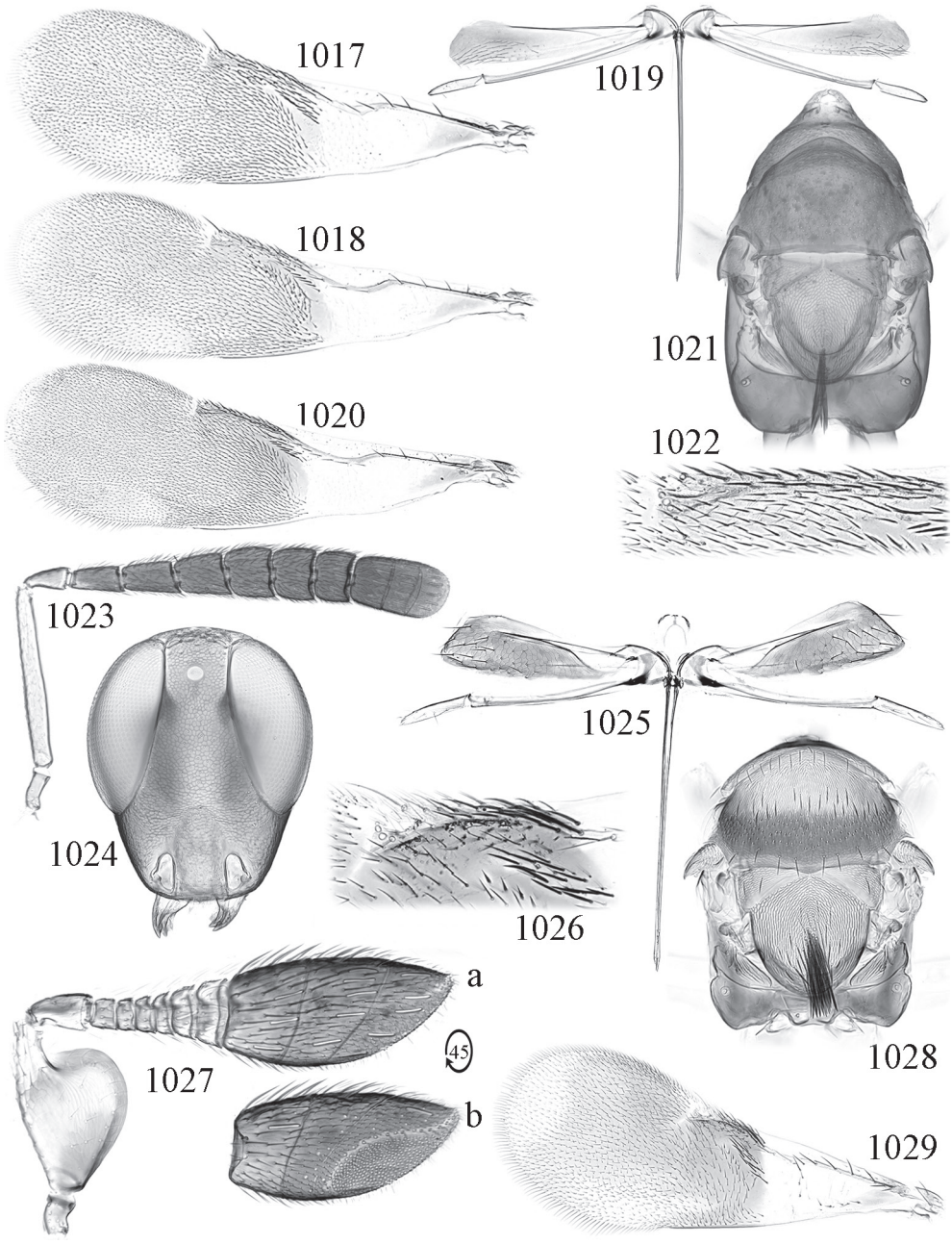
Figs 971-987. ***Cheiloneurus perses*** – (971) mesosoma, dorsal view. ***Cheiloneurus albinotatus*** – (972) apex of fore wing venation; (973) had, facial view; (974) antenna; (975) fore wing; (976) mesosoma, dorsal view. ***Cheiloneurus dymorus*** – (977) antenna (a, outer aspect of clava; b, inner aspect of clava); (978) apex of fore wing venation; (979) head, facial view; (980) brachypterous fore wing; (981) macropterous fore wing; (982) mesosoma, dorsal view; (983) ovipositor; (984) hypopygium. ***Cheiloneurus glycon*** – (985) mesosoma, dorsal view; (986) brachypterous fore wing; (987) macropterous fore wing.



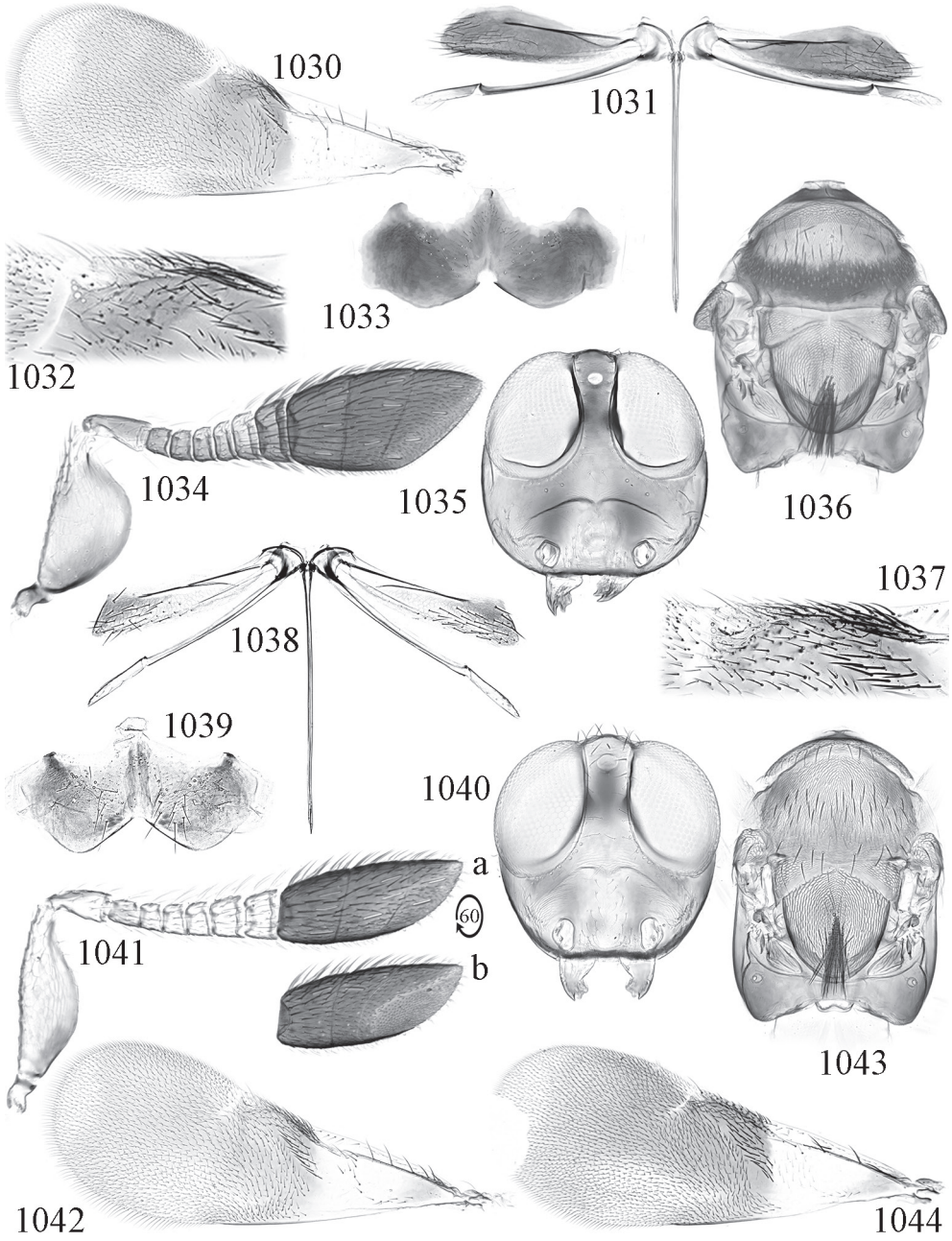
Figs 988-1002. ***Cheiloneurus glycon*** – (988) ovipositor; (989) apex of fore wing venation; (990) antenna (a, outer aspect of clava; b, inner aspect of clava); (991) head, facial view. ***Cheiloneurus meryae*** – (992) apex of fore wing venation; (993) ovipositor; (994) mesosoma, dorsal view; (995) antenna (a, outer aspect of clava; b, inner aspect of clava); (996) head, facial view; (997) fore wing. ***Cheiloneurus zeno*** – (998) fore wing; (999) antenna; (1000) head, facial aspect. ***Cheiloneurus cupreicollis*** – (1001) head, facial view; (1002) mesosoma, dorsal view.



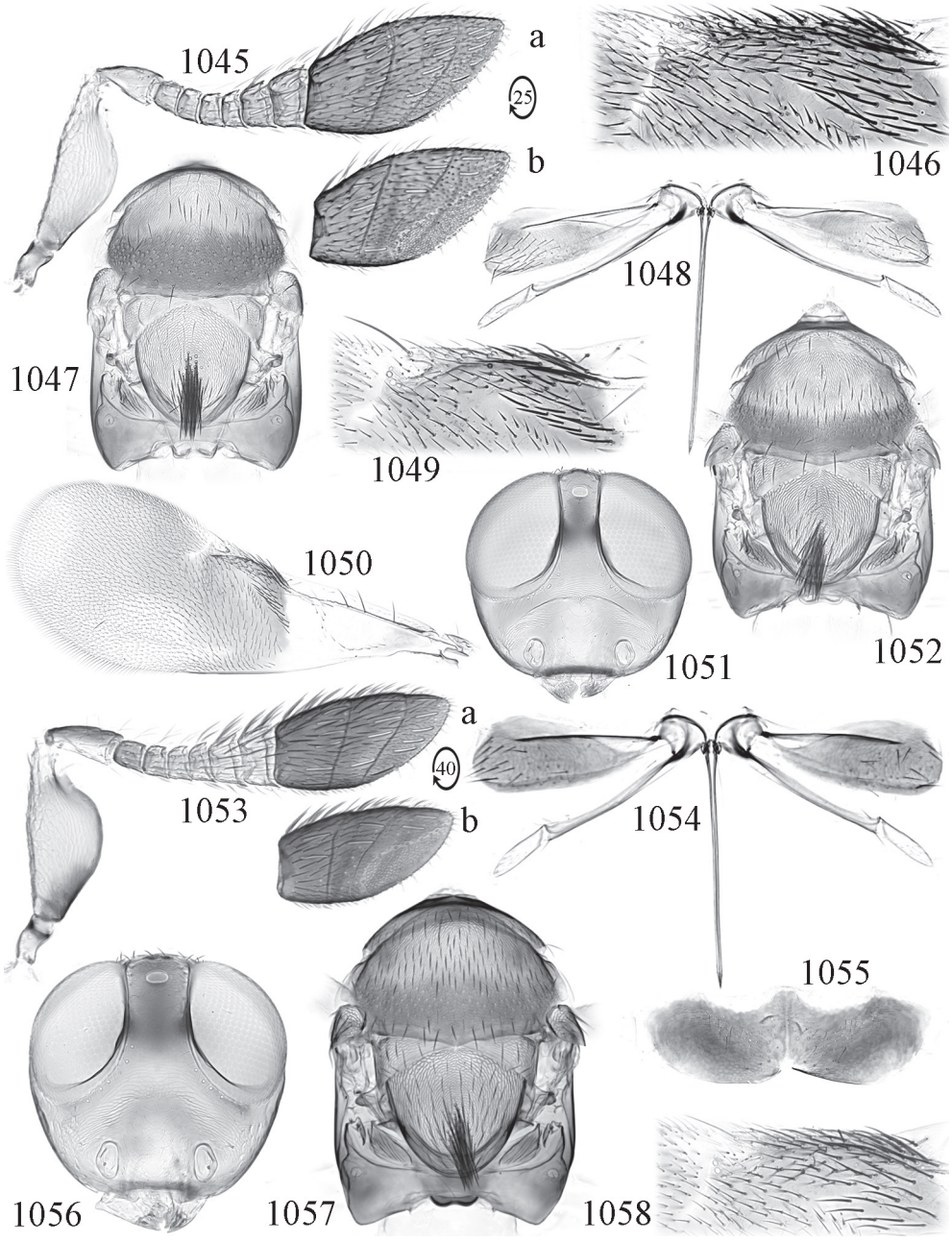
Figs 1003-1016. ***Cheiloneurus cupreicollis*** – (1003) antenna; (1004) fore wing; (1005) apex of fore wing venation. ***Cheiloneurus repola*** – (1006) fore wing; (1007) mesosoma, dorsal view; (1008) antenna; (1009) ovipositor; (1010) head, facial view. ***Cheiloneurus compressicornis*** – (1011) head, facial view, variant; (1012) head, facial view, variant; (1013) antenna, variant; (1014) antenna, variant; (1015) apex of fore wing venation; (1016) ovipositor.



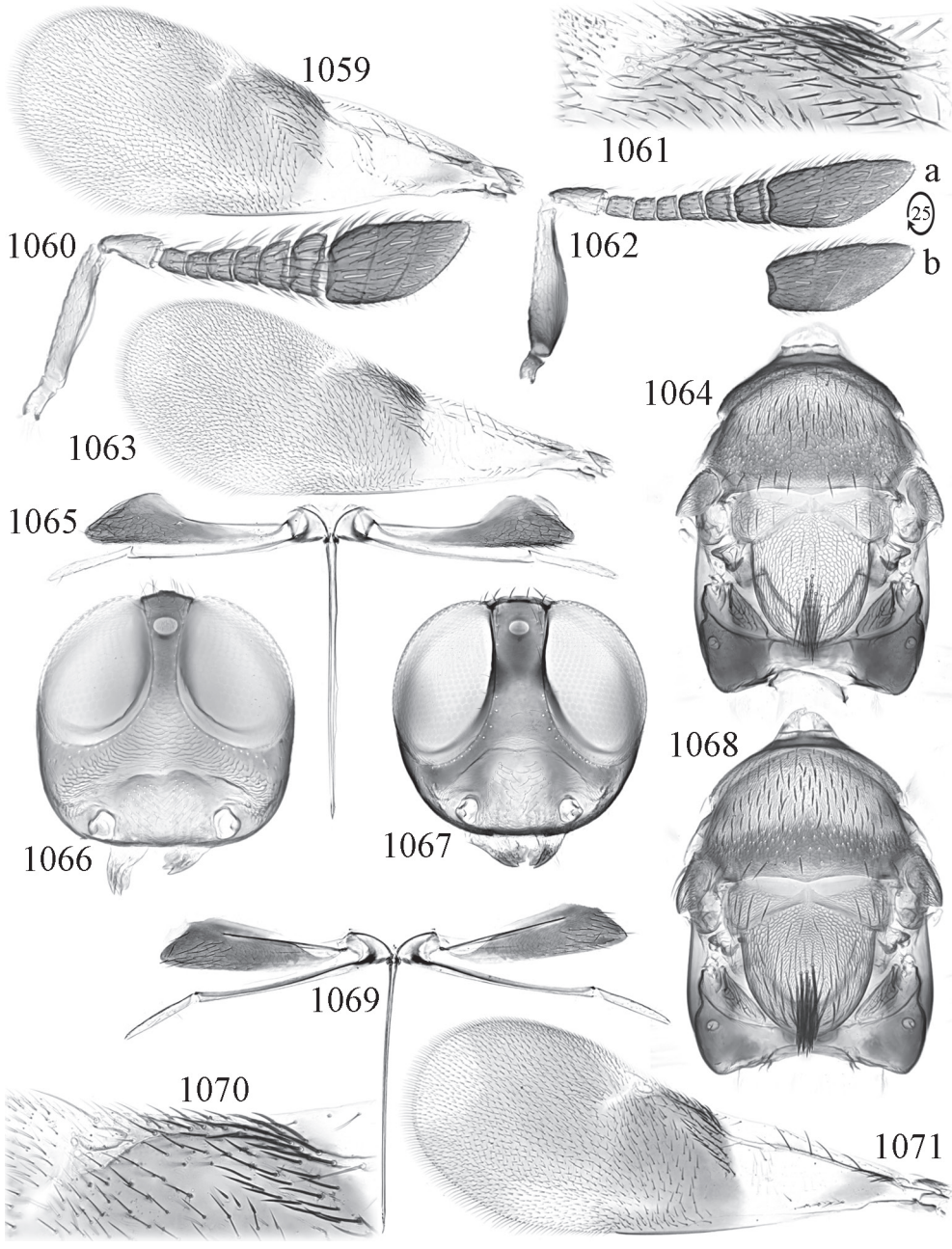
Figs 1017-1029. ***Cheiloneurus compressicornis*** – (1017) fore wing, variant; (1018) fore wing, variant. ***Cheilonereurus leone***, HT – (1019) ovipositor; (1020) fore wing; (1021) mesosoma, dorsal view; (1022) apex of fore wing venation; (1023) antenna; (1024) head, facial view. ***Cheiloneurus betes*** – (1025) ovipositor; (1026) apex of fore wing venation; (1027) antenna (a, outer aspect of clava; b, inner aspect of clava); (1028) mesosoma, dorsal view; (1029) fore wing.



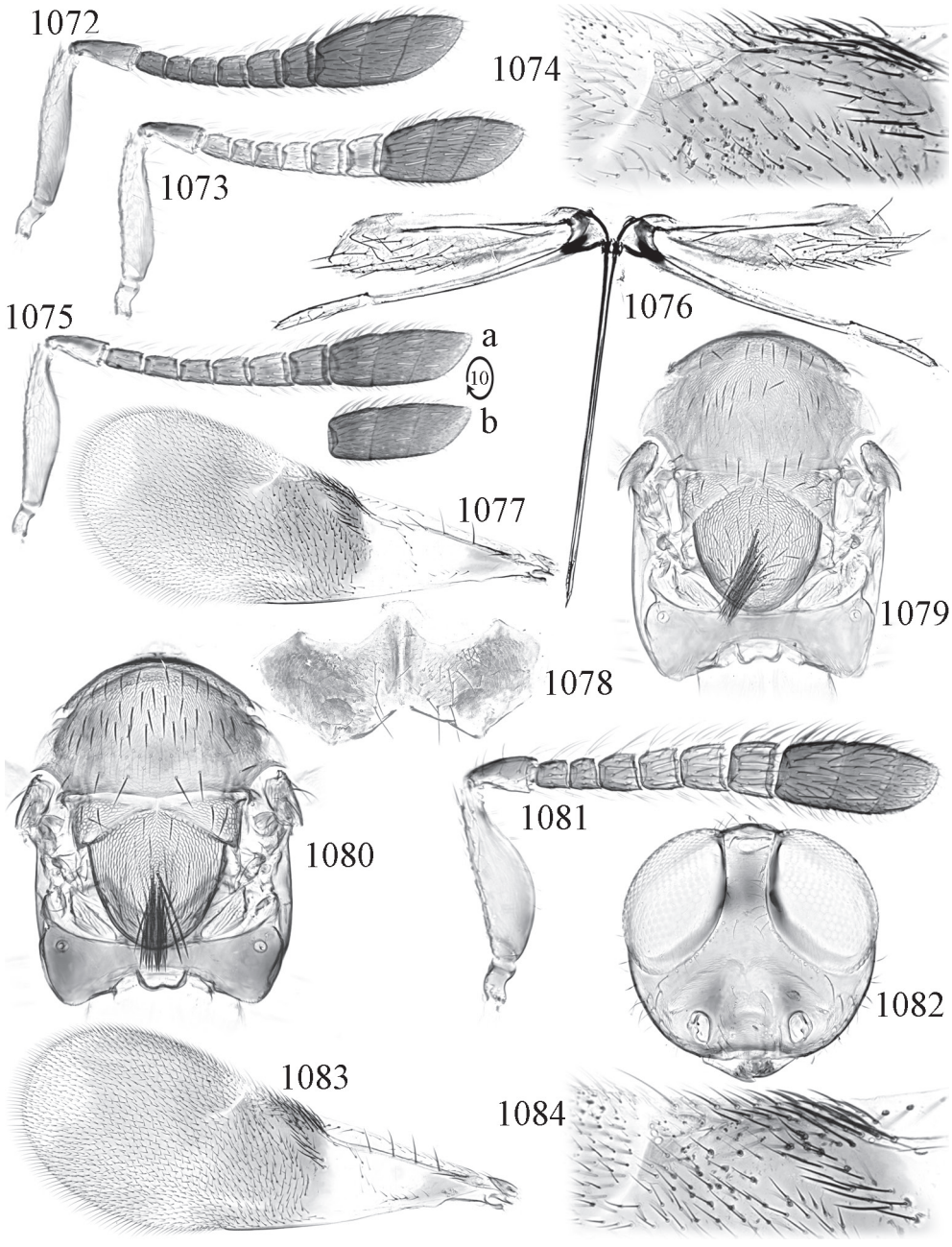
Figs 1030-1044. ***Cheiloneurus diaces***, HT – (1030) fore wing; (1031) ovipositor; (1032) apex of fore wing venation; (1033) hypopygium; (1034) antenna; (1035) head, facial view; (1036) mesosoma. dorsal view. ***Cheiloneurus ariston*** – (1037) apex of fore wing venation; (1038) ovipositor; (1039) hypopygium; (1040) head, facial view; (1041) antenna (a, outer aspect of clava; b, inner aspect of clava); (1042) fore wing; (1043) mesosoma, dorsal view. ***Cheiloneurus jeroba***, HT – (1044) fore wing.



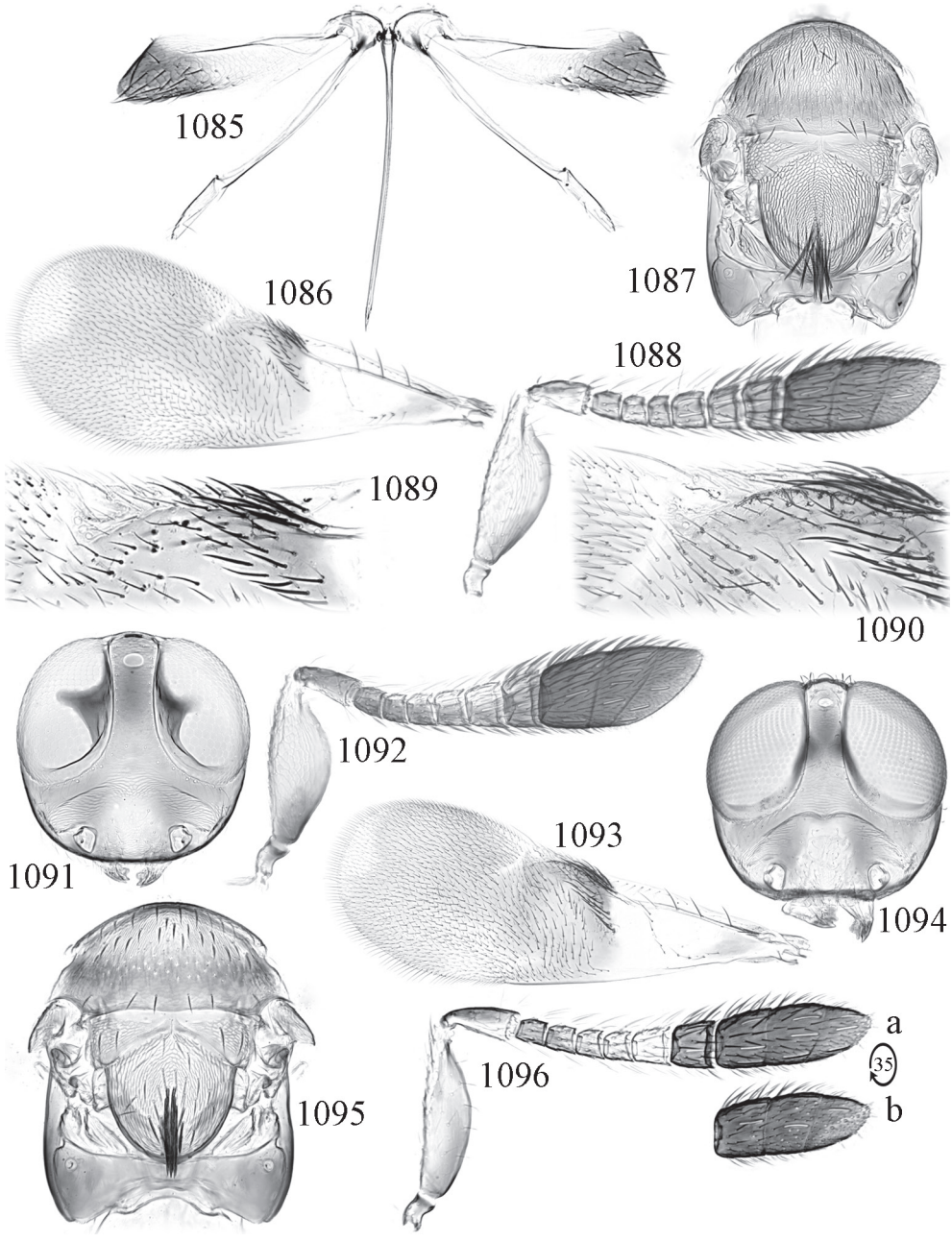
Figs 1045-1058. ***Cheiloneurus jeroba***, HT – (1045) antenna (a, outer aspect of clava; b, inner aspect of clava); (1046) apex of fore wing venation; (1047) mesosoma, dorsal view. ***Cheiloneurus letos*** – (1048) ovipositor, holotype; (1049) apex of fore wing venation; (1050) fore wing, holotype; (1051) head, facial view, holotype; (1052) mesosoma, dorsal view; (1053) antenna (a, outer aspect of clava; b, inner aspect of clava). ***Cheiloneurus cero***, HT – (1054) ovipositor; (1055) hypopygium; (1056) head, facial view; (1057) mesosoma, dorsal view; (1058) apex of fore wing venation.



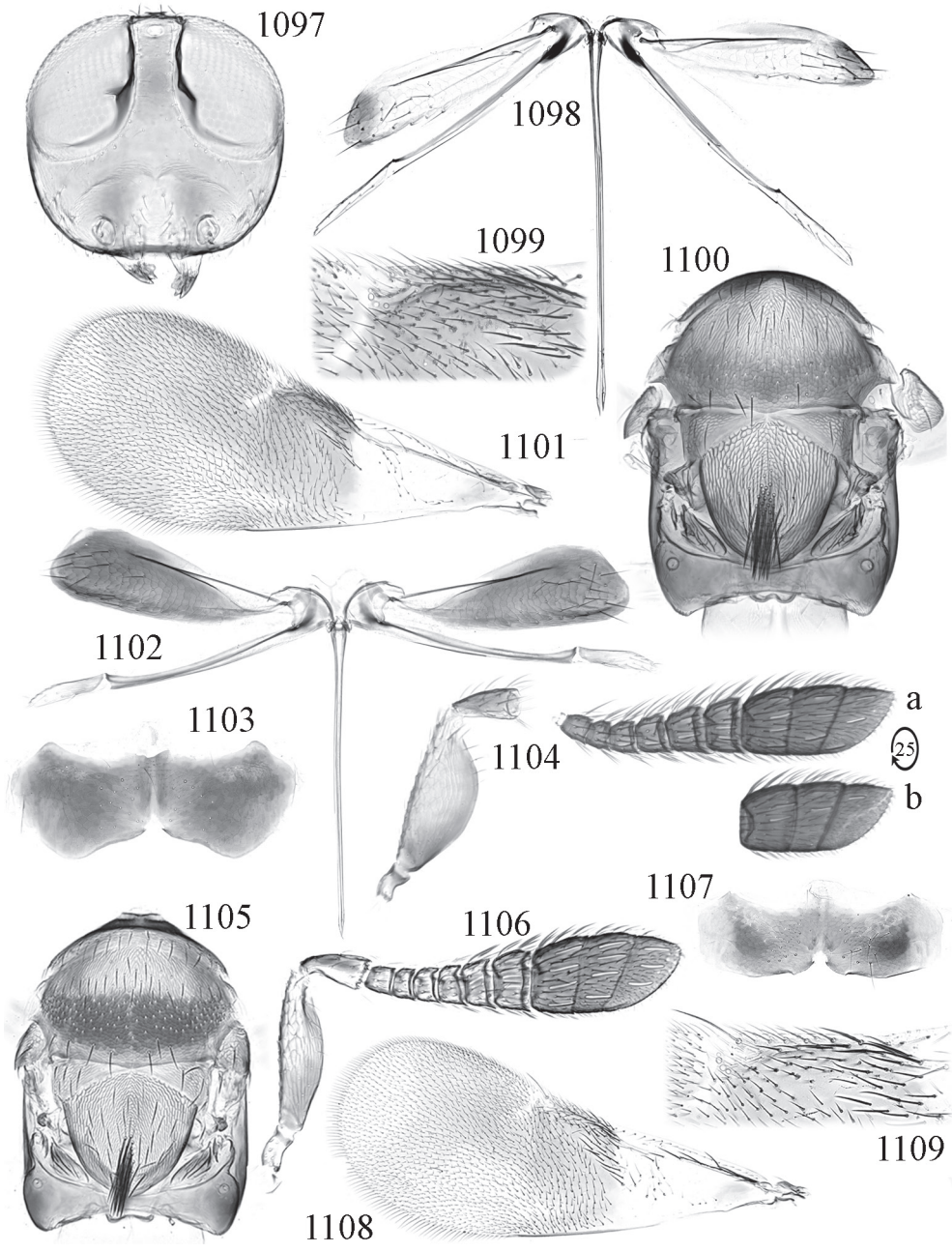
Figs 1059-1071. ***Cheiloneurus cero***, HT – (1059) fore wing; (1060) antenna. ***Cheiloneurus finator*** – (1061) apex of fore wing venation; (1062) antenna (a, outer aspect of clava; b, inner aspect of clava); (1063) fore wing; (1064) mesosoma, dorsal view; (1065) ovipositor; (1066) head, facial view. ***Cheiloneurus idifex***, HT – (1067) head, facial view; (1068) mesosoma, dorsal view; (1069) ovipositor; (1070) apex of fore wing venation; (1071) fore wing.



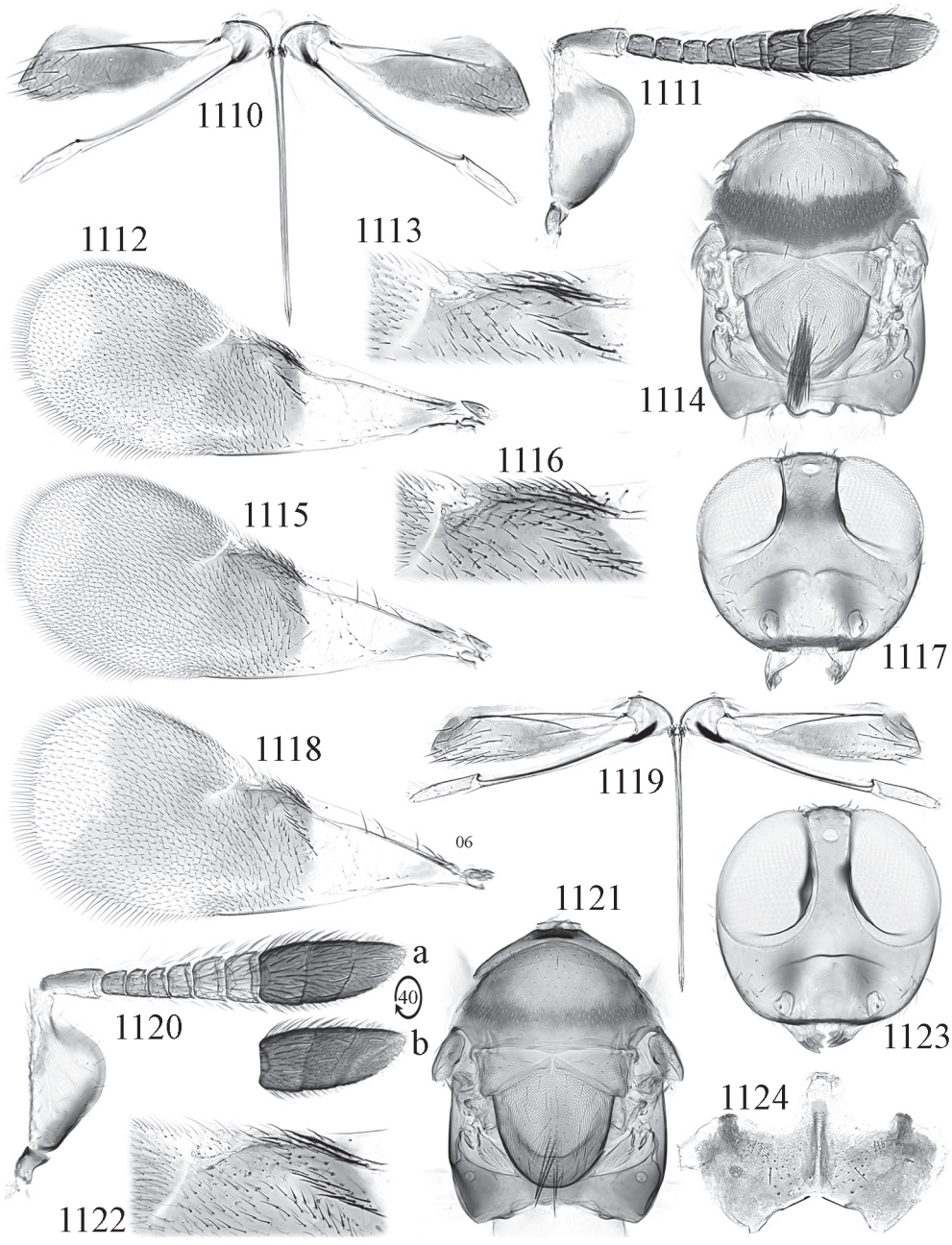
Figs 1072-1085. ***Cheiloneurus idifex*** – (1072) antenna, HT; (1073) antenna, variant. ***Cheiloneurus orbona*** – (1074) apex of fore wing venation; (1075) antenna (a, outer aspect of clava; b, inner aspect of clava); (1076) ovipositor; (1077) fore wing; (1078) hypopygium (1079) mesosoma, dorsal view. ***Cheiloneurus fautrix*** – (1080) mesosoma, dorsal view; (1081) antenna; (1082) head, facial view; (1083) fore wing; (1084). apex of fore wing venation.



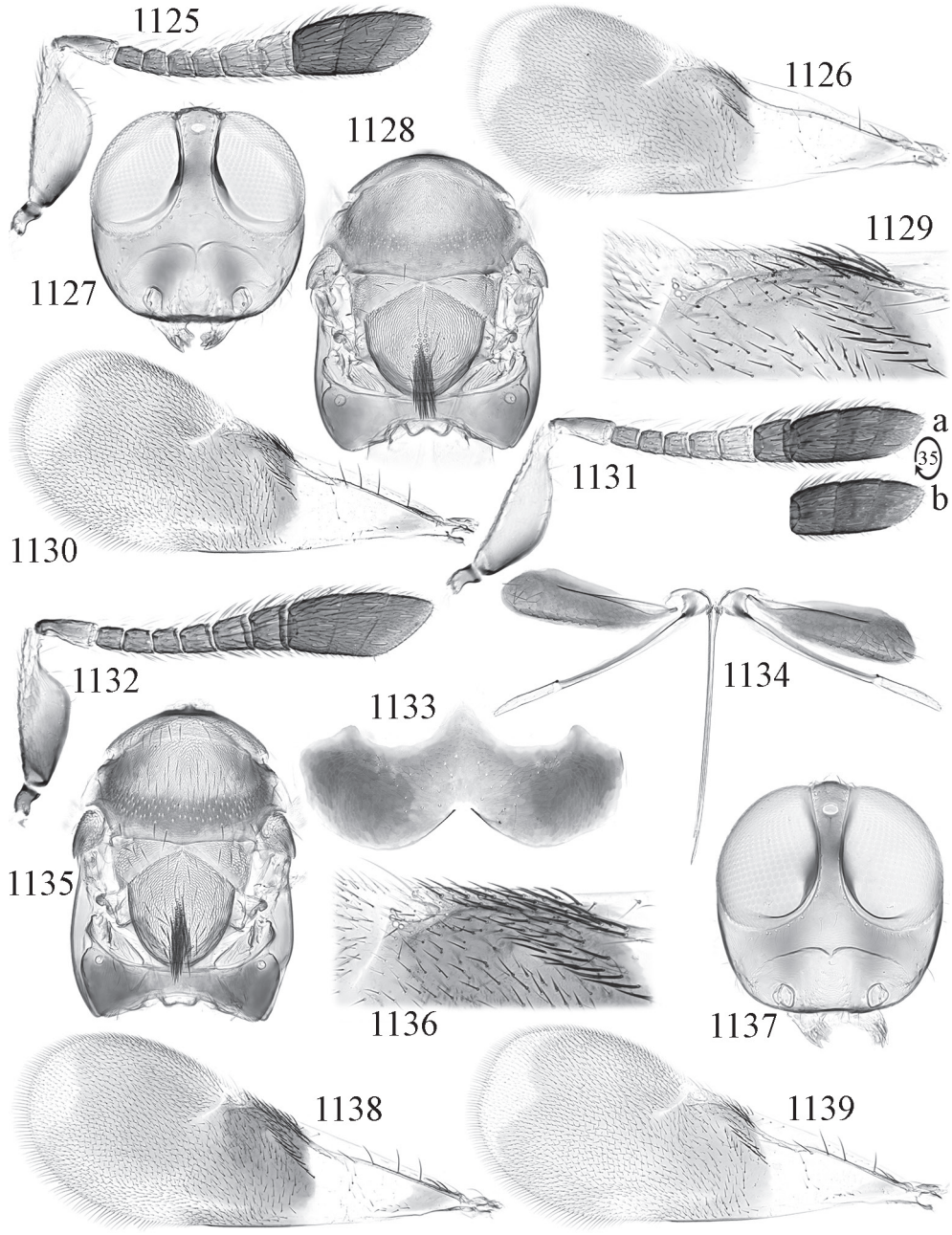
Figs 1085-1096. ***Cheiloneurus aesernia***, HT – (1085) ovipositor; (1086) fore wing; (1087) mesosoma, dorsal view; (1088) antenna; (1089) apex of fore wing venation. ***Cheiloneurus gyges*** – (1090) apex of fore wing venation; (1091) head, facial view, variant; (1092) antenna; (1093) fore wing; (1094) head, facial view, variant. ***Cheiloneurus lexovus***, HT – (1095) mesosoma, dorsal view; (1096) antenna (a, outer aspect of clava; b, inner aspect of clava).



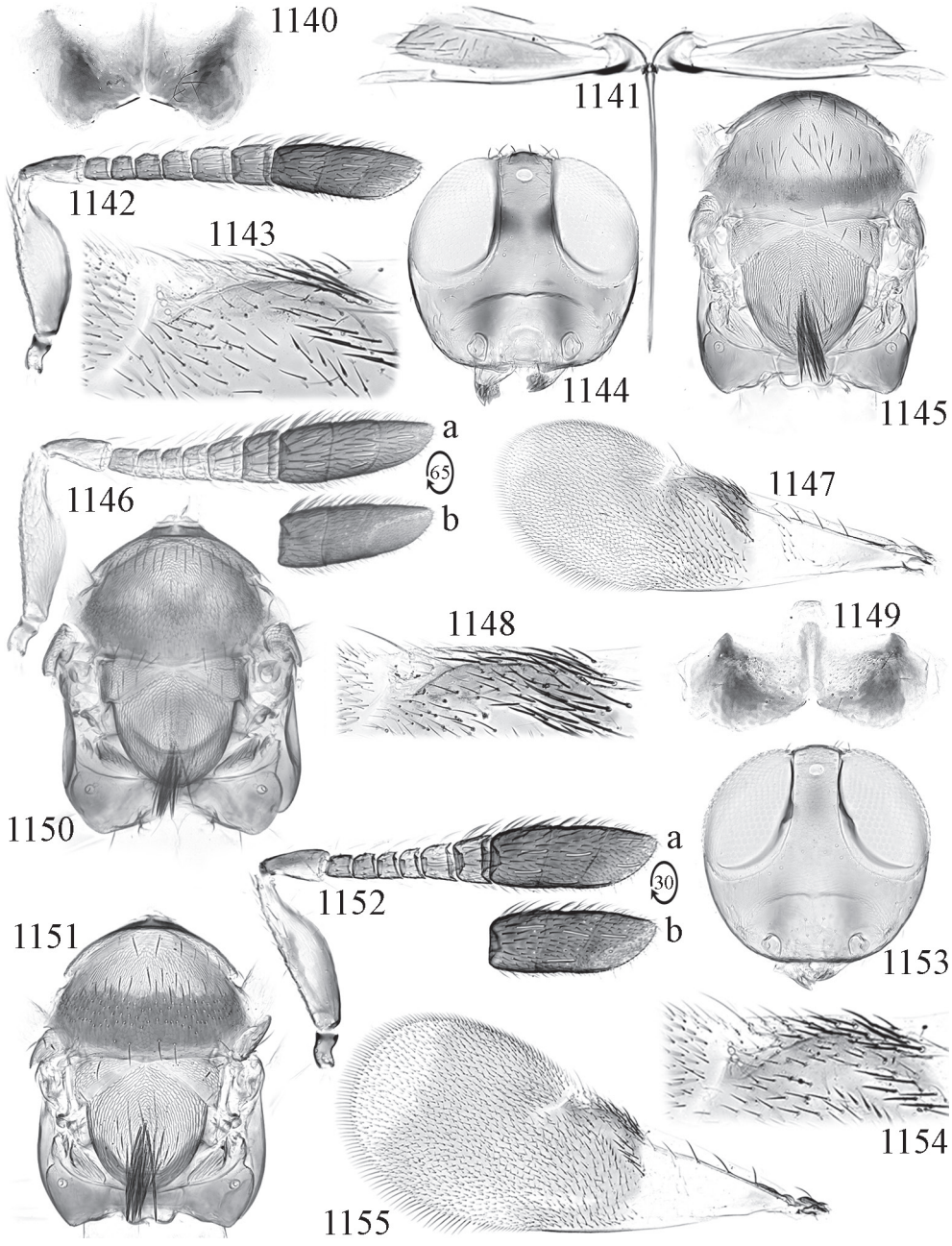
Figs 1097-1109. ***Cheiloneurus lexovus***, HT – (1097) head, facial view; (1098) ovipositor. ***Cheiloneurus numitor***, HT – (1099) apex of wing venation; (1100) mesosoma, dorsal view; (1101) fore wing; (1102) ovipositor; (1103) hypopygium; (1104) antenna (a, outer aspect of clava; b, inner aspect of clava). ***Cheiloneurus mora***, HT – (1105) mesosoma, dorsal view; (1106) antenna; (1107) hypopygium; (1108) fore wing, modified; (1109) apex of fore wing venation, modified.



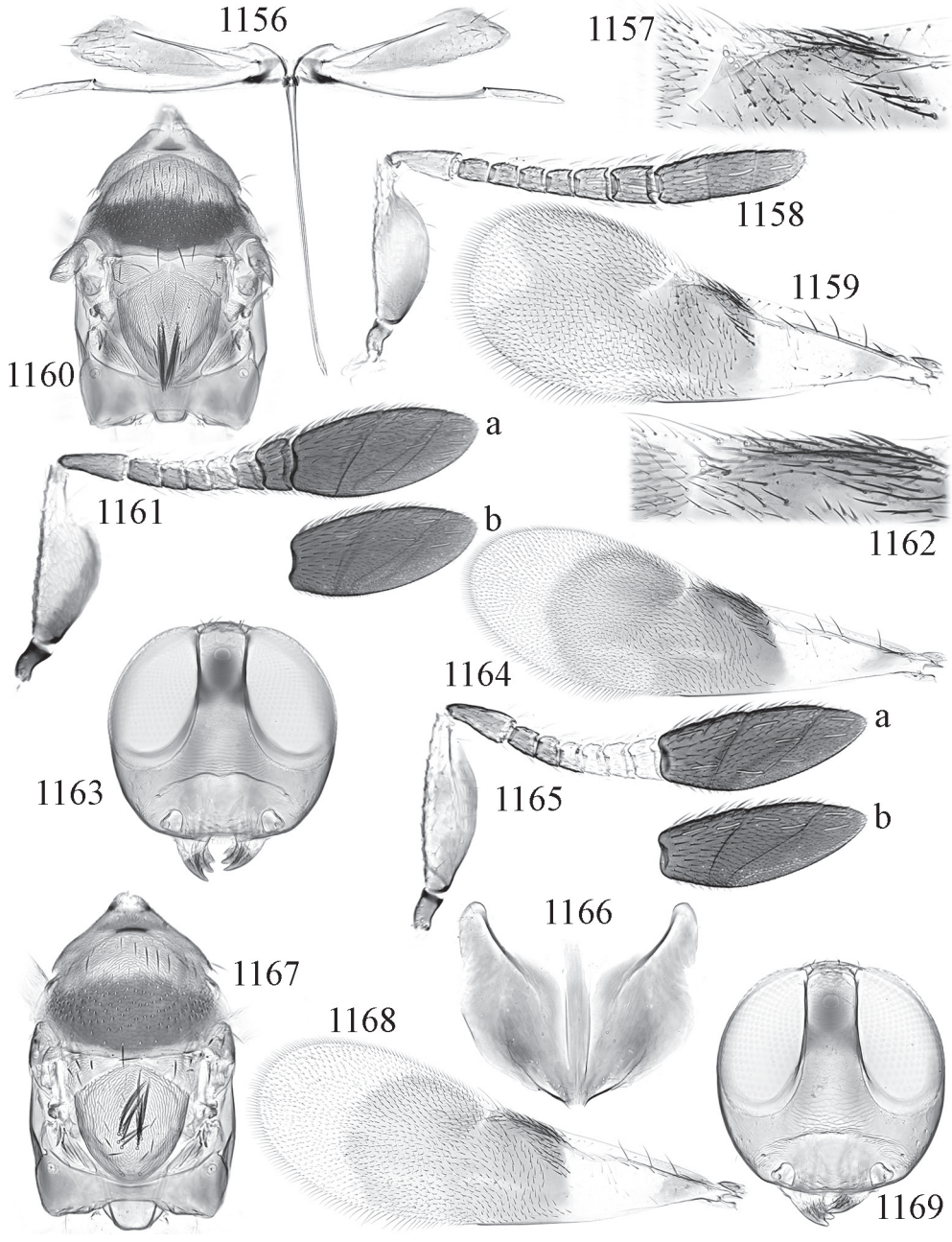
Figs 1110-1124. ***Cheiloneurus mora***, HT – (1110) ovipositor. ***Cheiloneurus ceiba*** – (1111) antenna; (1112) fore wing; (1113) apex of fore wing venation. ***Cheiloneurus nasica*** – (1114) mesosoma, dorsal view; (1115) fore wing; (1116) apex of fore wing venation; (1117) head, facial view; (1118) fore wing, variant; (1119) ovipositor; (1120) antenna (a, outer aspect of clava; b, inner aspect of clava). ***Cheiloneurus alopes***, HT – (1121) mesosoma, dorsal view; (1122) apex of fore wing venation; (1123) head, facial view; (1124) hypopygium (modified).



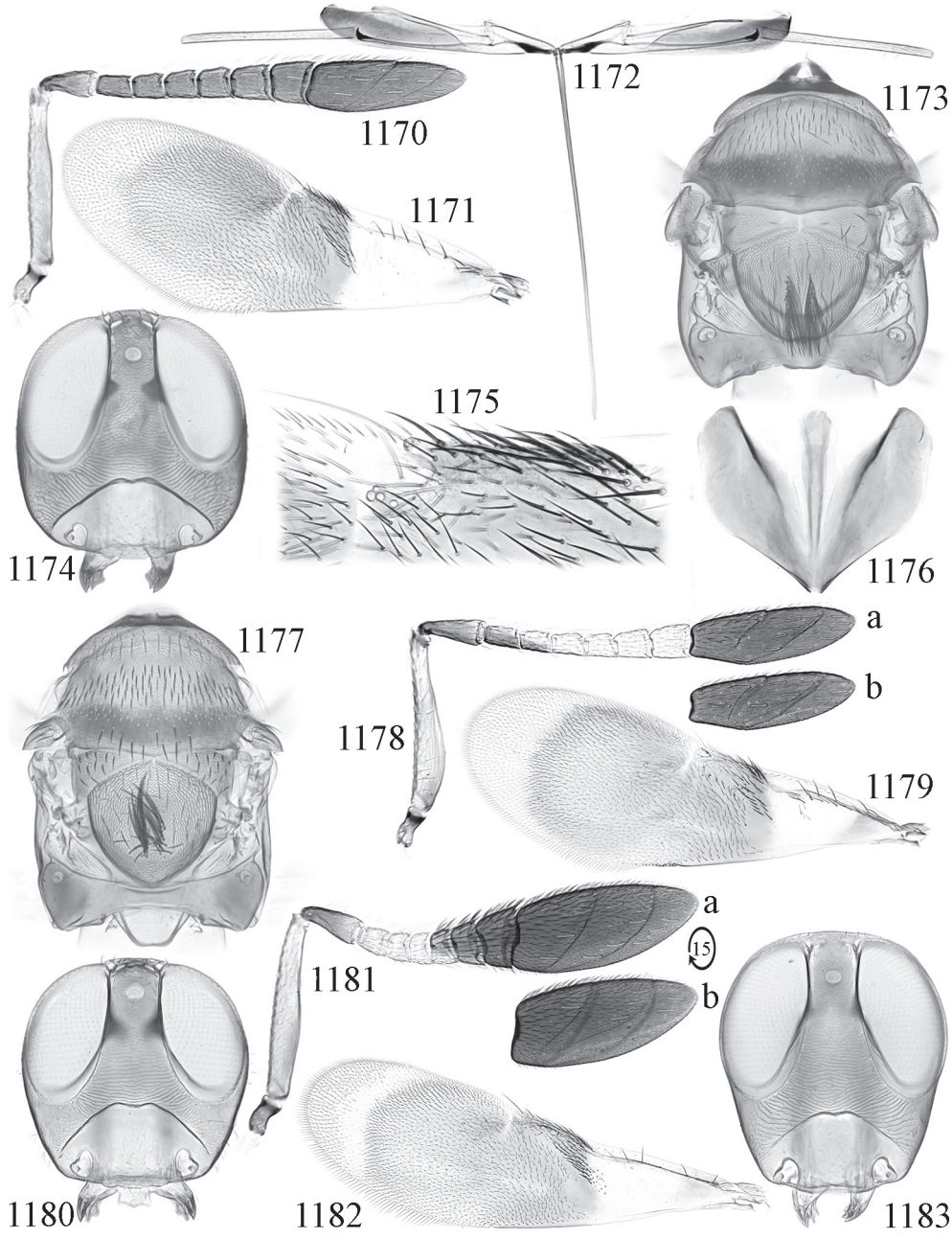
Figs 1125-1139. ***Cheiloneurus alopes***, HT – (1125) antenna; (1126) fore wing. ***Cheiloneurus janzeni*** – (1127) head, facial view; (1128) mesosoma, dorsal view; (1129) apex of fore wing venation; (1130) fore wing; (1131) antenna (a, outer aspect of clava; b, inner aspect of clava). ***Cheiloneurus dirce*** – (1132) antenna; (1133) hypopygium; (1134) ovipositor; (1135) mesosoma, dorsal view; (1136) apex of fore wing venation; (1137) head, facial view; (1138) fore wing. ***Cheiloneurus amethes***, HT – (1139) fore wing.



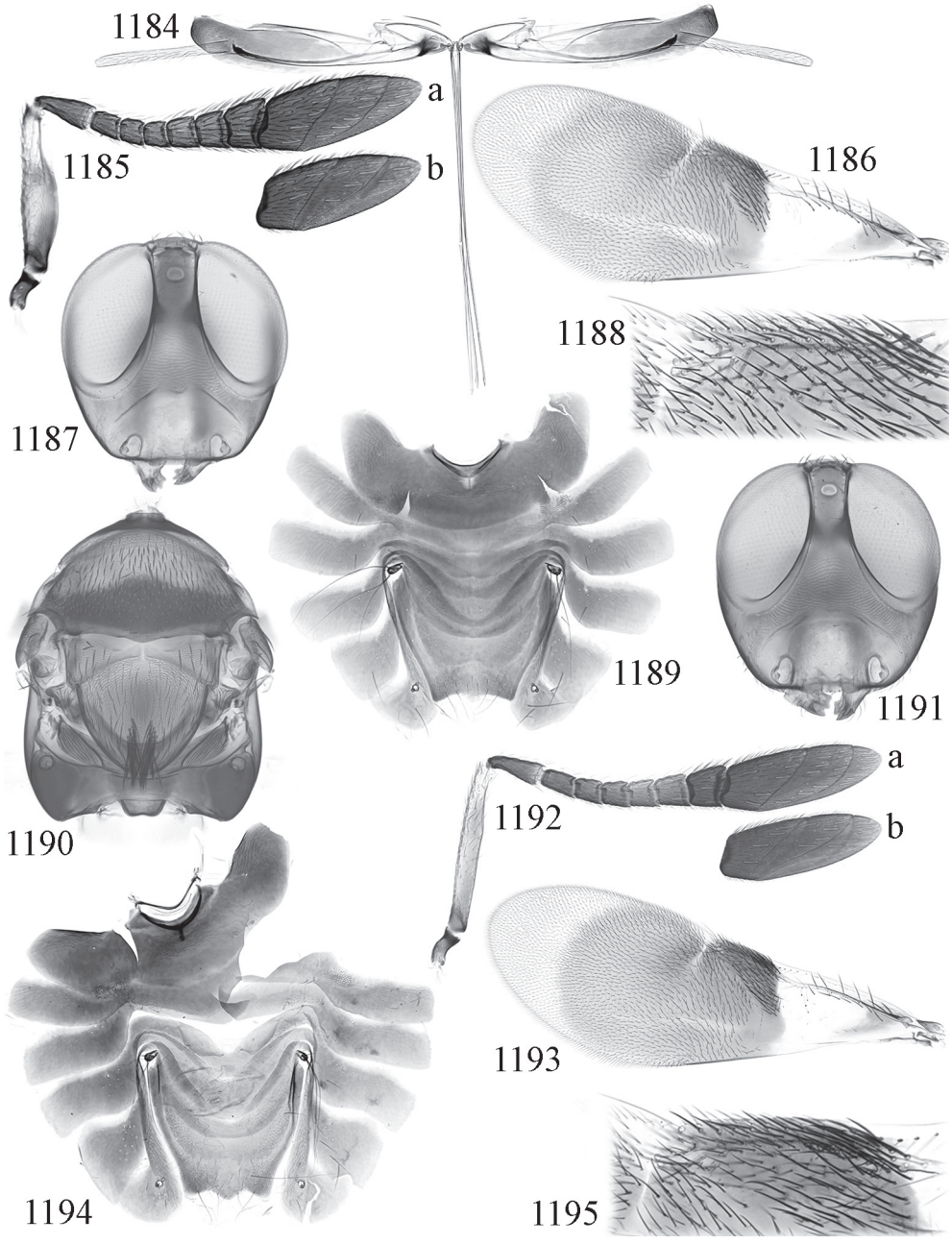
Figs 1140-1155. ***Cheiloneurus amethes***, HT – (1140) hypopygium; (1141) ovipositor; (1142) antenna; (1143) apex of fore wing venation; (1144) head, facial view; (1145) mesosoma, dorsal view. ***Cheiloneurus metheus*** – (1146) antenna (a, outer aspect of clava; b, inner aspect of clava); (1147) fore wing; (1148) apex of fore wing venation; (1149) hypopygium; (1150) mesosoma. dorsal view. ***Cheiloneurus omorus*** – (1151) mesosoma, dorsal view; (1152) antenna (a, outer aspect of clava; b, inner aspect of clava); (1153) head, facial view; (1154) apex of fore wing venation; (1155) fore wing.



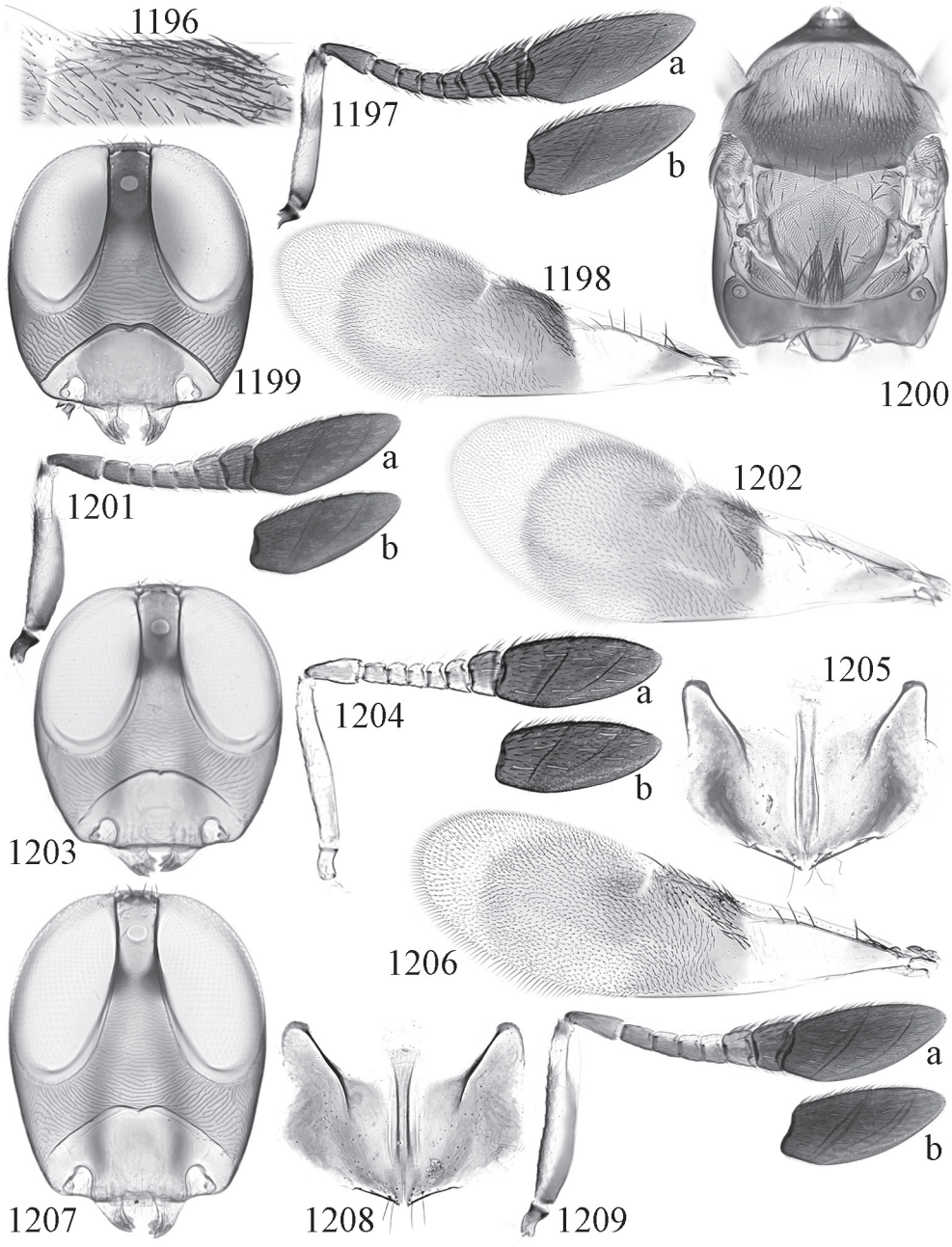
Figs 1156-1169. ***Cheiloneurus omorus*** – (1156) ovipositor. ***Cheiloneurus nebucha***, HT – (1157) apex of fore wing venation; (1158) antenna; (1159) fore wing. ***Prochiloneurus surwaka*** – (1160) mesosoma, dorsal view; (1161) antenna (a, outer aspect of clava; b, inner aspect of clava); (1162) apex of fore wing venation; (1163) head, facial view; (1164) fore wing. ***Prochiloneurus alasirus***, HT – (1165) antenna; (1166) hypopygium; (1167) mesosoma, dorsal view; (1168) fore wing; (1169) head, facial view.



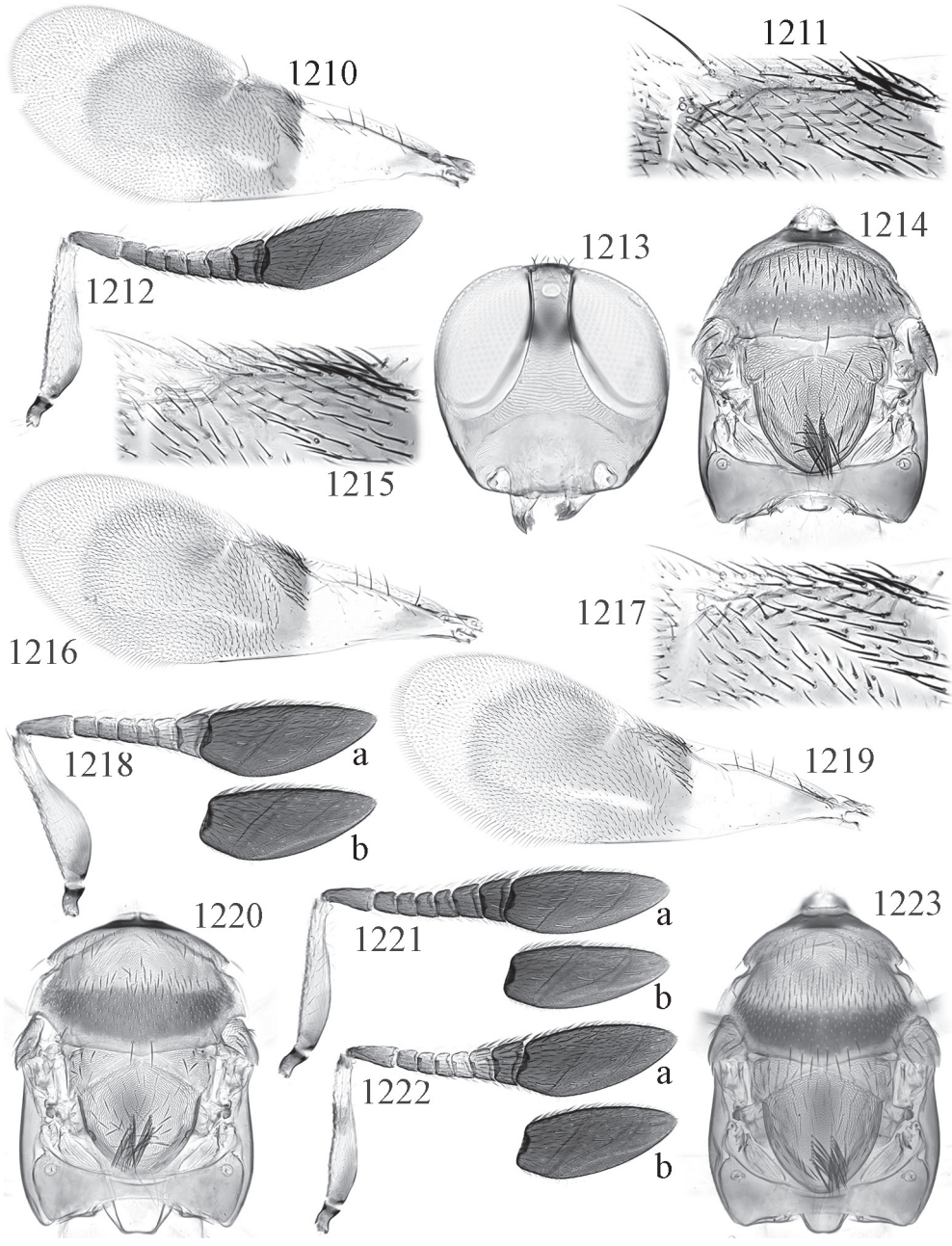
Figs 1170-1183. ***Prochiloneurus olax***, HT – (1170) antenna; (1171) fore wing; (1172) ovipositor; (1173) mesosoma, dorsal view; (1174) head, facial view; (1175) apex of fore wing venation; (1176) hypopygium. ***Prochiloneurus armidus,*** HT – (1177) mesosoma, dorsal view; (1178) antenna (a, outer aspect of clava; b, inner aspect of clava); (1179) fore wing; (1180) head, facial view. ***Prochiloneurus akea***, HT – (1181) antenna (a, outer aspect of clava; b, inner aspect of clava); (1182) fore wing; (1183) head, facial view.



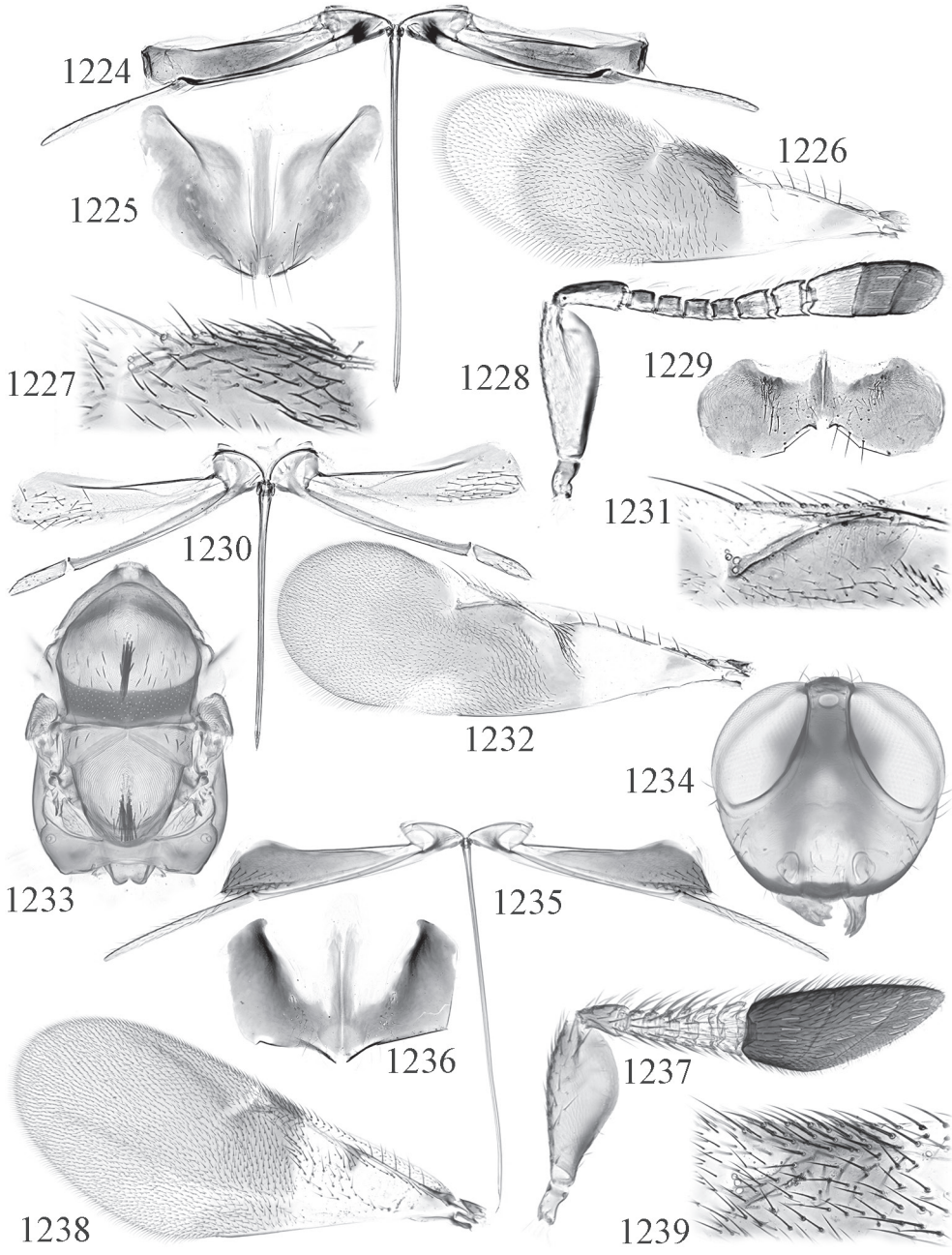
Figs 1184-1195. ***Prochiloneurus abelio***, HT – (1184) ovipositor; (1185) antenna (a, outer aspect of clava; b, inner aspect of clava); (1186) fore wing; (1187) head, facial view; (1188) apex of fore wing venation; (1189) gastral tergites; (1190) mesosoma, dorsal view. ***Prochiloneurus helleria*** – (1191) head, facial view; (1192) antenna (a, outer aspect of clava; b, inner aspect of clava); (1193) fore wing; (1194) gastral tergittes; (1195) apex of fore wing venation.



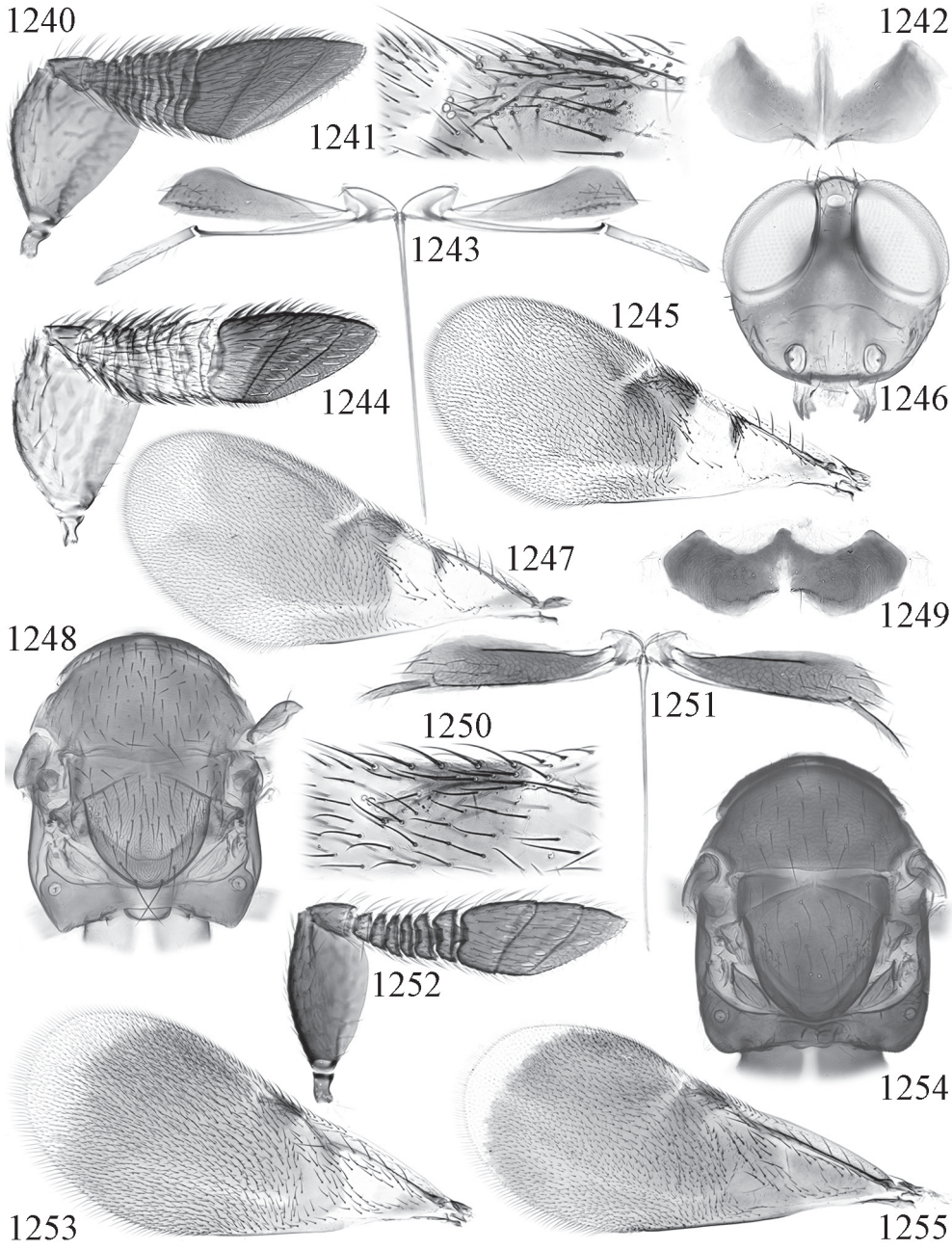
Figs 1196-1209. ***Prochiloneurus lenus*** – (1196) apex of fore wing venation; (1197) antenna (a, outer aspect of clava; b, inner aspect of clava); (1198) head, facial view; (1200) mesosoma, dorsal view. ***Prochiloneurus aethus***, HT – (1201) antenna (a, outer aspect of clava; b, inner aspect of clava); (1202) fore wing; (1203) head, facial view. ***Prochiloneurus modestus*** – (1204) antenna (a, outer aspect of clava; b, inner aspect of clava); (1205) hypopygium; (1206) fore wing. ***Prochiloneurus dactylopii*** – (1207) head, facial view; (1208) hypopygium; (1209) antenna (a, outer aspect of clava; b, inner aspect of clava).



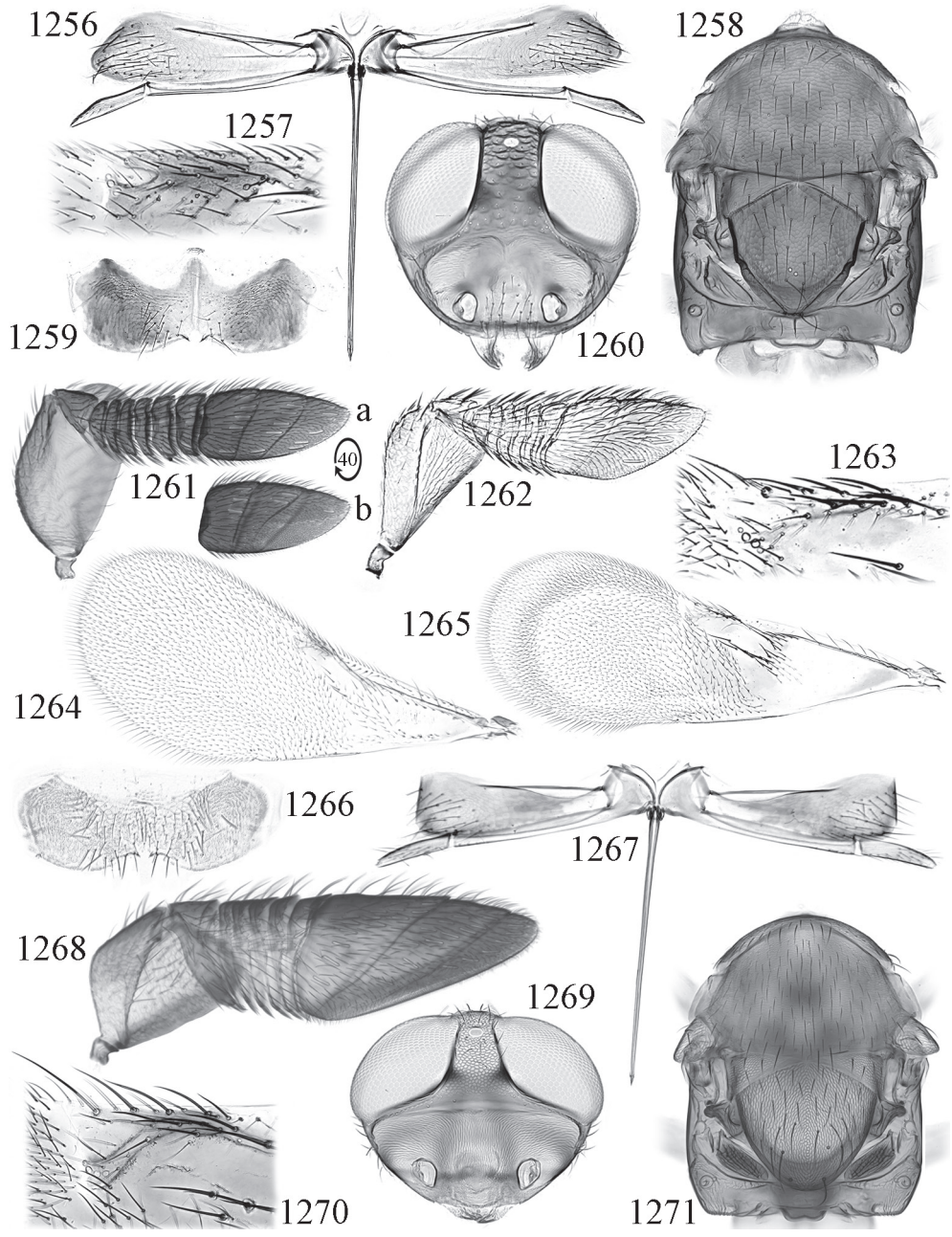
Figs 1210-1223. ***Prochiloneurus dactylopii*** – (1210) fore wing; (1211) apex of fore wing venation. ***Prochilonerus thonus*** – (1212) antenna; (1213) head, facial view; (1214) mesosoma, dorsal view; (1215) apex of fore wing venation; (1216) fore wing. ***Prochiloneurus lucetia*** – (1217) apex of fore wing venation; (1218) antenna (a, outer aspect of clava; b, inner aspect of clava); (1219) fore wing; (1220) mesosoma, dorsal view. ***Prochiloneurus zunigai*** – (1221) antenna (a, outer aspect of clava; b, inner aspect of clava); (1222) antenna (a, outer aspect of clava; b, inner aspect of clava), variant; (1223) mesosoma, dorsal view.



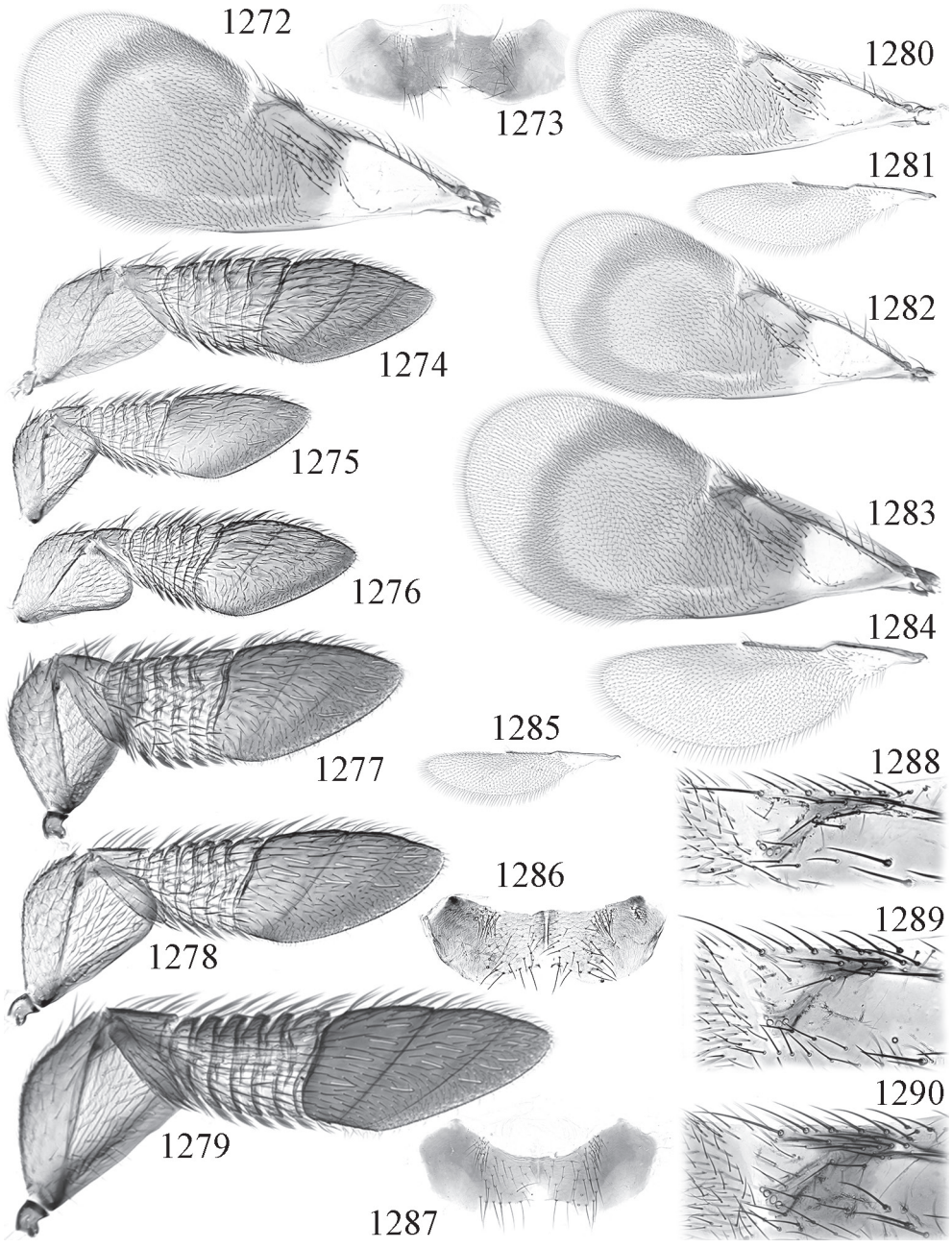
Figs 1224-1239. ***Prochiloneurus zunigai*** – (1224) ovipositor; (1225) hypopygium; (1226) fore wing; (1227) apex of fore wing venation. ***Diversinervus elegans*** – (1228) antenna; (1229) hypopygium; (1230) ovipositor; (1231) apex of fore wing venation; (1232) fore wing; (1233) mesosoma, dorsal view. ***Iceromyia flavifrons*** – (1234) head, facial view (restructured); (1235) ovipositor; (1236) hypopygium; (1237) antenna; (1238) fore wing; (1239) apex of fore wing venation.



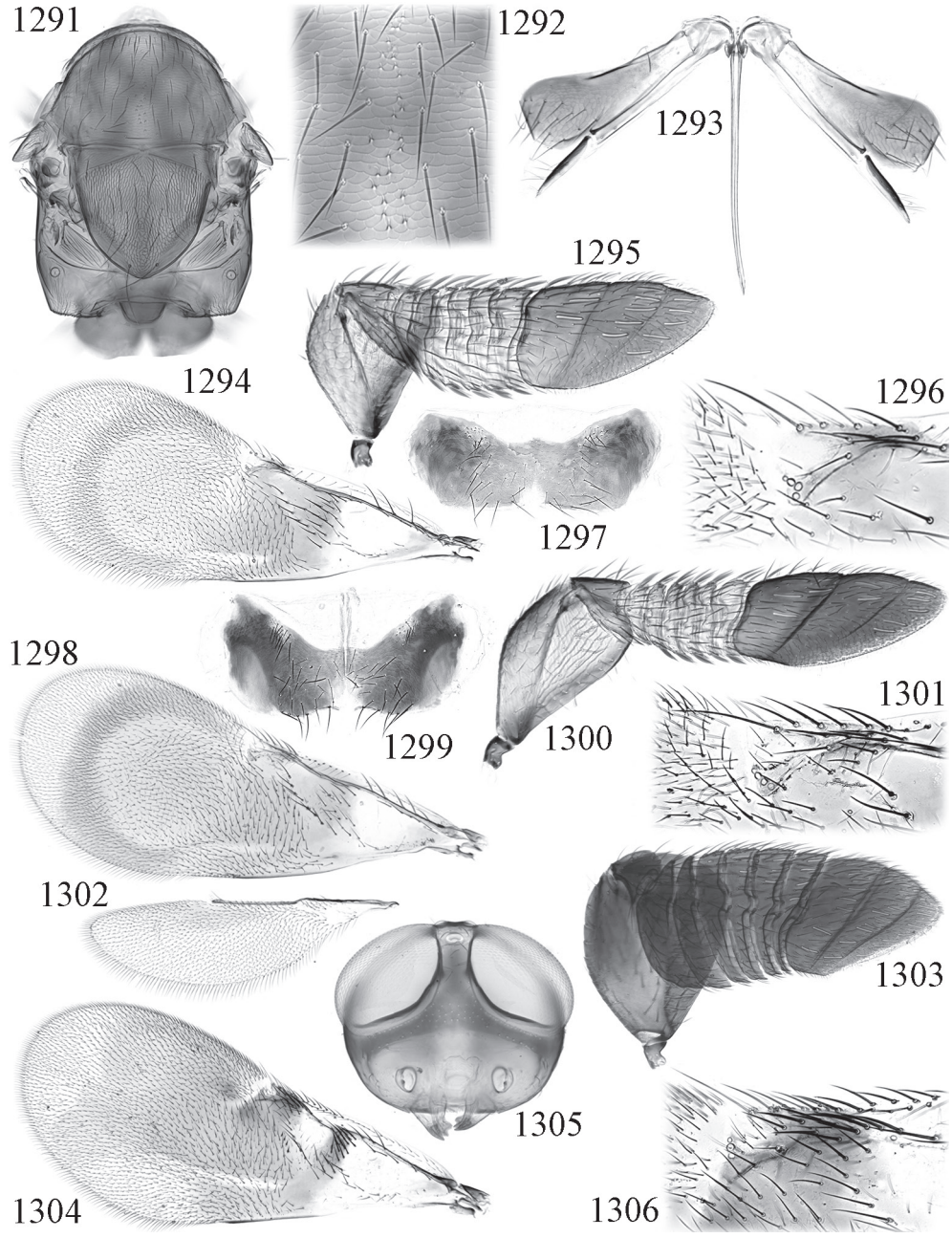
Figs 1240-1255. ***Homosemion bennetti*** – (1240) antenna; (1241) apex of fore wing venation; (1242) hypopygium; (1243) ovipositor; (1244) antenna, variant; (1245) fore wing, variant; (1246) head; (1247) fore wing; (1248) mesosoma, dorsal view. ***Eusemion monos*** – (1249) hypopygium (reconstructed); (1250) apex of fore wing venation; (1251) ovipositor; (1252) antenna; (1253) fore wing; (1254) mesosoma, dorsal view. ***Eusemion themisto*** – (1255) fore wing.



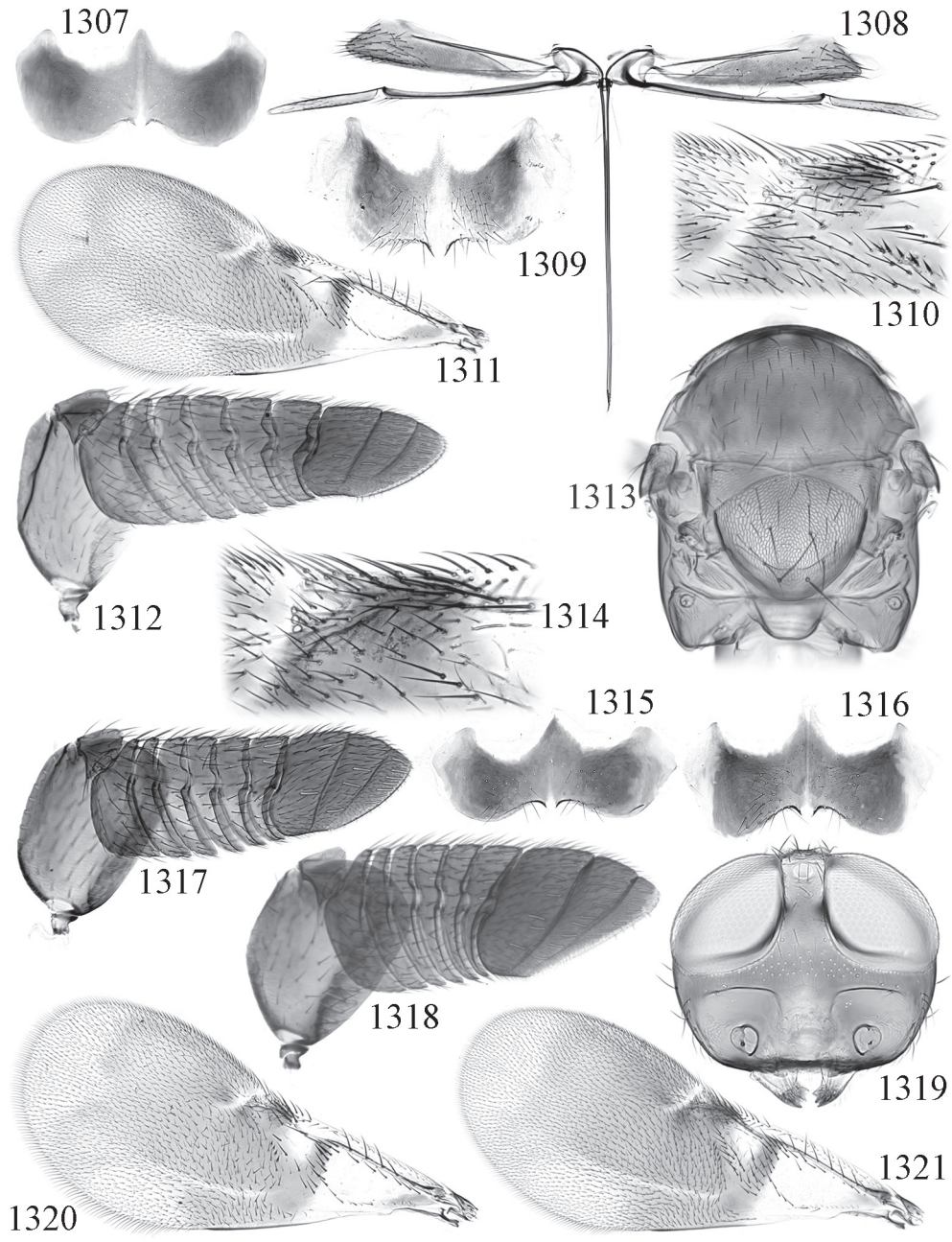
Figs 1256-1271. ***Eusemion themisto*** – (1256) ovipositor; (1257) apex of fore wing venation; (1258) mesosoma, dorsal view; (1259) hypopygium; (1260) head, facial view; (1261) antenna (a, outer aspect of clava; b, inner aspect of clava). ***Anicetus annulatus*** – (1262) antenna; (1263) apex of fore wing ventation; (1264) fore wing, ♂; (1265) fore wing; (1266) hypopygium. ***Anicetus oroso***, HT – (1267) ovipositor; (1268) antenna; (1269) head, facial view; (1270) apex of fore wing venation; (1271) mesosoma, dorsal view.



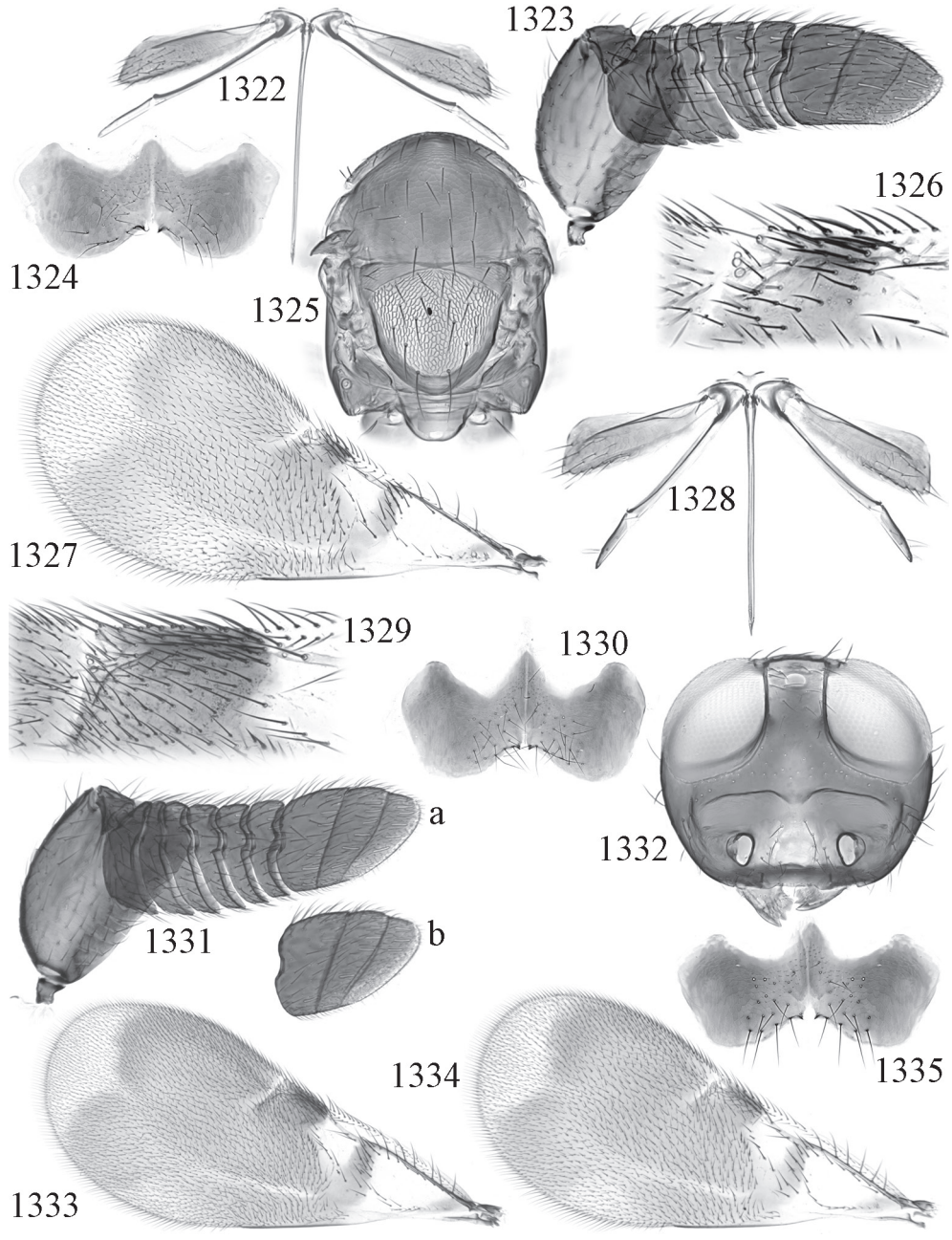
Figs 1272-1290. ***Anicetus oroso***, HT – (1272) fore wing; (1273) hypopygium. ***Anicetus lysithea*** – (1274) antenna; (1275-1276) antennae, smaller specimens, lower altitudes; (1277-1278) antennae, larger specimens, intermediate altitude; (1279) largest specimen, higher altitude; (1280) fore wing; (1281) hind wing; (1282) fore wing, large, dark specimen; (1283) fore wing, largest specimen; (1284) hind wing, largest specimen; (1285) hind wing, small specimen; (1286) hypopygium, variant; (1287) hypopygium, variant; (1288) apex of fore wing venation; (1289) apex of fore wing venation, larger specimen; (1290) apex of fore wing venation, large, dark specimen. [Figs 1274-1275, 1280-1285 are in proportion to specimen size.]



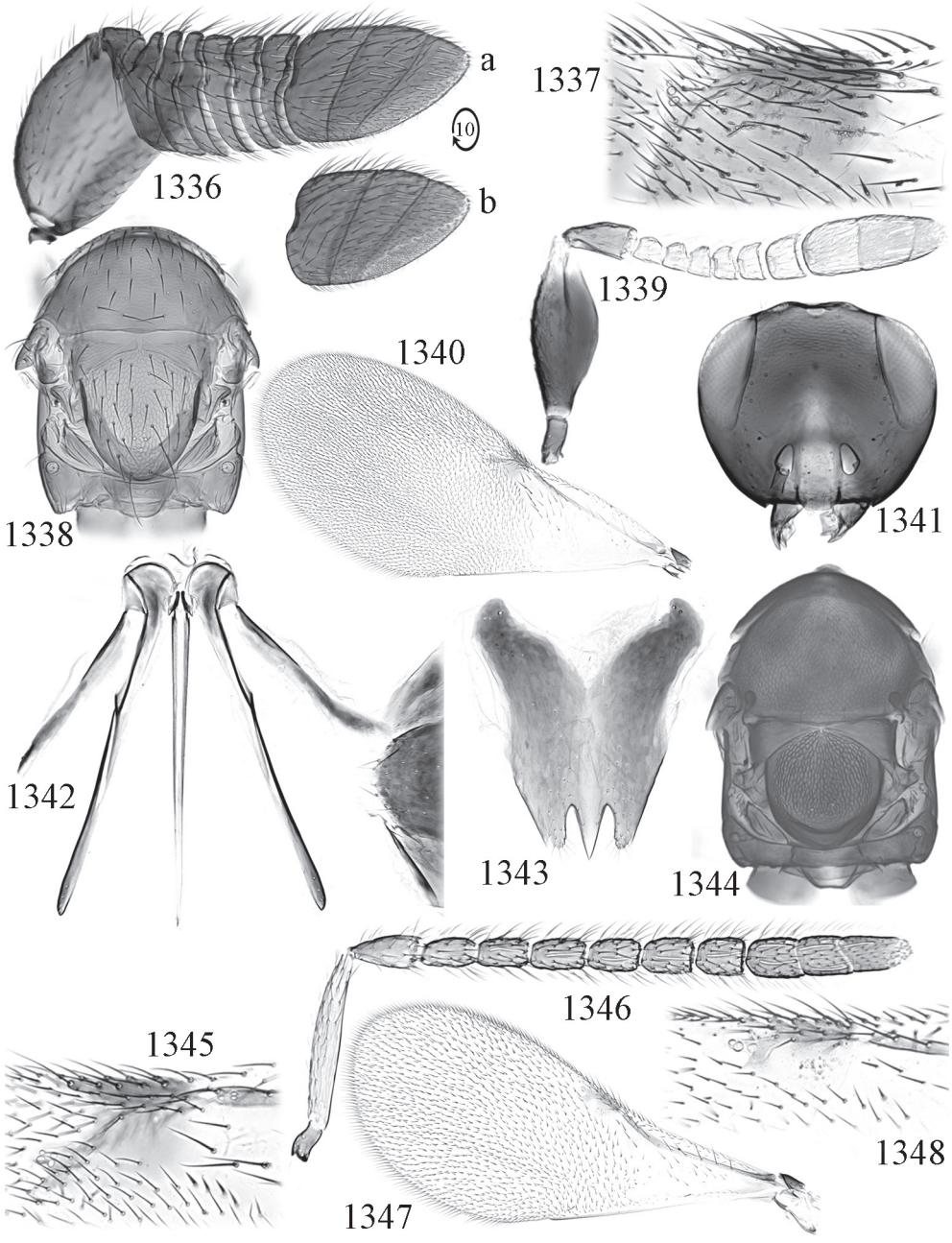
Figs 1291-1303. ***Anicetus lysithea*** – (1291) mesosoma in dorsal view; (1292) central area of mesoscutum enlarged showing mid-line pores; (1293) ovipositor. ***Anicetus cheras***, HT – (1294) fore wing; (1295) antenna; (1296) apex of fore wing venation; (1297) hypopygium. ***Anicetus apatos*** – (1298) fore wing; (1299) hypopygium; (1300) antenna; (1301) apex of fore wing venation; (1302) hindwing. ***Ammonencyrtus hyperion*** – (1303) antenna; (1304) fore wing; (1305) head in facial view; (1306) apex of fore wing venation.



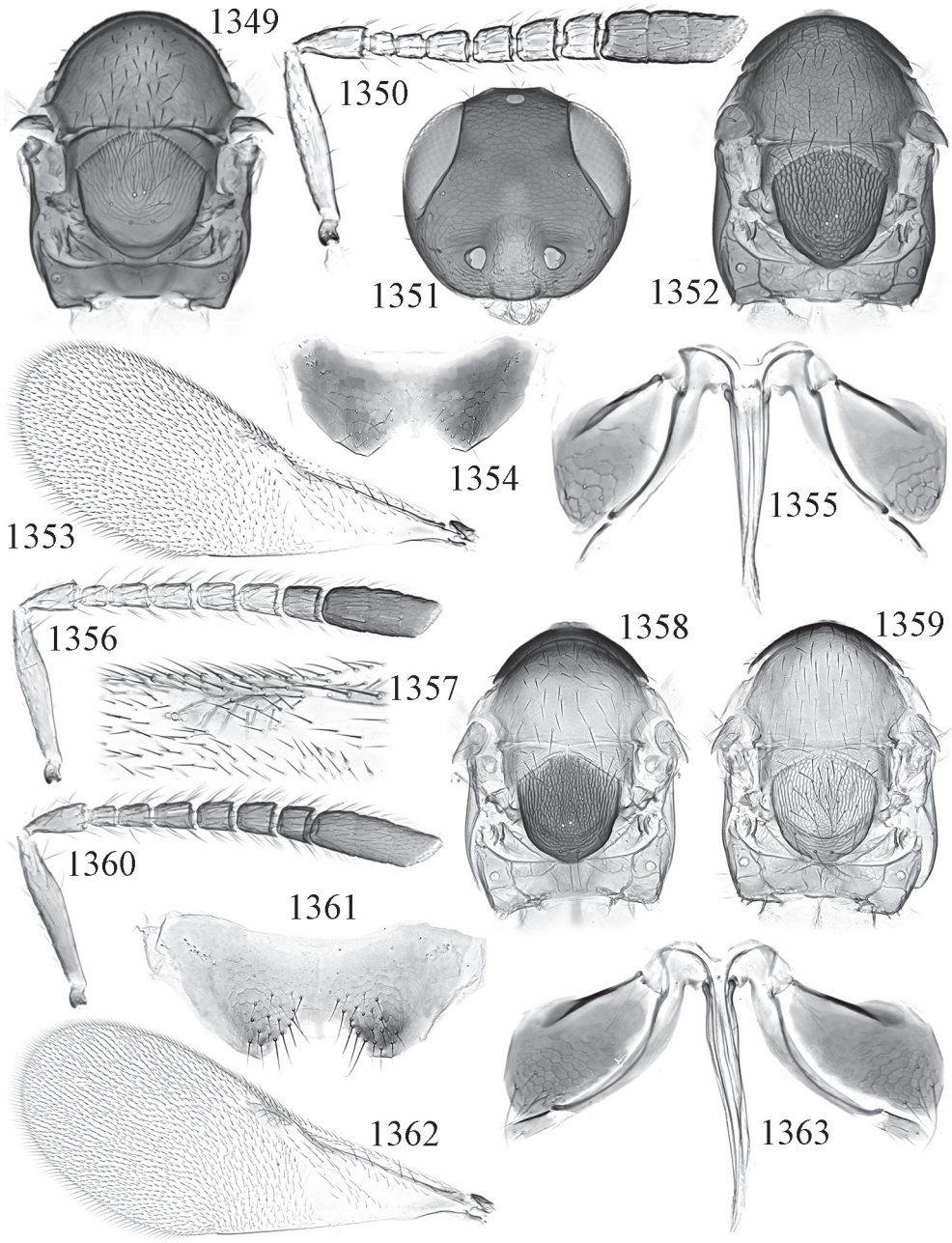
Figs 1307-1321. ***Ammonencyrtus hyperion*** – (1307) hypopygium. ***Ammonencyrtus prosymnos***, HT – (1308) ovipositor; (1309) hypopygium; (1310) apex of fore wing venation; (1311) fore wing; (1312) antenna. ***Ammonoencyrtus carolinensis*** – (1313) mesosoma, dorsal view; (1314) apex of fore wing venation; (1315) hypopygium, variant; (1316) hypopygium, variant; (1317) antenna, variant; (1318) antenna, variant; (1319) head, facial view; (1320) fore wing, variant; (1321) fore wing, variant.



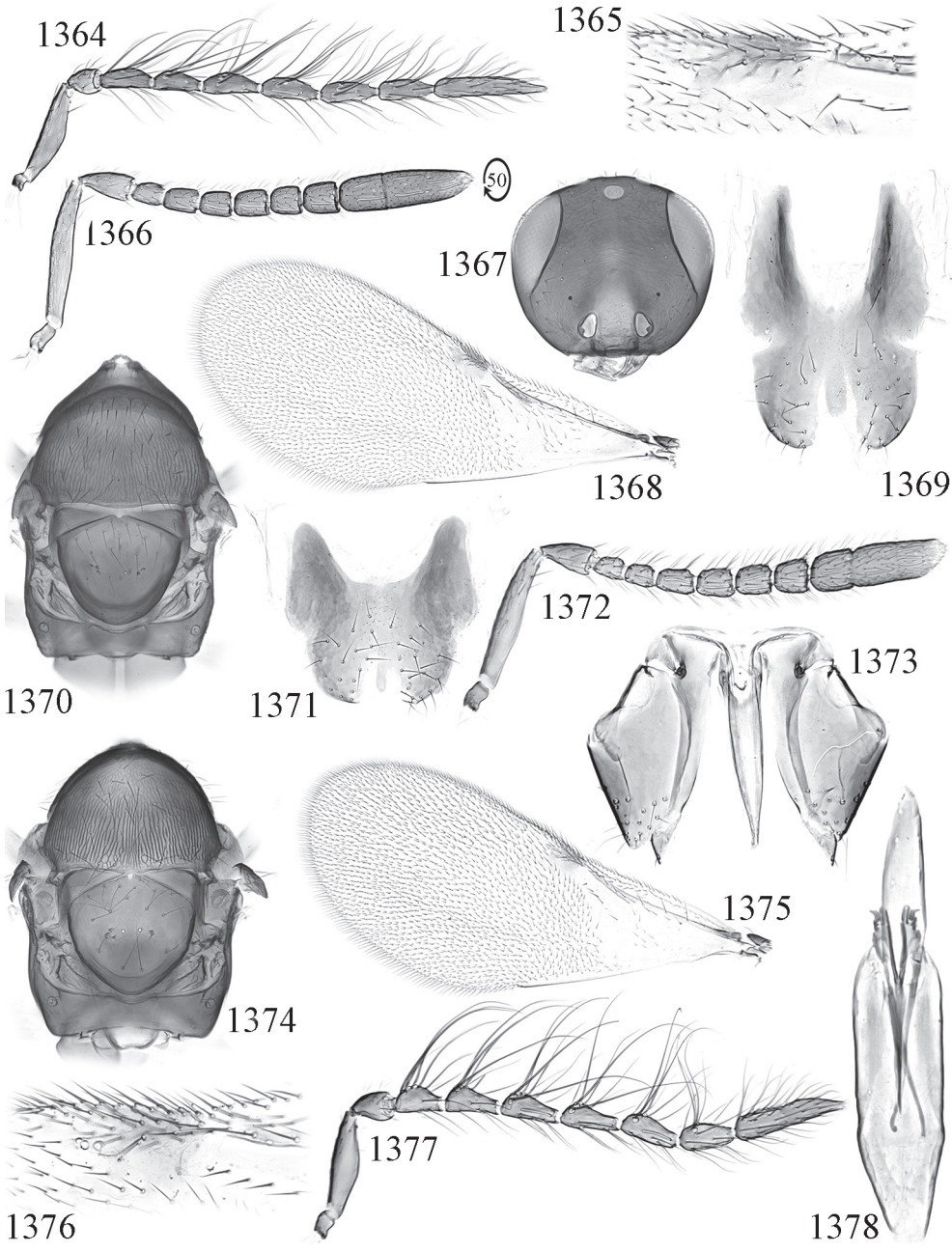
Figs 1322-1335. ***Ammonoencyrtus carolinensis*** – (1322) ovipositor. ***Ammonoencyrtus keira***, HT – (1323) antenna; (1324) hypopygium (1325) mesosoma, dorsal view; (1326) apex of fore wing venation; (1327) fore wing; (1328) ovipositor. ***Ammonoencyrtus galas*** – (1329) apex of fore wing venation; (1330) hypopygium; (1331) antenna (a, outer aspect of clava; b, inner aspect of clava; (1332) head, facial view; (1333) fore wing. ***Ammonoencyrtus xanthos*** – (1334) fore wing; (1335) hypopygium.



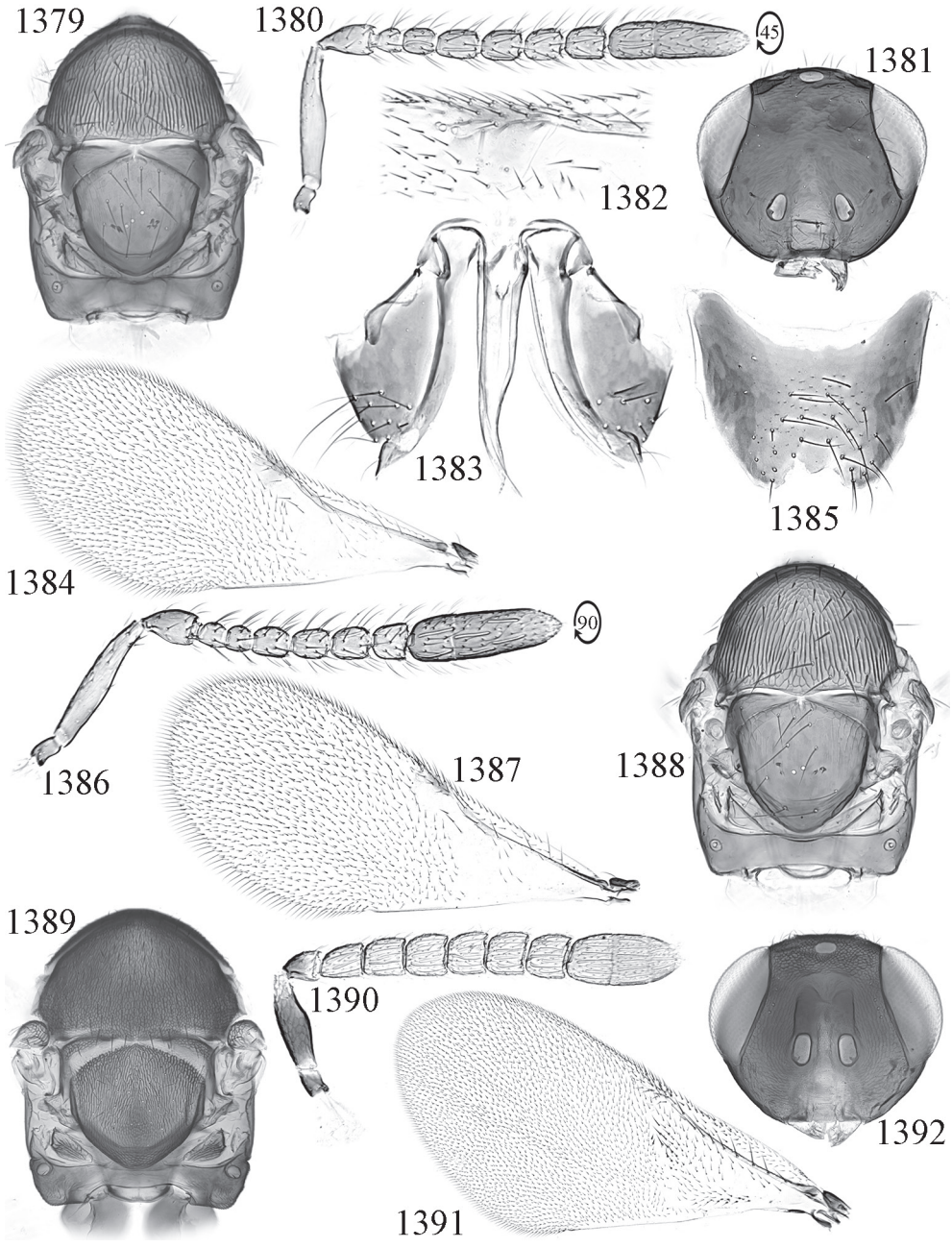
Figs 1336-1348. ***Ammonoencyrtus xanthos*** – (1336) antenna (a, clava outer aspect; b, clava, inner aspect); (1337) apex of fore wing venation; (1338) mesosoma, dorsal view. ***Polaszekius nemesis*** – (1339) antenna; (1340) fore wing; (1341) head, facial view (restructured); (1342) ovipositor, showing attachment of outer plate to apical gastral tergite; (1343) hypopygium; (1344) mesosoma, dorsal view; (1345) apex of fore wing venation. ***Protyndarichoides hermippe***, HT – (1346) antenna; (1347) fore wing; (1348) apex of fore wing venation.



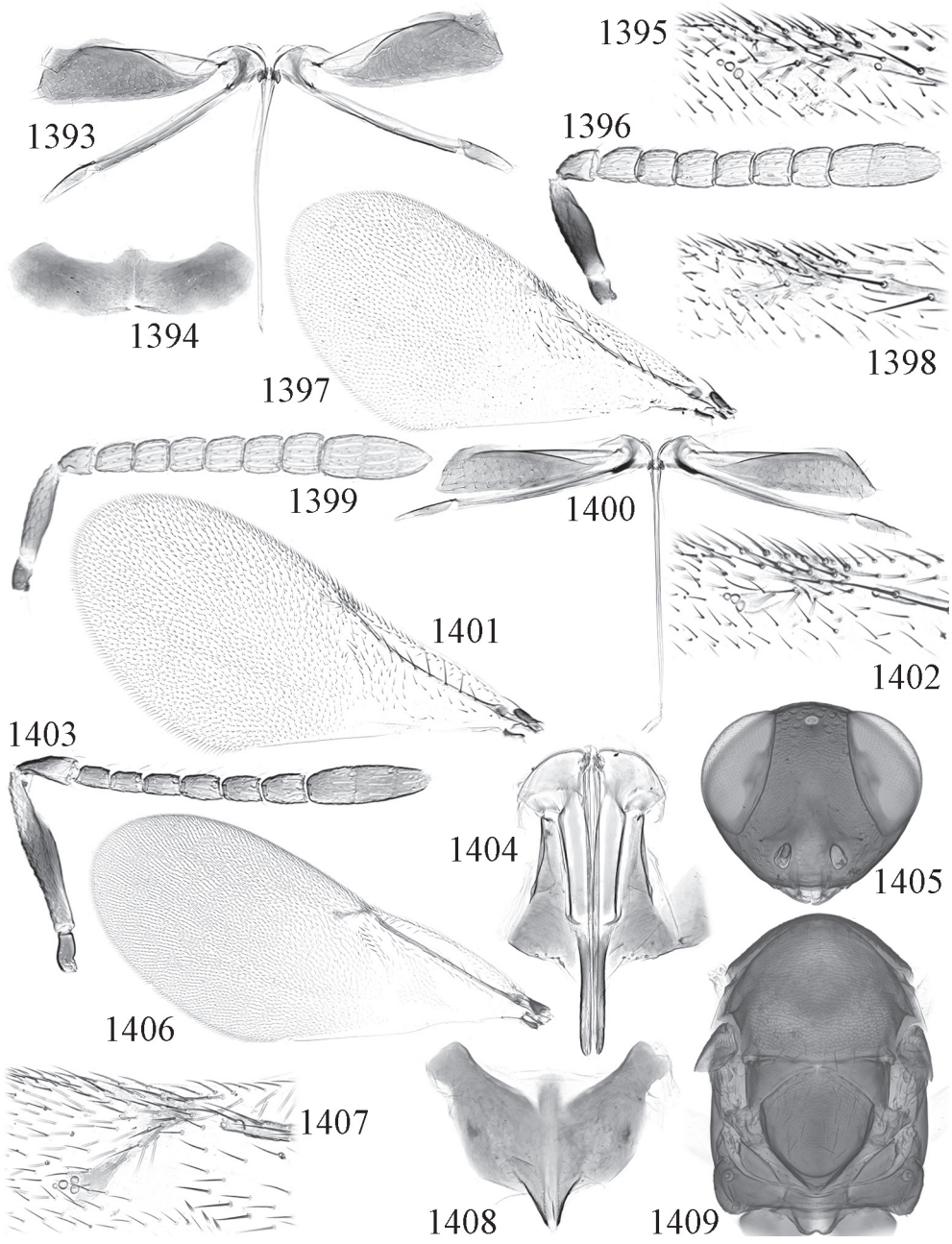
Figs 1349-1363. ***Protyndarichoides hermippe***, HT – (1349) mesosoma, dorsal view. ***Protyndarichoides isonus*** – (1350) antenna; (1351) head, facial view; (1352) mesosoma, dorsal view; (1353) fore wing; (1354) hypopygium; (1355) ovipositor. ***Protyndarichoides nigriceps*** – (1356) antenna, variant; (1357) apex of fore wing venation; (1358-1359) mesosoma, dorsal view, variants; (1360) antenna, variant; (1361) hypopygium; (1362) fore wing; (1363) ovipositor.



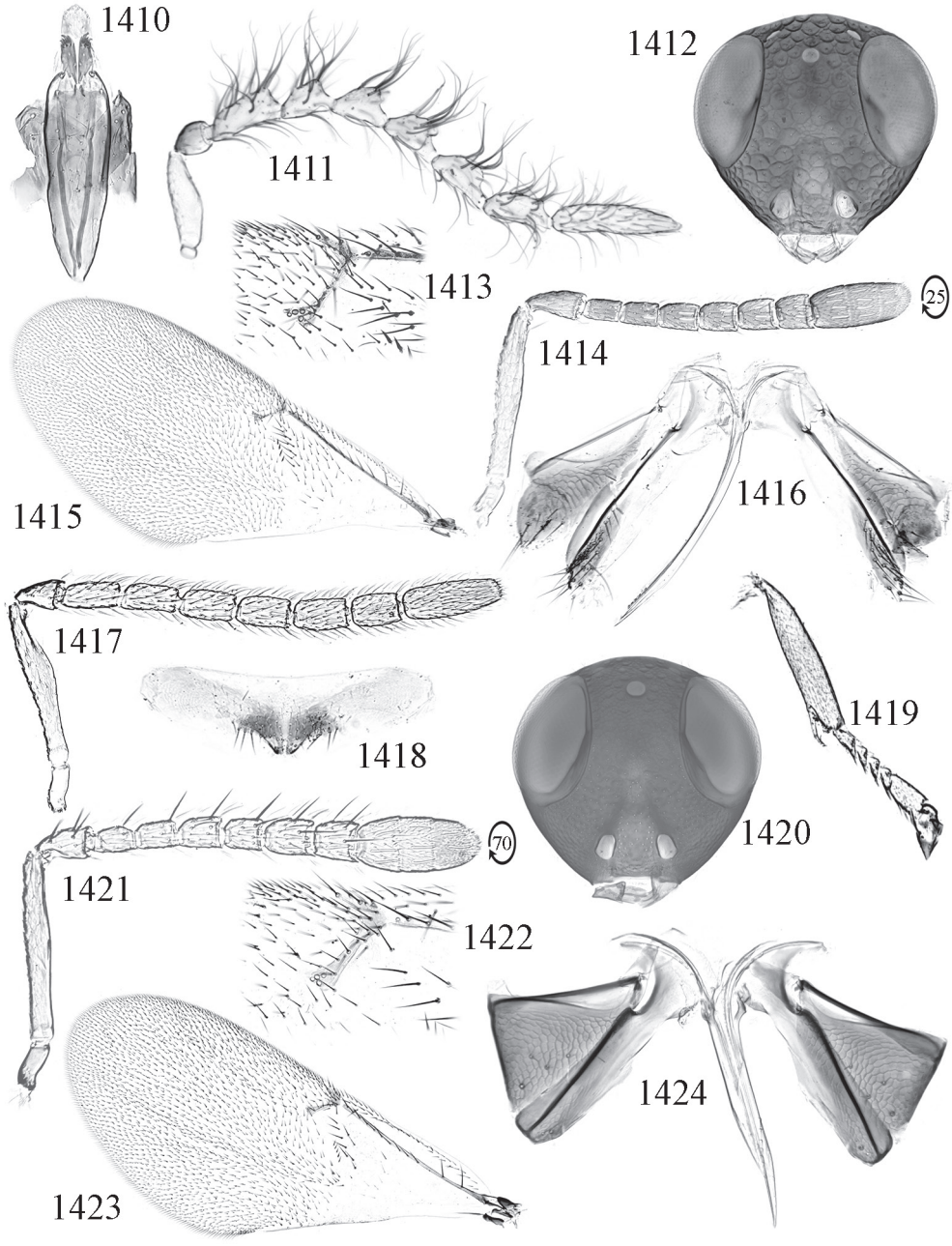
Figs 1364-1378. ***Protyndarichoides nigriceps*** – (1364) antenna, ♂. ***Protyndarichoides elathes***, HT – (1365) apex of fore wing venation; (1366) antenna; (1367) head, facial view; (1368) fore wing; (1369) hypopygium; (1370) mesosoma, dorsal view. ***Protyndarichoides euanthos*** – (1371) hypopygium; (1372) antenna; (1373) ovipositor; (1374) mesosoma, dorsal view; (1375) fore wing; (1376) apex of fore wing venation; (1377) antenna, ♂; (1378) genitalia, ♂.



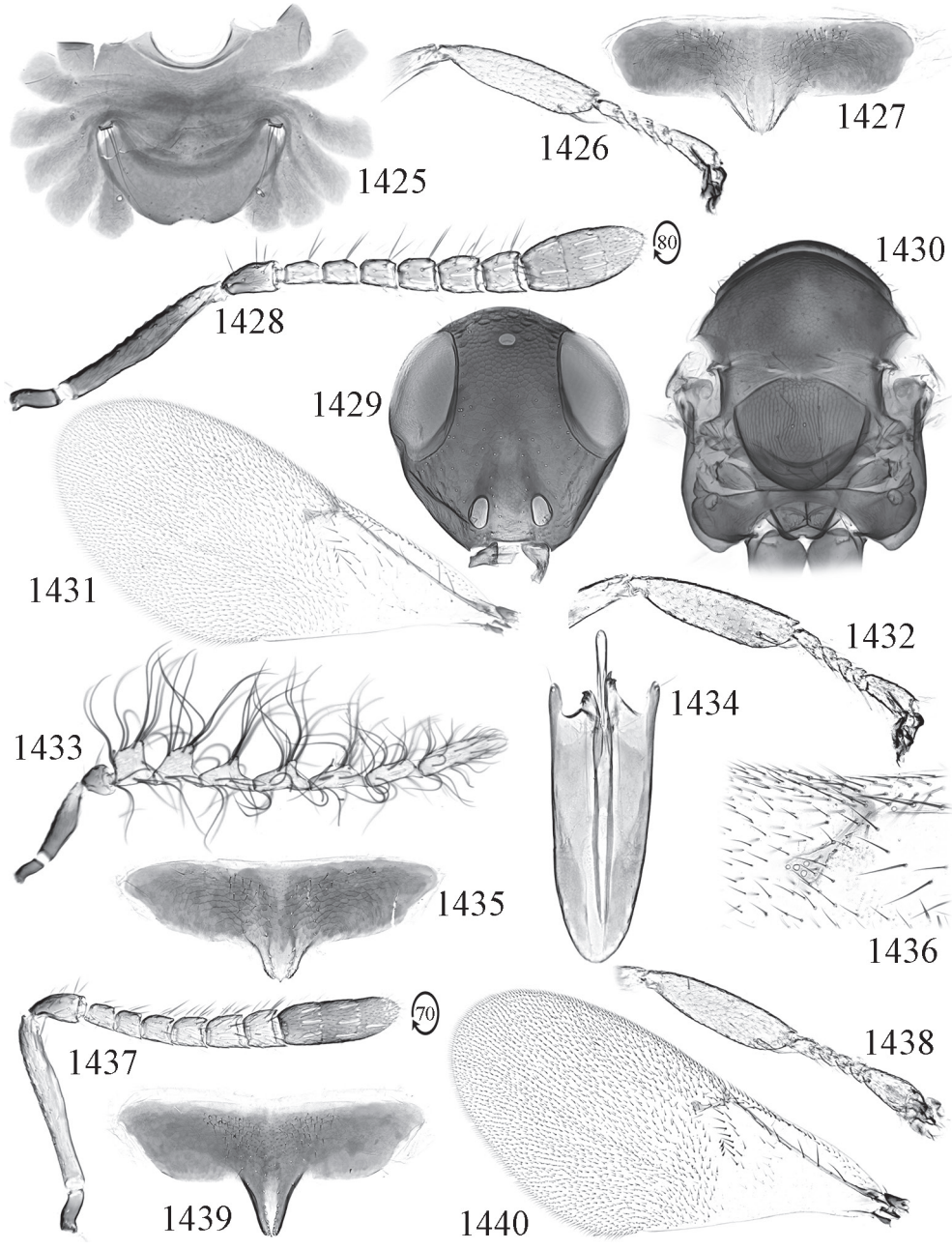
Figs 1379-1392. ***Protyndarichoides damocles*** – (1379) mesosoma, dorsal view; (1380) antenna; (1381) head, facial view; (1382) apex of fore wing venation; (1383) ovipositor; (1384) fore wing; (1385) hypopygium. ***Protyndarichoides hephaestus*** – (1386) antenna; (1387) fore wing; (1388) mesosoma, dorsal view (modified). ***Gahaniella chaldenes*** – (1389) mesosoma, dorsal view; (1390) antenna; (391) fore wing; (1392) head, facial view.



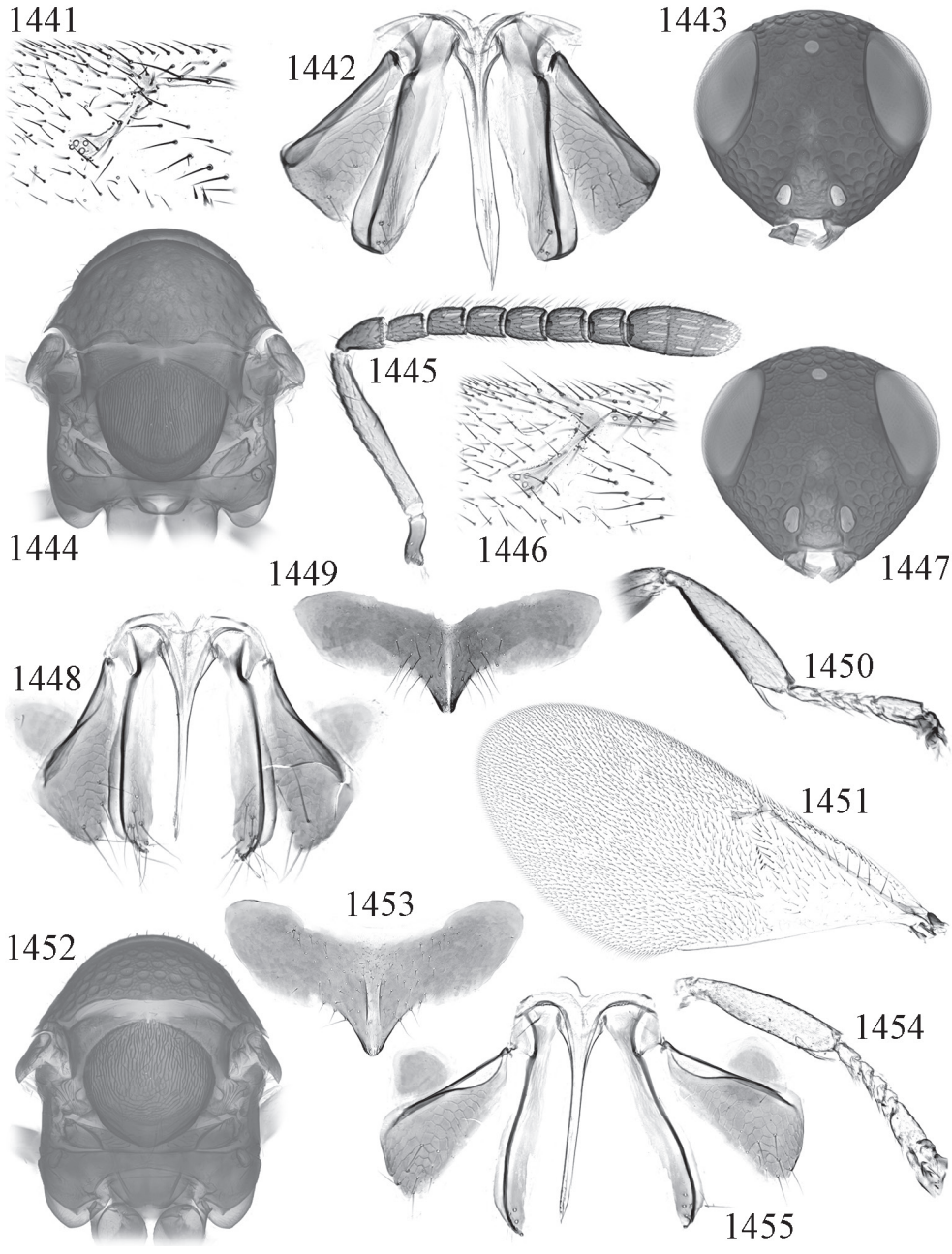
Figs 1393-1409. ***Gahaniella chaldenes*** – (1393) ovipositor; (1394) hypopygium (reconstructed); (1395) apex of fore wing venation. ***Gahaniella californica*** – (1396) antenna; (1397) fore wing; (1398) apex of fore wing venation. ***Gahaniella saissetiae*** – ((1399) antenna; (1400) ovipositor; (1401) fore wing; (1402) apex of fore wing venation. ***Prionomitus mitratus*** – (1403) antenna; (1404) ovipositor; (1405) head, facial view; (1406) fore wing; (1407) apex of fore wing venation; (1408) hypopygium; (1409) mesosoma, dorsal view.



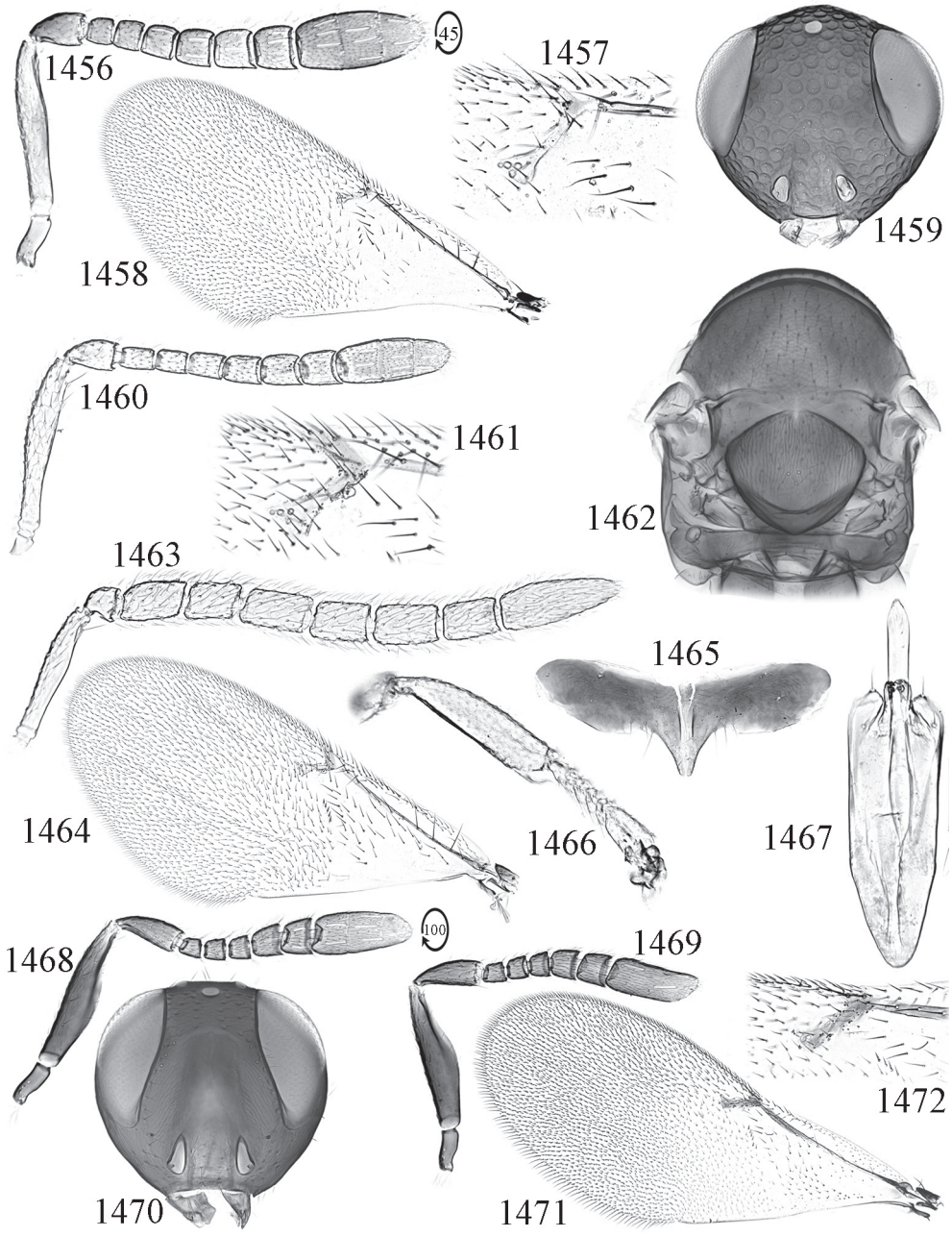
Figs 1410-1424. ***Prionomitus mitratus*** – (1410) genitalia, ♂; (1411) antenna, ♂. ***Sectiliclava isis*** – (1412) head, facial view; (1413) apex of fore wing venation; (1414) antenna; (1415) fore wing; (1416) ovipositor; (1417) antenna, ♂; (1418) hypopygium; (1419) fore tibia and tarsus, showing enlarged apical tarsal segment. ***Sectiliclava helikes***, HT – (1420) head, facial view; (1421) antenna; (1422) apex of fore wing venation; (1423) fore wing; (1424) ovipositor.



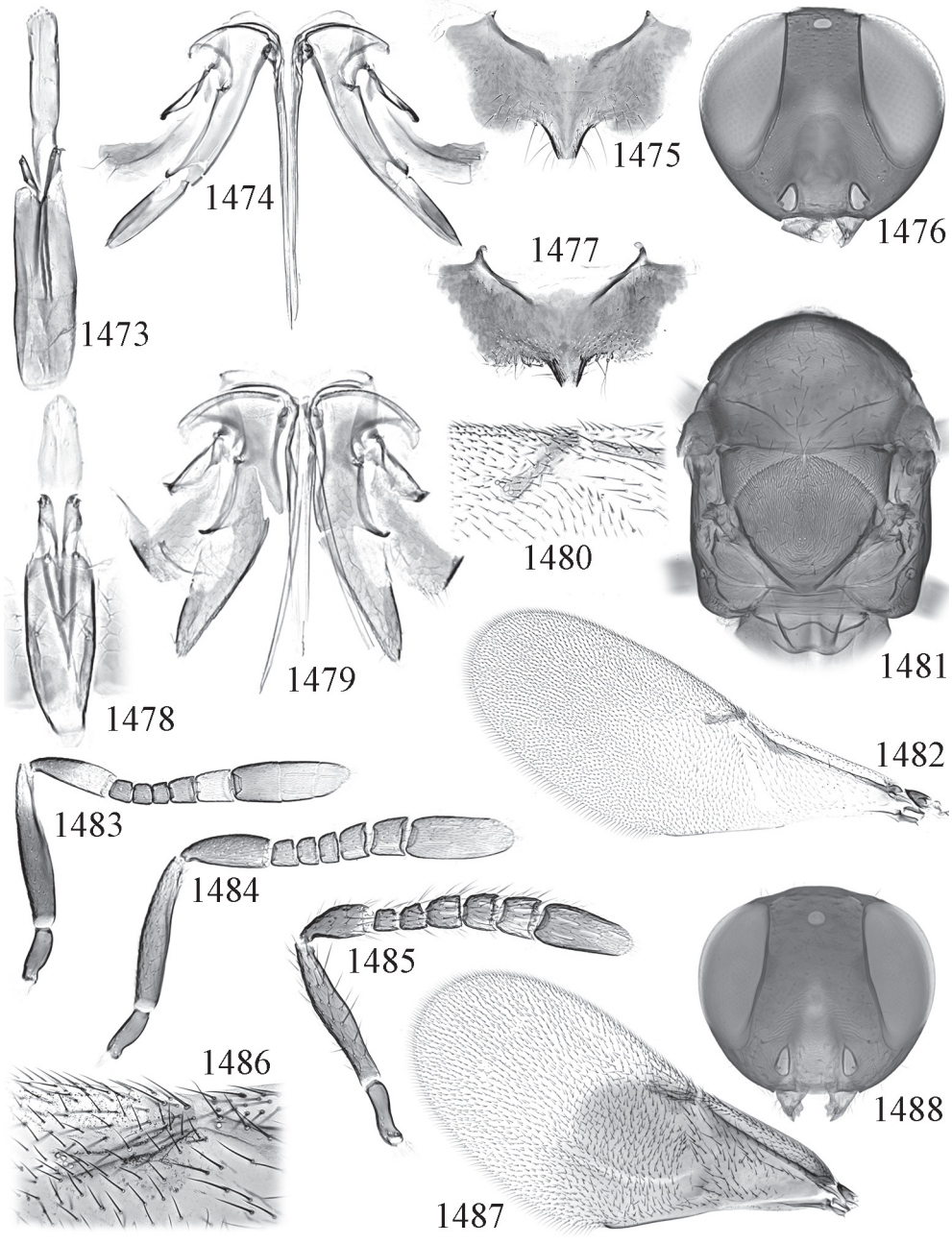
Figs 1425-1440. ***Sectiliclava helikes***, HT – (1425) gastral tergites; (1426) fore tibia and tarsus showing enlarged apical tarsal segment; (1427) hypopygium. ***Sectiliclava megleos*** – (1428) antenna; (1429) head, facial view; (1430) mesosoma, dorsal view; (1431) fore wing; (1432) fore tibia and tarsus showing enlarged apical tarsal segment; (1433) antenna, ♂; (1434) genitalia, ♂; (1435) hypopygum; (1436) apex of fore wing venation. ***Sectiliclava fusui***, HT – (1437) antenna; (1438) fore tibia and tarsus showing enlarged apical tarsal segment; (1439) hypopygium (reconstructed); (1440) fore wing.



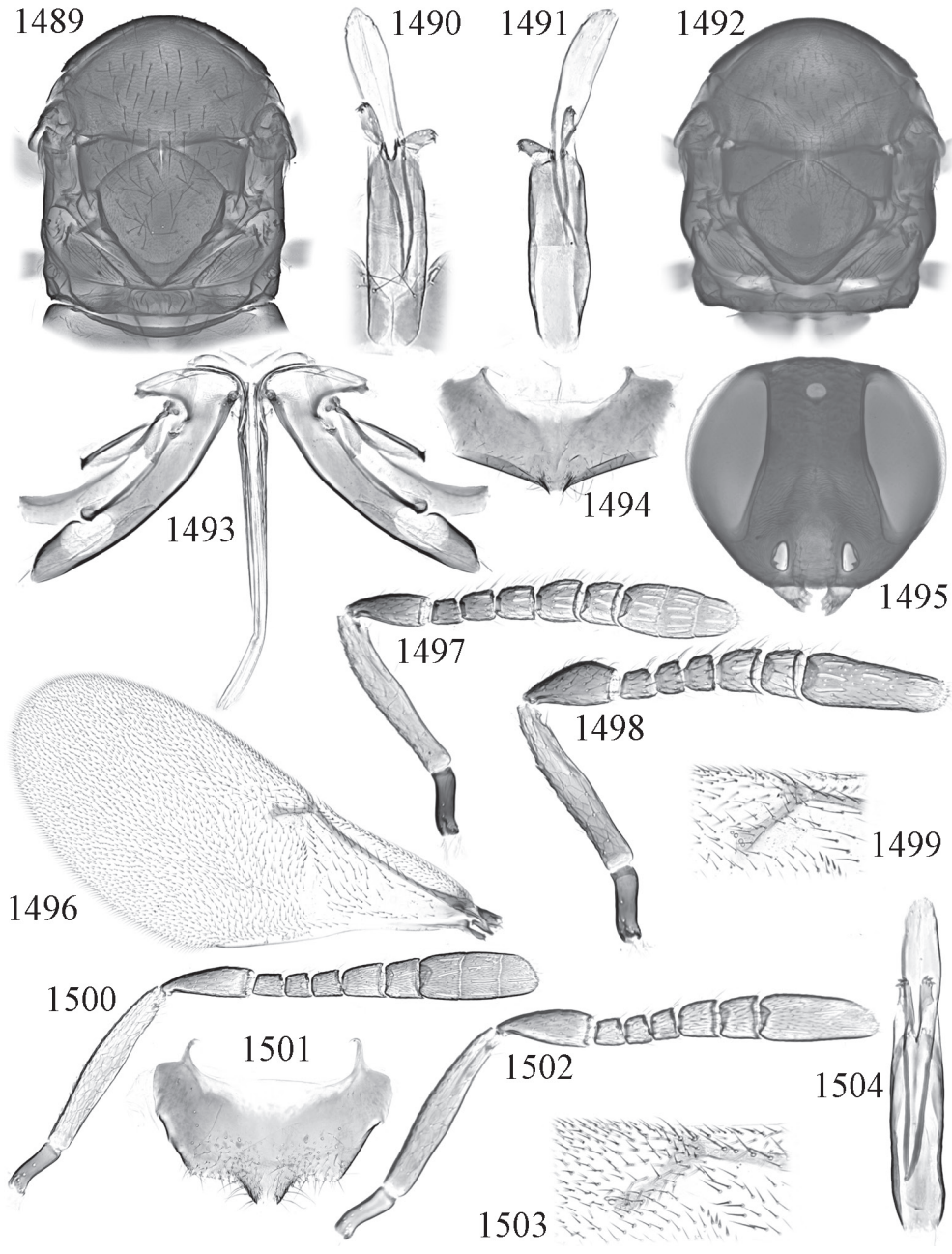
Figs 1441-1455. ***Sectiliclava fusui***, HT – (1441) apex of fore wing venation; (1442) ovipositor; (1443) head, facial view; (1444) mesosoma, dorsal view. ***Sectiliclava arion*** – (1445) antenna; (1446) apex of fore wing venation; (1447) head, facial view; (1448) ovipositor; (1449) hypopygium; (1450) fore tibia and tarsus showing enlarged apical tarsal segment; (1452) mesosoma, dorsal view. ***Sectiliclava pulchriceps*** – (1453) hypopygium; (1454) fore tibia and tarsus showing enlarged apical tarsal segment; (1455) ovipositor.



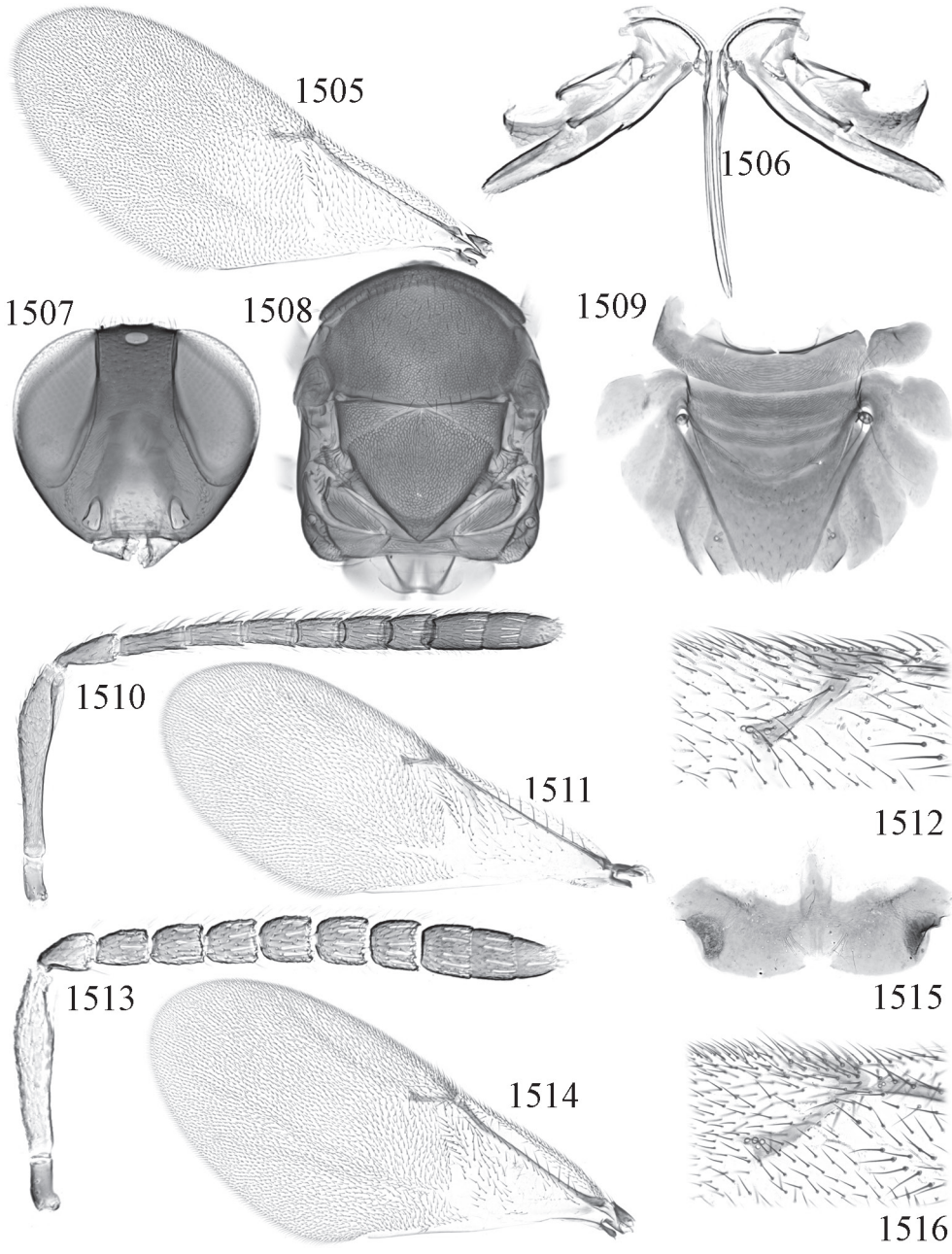
Figs 1456-1472. ***Sectiliclava pulchriceps*** – (1456) antenna; (1457) apex of fore wing venation; (1458) fore wing; (1459) head, facial view. ***Sectiliclava rojasorum*** – (1460) antenna; (1461) apex of fore wing venation, ♂; (1462) mesosoma, dorsal view, ♂; (1463) antenna, ♂; (1464) fore wing, ♂; (1465) hypopygium; (1466) fore tibia and tarsus showing enlarged apical tarsal segment; (1467) genitalia, ♂. ***Trechnites merops*** – (1468) antenna; (1469) antenna, ♂; (1470) head, facial view; (1471) fore wing; (1472) apex of fore wing venation.



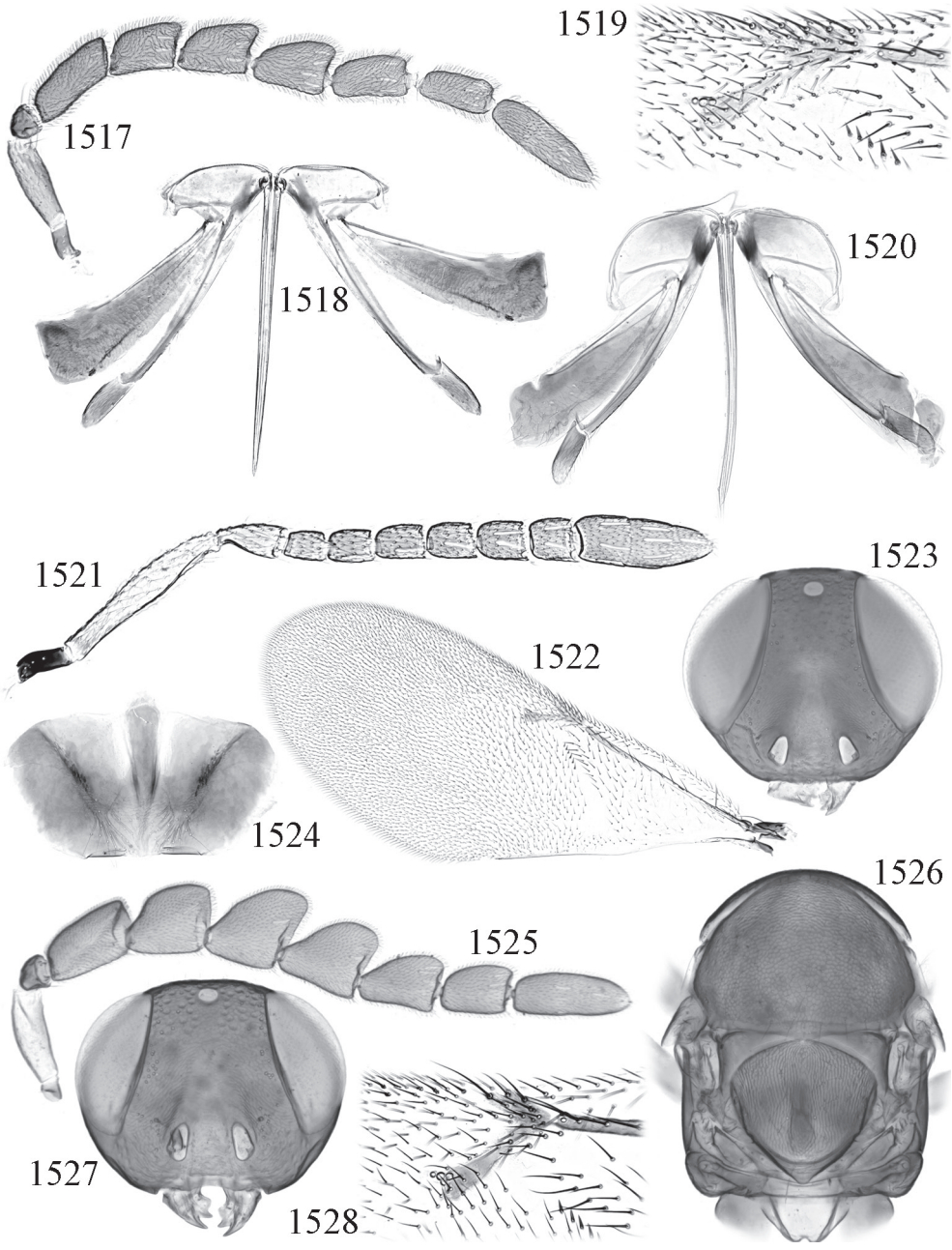
Figs 1473-1488. ***Trechnites merops*** – (1473) genitalia, ♂; (1474) ovipositor; (1475) hypopygium. ***Trechnites thelxines*** – (1476) head, facial view; (1477) hypopygium; (1478) genitalia, ♂; (1479) ovipositor; (1480) apex of fore wing venation; (1481) mesosoma (restructured), dorsal view; (1482) fore wing; (1483) antenna; (1484) antenna, ♂. ***Trechnites thyones*****,** HT ♂ – (1485) antenna; (1486) apex of fore wing venation; (1487) fore wing; (1488) head, facial view.



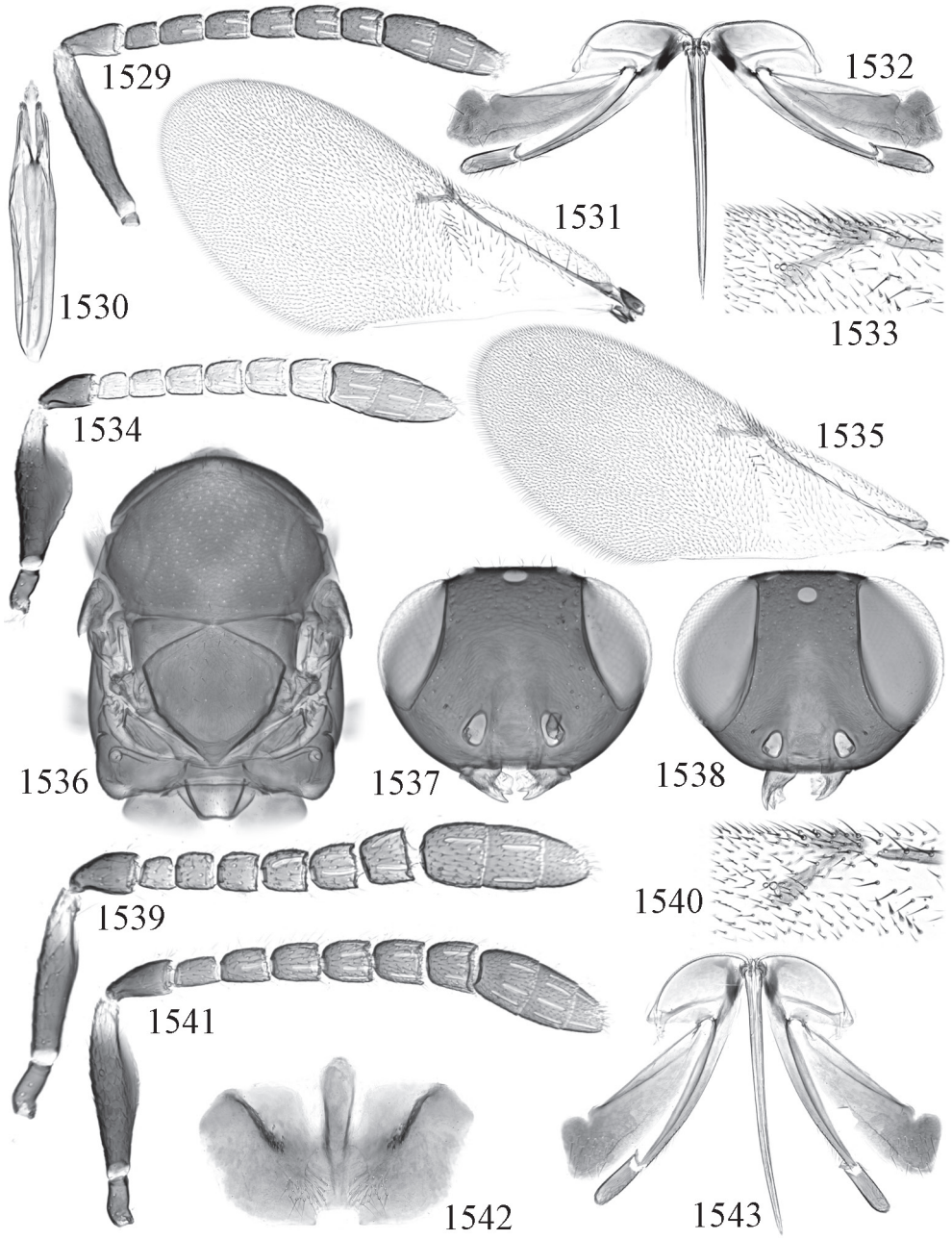
Figs 1489-1504. ***Trechnites thyones*** – (1489) mesosoma, dorsal view; (1490) genitalia, ♂. ***Trechnites kale*** – (1491) genitalia, ♂; (1492) mesosoma, dorsal view; (1493) ovipositor (restructured); (1494) hypopygium (posterior margin slightly curled inwards); (1495) head, facial view; (1496) fore wing; (1497) antenna; (1498) antenna, ♂; (1499) apex of fore wing venation. ***Trechnites spondes*** – (1500) antenna; (1501) hypopygium; (1502) antenna, ♂; (1503) apex of fore wing venation; (1504) genitalia, ♂.



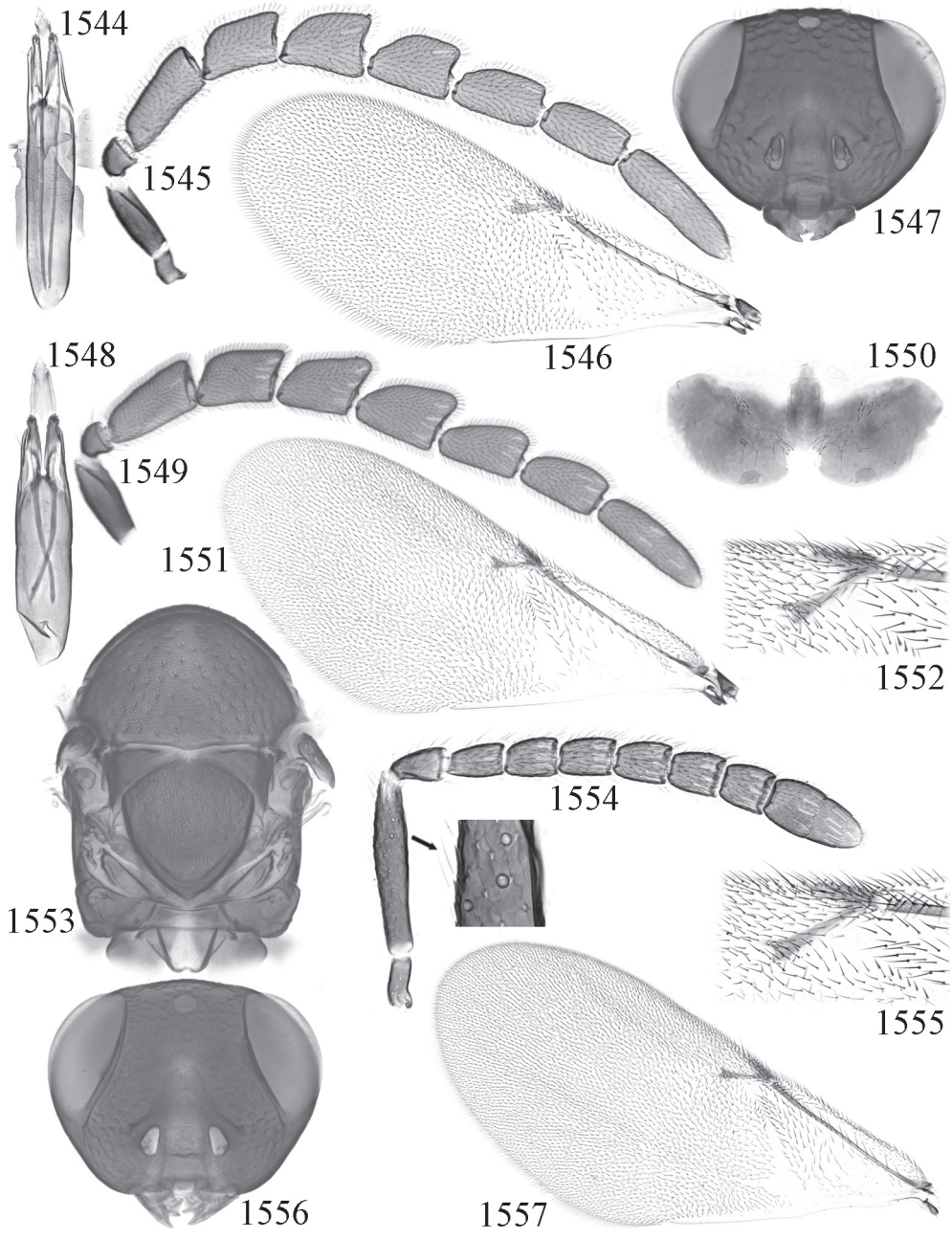
Figs 1505-1516. ***Trechnites spondes*** – (1505) fore wing; (1506) ovipositor; (1507) head, facial view; (1508) mesosoma, dorsal view; (1509) gastral tergites. ***Psyllaephagus domitius***, HT – (1510) antenna; (1511) fore wing; (1512) apex of fore wing venation. ***Psyllaephagus ufens*** – (1513) antenna; (1514) fore wing, HT; (1515) hypopygium (reconstructed); (1516) apex of fore wing venation, HT.



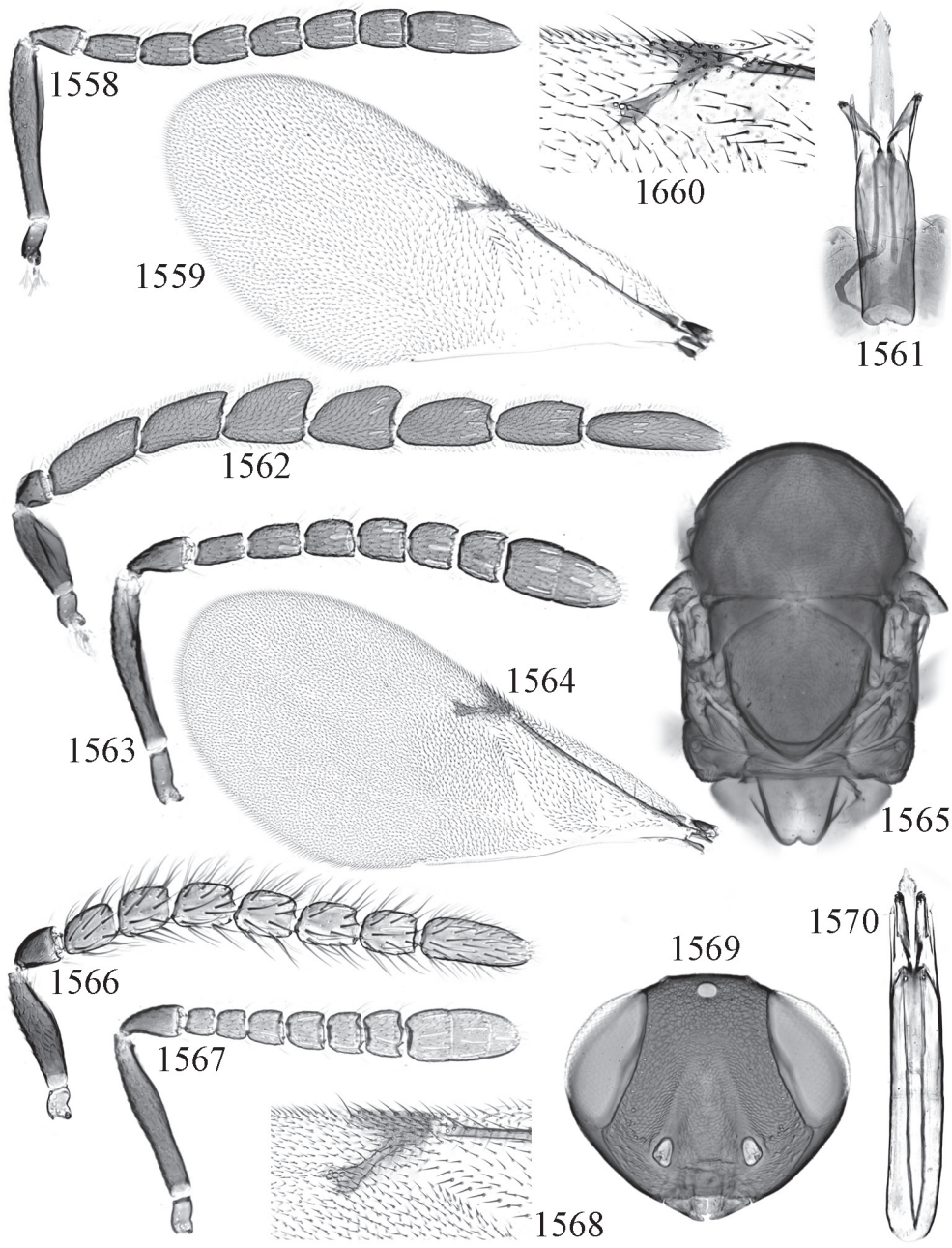
Figs 1517-1528. ***Psyllaephagus ufens*** – (1517) antenna, ♂; (1518) ovipositor (reconstructed). ***Psyllaephagus heles***, HT – (1519) apex of fore wing venation; (1520) ovipositor; (1521) antenna; (1522) fore wing; (1523) head, facial view (reconstructed); (1524) hypopygium. ***Psyllaephagus othrys*** – (1525) antenna, ♂; (1526) mesosoma, dorsal view; (1527) head, facial view; (1528) apex of fore wing venation.



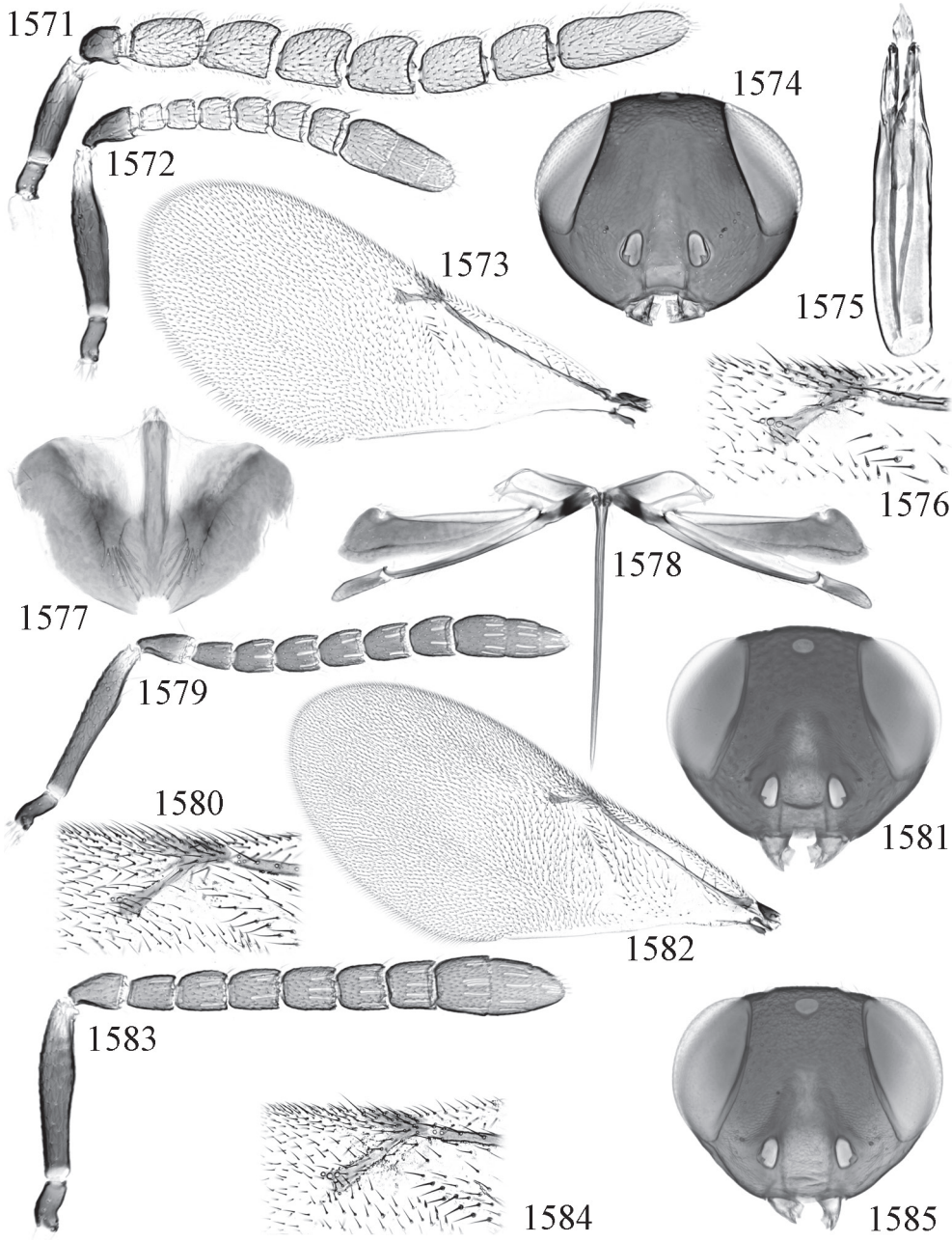
Figs 1529-1543. ***Psyllaephagus othrys*** – (1529) antenna; (1530) genitalia, ♂; (1531) fore wing. ***Psyllaephagus alisanos***, HT – (1532) ovipositor (reconstructed); (1533) apex of fore wig venation; (1534) antenna; (1535) fore wing. ***Psyllaephagus trioziphagus*** – (1536) mesosoma, dorsal view; (1537) head, facial view, variant; (1538) head, facial view, variant; (1539) antenna, variant; (1540) apex of fore wing venation; (1541) antenna, variant; (1542) hypopygium; (1543) ovipositor.



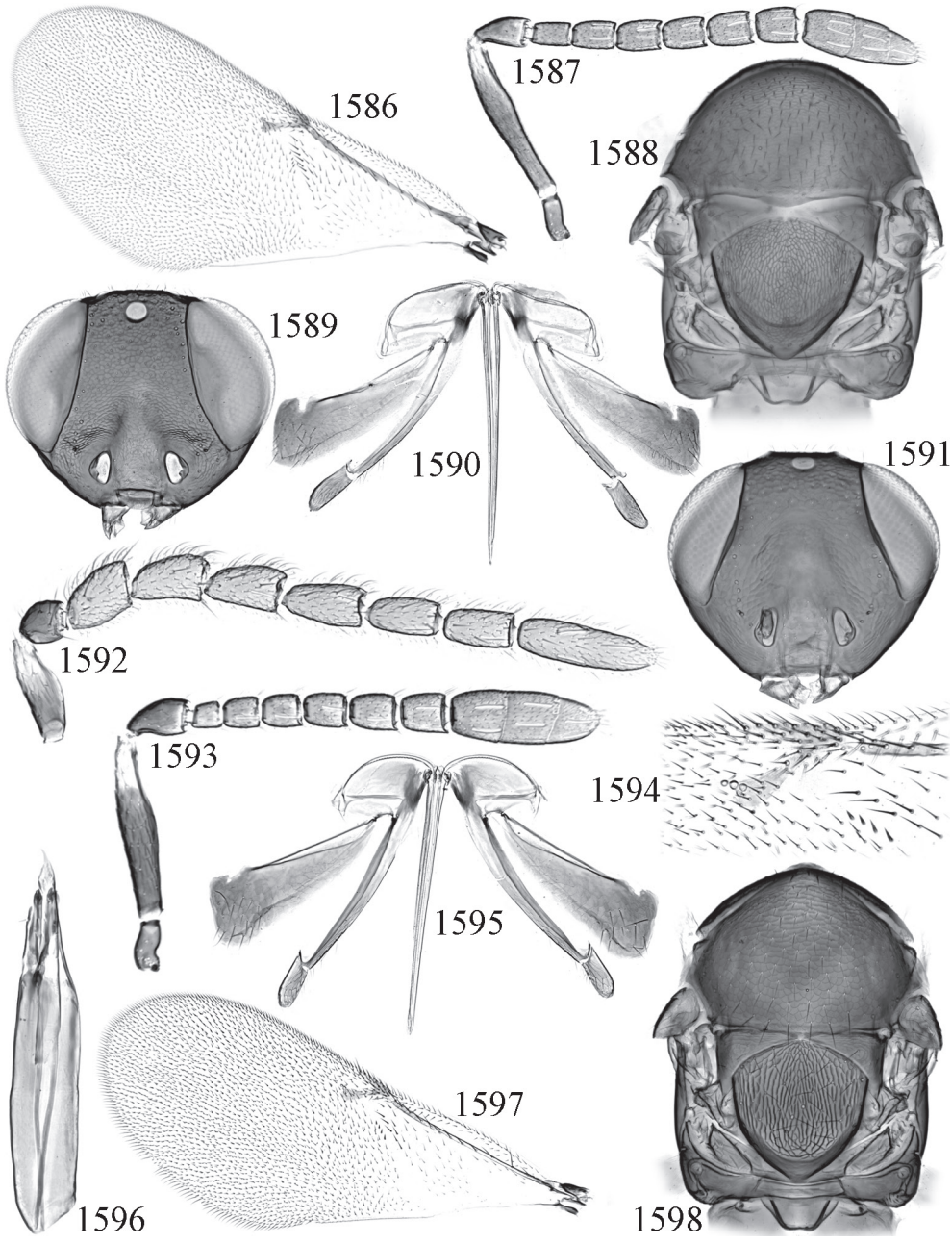
Figs 1544-1557. ***Psyllaephagus trioziphagus*** – (1544) genitalia, ♂; (1545) antenna, ♂; (1546) fore wing. ***Psyllaephagus creusa*** – (1547) head, facial view; (1548) genitalia, ♂; (1549) antenna, ♂; (1550) hypopygium; (1551) fore wing; (1552) apex of fore wing venation; (1553) mesosoma, dorsal view; (1554) antenna, part of scape enlarged to show campaniform sensilla. ***Psyllaephagus kallichoa***, HT – (1555) apex of fore wing venation; (1556) head, facial view; (1557) fore wing.



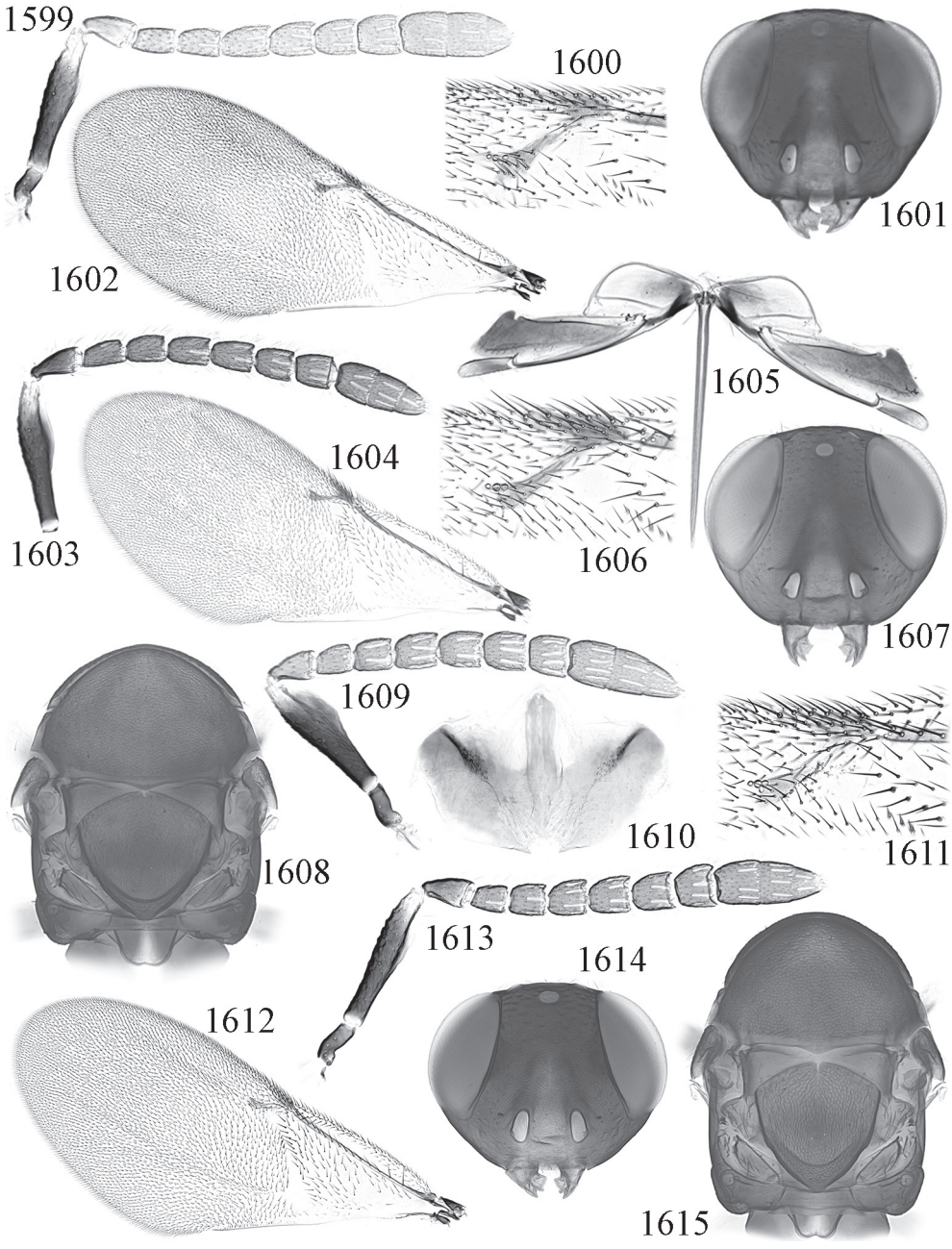
Figs 1558-1570. ***Psyllaephagus kallichoa***, HT – (1558) antenna. ***Psyllaephagus epulo*** – (1559) fore wing, HT; (1560) apex of fore wing venation, HT; (1561) genitalia, ♂; (1562) antenna, ♂; (1563) antenna, HT. ***Psyllaephagus pilosus*** – (1564) fore wing; (1565) mesosoma, dorsal view; (1566) antenna, ♂; (1567) antenna; (1568) apex of fore wing venation; (1569) head, facial view; (1570) genitalia, ♂.



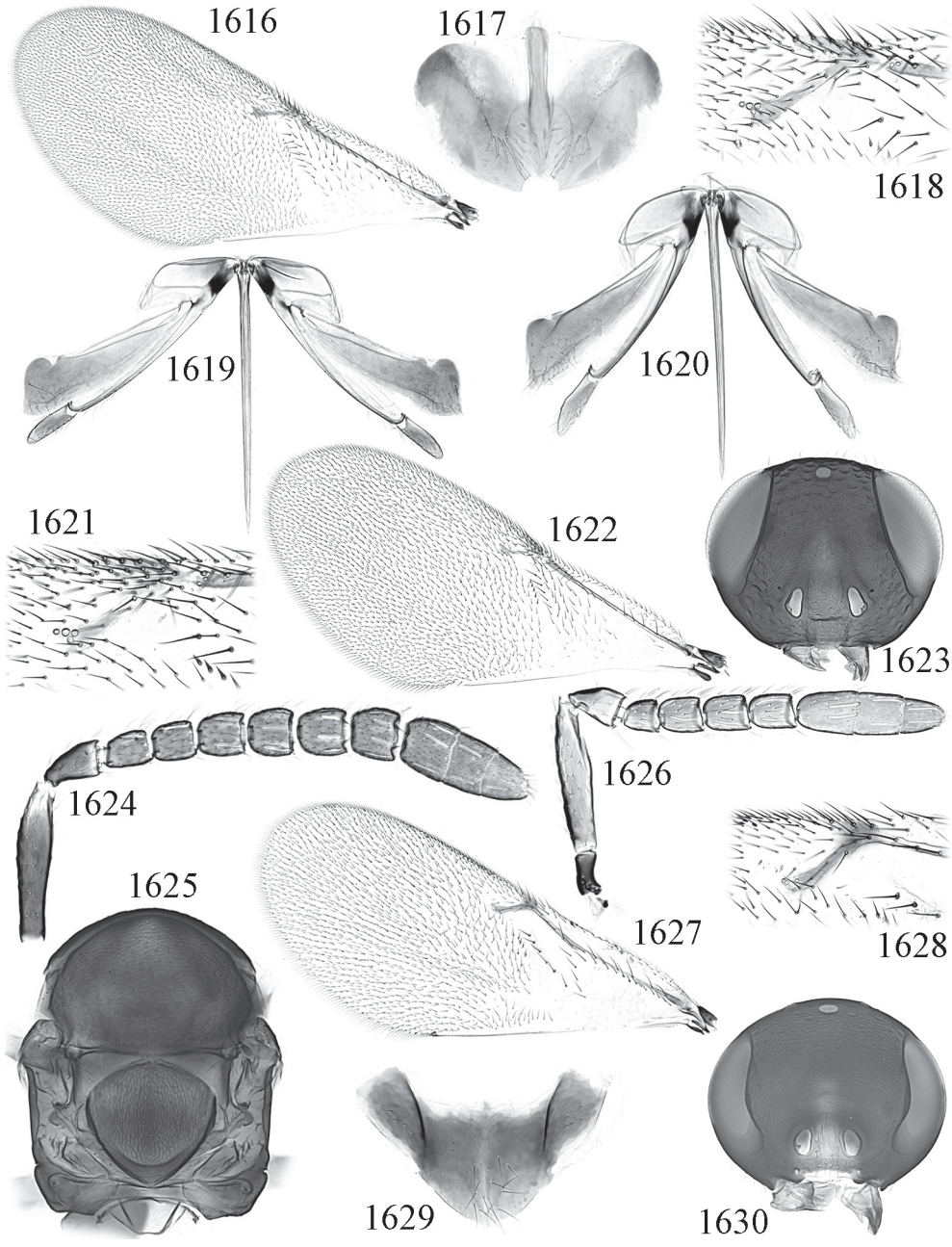
Figs 1571-1585. ***Psyllaephagus yaseeni*** – (1571) antenna, ♂; (1572) antenna; (1573) fore wing; (1574) head, facial view; (1575) genitalia, ♂; (1576) apex of fore wing venation. ***Psyllaephagus xepo***, HT – (1577) hypopygium; (1578) ovipositor; (1579) antenna; (1580) apex of fore wing venation; (1581) head, facial view; (1582) fore wing. ***Psyllaephagus thonis*** – (1583) antenna; (1584) apex of fore wing venation, HT; (1585) head, facial view.



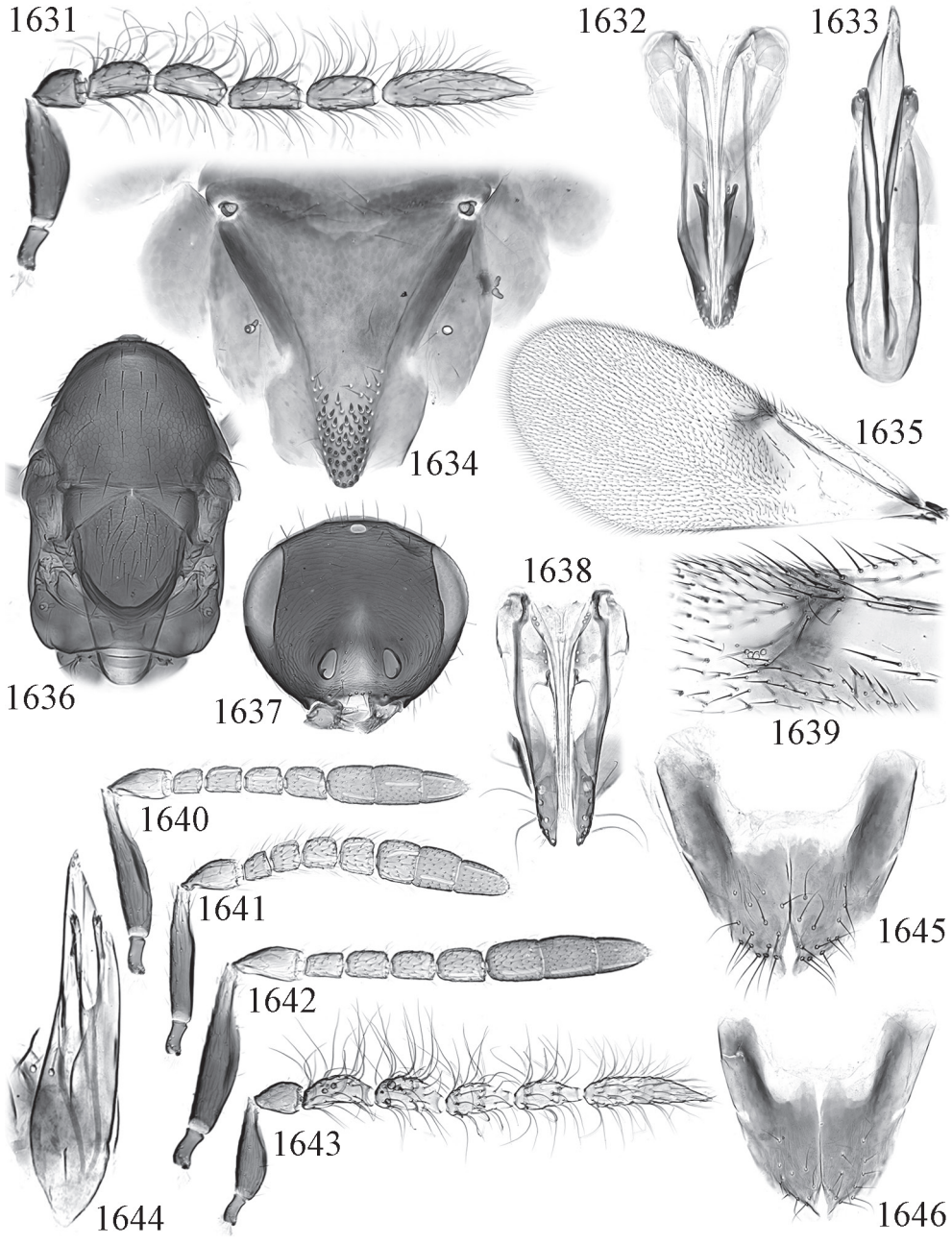
Figs 1586-1598. ***Psyllaephagus thonis*** – (1586) fore wing. ***Psyllaephagus alexion*** – (1587) antenna; (1588) mesosoma, dorsal view; (1589) head, facial view; (1590) ovipositor. ***Psyllaephagus rotundiformis*** – (1591) head, facial view; (1592) antenna, ♂; (1593) antenna; (1594) apex of fore wing venation; (1595) ovipositor; (1596) genitalia, ♂; (1597) fore wing; (1598) mesosoma, dorsal view.



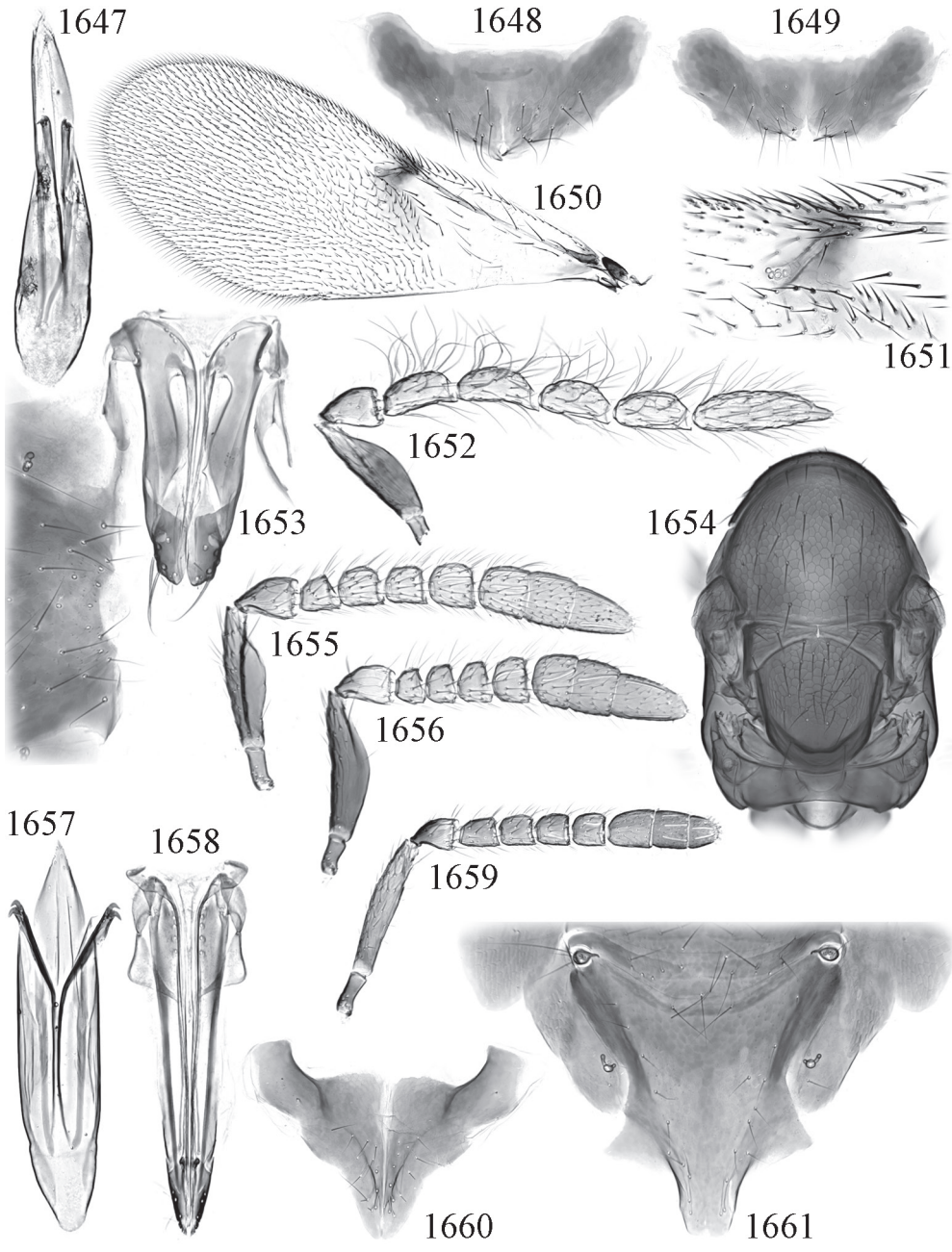
Figs 1599-1615. ***Psyllaephagus korus***, HT – (1599) antenna; (1600) apex of fore wing venation; (1601) head, facial view; (1602) fore wing. ***Psyllaephagus tyche*** – (1603) antenna, HT; (1604) fore wing, HT; (1605) ovipositor; (1606) apex of fore wing venation, HT; (1607) head, facial view; (1608) mesosoma, dorsal view. ***Psyllaephagus moros***, HT – (1609) antenna; (1610) hypopygium (restructured); (1611) apex of fore wing venation; (1612) fore wing. ***Psyllaephagus phelys*** – (1613) antenna; (1614) head, facial view; (1615) mesosoma, dorsal view.



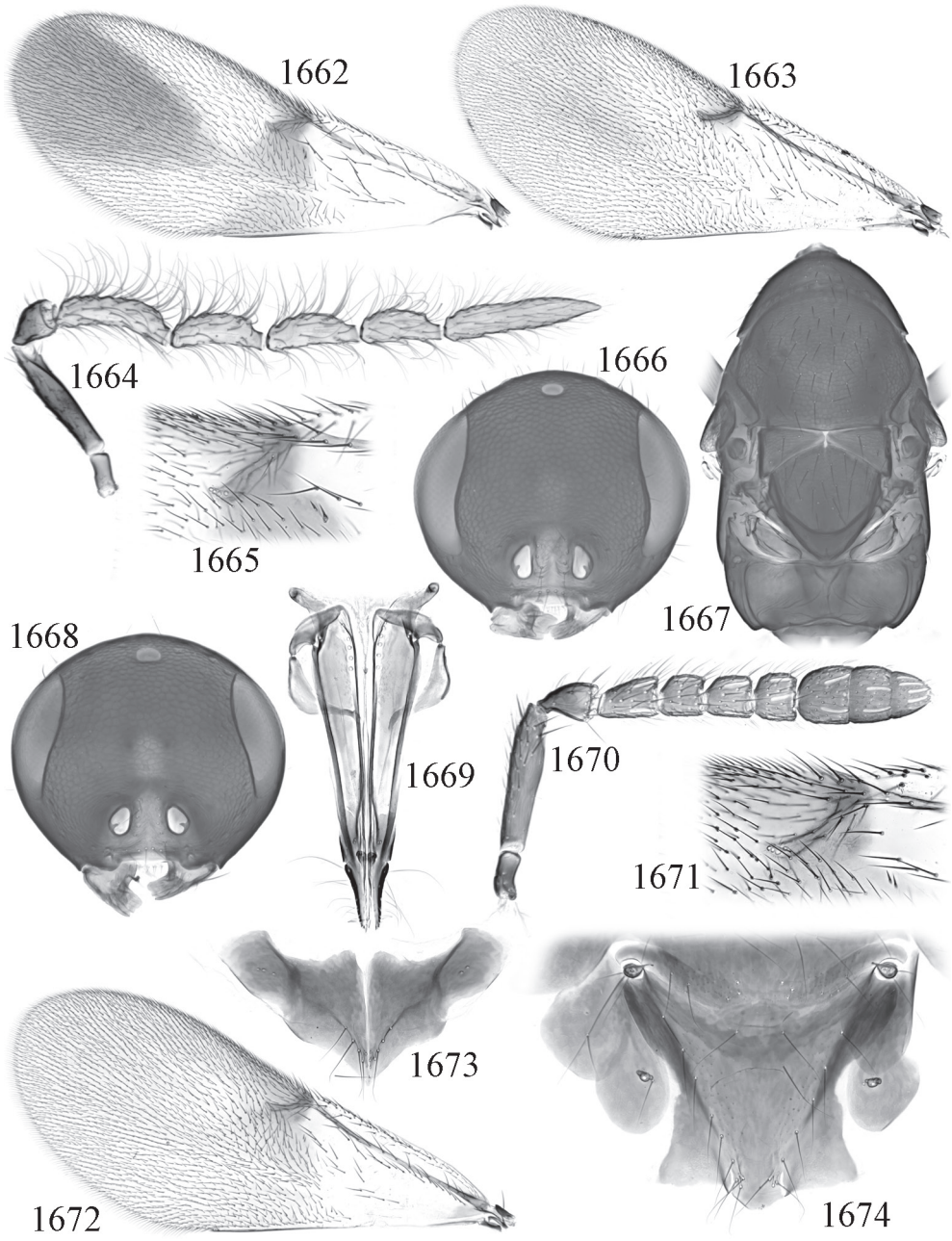
Figs 1616-1630. ***Psyllaephagus phelys***, HT – (1616); fore wing; (1617) hypopygium; (1618) apex of fore wing venation; (1619) ovipositor. ***Psyllaephagus gyces*** – (1620) ovipositor; (1621) apex of fore wing venation, HT; (1622) fore wing, HT; (1623) head, facial view; (1624) antenna, HT; (1625) mesosoma, dorsal view. ***Cercobelus epimetheus*** – (1626) antenna; (1627) fore wing; (1628) apex of fore wing venation; (1629) hypopygium; (1630) head, facial view.



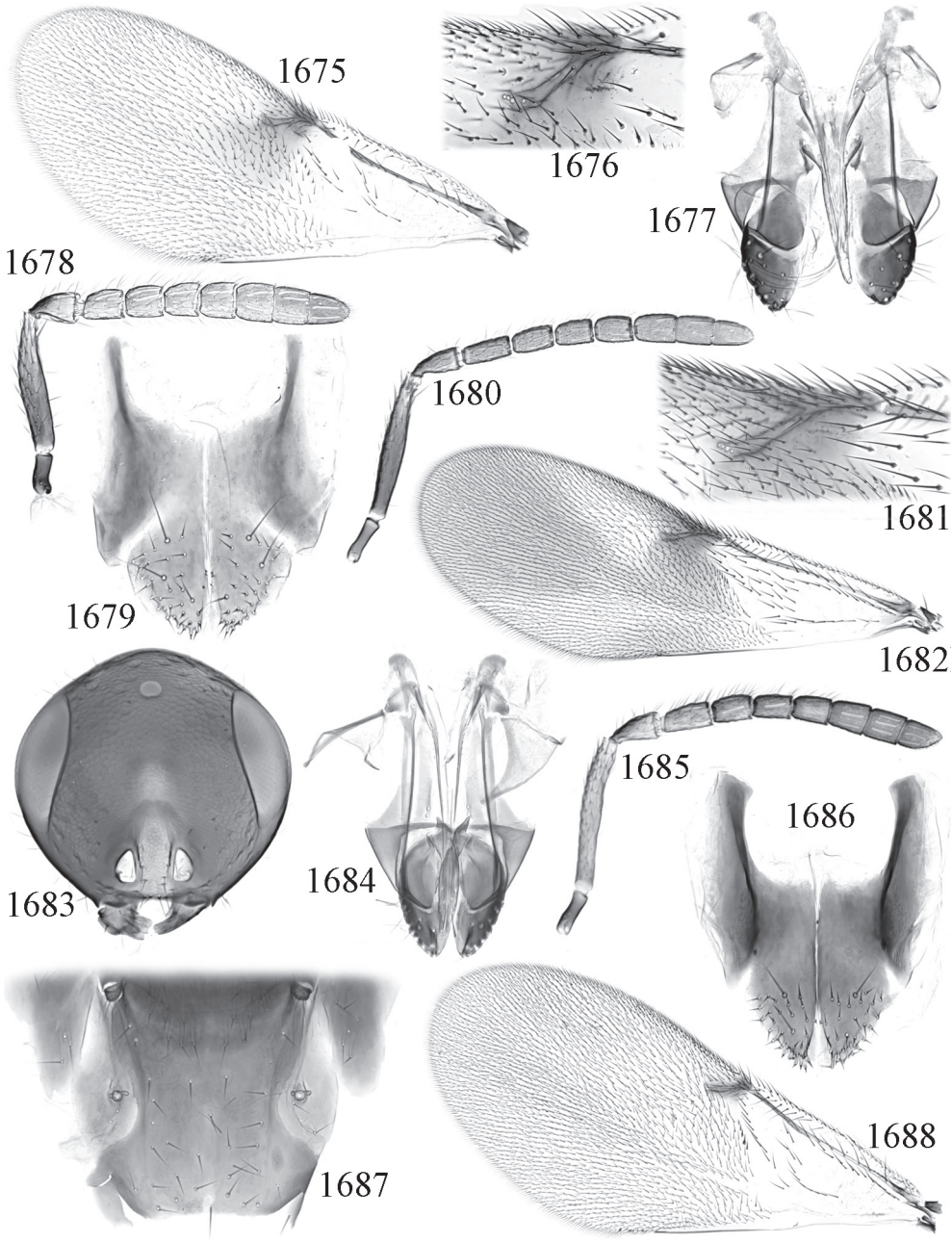
Figs 1631-1646. ***Cercobelus epimetheus*** – (1631) antenna, ♂; (1632) ovipositor; (1633) genitalia, ♂; (1634) terminal gastral tergites showing rasp-like structure at apex of syntergum. ***Cercobelus adrastea*** – (1635) fore wing; (1636) mesosoma, dorsal view; (1637) head, facial view; (1638) ovipositor; (1639) apex of fore wing venation; (1640) antenna; (1641 antenna, variant; (1642) antenna, variant; (1643) antenna, ♂; (1644) genitalia, ♂; (1645) hypopygium, variant; (1646) hypopygium, variant.



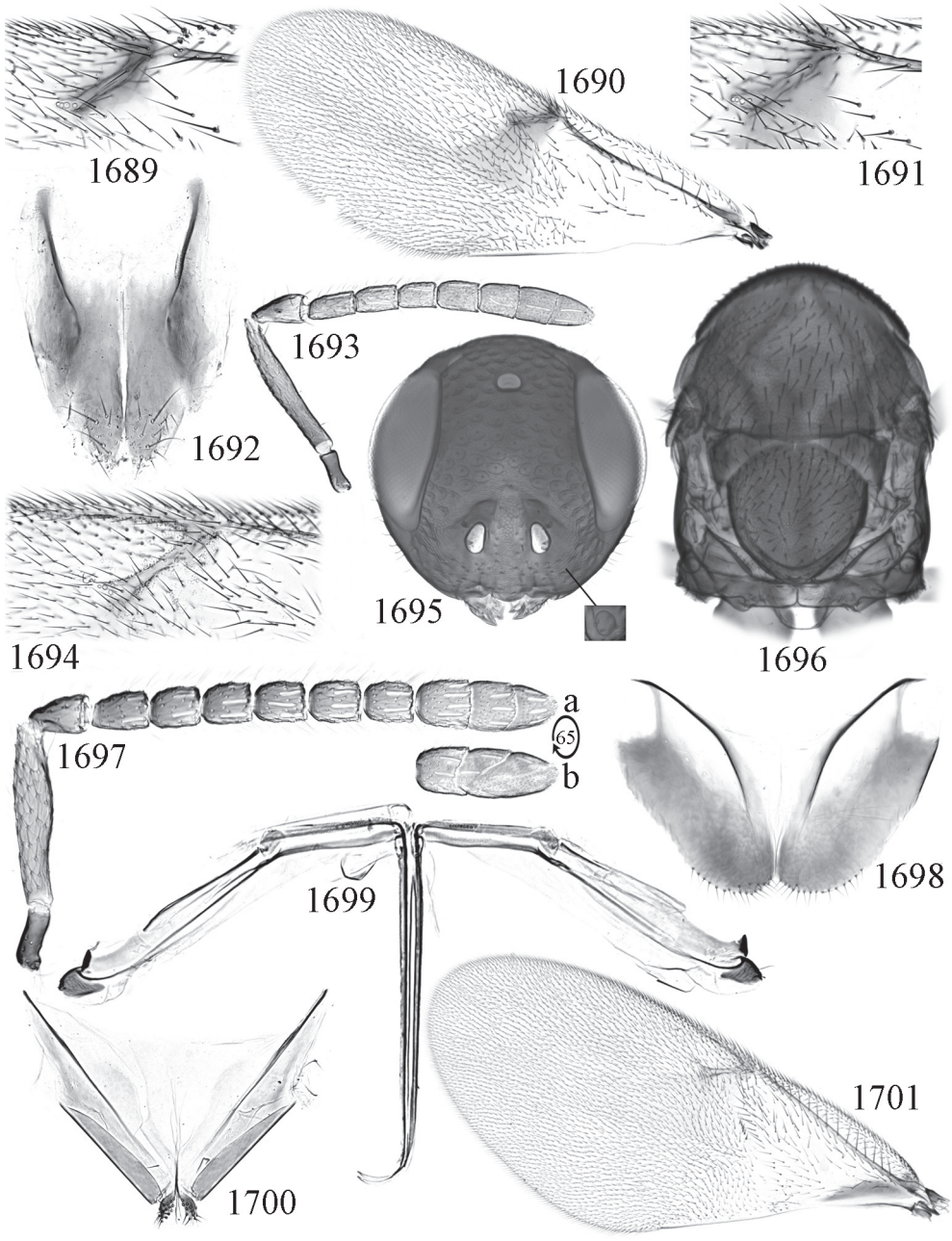
Figs 1647-1661. ***Cercobelus isara*** – (1647) genitalia, ♂; (1648) hypopygium, variant; (1649) hypopygium, variant; (1650) fore wing; (1651) apex of fore wing venation; (1652) antenna, ♂; (1653) ovipositor, showing attachment to syntergum; (1654) mesosoma, dorsal view; (1655) antenna; (1656) antenna, variant. ***Cercobelus sithon*** – (1657) genitalia, ♂; (1658) ovipositor; (1559) antenna, HT; (1660) hypopygium; (1661) terminal gastral tergites, showing structure of syntergum.



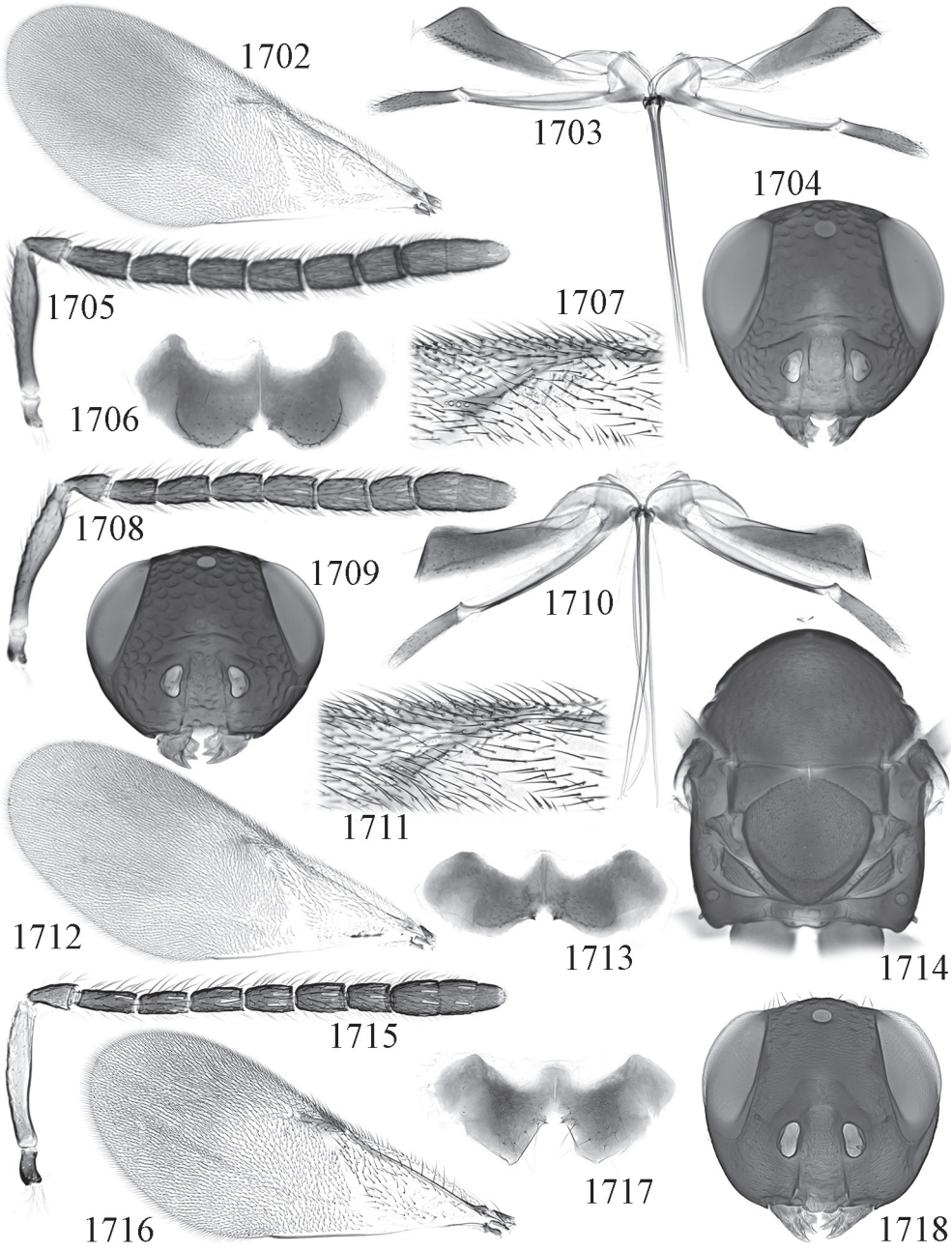
Figs 1662-1674. ***Cercobelus sithon*** – (1662) fore wing, HT; (1663) fore wing, ♂ (enhanced); (1664) antenna, ♂; (1665) apex of fore wing venation, HT; (1666) head, facial view. ***Cercobelus pleiades***, HT – (1667) mesosoma, dorsal view; (1668) head, facial view; (1669) ovipositor; (1670) antenna; (1671) apex of fore wing venation; (1672) fore wing; (1673) hypopygium; (1674) apical gastral tergites showing structure of syntergum.



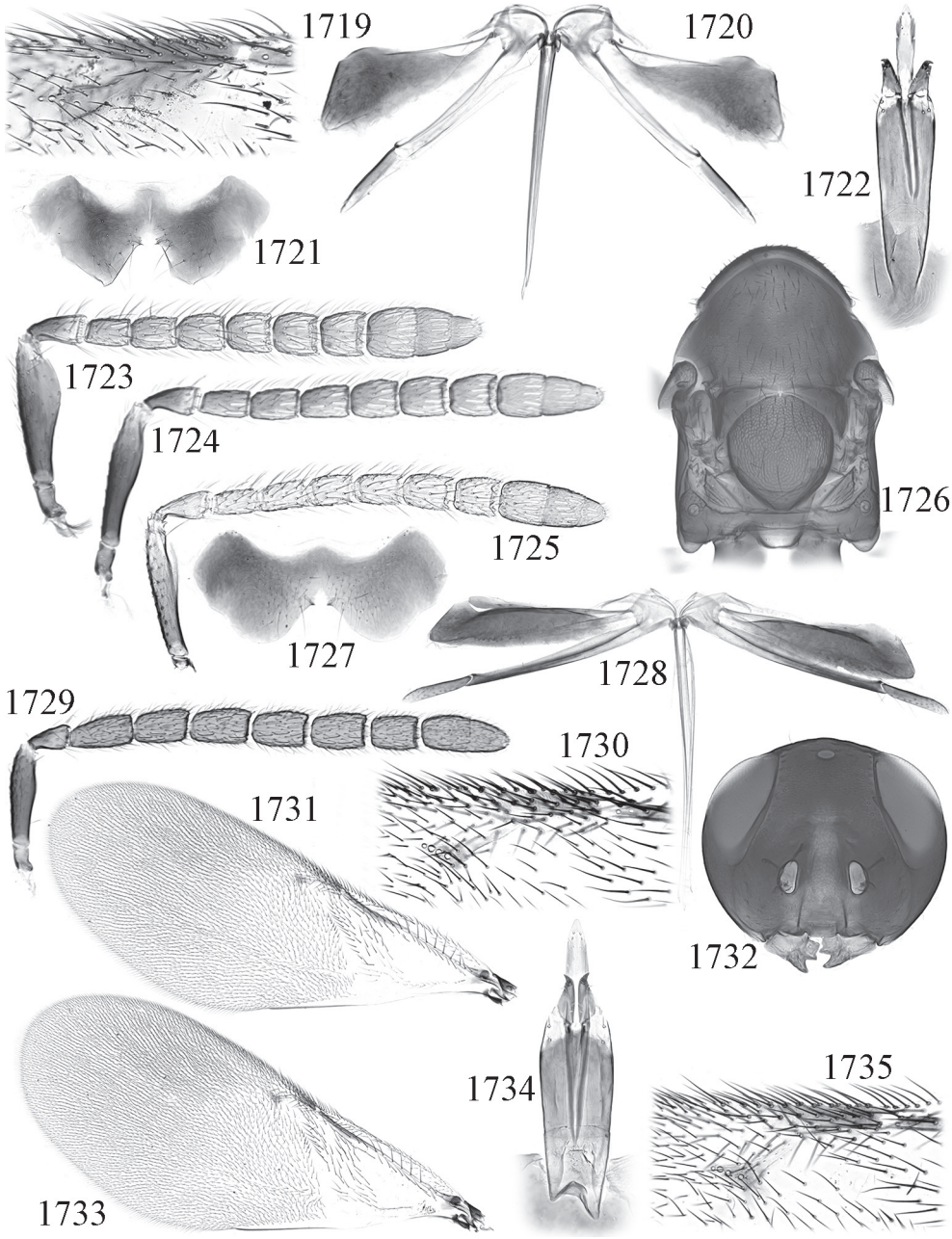
Figs 1675-1688. ***Cercobelus tartarus***, HT – (1675) fore wing; (1676) apex of fore wing venation; (1677) ovipositor; (1678) antenna; (1679) hypopygium. ***Cercobelus ulixes***, HT – (1680) antenna; (1681) fore wing venation; (1682) fore wing. ***Cercobelus phanes***, HT – (1683) head, facial view; (1684) ovipositor; (1685) antenna; (1686) hypopygium; (1687) apical gastral tergites showing structure of syntergum; (1688) fore wing.



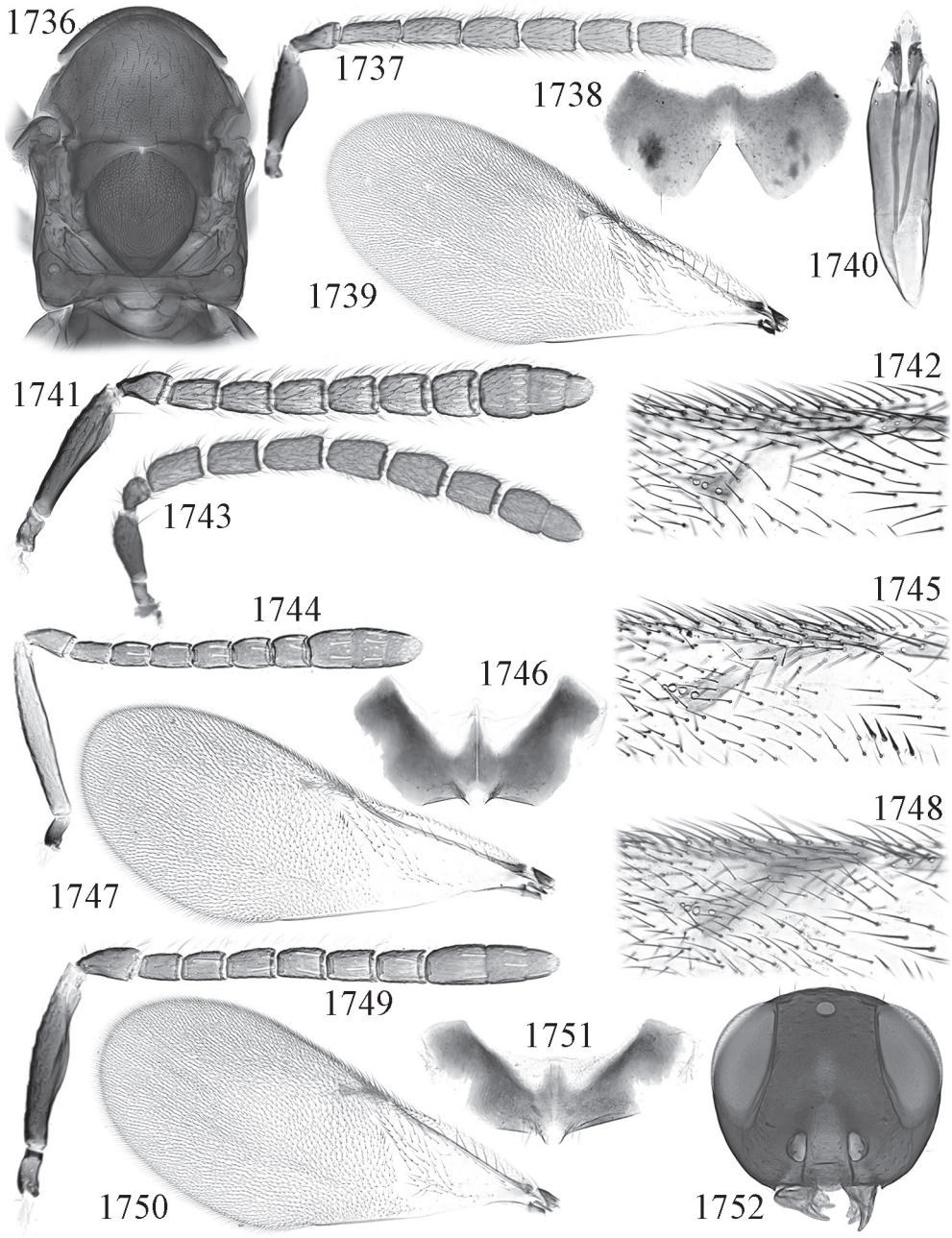
Figs 1689-1701. ***Cercobelus phanes***, HT – (1689) apex of fore wing venation. ***Cercobelus godoyae*** – (1690) fore wing; (1691) apex of fore wing venation; (1692) hypopygium; (1693) antenna. ***Arianus porusos*** – (1694) apex of fore wing venation; (1695) head, facial view, showing position and visible structure of "gland" near lateral mouth margin on posterior side of head as seen through cuticle below torulus; (1696) mesosoma, dorsal view; (1697) antenna (a, outer aspect of clava; b, inner aspect of clava); (1698) second gastral sternite; (1699) ovipositor; (1700) hypopygium, posterior margin partly curled inwards (enhanced); (1701) fore wing.



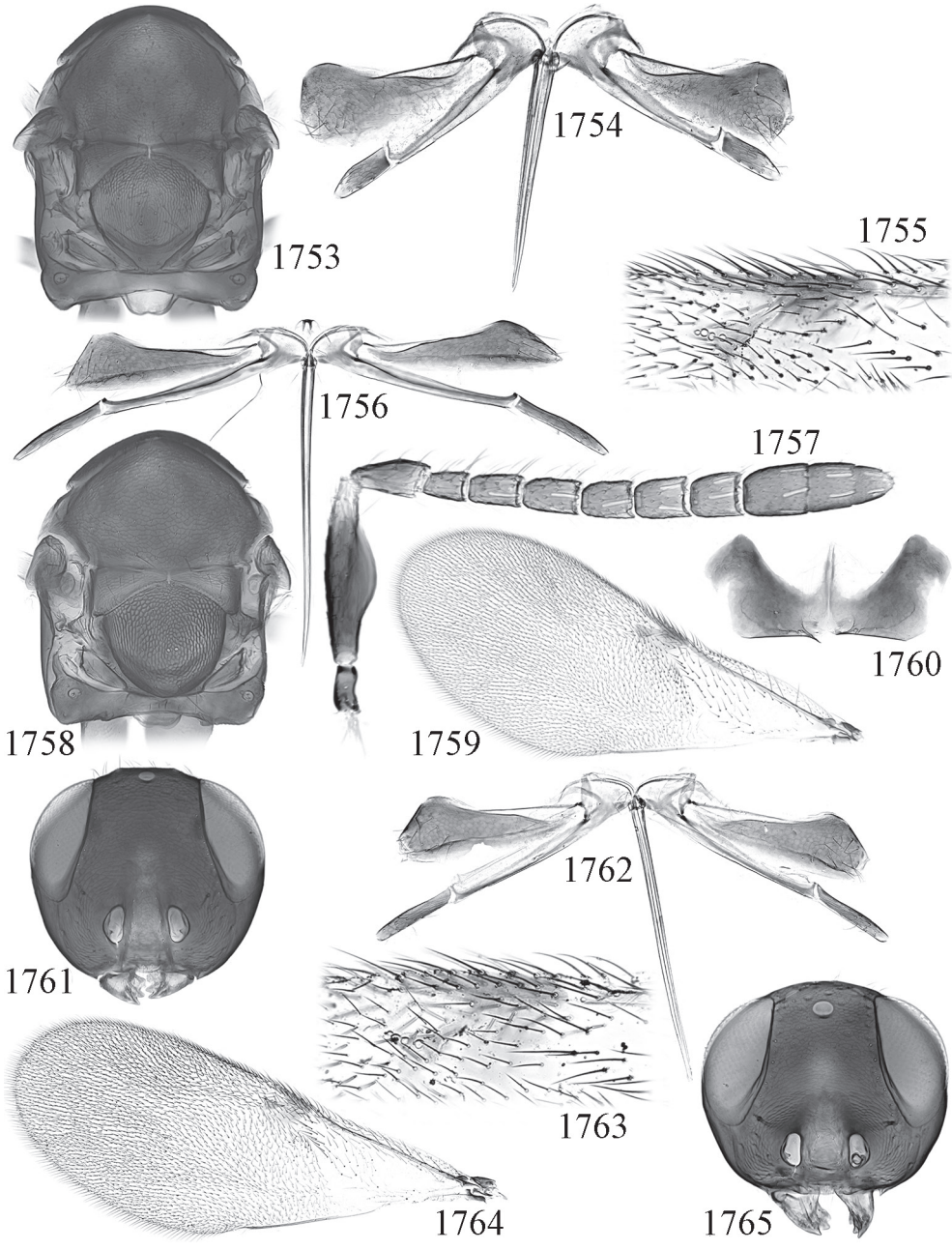
Figs 1702-1718. ***Caldencyrtus balor***, HT – (1702) fore wing (enhanced); (1703) ovipositor; (1704) head, facial view; (1705) antenna; (1706) hypopygium; (1707) apex of fore wing venation. ***Caldencyrtus meresmo***, HT – (1708) antenna; (1709) head, facial view; (1710) ovipositor; (1711) apex of fore wing venation; (1712) fore wing (enhanced); (1713) hypopygium; (1714) mesosoma, dorsal view. ***Caldencyrtus olwen***, HT – (1715) antenna; (1716) fore wing; (1717) hypopygium; (1718) head, facial view.



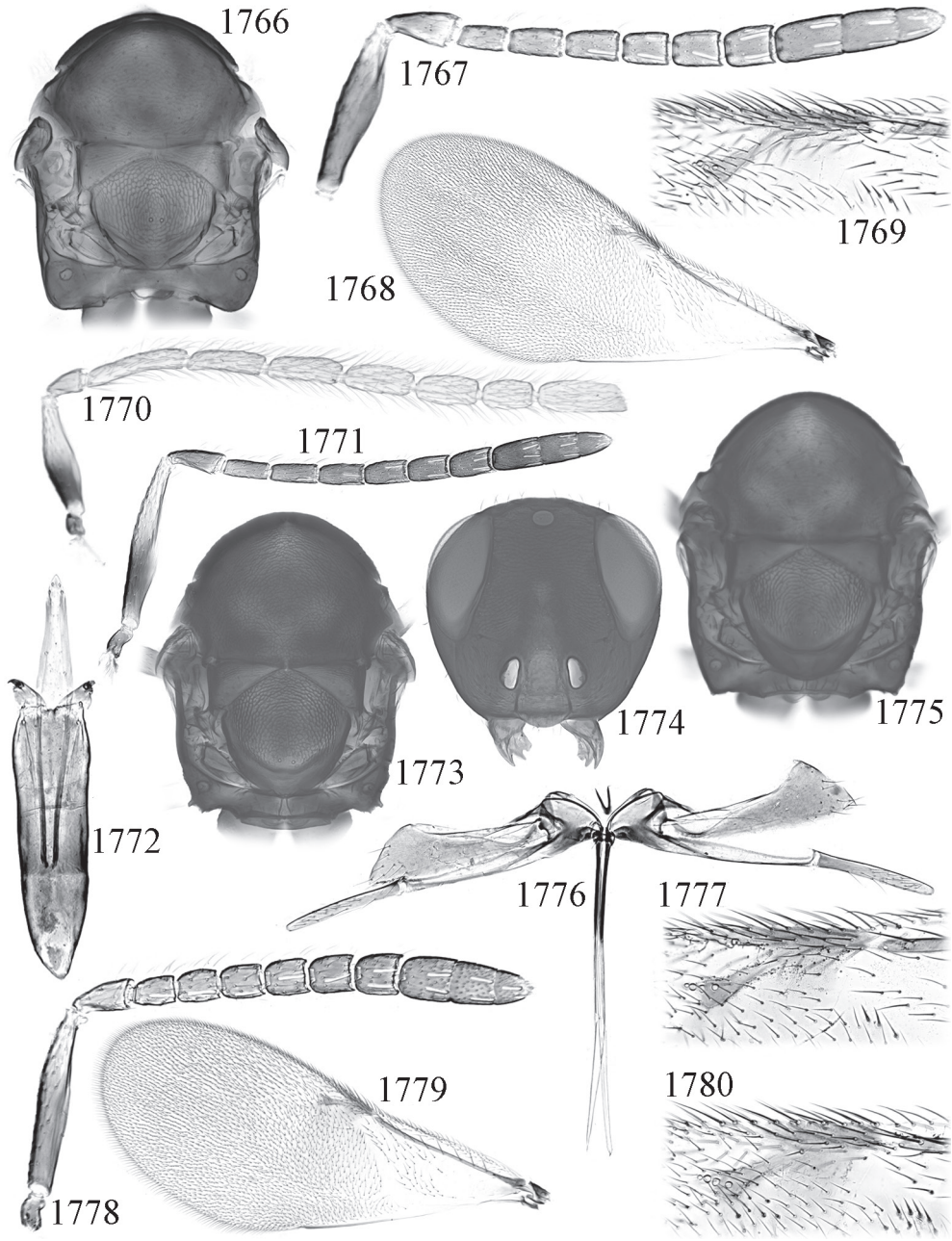
Figs 1719-1735. ***Caldencyrtus olwen***, HT – (1719) apex of fore wing venation; (1720) ovipositor; (1721) hypopygium. ***Caldencyrtus acamas*** – (1722) genitalia, ♂; (1723) antenna; (1724) antenna variant; (1725) antenna, variant; (1726) mesosoma, dorsal view; (1727) hypopygium; (1728) ovipositor; (1729) antenna, ♂; (1730) apex of fore wing venation; (1731) fore wing; (1732) head, facial view. ***Caldencyrtus antander*** – (1733) fore wing; (1734) genitalia, ♂; (1735) apex of fore wing venation.



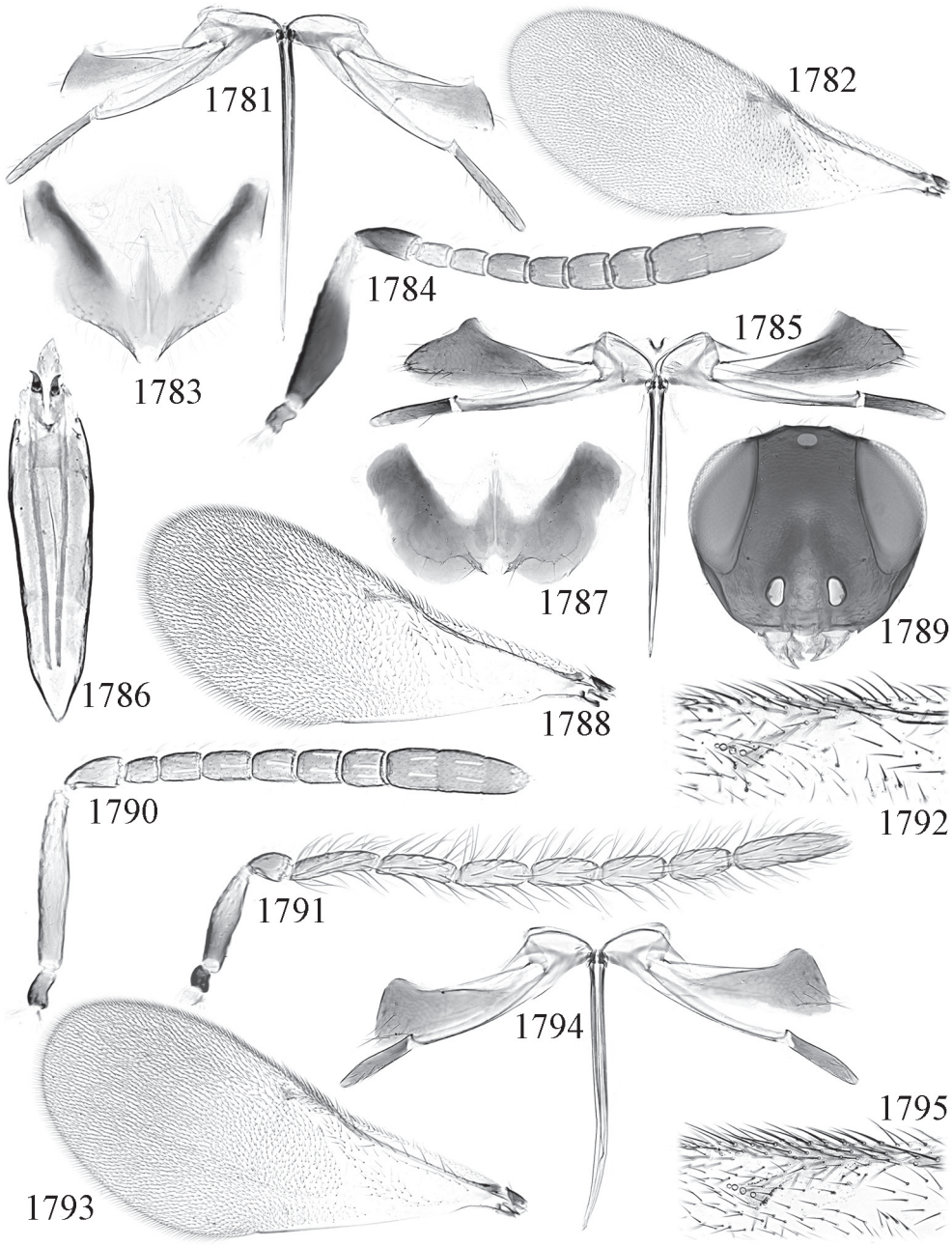
Figs 1736-1752. ***Caldencyrtus antander*** – (1736) mesosoma, dorsal view, ♂; (1737) antenna, ♂; (1738) hypopygium (enhanced). ***Caldencyrtus mitchelli*** – (1739) fore wing; (1740) genitalia, ♂; (1741) antenna; (1742) apex of fore wing venation; (1743) antenna, ♂. ***Dalek thanatos***, HT – (1744) antenna; (1745) apex of fore wing venation; (1746) hypopygium; (1747) fore wing. ***Dalek carme*** – (1748) apex of fore wing venation; (1749) antenna; (1750) fore wing; (1751) hypopygium, posterior margin slightly curled inwards; (1752) head, facial view.



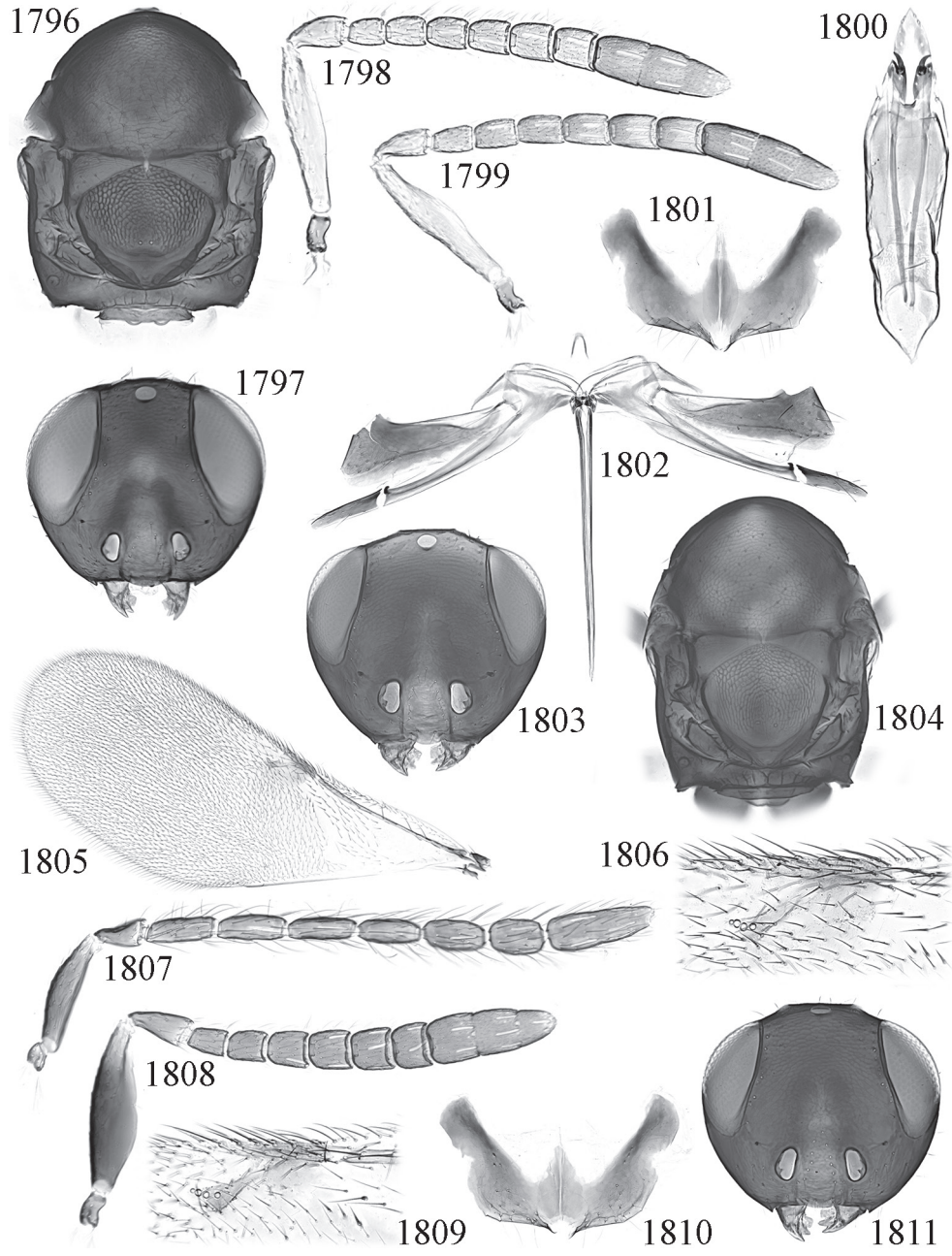
Figs 1753-1765. ***Dalek carme*** – (1753) mesosoma, dorsal view; (1754) ovipositor. ***Dalek ananke*** – (1755) apex of fore wing venation; (1756) ovipositor; (1757) antenna; (1758) mesosoma, dorsal view; (1759) fore wing; (1760) hypopygium, posterior margin slightly curled inwards; (1761) head, facial view. ***Dalek orthia*** – (1761) ovipositor; (1763) apex of fore wing venation; (1764) fore wing; (1765) head, facial view.



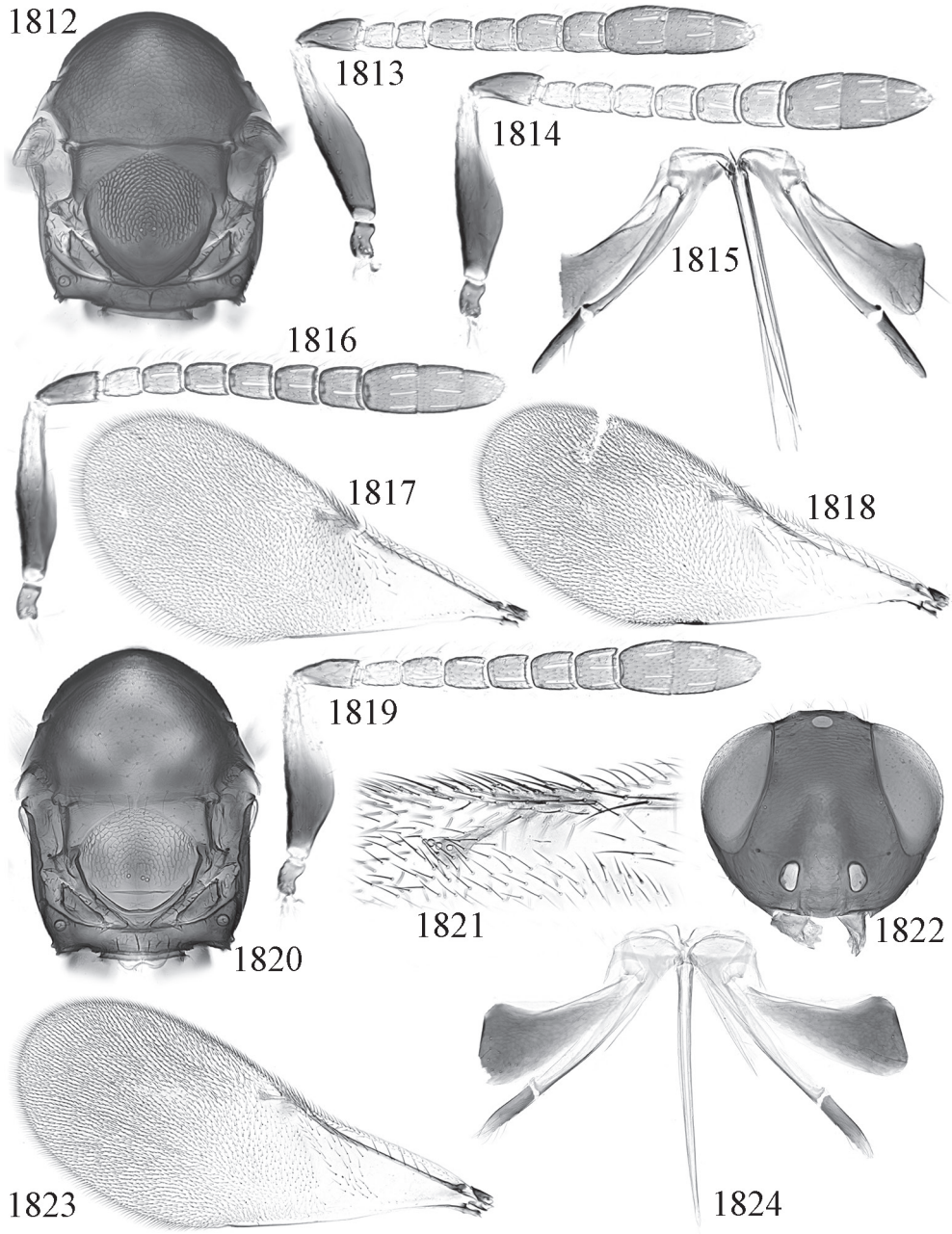
Figs 1766-1780. ***Dalek orthia*** – (1766) mesosoma; (1767) antenna. ***Dalek pleione*** – (1768) fore wing; (1769) apex of fore wing venation; (1770) antenna, ♂; (1771) antenna; (1772) genitalia, ♂; (1773) mesosoma, dorsal view; (1774) head, facial view. ***Dalek jigas*** – (1775) mesosoma, dorsal view; (1776) ovipositor; (1777) apex of fore wing venation; (1778) antenna; (1779) fore wing. ***Dalek minerva*** – (1780) apex of fore wing venation.



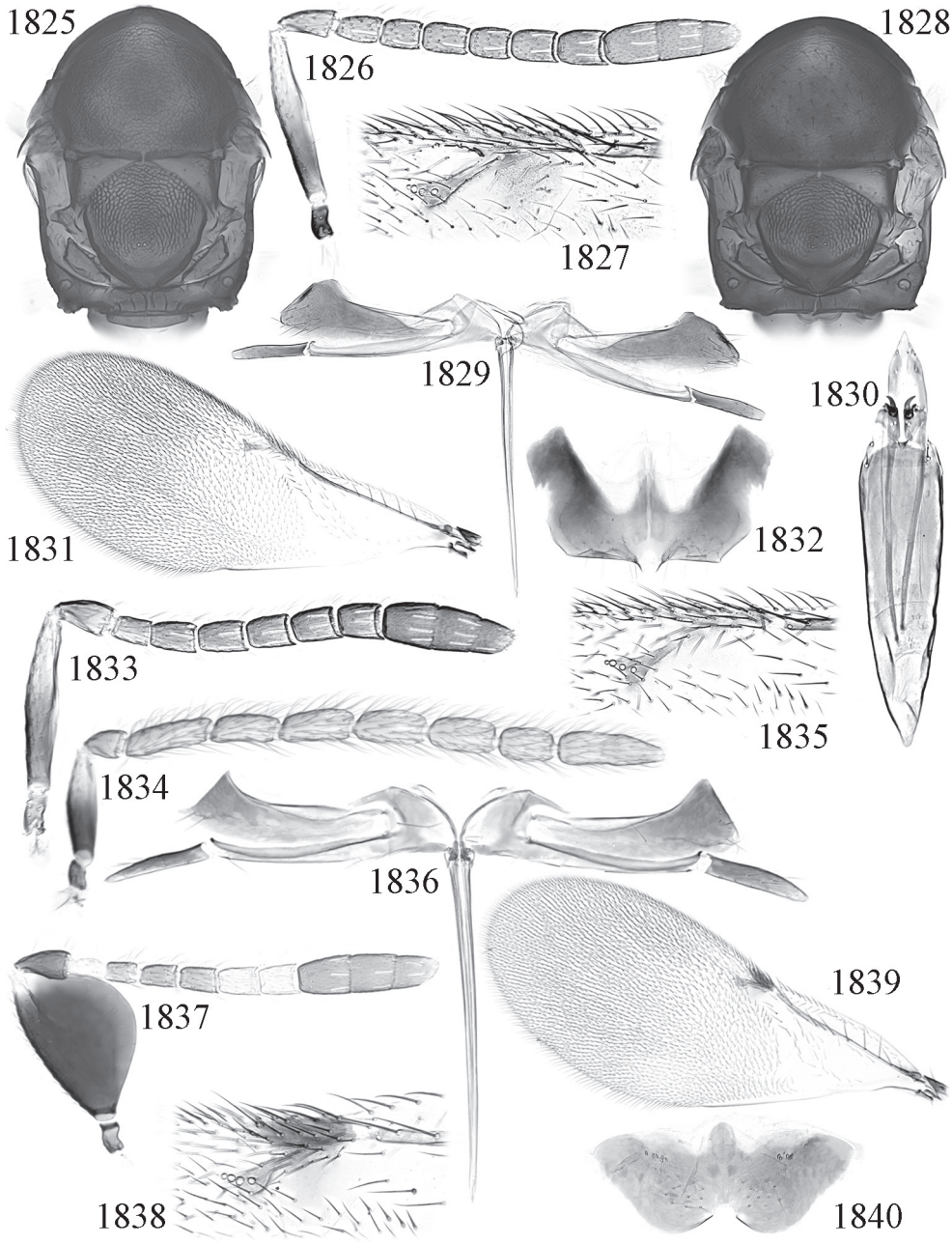
Figs 1781-1795. ***Dalek minerva*** – (1781) ovipositor; (1782) fore wing; (1783) hypopygium; (1784) antenna. ***Dalek arax*** – (1785) ovipositor; (1786) genitalia, ♂; (1787) hypopygium; (1788) fore wing; (1789) head, facial view; (1790) antenna; (1791) antenna, ♂; (1792) apex of fore wing venation. ***Dalek saurax*** – (1793) fore wing; (1794) ovipositor; (1795) apex of fore wing venation.



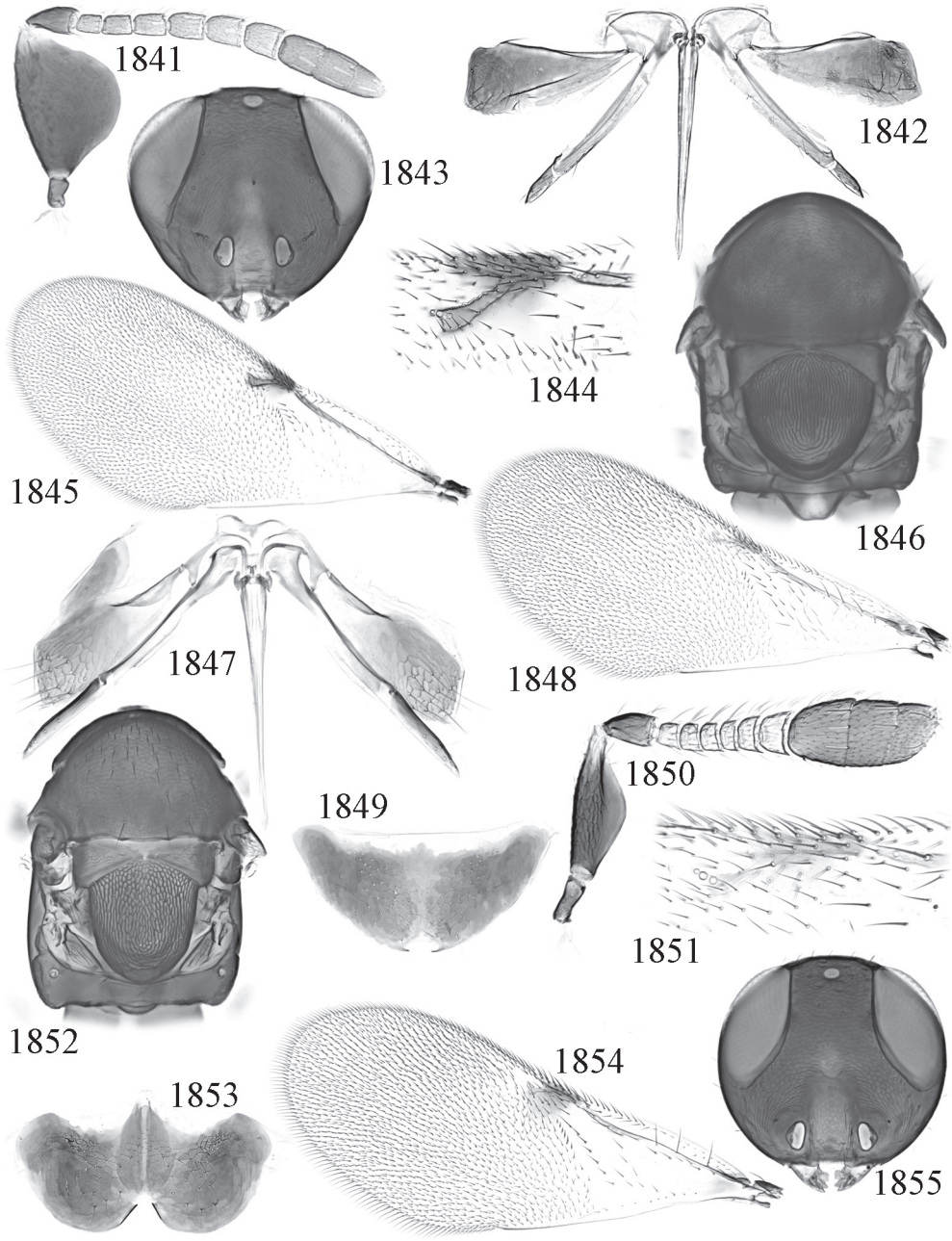
Figs 1796-1811. ***Dalek saurax*** – (1796) mesosoma, dorsal view; (1797) head, facial view; (1798) antenna, variant; (1799) antenna. ***Dalek cyclos*** – (1800) genitalia, ♂; (1801) hypopygium. posterior margin slightly curled inwards; (1802) ovipositor (1803) head, facial view; (1804) mesosoma, dorsal view; (1805) fore wing; (1806) apex of fore wing venation; (1807) antenna, ♂; (1808) antenna. ***Dalek gubrana*** – (1809) apex of fore wing venation; (1810) hypopygium; (1811) head, facial view.



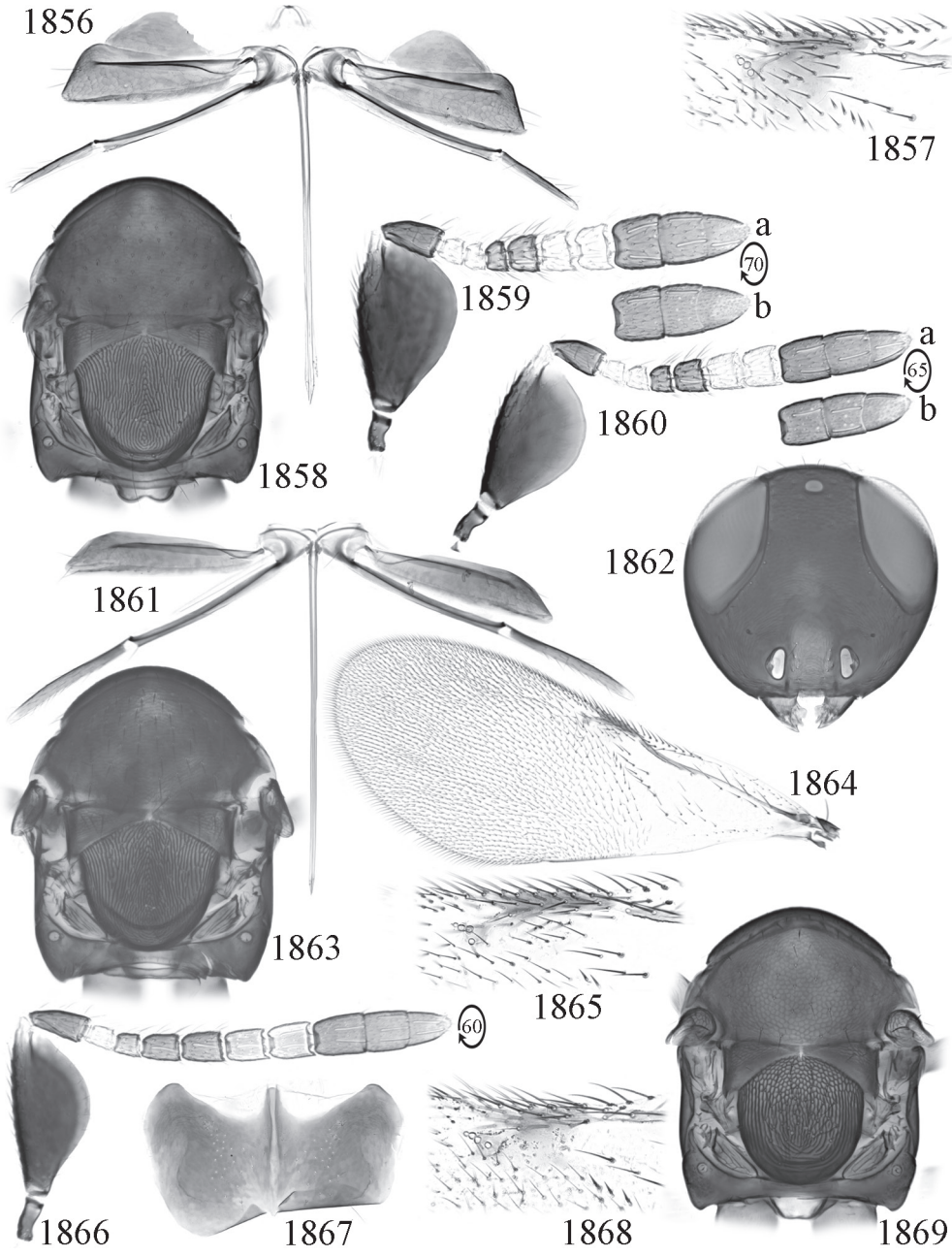
Figs 1812-1824. ***Dalek gubrana*** – (1812) mesosoma, dorsal view; (1813) antenna, variant; (1814) antenna, variant; (1815) ovipositor; (1816) antenna; (1817) fore wing. ***Dalek pomona***, HT – (1818) fore wing; (1819) antenna; (1820) mesosoma, dorsal view; (1821) apex of fore wing venation; (1822) head, facial view. ***Dalek elana***, HT – (1823) fore wing; (1824) ovipositor.



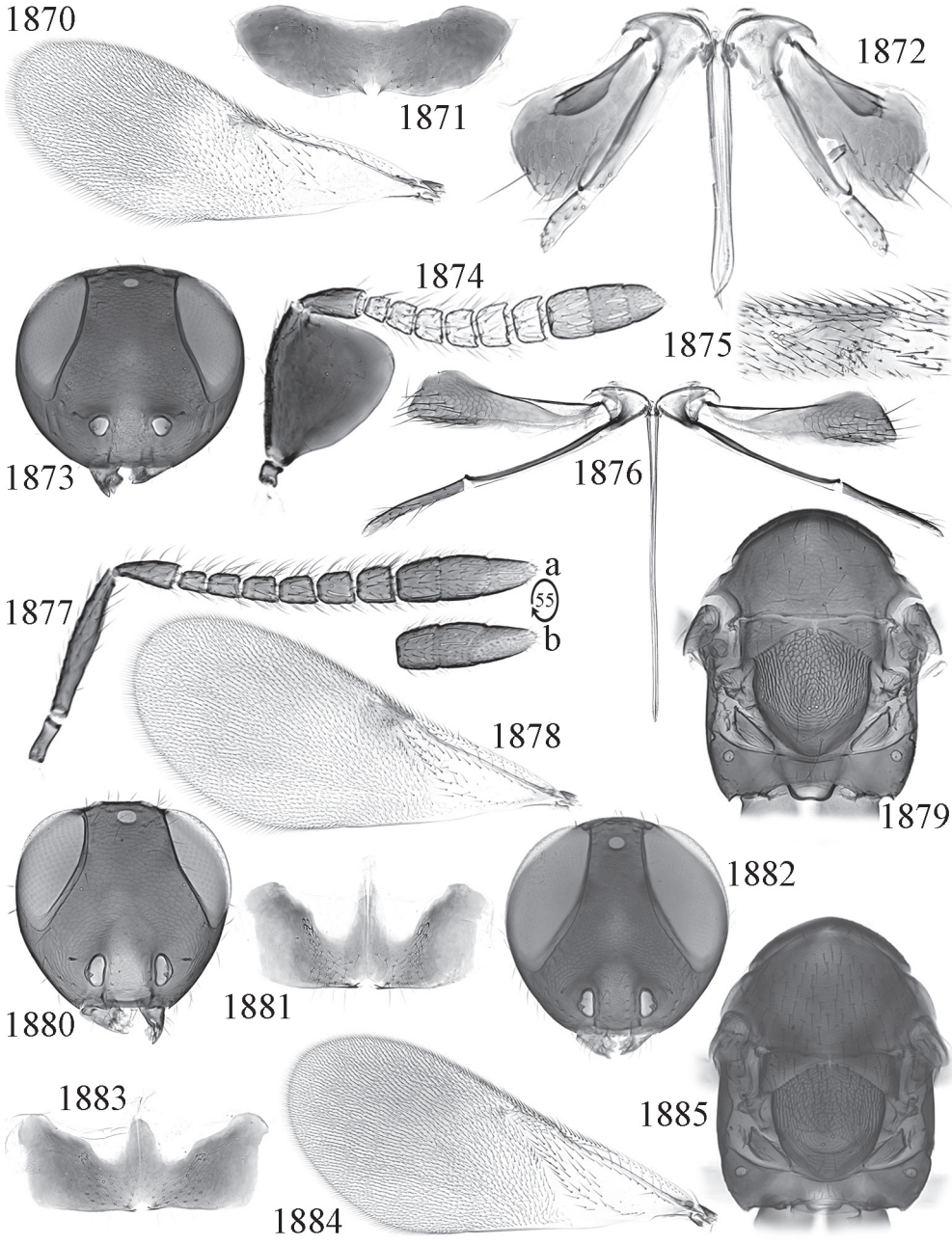
Figs 1825-1840. ***Dalek elana***, HT – (1825) mesosoma, dorsal view; (1826) antenna; (1827) apex of fore wing venation. ***Dalek nationi*** – (1828) mesosoma, dorsal view; (1829) ovipositor; (1830) genitalia, ♂; (1831) fore wing; (1832) hypopygium; (1833) antenna; (1834) antenna, ♂; (1835) apex of fore wing venation. ***Mendisa gaia***, HT – (1836) ovipositor; (1837) antenna; (1838) apex of fore wing venation; (1839) fore wing. ***Harlarus titana*** – (1840) hypopygium.



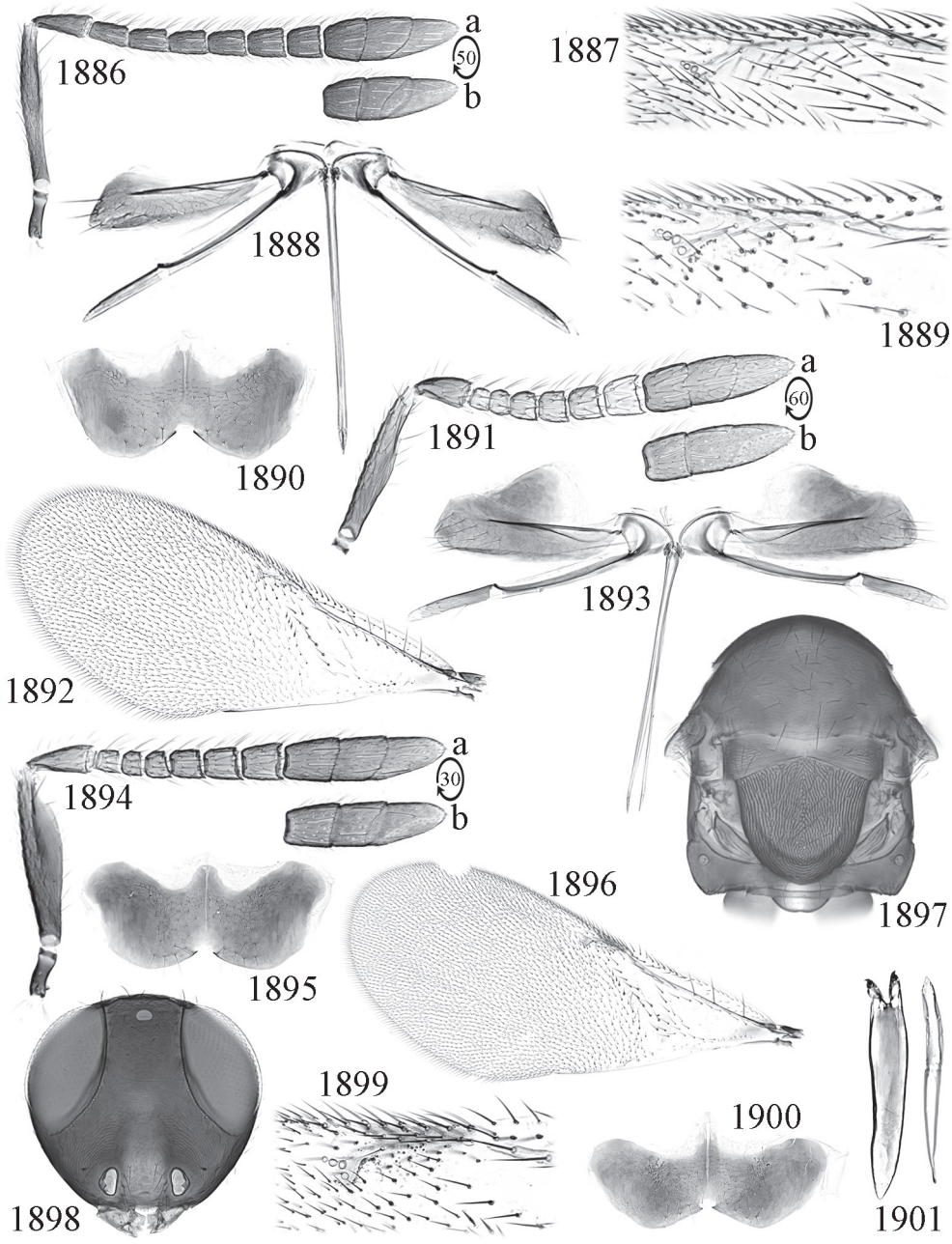
Figs 1841-1855. ***Harlarus titana*** – (1841) antenna; (1842) ovipositor; (1843) head, facial view; (1844) apex of fore wing venation; (1845) fore wing; (1846) mesosoma, dorsal view. ***Raquanus hades*** – (1847) ovipositor; (1848) fore wing; (1849) hypopygium; (1850) antenna; (1851) mesosoma, dorsal view; (1852) apex of fore wing venation. ***Esphora cyllene*** – (1853) hypopygium; (1854) fore wing; (1855) head, facial view.



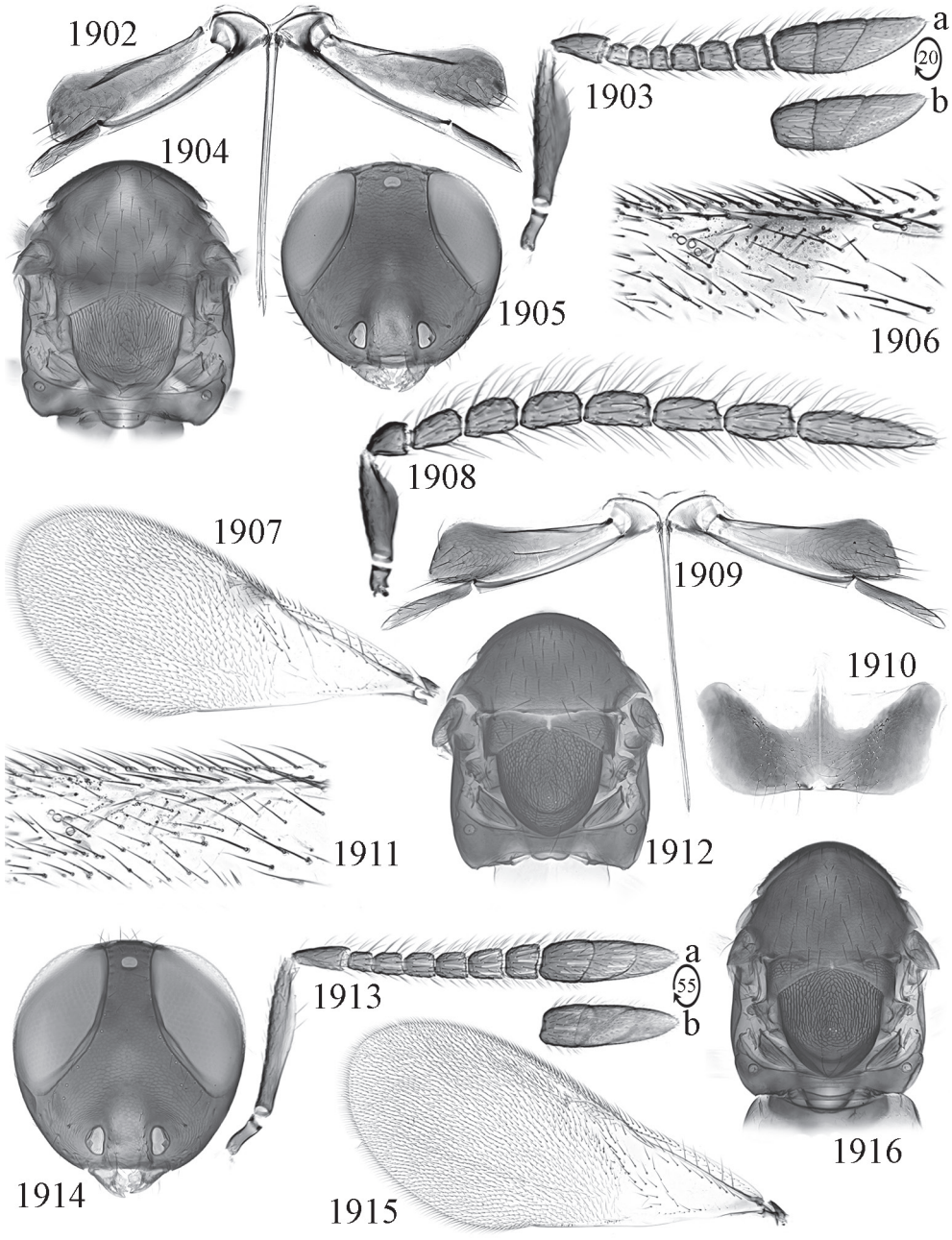
Figs 1856-1869. ***Esphora cyllene*** – (1856) ovipositor; (1857) apex of fore wing venation; (1858) mesosoma, dorsal view; (1859) antenna (a, outer aspect of clava; b, inner aspect of clava); (1860) antenna, variant (a, outer aspect of clava; b, inner aspect of clava). ***Esphora rhea*** – (1861) ovipositor; (1862) head, facial view; (1863) mesosoma, dorsal view; (1864) fore wing; (1865) apex of fore wing venation; (1866) antenna; (1867) hypopygium (posterior margin slightly curled inwards). ***Sosara geras*** – (1868) apex of fore wing venation; (1869) mesosoma, dorsal view.



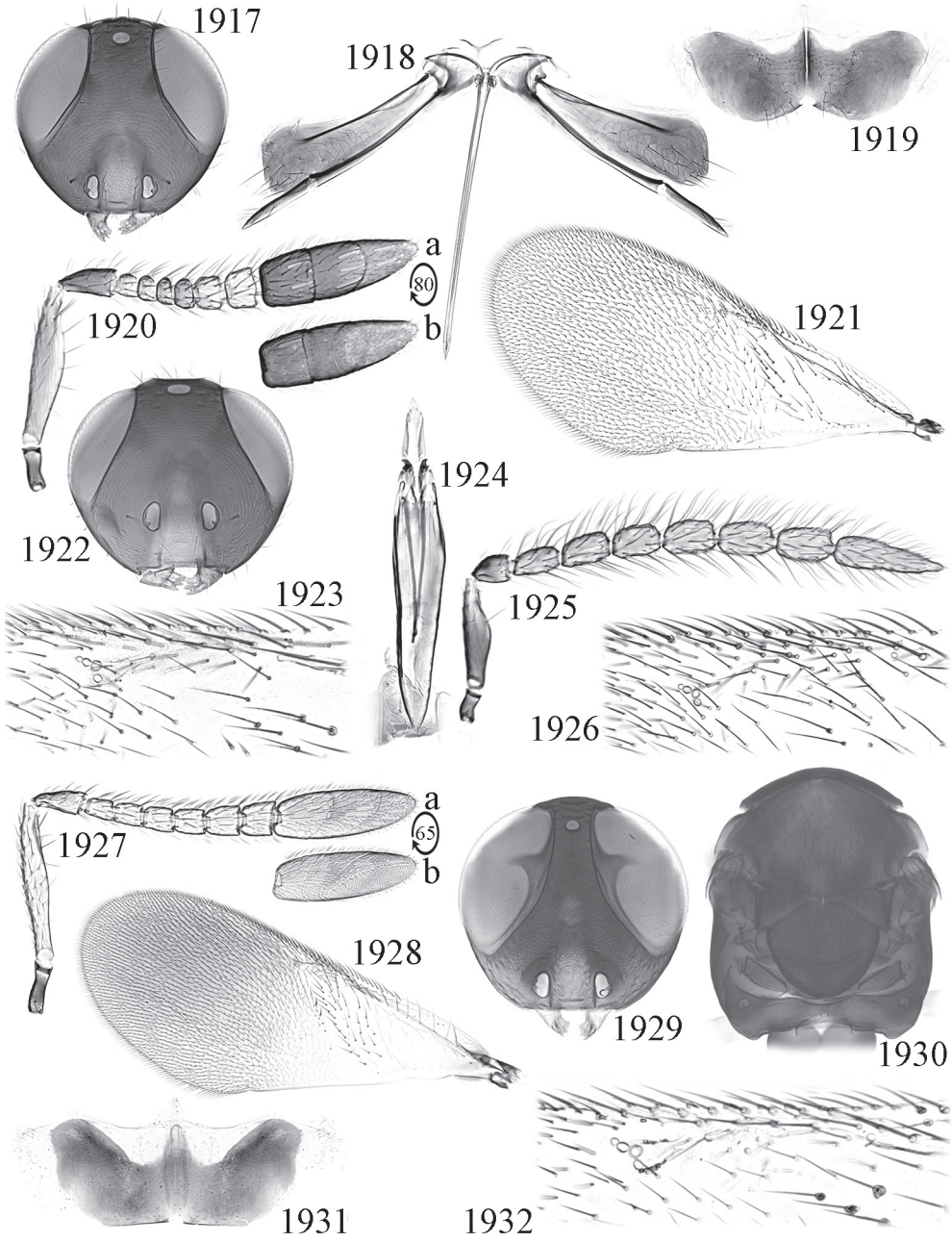
Figs 1870-1885. ***Sosara geras*** – (1870) fore wing; (1871) hypopygium; (1872) ovipositor; (1873) head, facial view; (1874) antenna. ***Hebynthus kapo***, HT – (1875) apex of fore wing venation; (1876) ovipositor; (1877) antenna (a, outer aspect of clava; b, inner aspect of clava); (1878) fore wing; (1879) mesosoma, dorsal view; (1880) head, facial view; (1881) hypopygium. ***Hebynthus maros***, HT – (1882) head, facial view; (1883) hypopygium; (1884) fore wing; (1885) mesosoma, dorsal view.



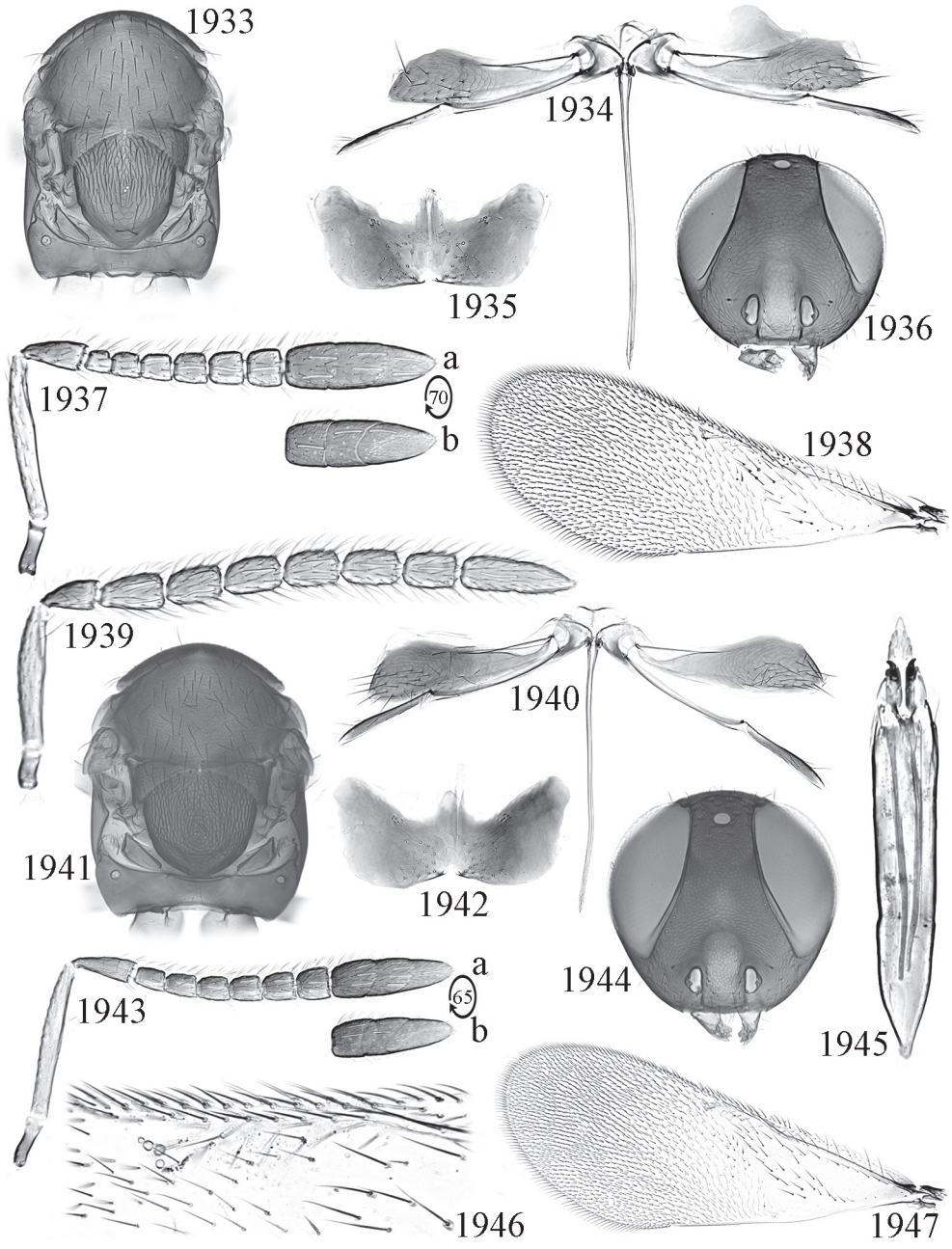
Figs 1886-1901. ***Hebynthus maros*** – (1886) antenna; (1887) apex of fore wing venation. ***Hebynthus phyrra***, HT – (1888) ovipositor; (1889) apex of fore wing venation; (1890) hypopygium; (1891) antenna (a, outer aspect of clava; b, inner aspect of clava); (1892) fore wing. ***Hebynthus cleon***, HT – (1893) ovipositor; (1894) antenna (a, outer aspect of clava; b, inner aspect of clava); (1895) hypopygium; (1896) fore wing; (1897) mesosoma, dorsal view; (1898) head, facial view; (1899) apex of fore wing venation. ***Hebynthus solex*** – (1900) hypopygium; (1901) genitalia, ♂ (phallobase and aedeagus separated).



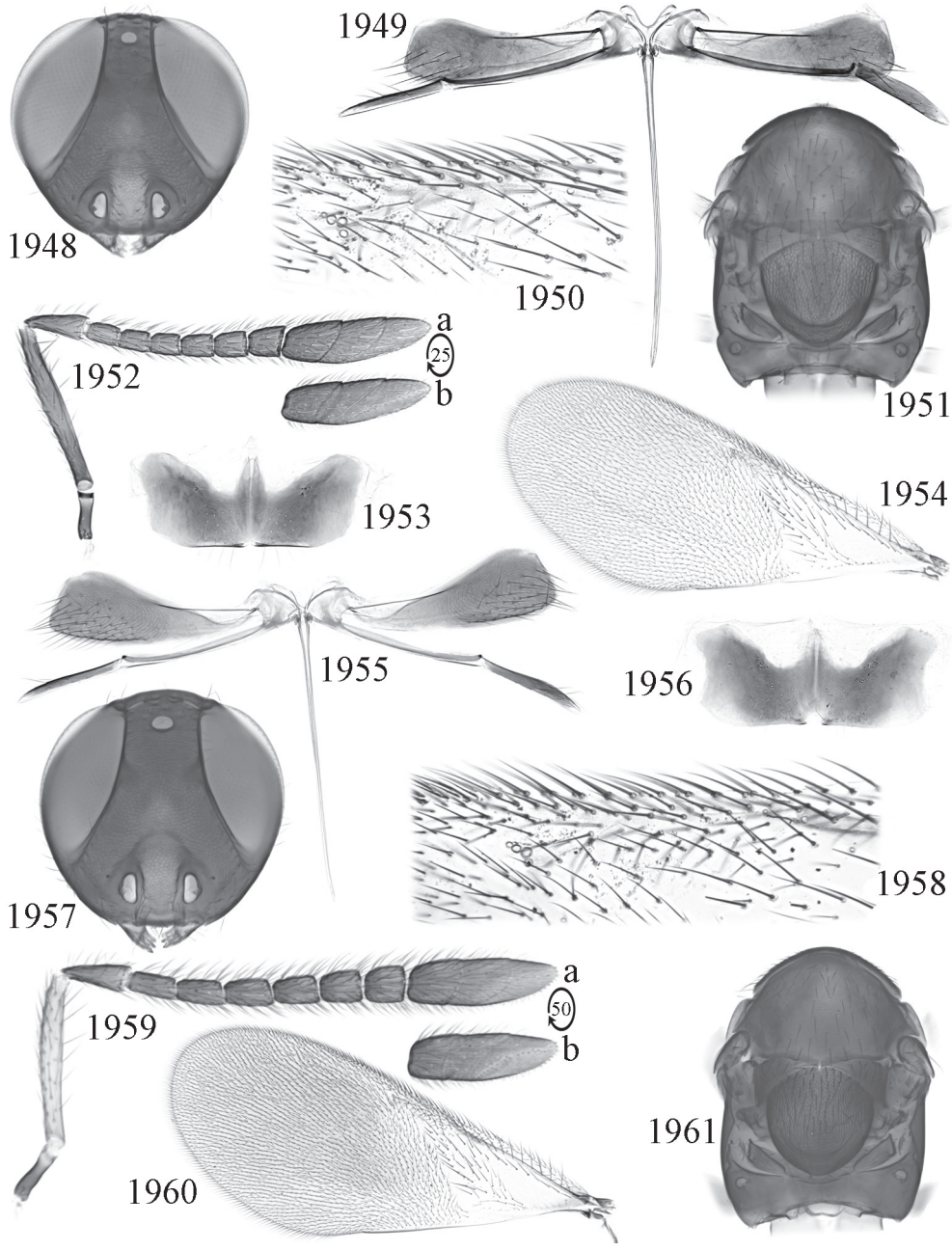
Figs 1902-1916. ***Hebynthus solex*** – (1902) ovipositor; (1903) antenna (a, outer aspect of clava; b, inner aspect of clava); (1904) mesosoma, dorsal view; (1905) head, facial view; (1906) apex of fore wing venation; (1907) fore wing; (1908) antenna, ♂. ***Hebynthus himalia*** – (1909) ovipositor; (1910) hypopygium; (1911) apex of fore wing venation; (1912) mesosoma, dorsal view; (1913) antenna (a, outer aspect of clava; b, inner aspect of clava); (19134head, facial view; (1915) fore wing. ***Hebynthus cosmus*** – (1916) mesosoma, dorsal view.



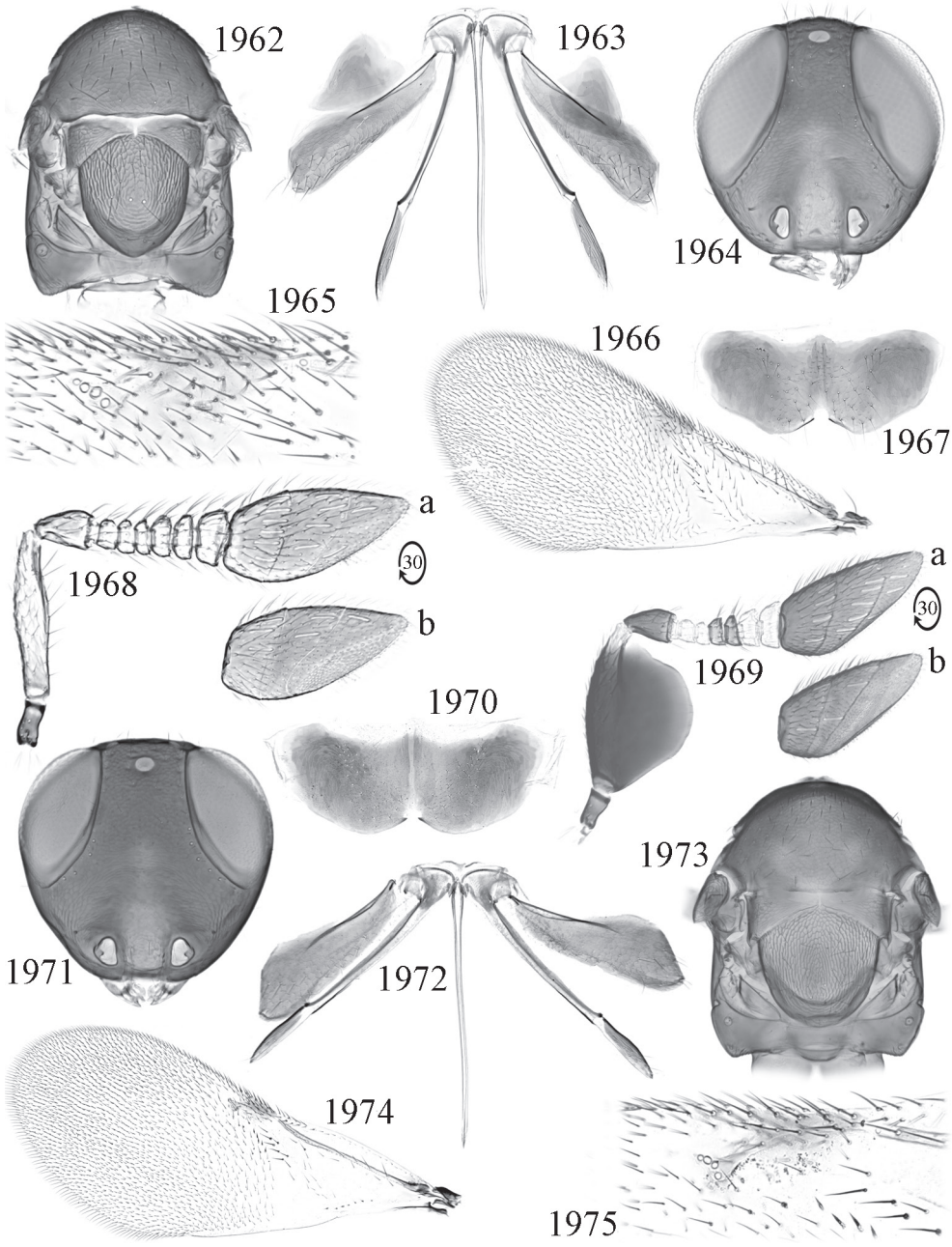
Figs 1917-1932. ***Hebynthus cosmus*** – (1917) head, facial view; (1918) ovipositor; (1919) hypopygium; (1920) antenna (a, outer aspect of clava; b, inner aspect of clava); (1921) fore wing; (1922) head, facial view, ♂; (1923) apex of fore wing venation; (1924) genitalia, ♂; (1925) antenna, ♂. ***Hebynthus menai*** – (1926) apex of fore wing venation; (1927) antenna (a, outer aspect of clava; b, inner aspect of clava); (1928) fore wing; (1929) head, facial view; (1930) mesosoma, dorsal view; (1931) hypopygium. ***Hebynthus cira***, HT – (1932) apex of fore wing venation.



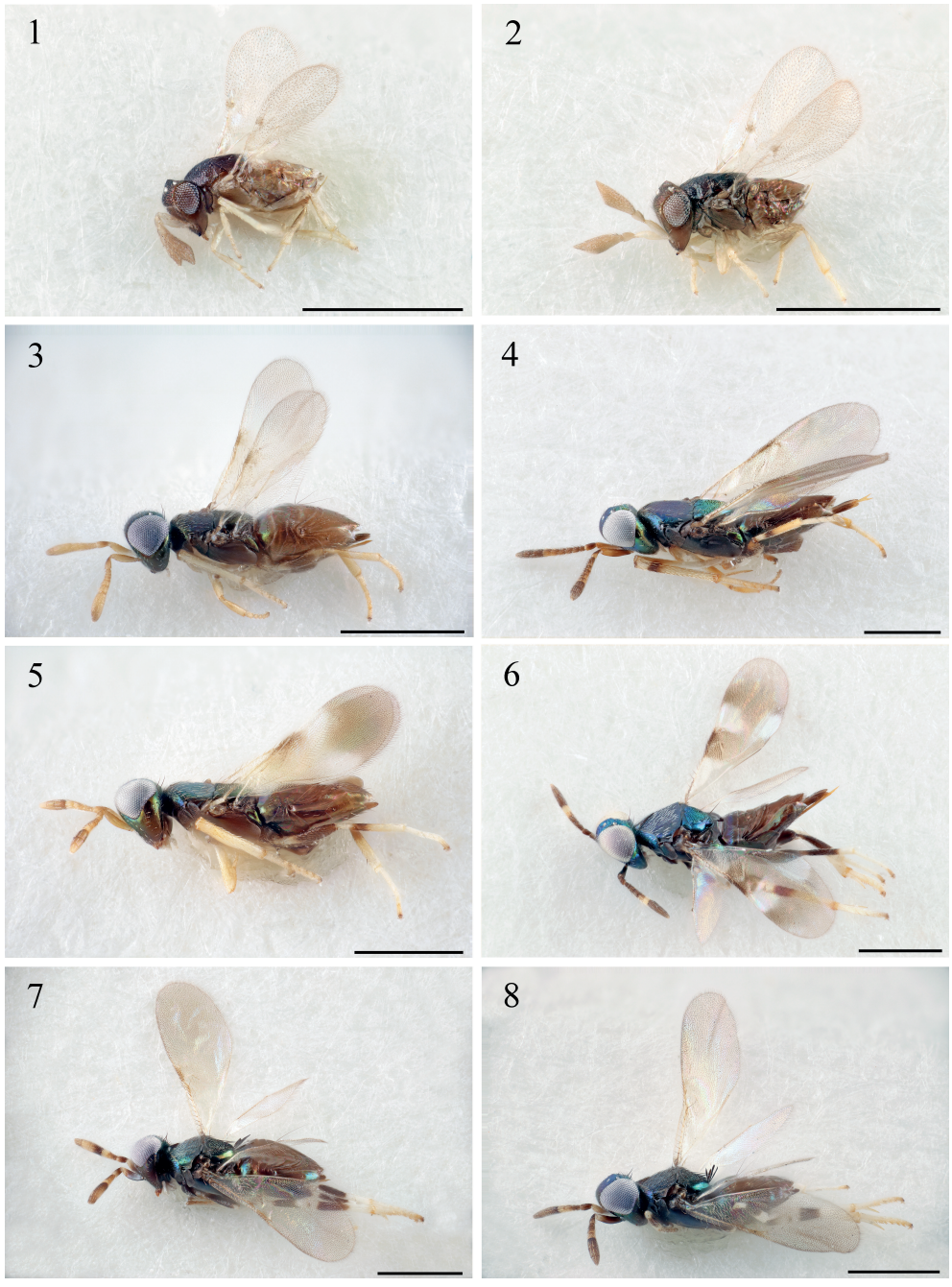
Figs 1933-1947. ***Hebynthus cira***, HT – (1933) mesosoma, dorsal view; (1934) ovipositor (reconstructed); (1935) hypopygium (reconstructed); (1936) head, facial view; (1937) antenna (a, outer aspect of clava; b, inner aspect of clava); (1938) fore wing. ***Hebynthus erythrax*** – (1939) antenna, ♂; (1940) ovipositor; (1941) mesosoma, dorsal view; (1942) hypopygium; (1943) antenna (a, outer aspect of clava; b, inner aspect of clava); (1944) head, facial view; (1945) genitalia, ♂; (1946) apex of fore wing venation; (1947) fore wing.



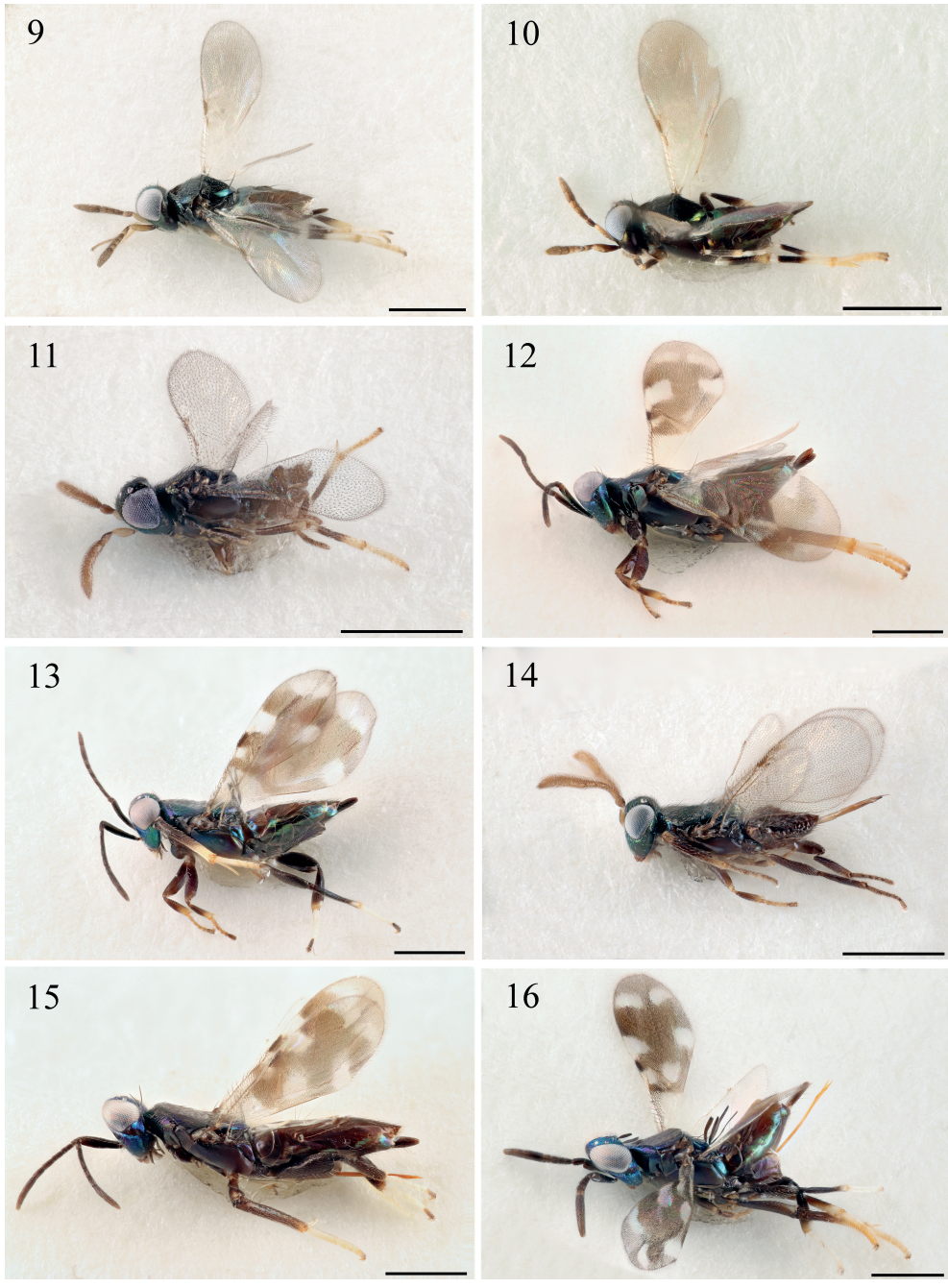
Figs 1948-1961. ***Hebynthus callirhoe*** – (1948) head, facial view; (1949) ovipositor; (1950) apex of fore wing venation; (1951) mesosoma, dorsal view; (1952) antenna (a, outer aspect of clava; b, inner aspect of clava); (1953) hypopygium; (1954) fore wing. ***Hebynthus tamones*** – (1955) ovipositor; (1956) hypopygium; (1957) head, facial view; (1958) apex of fore wing venation; (1959) antenna (a, outer aspect of clava; b, inner aspect of clava); (1960) fore wing; (1961) mesosoma, dorsal view.



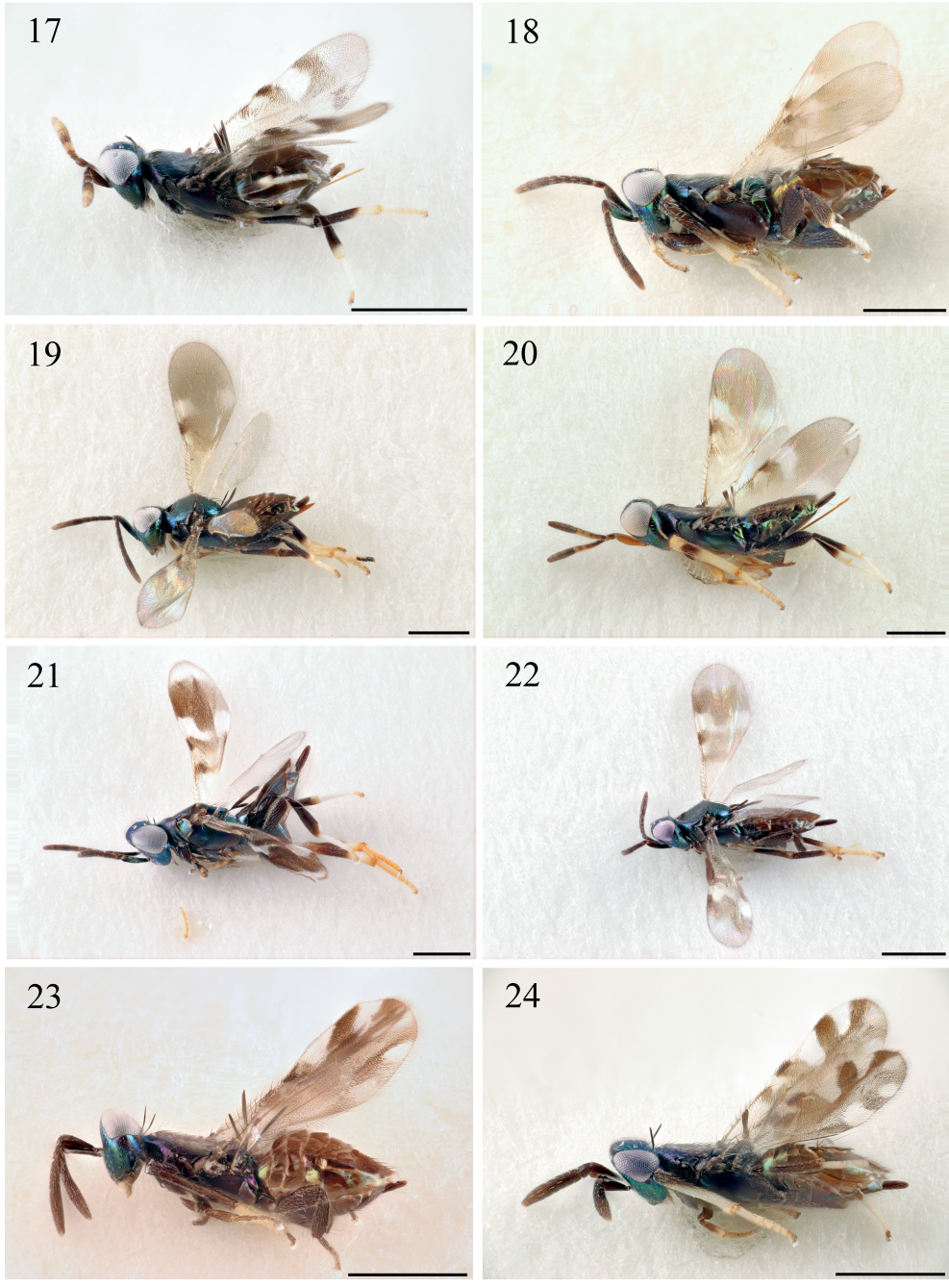
Figs 1962-1975. ***Alkonia tiquanus***, HT – (1962) mesosoma, dorsal view; (1963) ovipositor; (1964) head, facial view; (1965) apex of fore wing venation; (1966) fore wing; (1967) hypopygium; (1968) antenna (a, outer aspect of clava; b, inner aspect of clava; clava slightly collapsed). ***Elaxis auster***, HT – (1969) antenna (a, outer aspect of clava; b, inner aspect of clava); (1970) hypopygium; (1971) head (modified), facial aspect; (1972) ovipositor; (1973) mesosoma, dorsal aspect; (1974) fore wing; (1975) apex of fore wing venation.



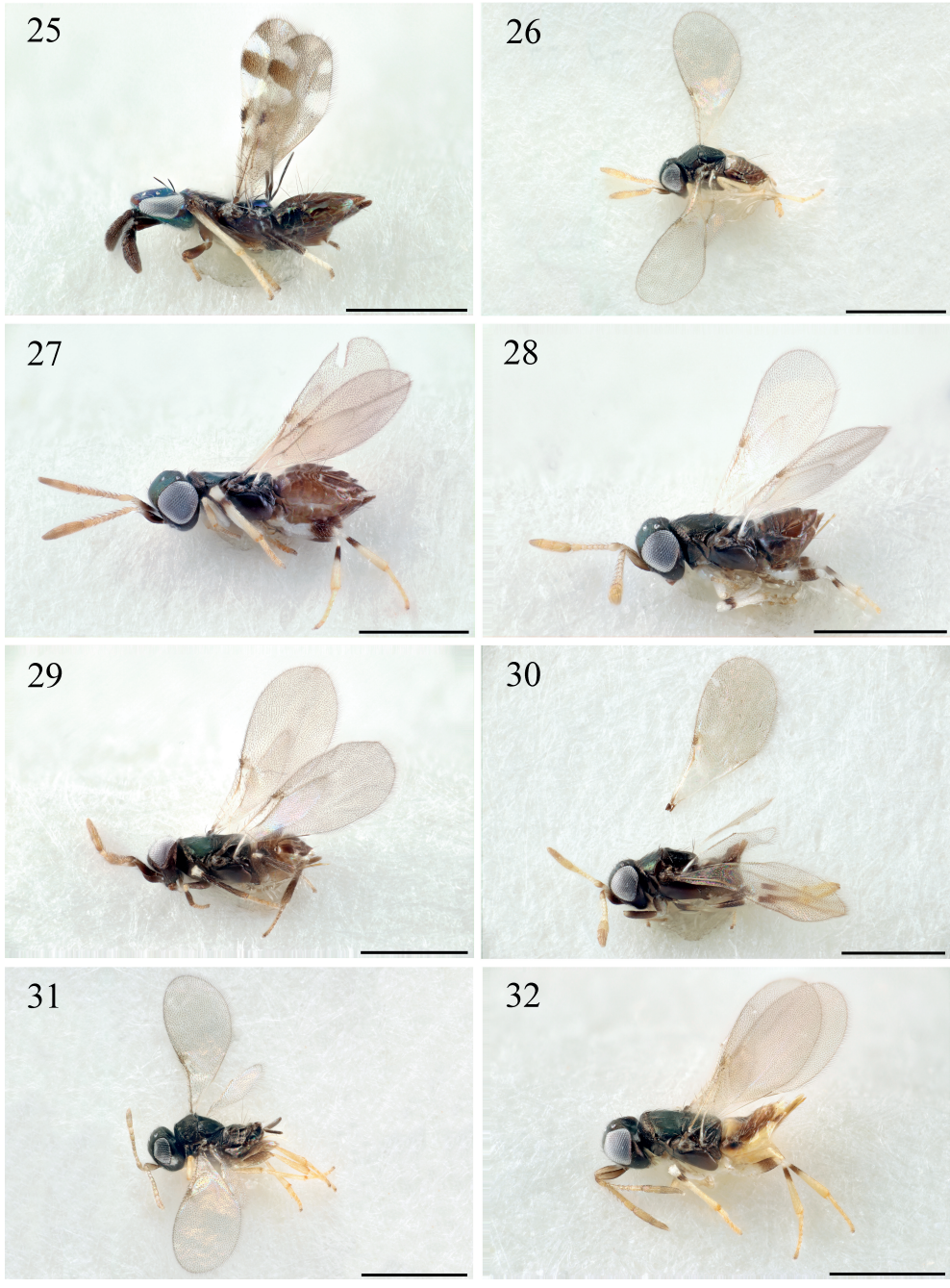
Habitus 1-8. (1) *Arrhenophagus chionaspidis*; (2) *Arrhenophagus albitibiae*; (3) *Adelencyrtus chionaspidis*; (4) *Adelencyrtus plocus*, HT; (5) *Adelencyrtus odonaspidis*; (6) *Adelencyrtus bifasciatus*; (7) *Plagiomerus bangaloriensis*; (8) *Plagiomerus hospes*.



Habitus 9-16. (9) *Plagiomerus calabes*, HT; (10) *Plagiomerus peruviensis*; (11) *Plagiomerus peruviensis*, ♂; (12) *Homalopoda onothrix*, HT; (13) *Homalopoda aesira*, HT; (14) *Homalopoda aesira*, ♂; (15) *Homalopoda cristata*; (16) *Homalopoda rehdera*, HT.

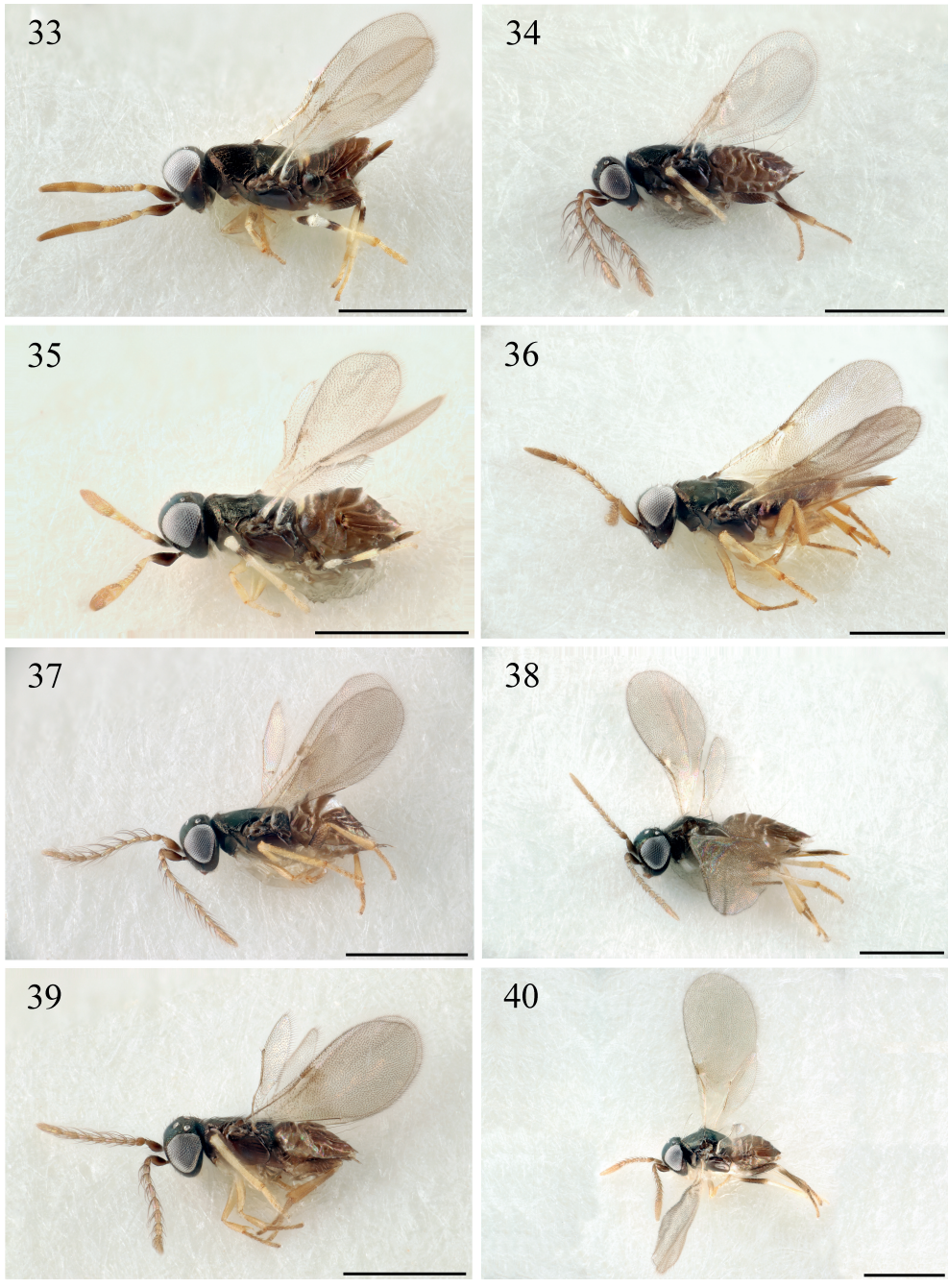


Habitus 17-24. (17) *Homalopoda aibeus*, HT; (18) *Homalopoda beatriz*, HT; (19) *Homalopoda carpha*; (20) *Homalopoda baunos*; (21) *Homalopoda opsis*, HT; (22) *Homalopoda donatos*, HT; (23) *Pseudhomalopoda tapura*; (24) *Pseudhomalopoda festa*, HT.

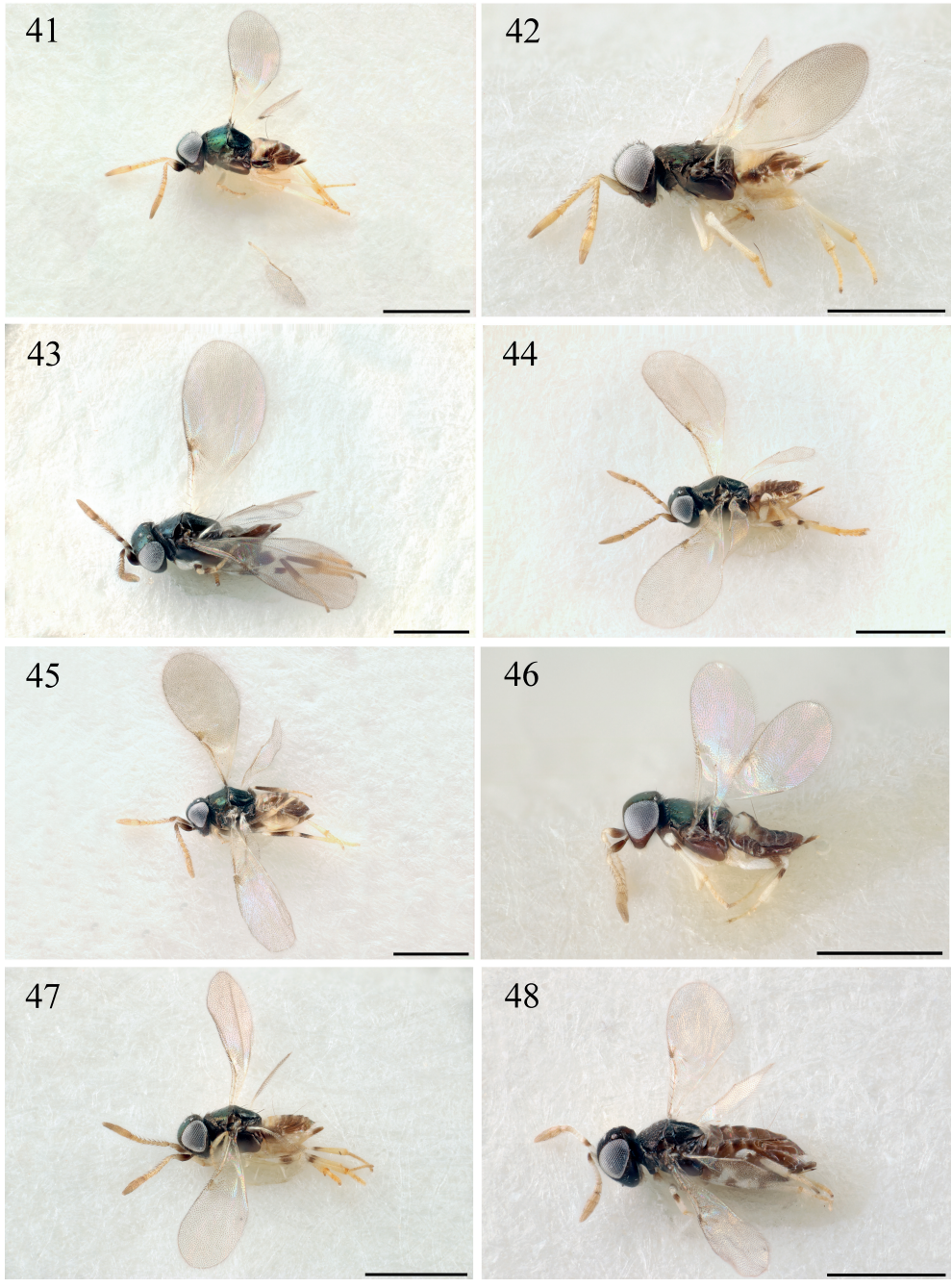


Habitus 25-32. (25) *Pseudhomalopoda prima*; (26) *Coccidencyrtus viviana*, HT; (27) *Coccidencyrtus aries*, HT; (28) *Coccidencyrtus gowanus*, HT; (29) *Coccidencyrtus reshan*, HT; (30) *Coccidencyrtus juno*, HT; (31) *Coccidencyrtus chenoa*, HT; (32) *Coccidencyrtus procris*, HT.

No images available: *Caenohomalopoda guamensis*; *Coccidencyrtus pomadus*.

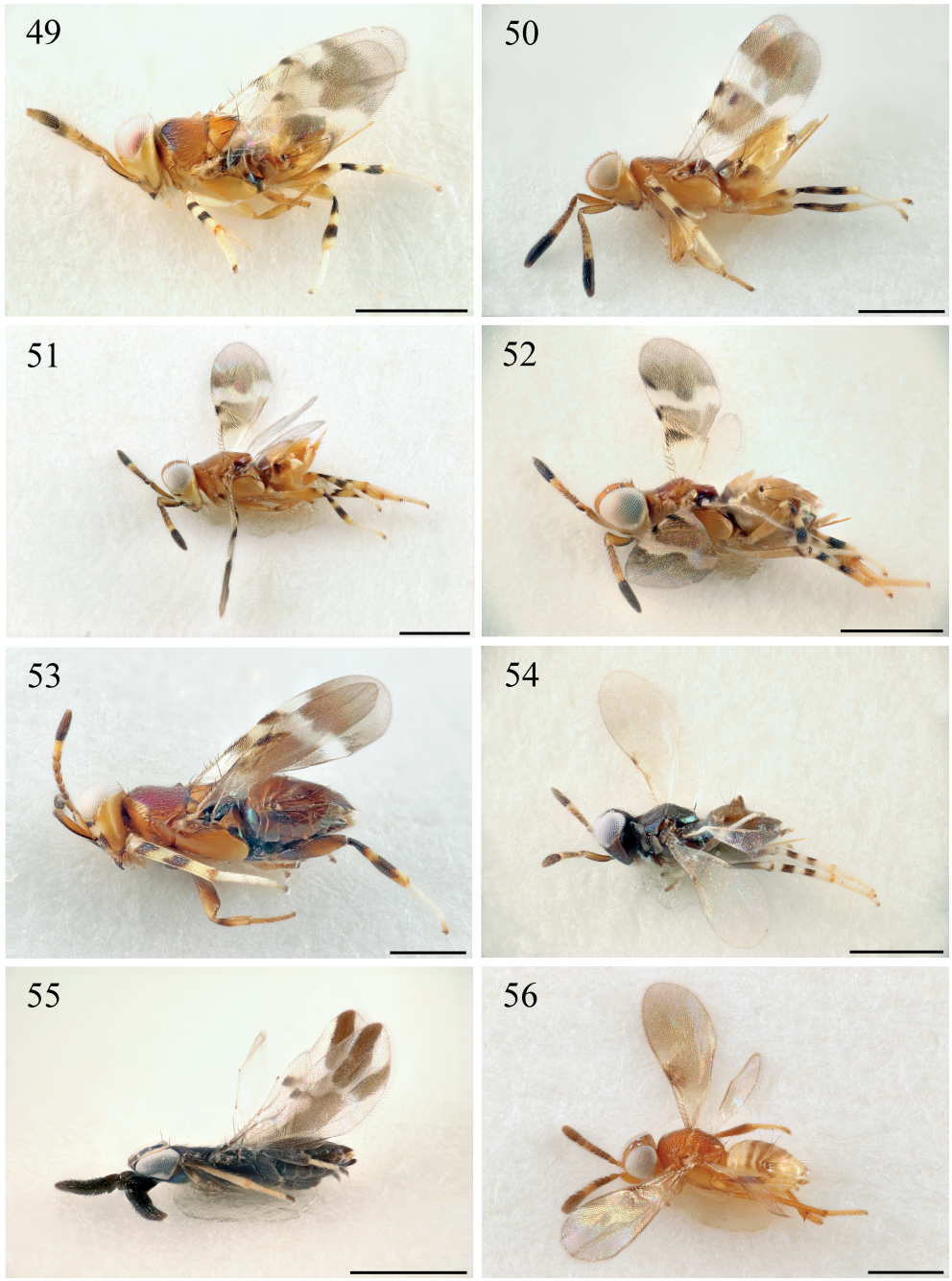


Habitus 33-40. (33) *Cocccidencyrtus umbro*, HT; (34) *Coccidencyrtus umbro*, ♂; (35) *Coccidencyrtus cyathus*, HT; (36) *Coccidencyrtus xero*; (37) *Coccidencyrtus xero*, ♂; (38) *Coccidencyrtus xylomus*, HT; (39) *Coccidencyrtus xylomus*, ♂; (40) *Coccidencyrtus jacintha*, HT.



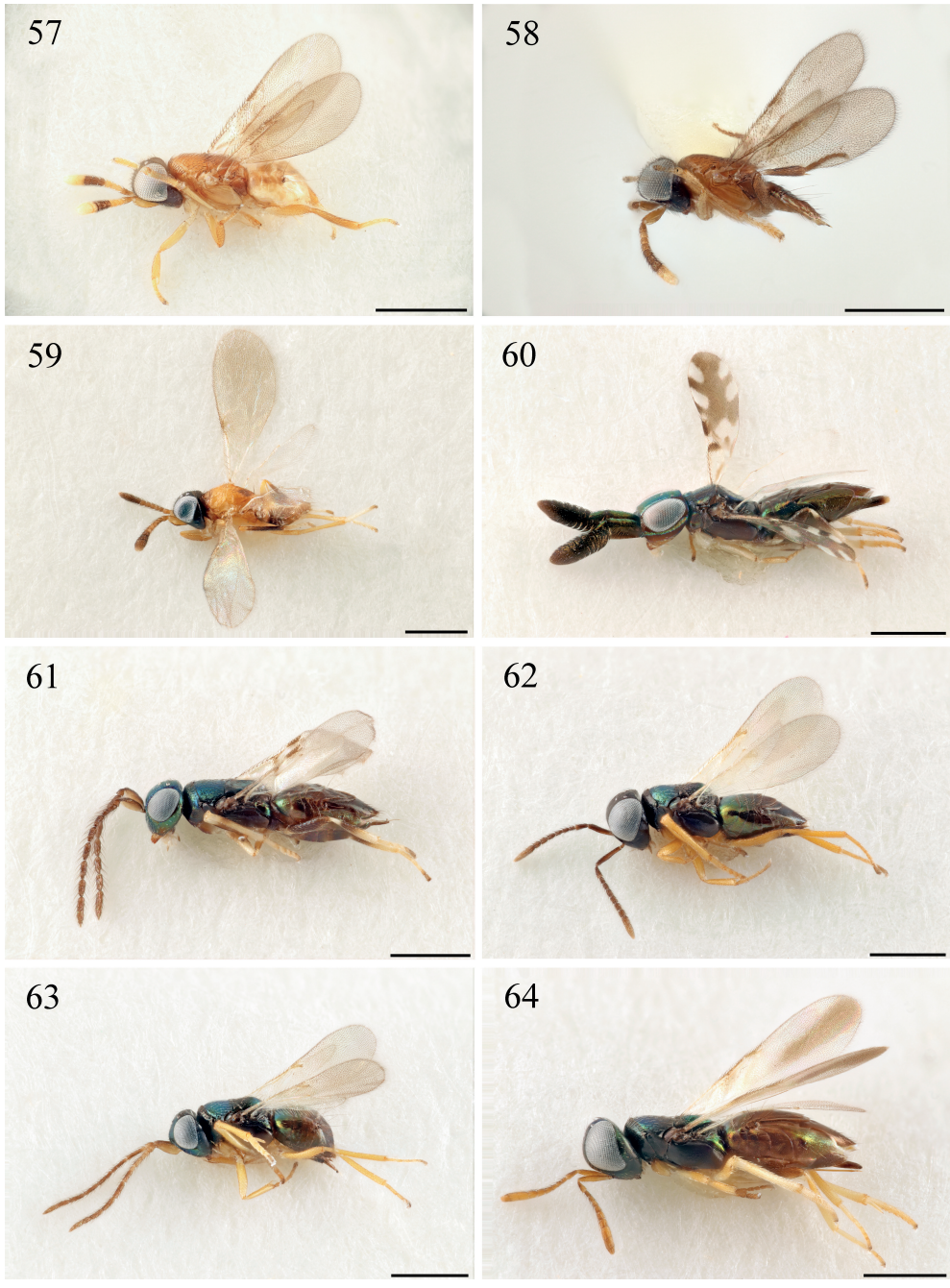
Habitus 41-48. (41) *Coccidencyrtus sivan*, HT; (42) *Coccidencyrtus ochraceipes*; (43) *Coccidencyrtus quebrus*, HT; (44) *Coccidencytus matias*, HT; (45) *Coccidencyrtus harpales*, HT; (46) *Coccidencyrtus solivus*, HT; (47) *Coccidencyrtus thuryus*, HT; (48) *Quetsira tinthrax*, HT.

No images available: *Coccidencyrtus fescus*; *Coccidencyrtus tristeryx*.

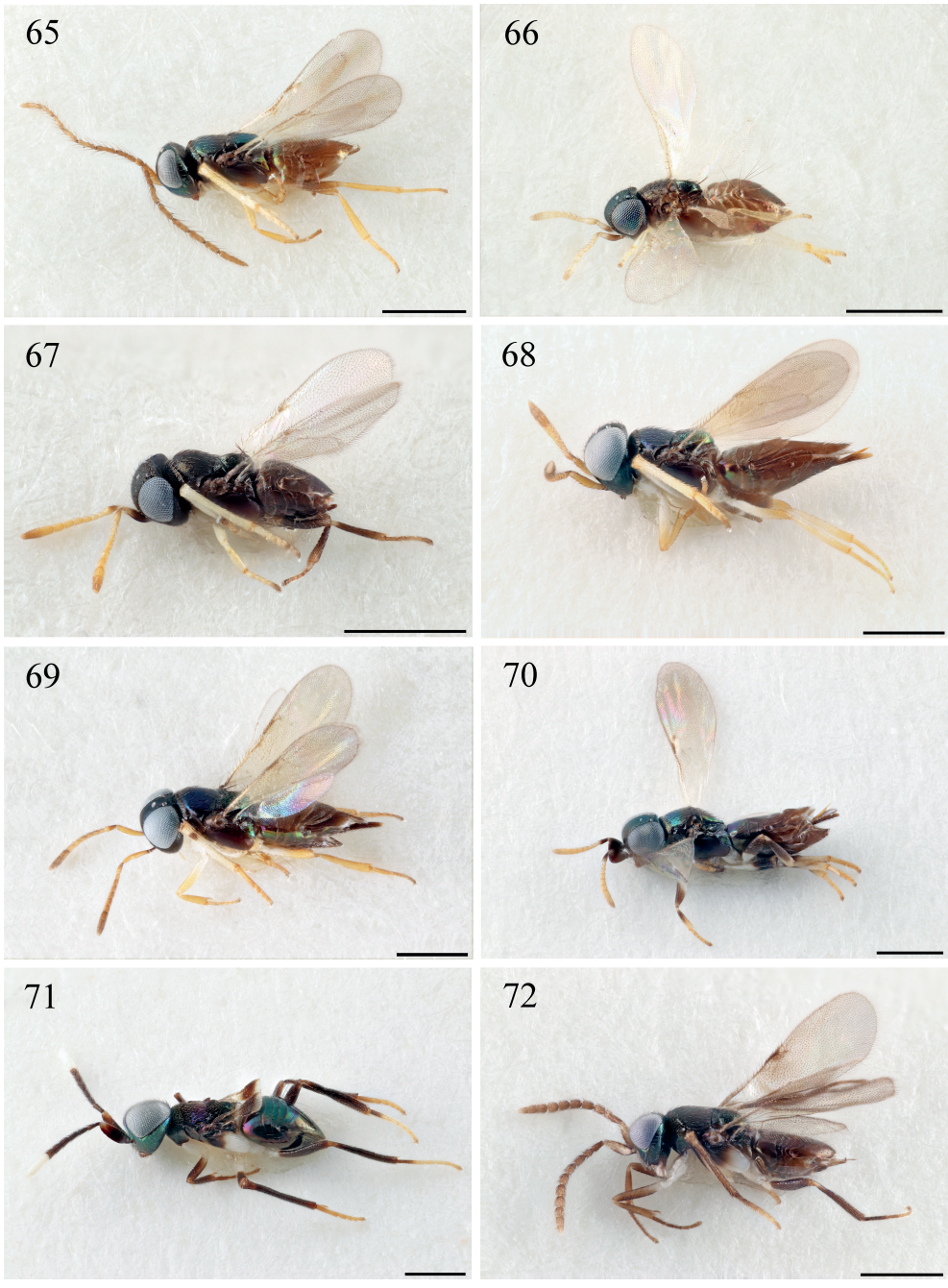


Habitus 49-56. (49) *Neococcidencyrtus mansua*, HT; (50) *Neococcidencyrtus grias*; (51) *Neococcidencyrtus drysus*; (52) *Neococcidencyrtus cyclope*; (53) *Neococcidencyrtus orion*; (54) *Neococcidencyrtus crouzelae*; (55) *Comperiella lemniscata*; (56) *Orixia demos*, HT.

No images available: *Neococcidencyrtus hilaria*; *Neococcidencyrtus dracaenus*; *Neococcidencyrtus plinthus*.

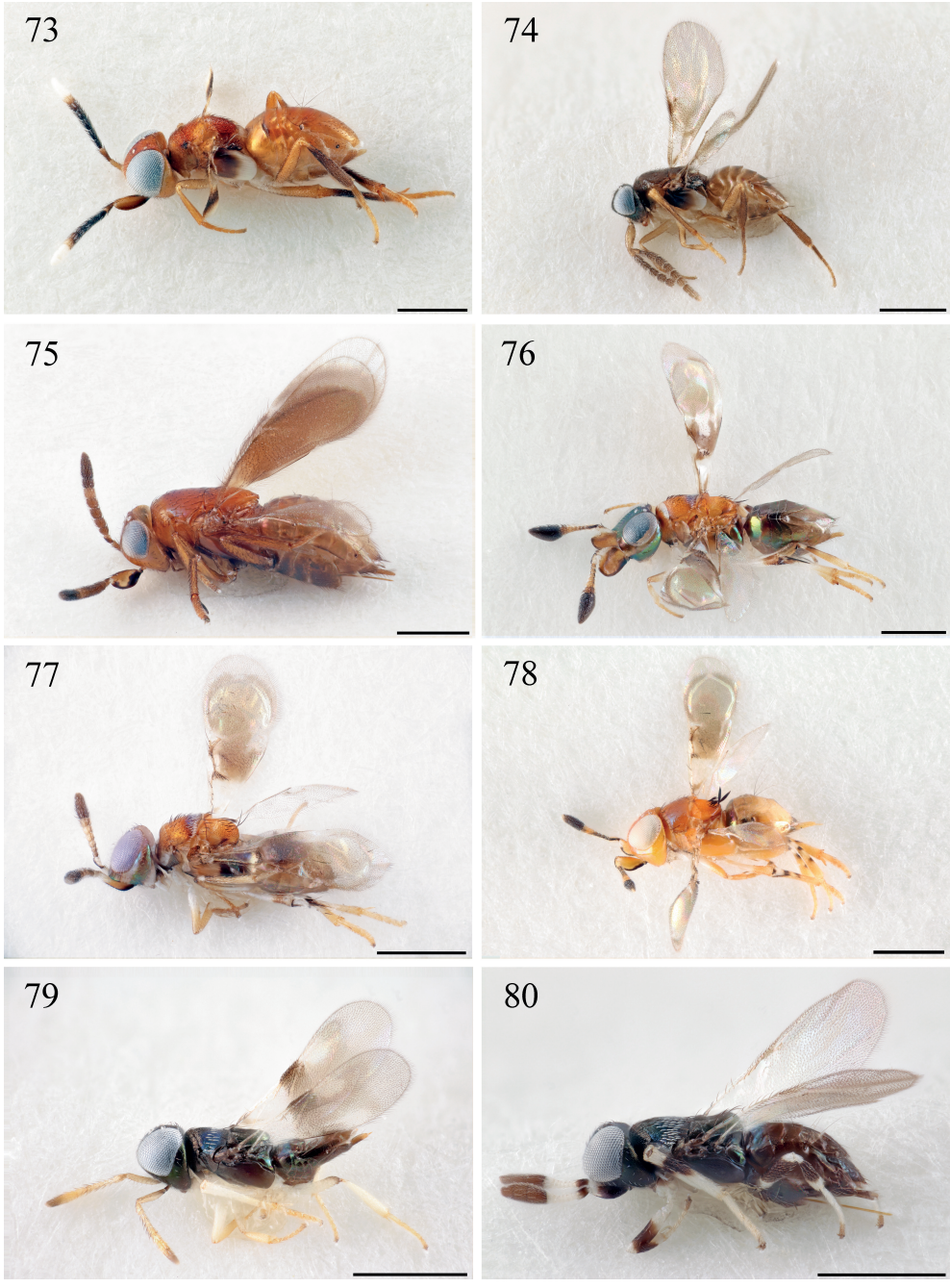


Habitus 57-64. (57) *Orixia philotes*. HT; (58) *Orixia philotes*, ♂; (59) *Orixia sirus*, HT; (60) *Cerapterocerus phragmitis*; (61) *Cerapterocerus phragmitis*, ♂; (62) *Helegonatopus pseudophanes*; (63) *Helegonatopus pseudophanes*, ♂; (64) *Mahencyrtus nitidus*.



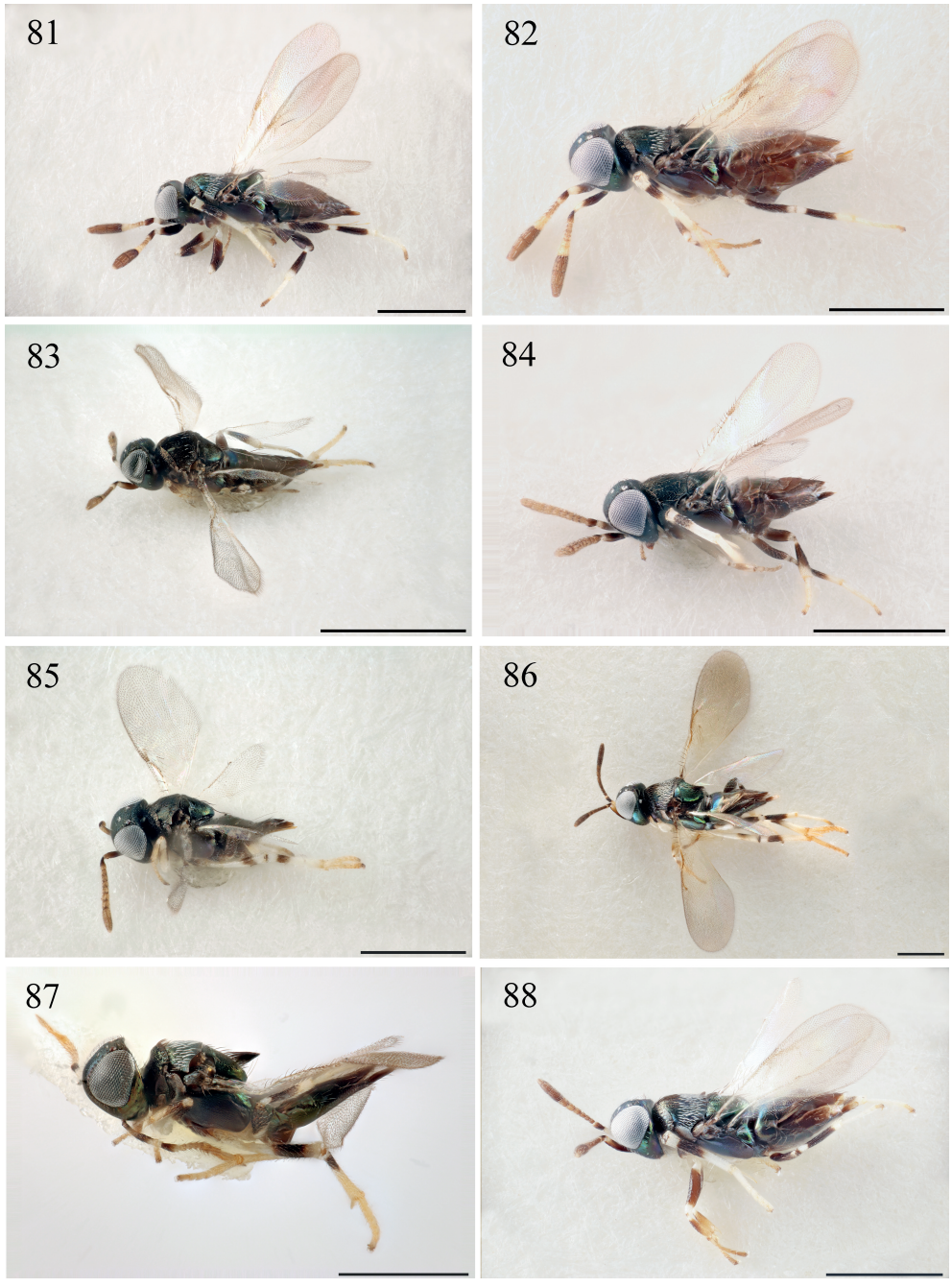
Habitus 65-72. (65) *Mahencyrtus nitidus*, ♂; (66) *Tico sinabelus*, HT; (67) *Tico ryaspis*, HT; (68) *Georynus aitne*, HT; (69) *Prionias nodutus*, HT; (70) *Stadima moros*; (71) *Ludesia hemera*, HT; (72) *Ludesia, hemera*, ♂.

No images available: *Georynus dionysus*; *Strigenia laras*; *Oodia japetus*;



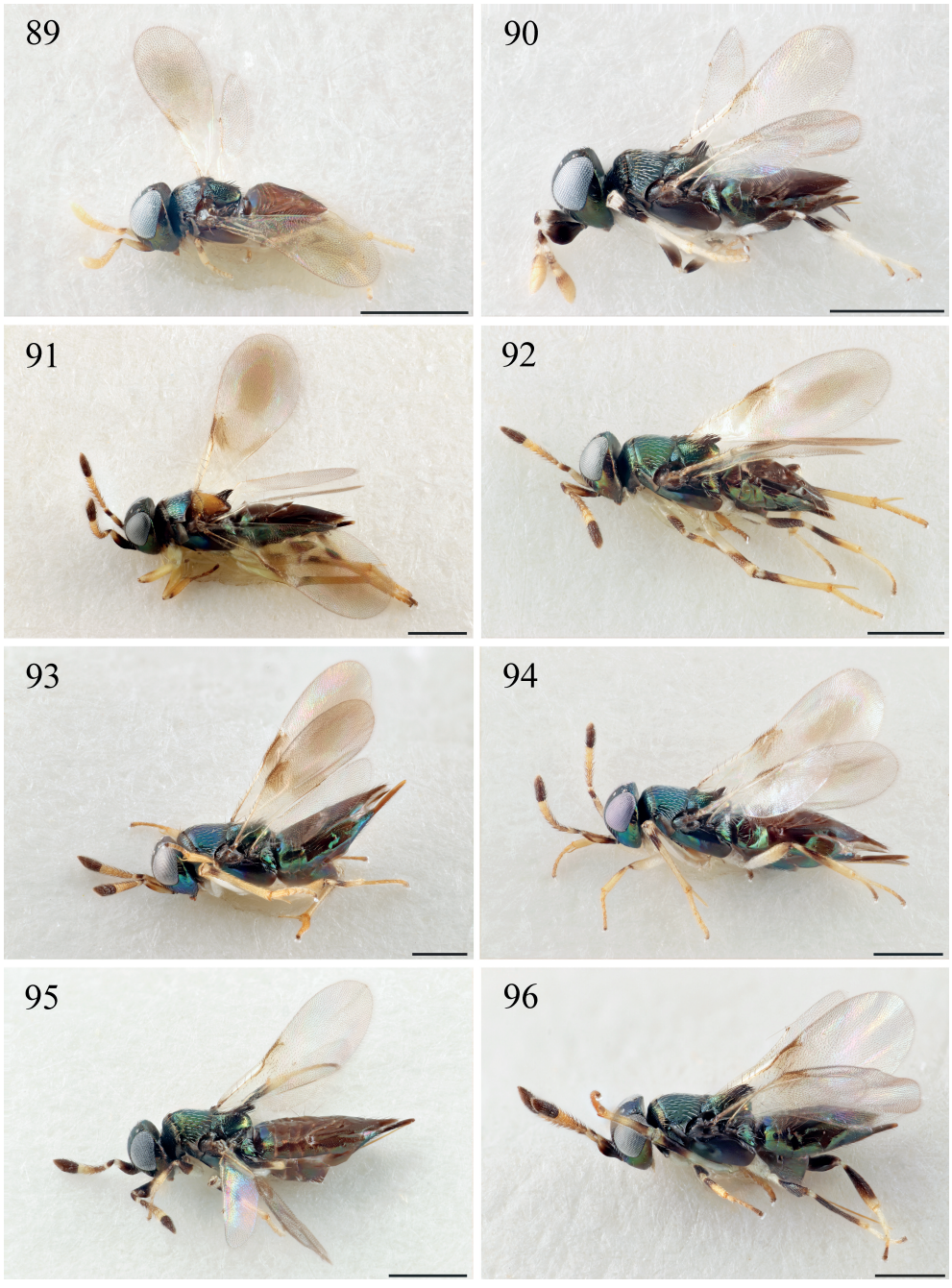
Habitus 73-80. (73) *Ludesia amalthea*, HT; (74) *Ludesia amalthea*, ♂; (75) *Angebra haraplyke*, HT; (76) *Anisophleps aoedis*; (77) *Anisophleps carpo*, HT; (78) *Lakshaphagus arnulfoi*, HT; (79) *Cheiloneurus magnolia*, HT; (80) *Cheiloneurus argentipes*, variant.

No images available: *Angebra praxidike*; *Cheiloneurus vitara*.



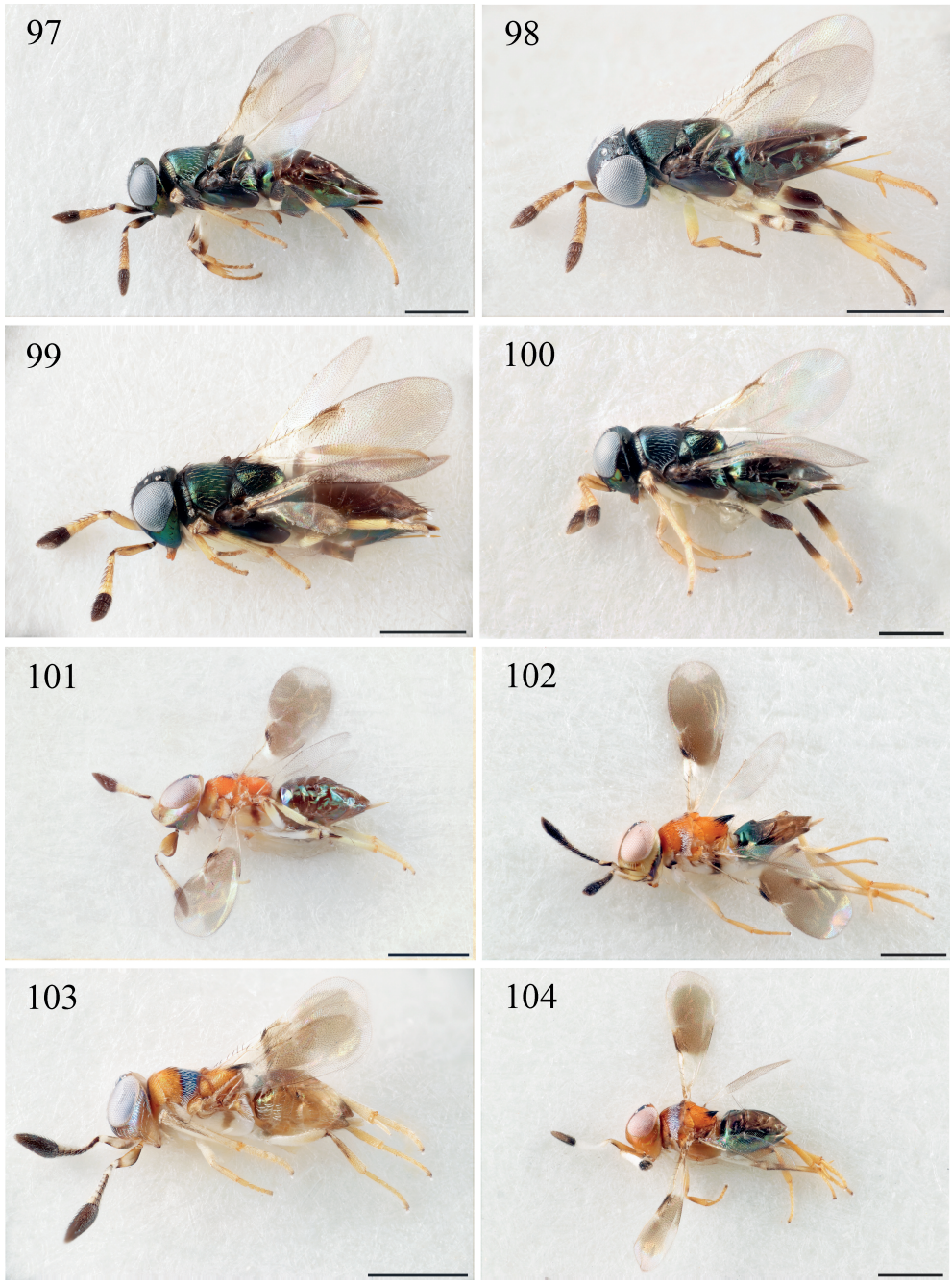
Habitus 81-88. (81) *Cheiloneurus argentipes*, variant; (82) *Cheiloneurus argentipes*, variant; (83) *Cheiloneurus carita*, HT; (84) *Cheiloneurus epytus*; (85) *Cheiloneurus danessa*, HT; (86) *Cheiloneurus idris*, HT; (87) *Cheiloneurus roellus*; (88) *Cheiloneurus dalycera*.

No habitus images: *Cheiloneurus socrates*; *Cheiloneurus ection*, *Cheiloneurus parvus*.



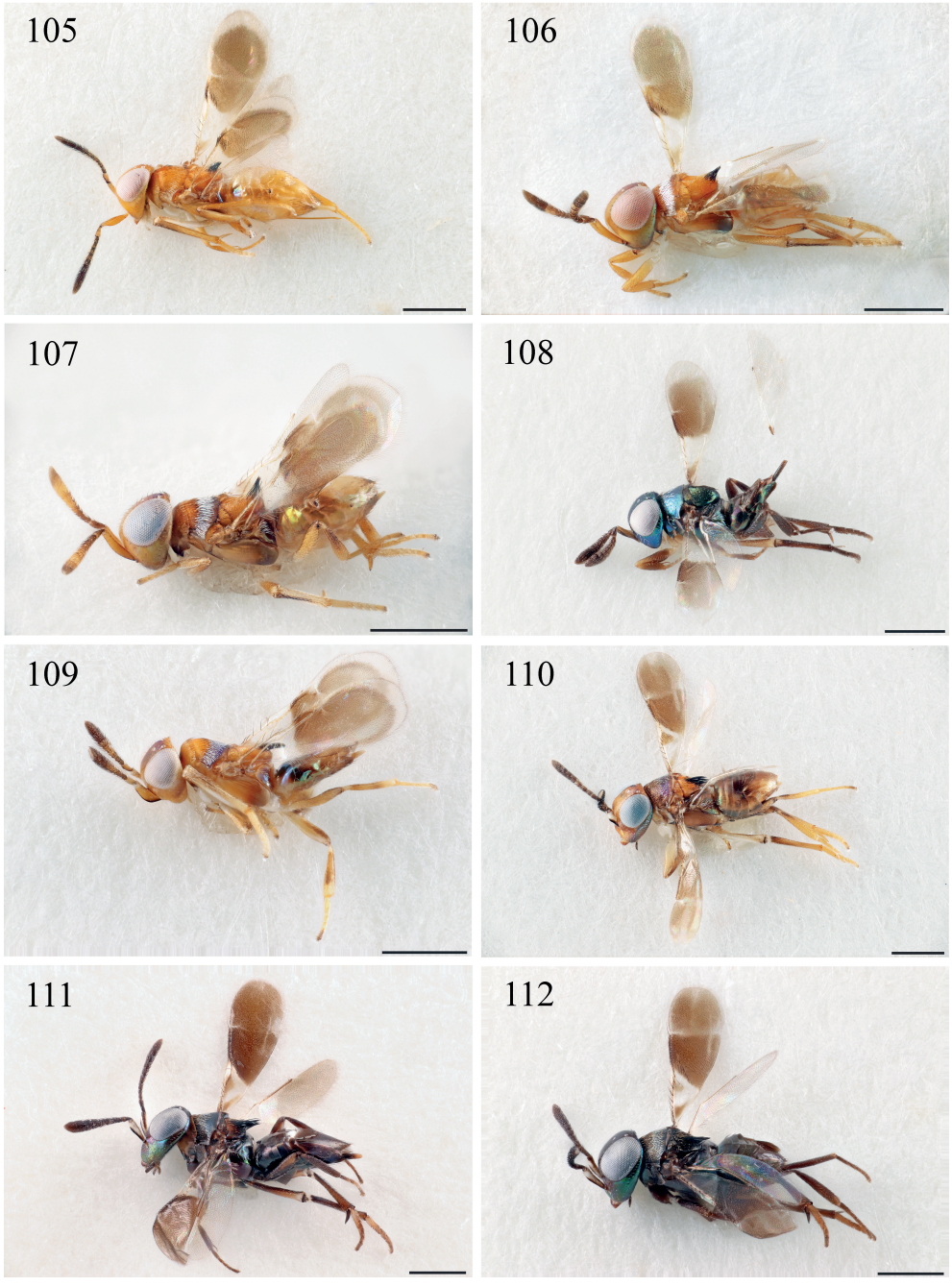
Habitus 89-96. (89) *Cheiloneurus semis*, HT; (90) *Cheiloneurus catreta*, HT; (91) *Cheiloneurus exeres*, HT; (92) *Cheiloneurus fidenas*, HT; (93) *Cheiloneurus miklo*, HT; (94) *Cheiloneurus lamus*; (95) *Cheiloneurus varablus*, HT; (96) *Cheiloneurus myndus*, HT.

No habitus images: *Cheiloneurus herndonia*.



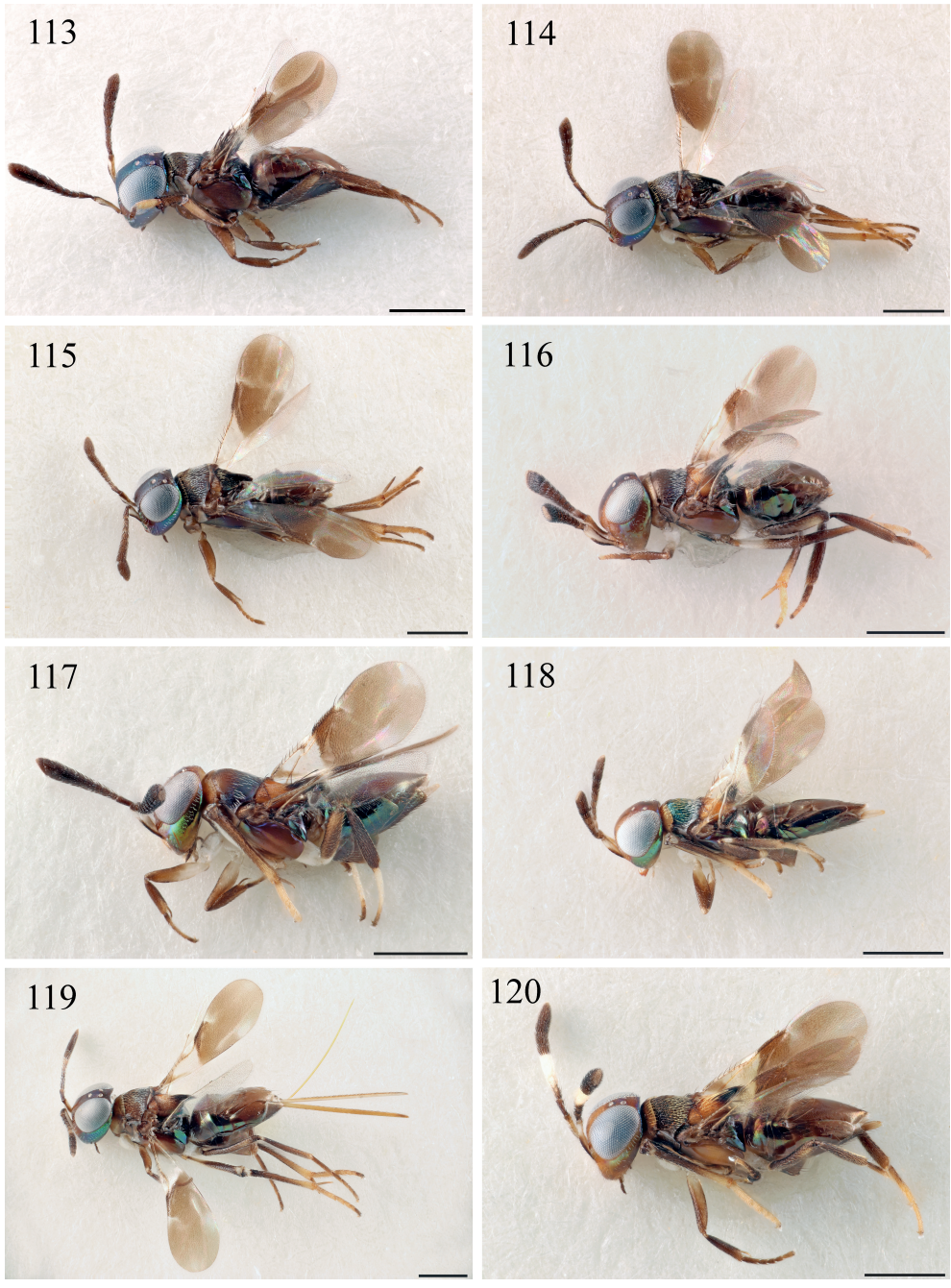
Habitus 97-104. (97) *Cheiloneurus rosea*, HT; (98) *Cheiloneurus onestas*, HT; (99) *Cheiloneurus mantua*, HT; (100) *Cheiloneurus hamadryas*; (101) *Cheiloneurus racidia*, HT; (102) *Cheiloneurus miranda*, HT; (103) *Cheiloneurus scolpax*, HT; (104) *Cheiloneurus genys*, HT.

No habitus images: *Cheiloneurus salome*, *Cheiloneurus loresa*, *Cheiloneurus mirabel*, *Cheiloneurus mardor*, *Cheiloneurus extillus*.



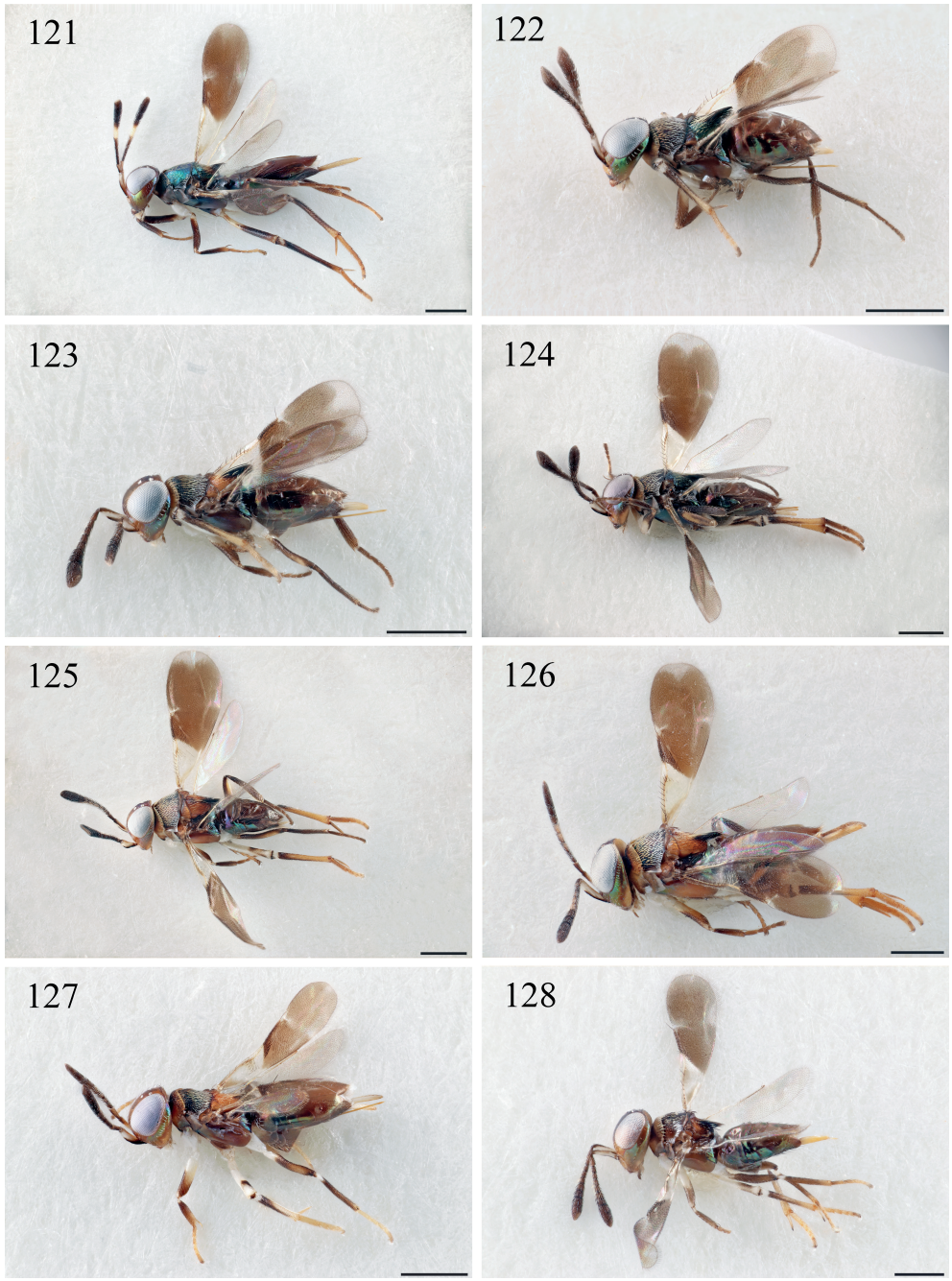
Habitus 105-112. (105) *Cheiloneurus fabius*; (106) *Cheiloneurus nintra*, HT; (107) *Cheiloneurus nintra*, variant; (108) *Cheiloneurus santaros*, HT; (109) *Cheiloneurus simus*, HT; (110) *Cheiloneurus castalia*, HT; (111) *Cheiloneurus dipsas*, HT; (112) *Cheiloneurus medusa*, HT.

No habitus images: *Cheiloneurus marcius*.



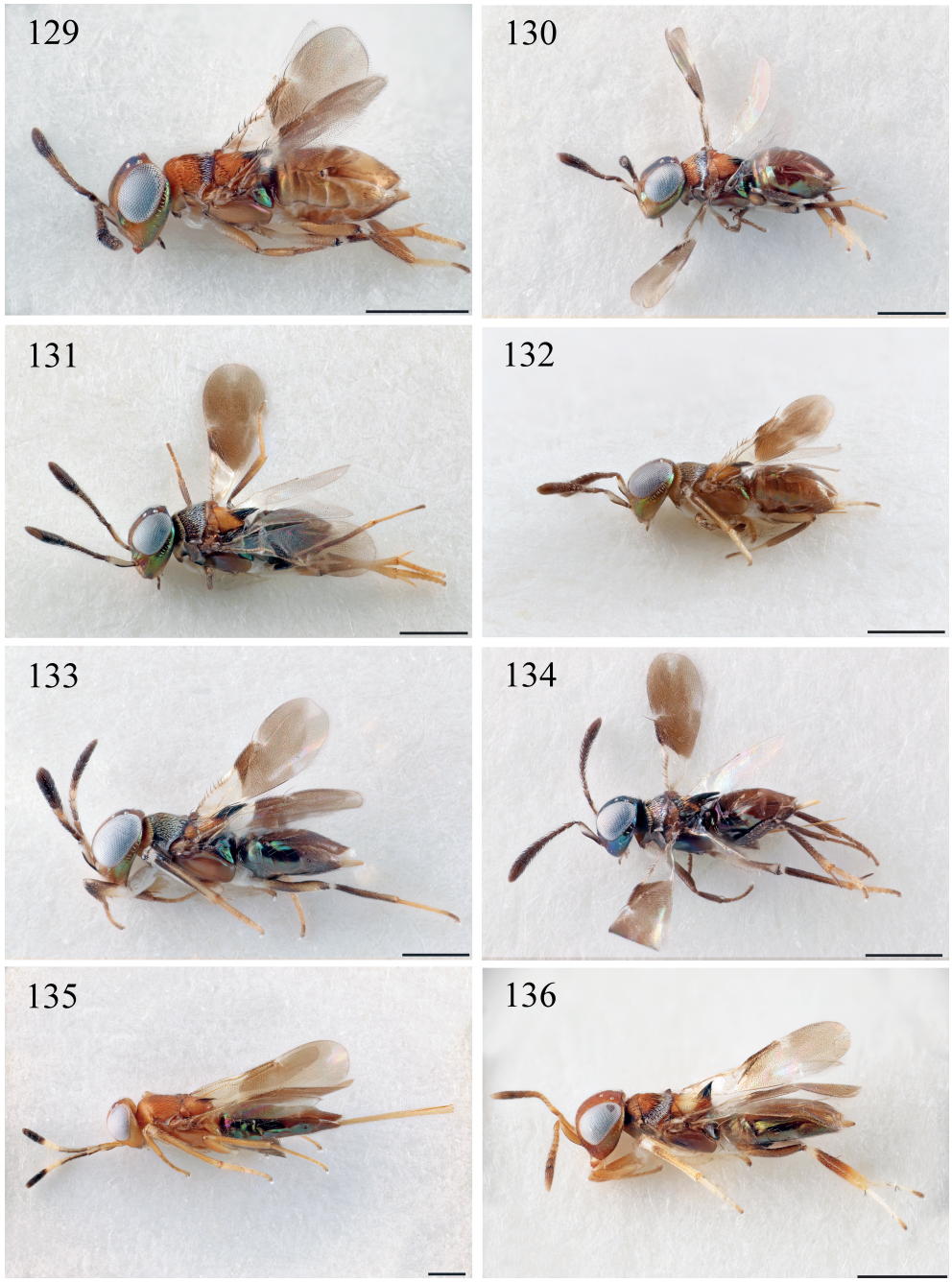
Habitus 113-120. (113) *Cheiloneurus seius*; (114) *Cheiloneurus poeana*, HT; (115) *Cheiloneurus oshtan*, HT; (116) *Cheiloneurus munda*, HT; (117) *Cheiloneurus iphigenes*, HT; (118) *Cheiloneurus solon*, HT; (119) *Cheiloneurus genua*, HT; (120) *Cheiloneurus goldus*, HT.

No habitus images: *Cheiloneurus amadeus*, *Cheiloneurus grimus*, *Cheiloneurus herxius*, *Cheiloneurus moloch*, *Cheiloneurus varus*, *Cheiloneurus pometia*.



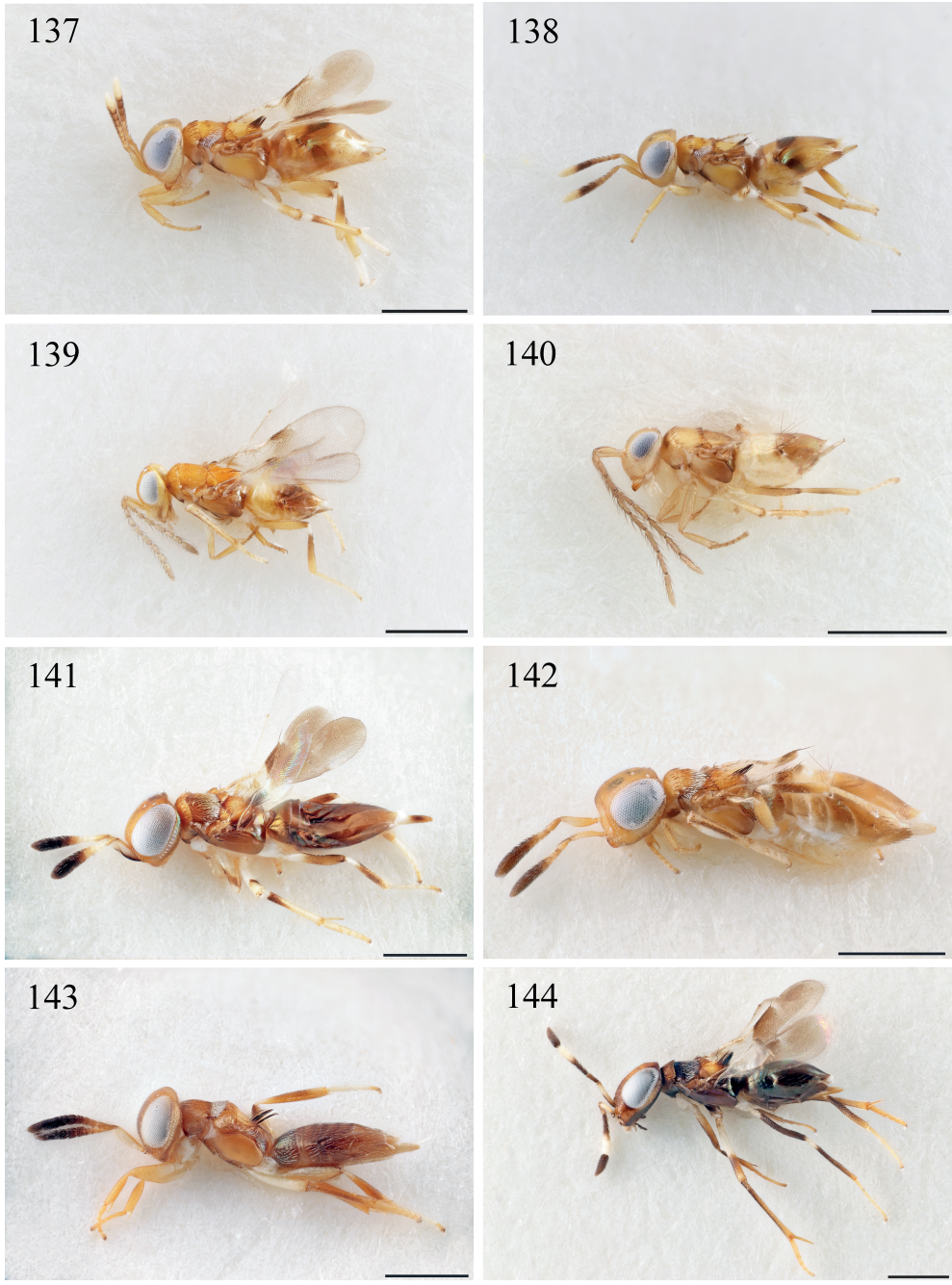
Habitus 121-128. (121) *Cheiloneurus aliphera*, HT; (122) *Cheiloneurus mckenziei*, HT; (123) *Cheiloneurus mckenziei*, variant; (124) *Cheiloneurus mckenziei*, variant; (125) *Cheiloneurus mckenziei*, variant, higher altitude; (126) *Cheiloneurus origo*, HT; (127) *Cheiloneurus feritas*, HT; (128) *Cheiloneurus bion*.

No habitus images: *Cheiloneurus mago*, *Cheiloneurus argos*, *Cheiloneurus paean*.



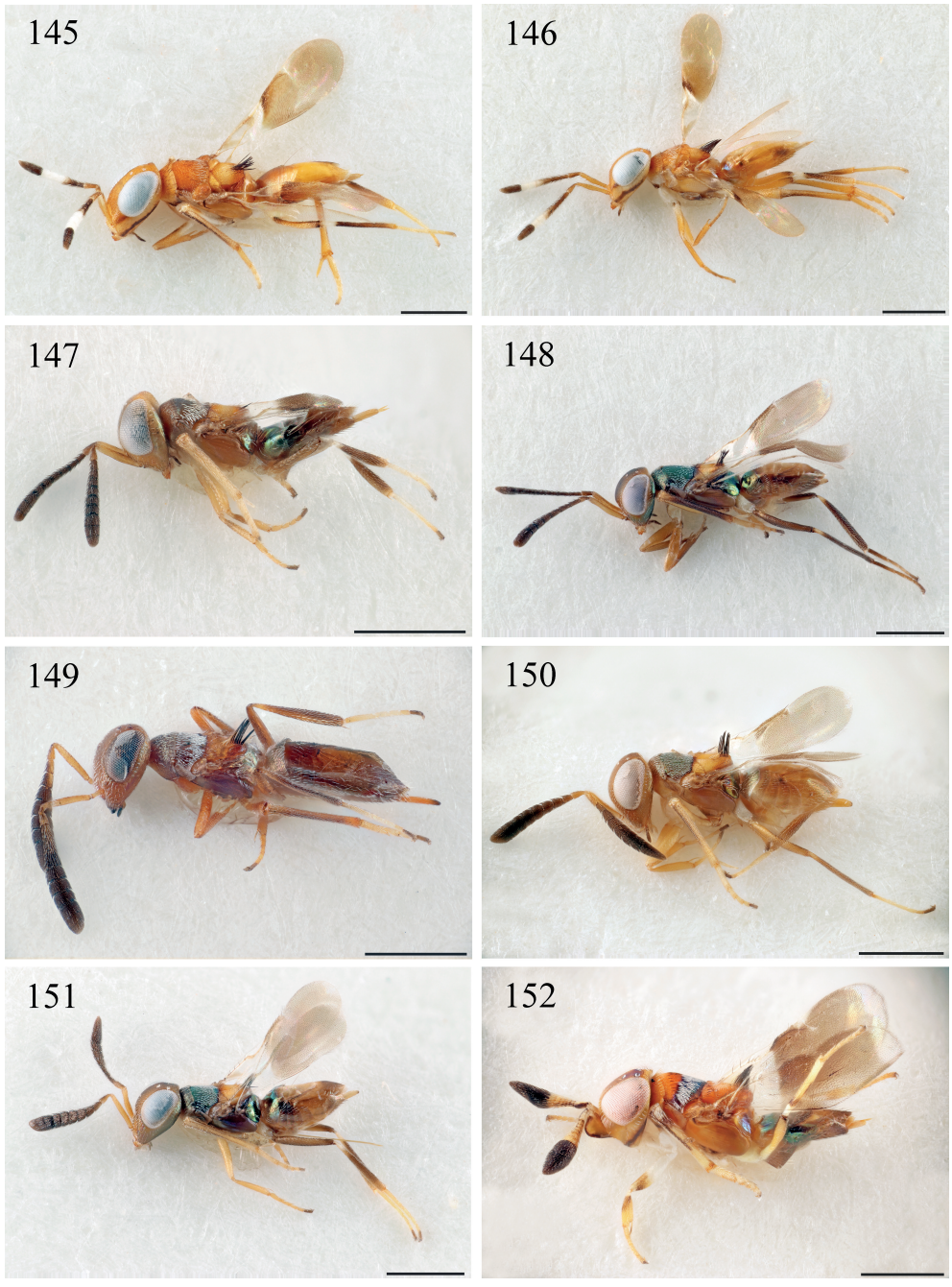
Habitus 129-136. (129) *Cheiloneurus zephyrus*, HT; (130) *Cheiloneurus pherus*, HT; (131) *Cheiloneurus lydia*, HT; (132) *Cheiloneurus parnisa*, HT; (133) *Cheiloneurus horocles*, HT; (134) *Cheiloneurus longisetaceus*; (135) *Cheiloneurus numida*, HT; (136) *Cheiloneurus elegans*.

No habitus images: *Cheiloneurus aunes*.



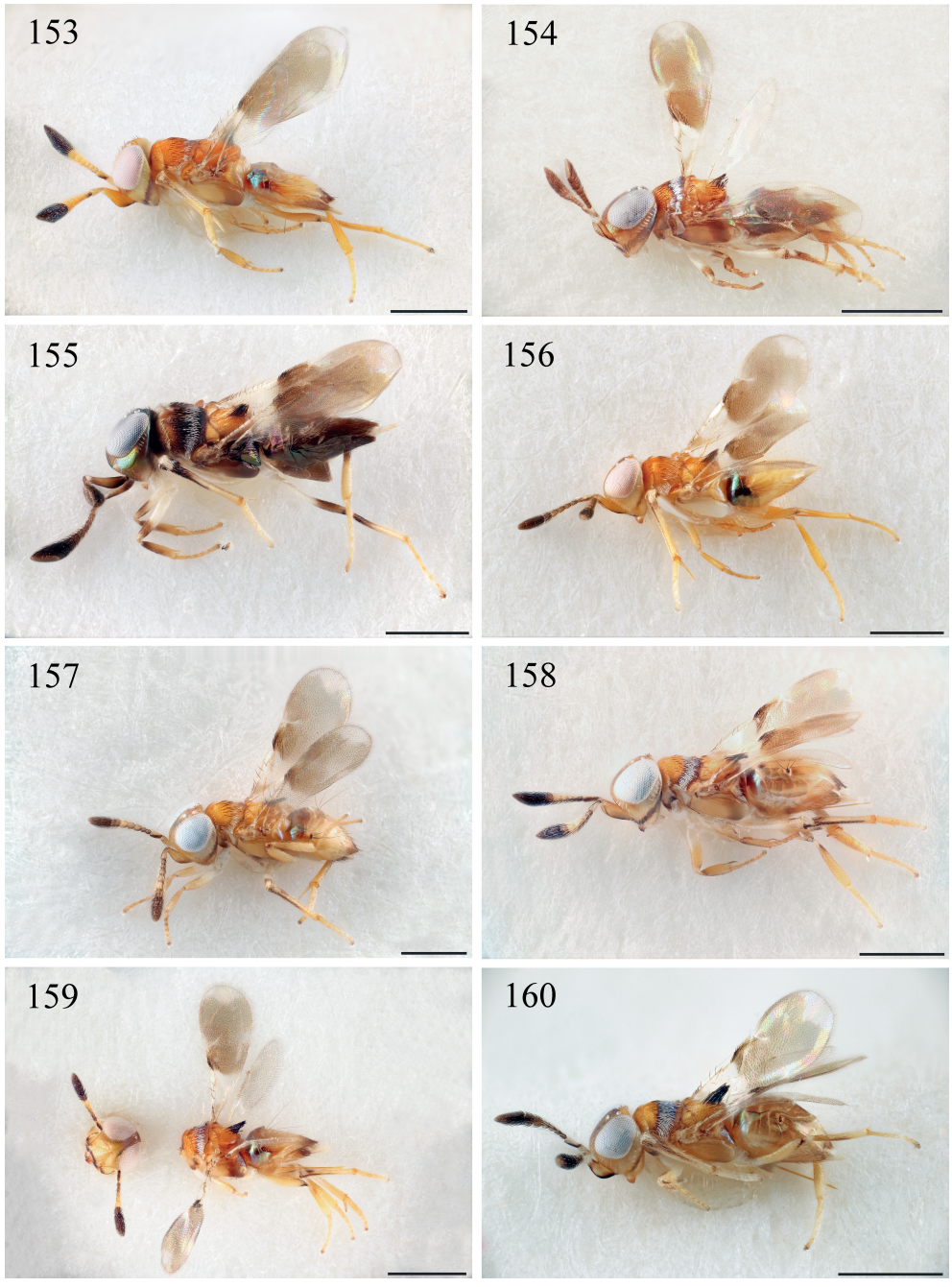
Habitus 137-144. (137) *Cheiloneurus tainus*, macropterous form; (138) *Cheiloneurus tainus*, micropterous form; (139) *Cheiloneurus tainus*, macropterous form, ♂; (140) *Cheiloneurus tainus*, micropterous form, ♂; (141) *Cheiloneurus leda*, HT; (142) *Cheiloneurus luceres*, HT; (143) *Cheiloneurus perses*, HT; (144) *Cheiloneurus dymorus*, HT.

No habitus image: *Cheiloneurus albinotatus*.



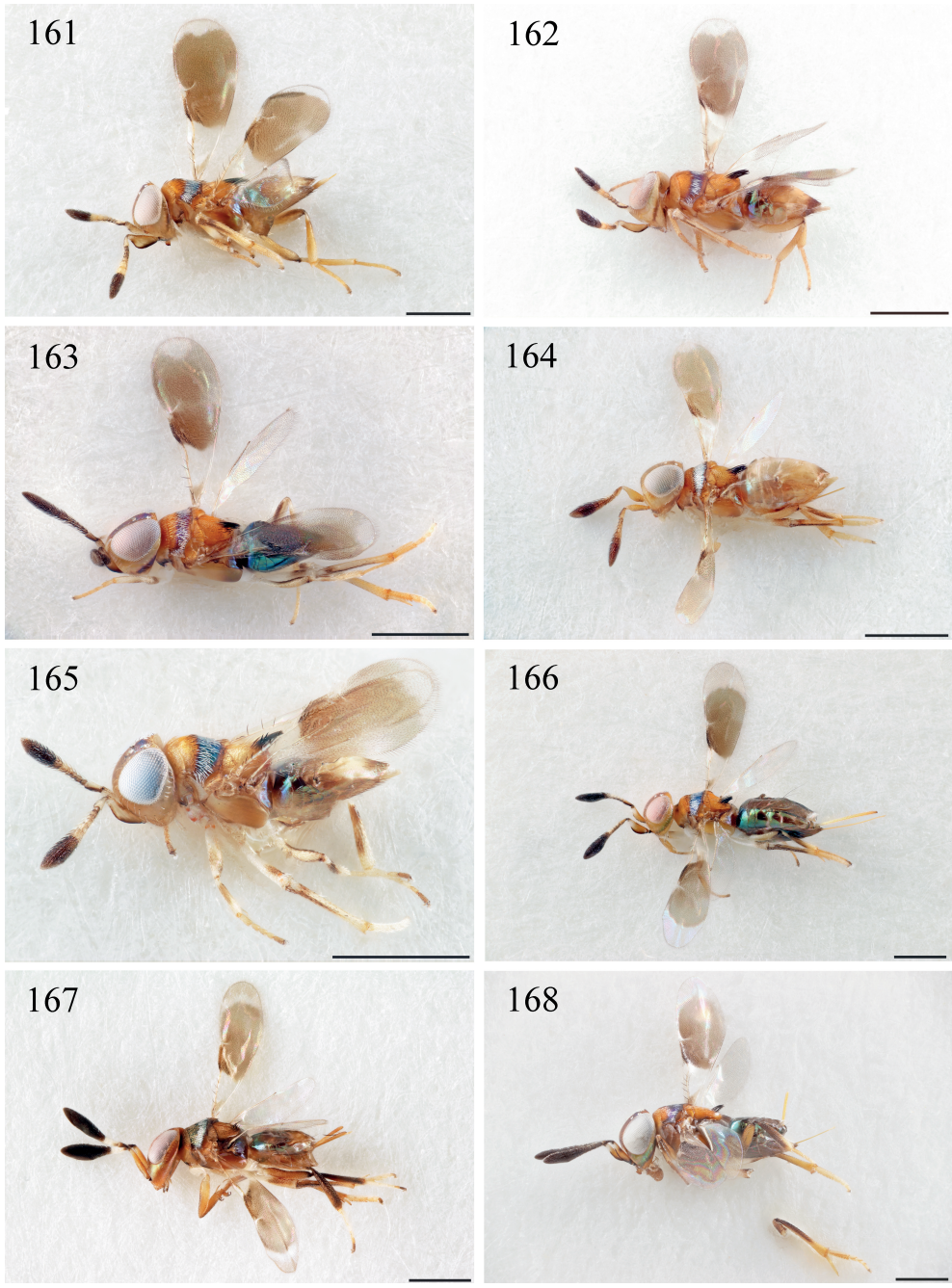
Habitus 145-152. (145) *Cheiloneurus glycon*, HT; (146) *Cheiloneurus meryae*, HT; (147) *Cheiloneurus zeno*, HT; (148) *Cheiloneurus cupreicollis*; (149) *Cheiloneurus repola*, HT; (150) *Cheiloneurus compressicornis*, typical form; (151) *Cheiloneurus compressicornis*, variant; (152) *Cheiloneurus betes*, HT.

No habitus image: *Cheiloneurus leone*.



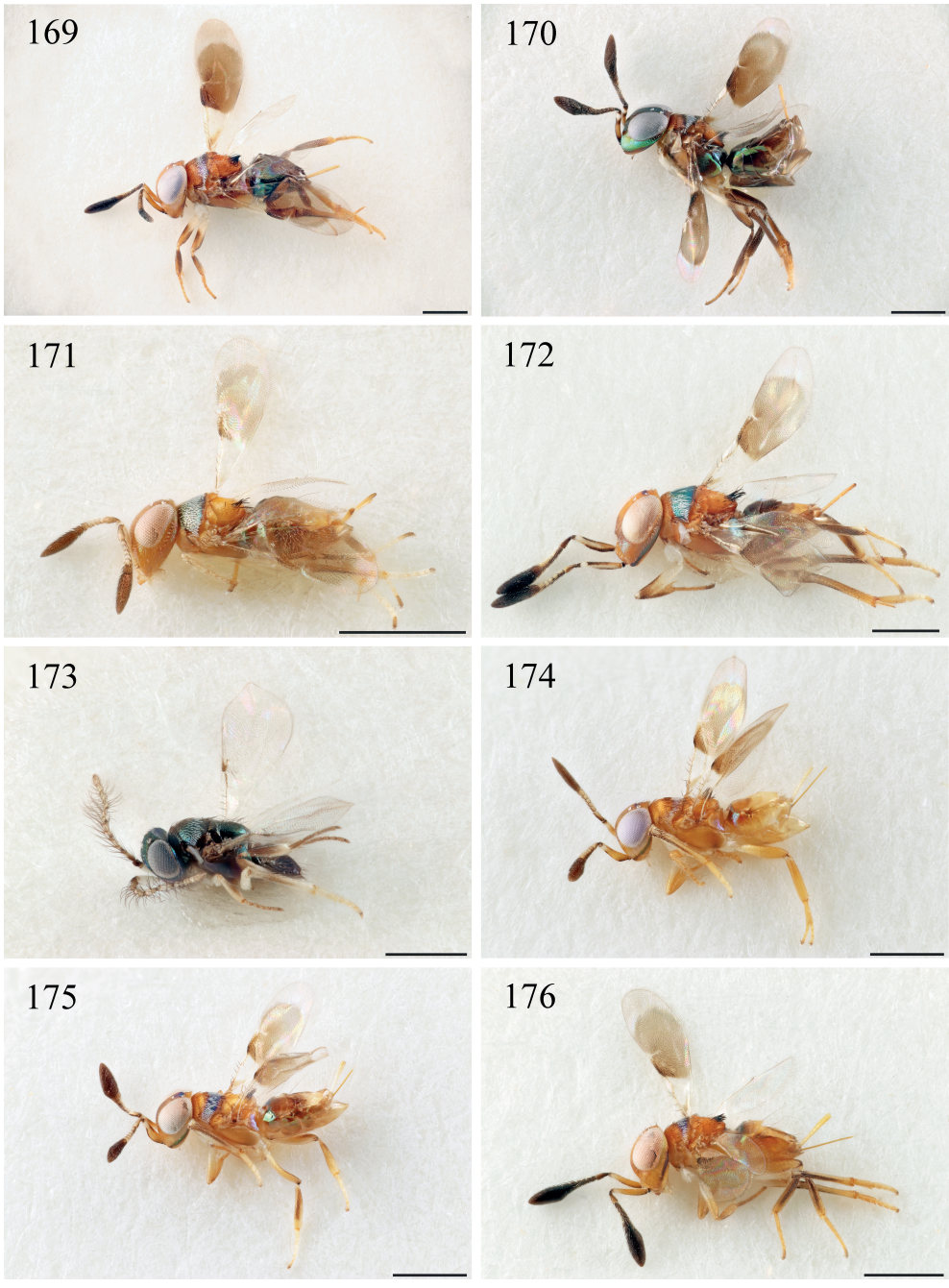
Habitus 153-160. (153) *Cheiloneurus ariston*, HT; (154) *Cheiloneruus letos*, HT; (155) *Cheiloneurus finator*, HT; (156) *Cheiloneurus orbona*, (157) *Cheiloneurus fautrix*; (158) *Cheiloneurus gyges*, HT; (159) *Cheiloneurus lexovus*, HT; (160) *Cheiloneurus ceiba*, HT.

No habitus images: *Cheiloneurus diaces*, *Cheiloneurus jeroba*, *Cheiloneurus cero*, *Cheiloneurus idifex*, *Cheiloneurus aesernia*, *Cheiloneurus numitor*, *Cheiloneurus mora*.



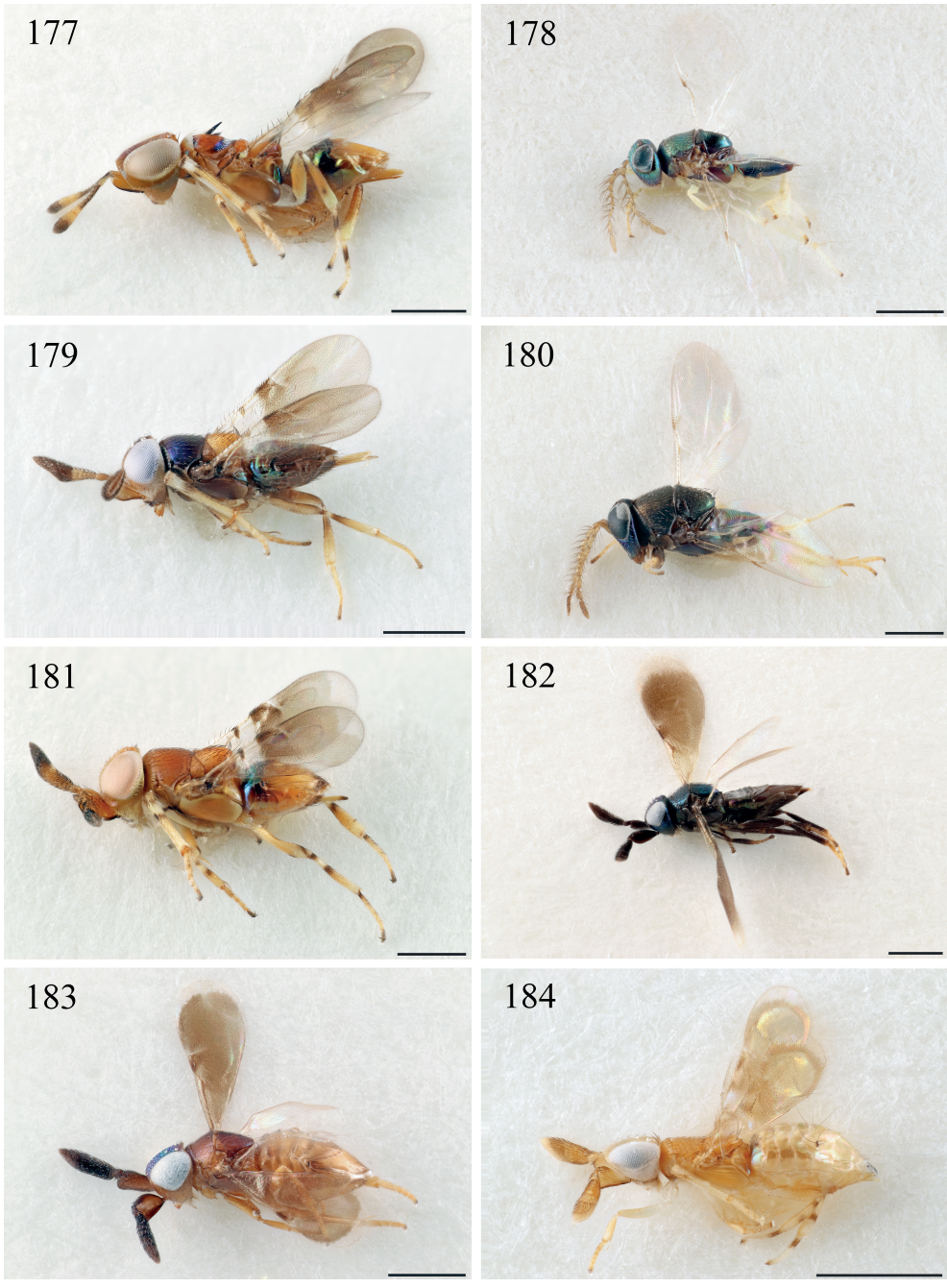
Habitus 161-168. (161) *Cheiloneurus nasica*, HT; (162) *Cheiloneurus janzeni*, HT; (163) *Cheiloneurus dirce*, HT; (164) *Cheiloneurus metheus*, HT; (165) *Cheiloneurus omorus*, HT; (166) *Prochiloneurus surwaka*, HT; (167) *Prochiloneurus akea*, HT; (168) *Prochiloneurus abelio*.

No habitus images: *Cheiloneurus alopes*, *Cheiloneurus amethes*, *Cheiloneurus nebucha*, *Prochiloneurus alasirus*, *Prochiloneurus olax*, *Prochiloneurus armidus*.

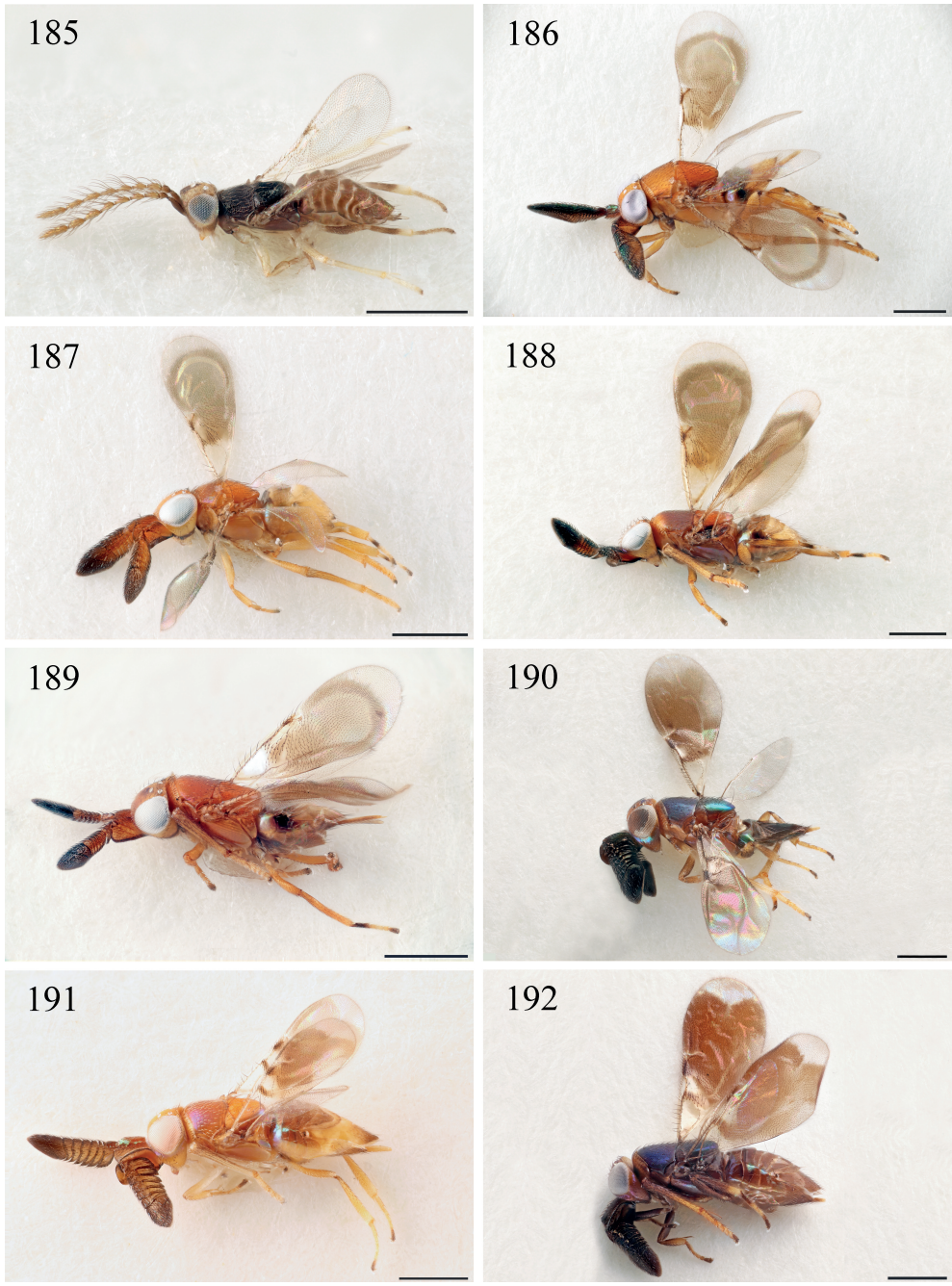


Habitus 169-176. (169) *Prochiloneurus helleria*, HT; (170) *Prochiloneurus lenus*, HT; (171) *Prochiloneurus modestus*; (172) *Prochiloneurus dactylopii*; (173) *Prochiloneurus dactylopii*, ♂; (174) *Prochiloneurus thonus*, HT; (175) *Prochiloneurus lucetia*, HT; (176) *Prochiloneurus zunigai*.

No habitus images: *Prochiloneurus aethus*.

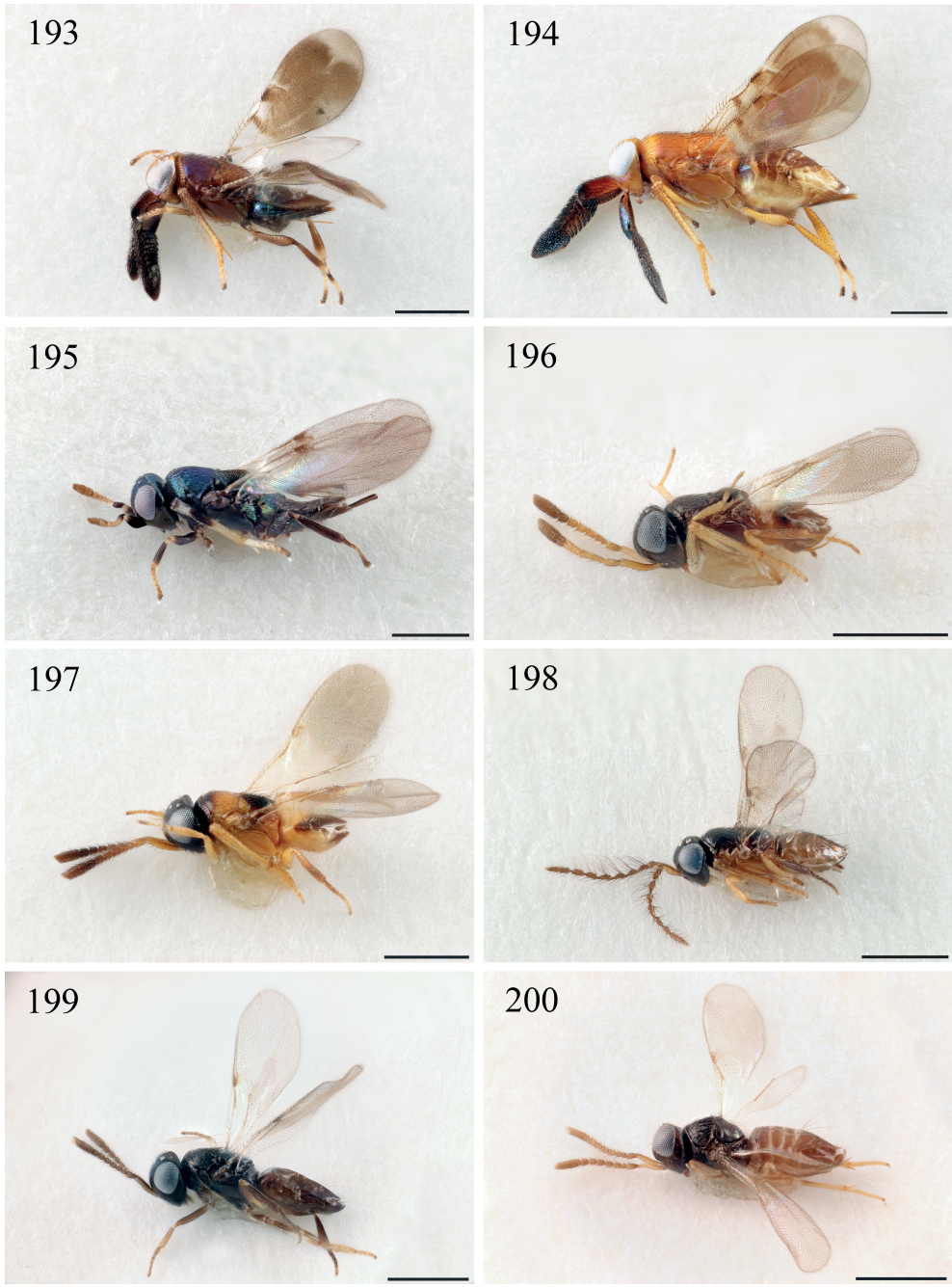


Habitus 177-184. (177) *Diversinervus elegans*; (178) *Diversinervus elegans*, ♂; (179) *Iceromyia flavifrons*; (180) *Iceromyia flavifrons*, ♂; (181) *Homosemion bennetti*; (182) *Eusemion monos*, HT; (183) *Eusemion themisto*, HT; (184) *Anicetus annulatus*.



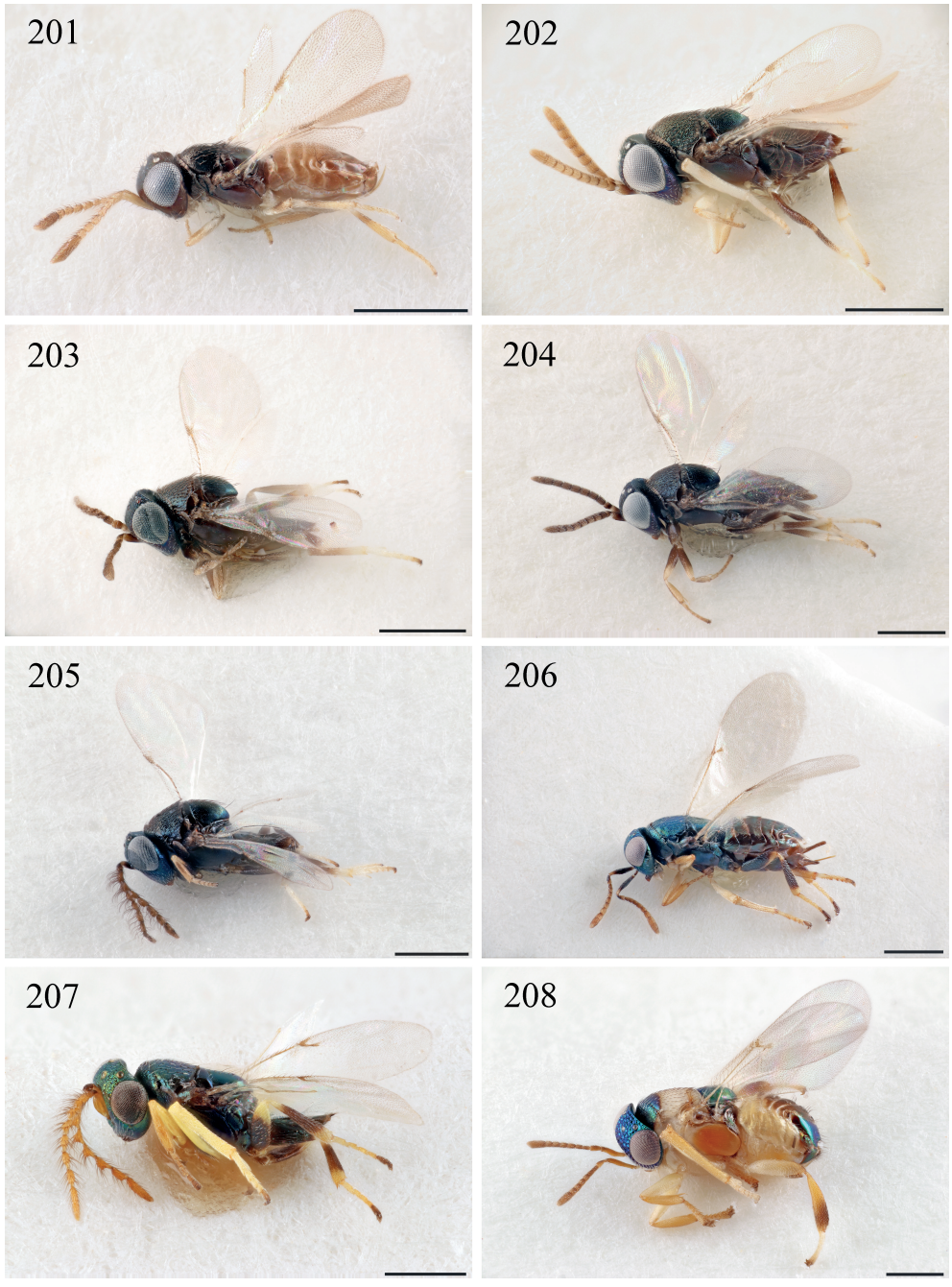
Habitus 185-192. (185) *Anicetus annulatus*, ♂; (186) *Anicetus arche*, HT; (187) *Anicetus lysithea*, HT; (188) *Anicetus lysithea*, variant; (189) *Anicetus apatos*, HT; (190) *Ammonoencyrtus hyperion*, HT; (191) *Ammonoenyrtus carolinensis*; (192) *Ammonoencyrtus galas*, HT.

No habitus images: *Anicetus oroso*, *Anicetus cheras*, *Ammonoencyrtus prosymnos*, *Ammonoencyrtus keira*.

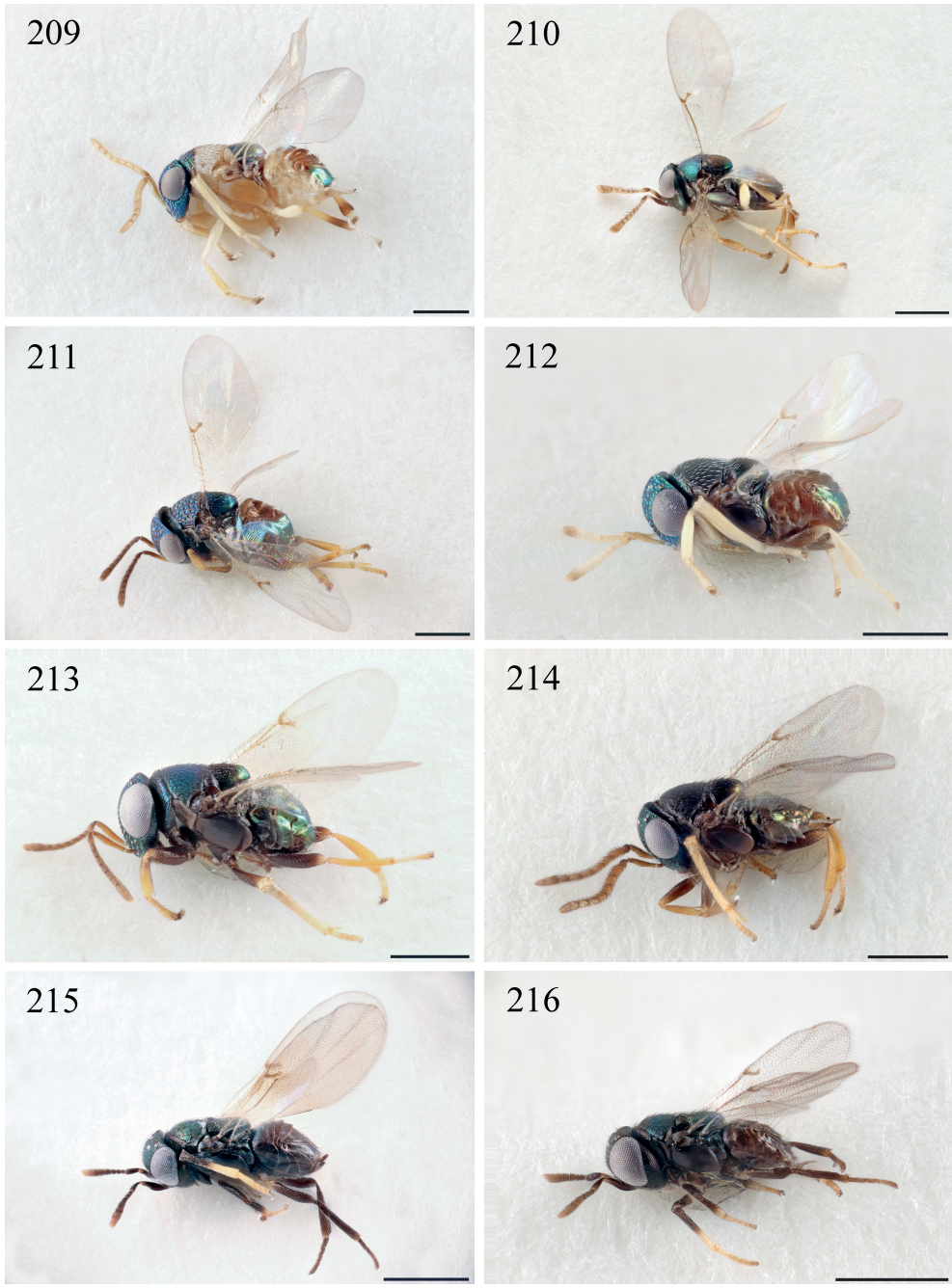


Habitus 193-200. (193) *Ammonoencyrtus xanthos*, HT; (194) *Ammonoencyrtus autone*, HT; (195) *Polaszekius nemesis*, HT; (196) *Protyndarichoides isonus*, HT; (197) *Protyndarichoides nigriceps*; (198) *Protyndarichoides nigriceps*, ♂; (199) *Protyndarichoides euanthos*, HT; (200) *Protyndarichoudes damocles*, HT.

No habitus images: *Protyndarichoides hermippe*, *Protyndarichoides elathes*.

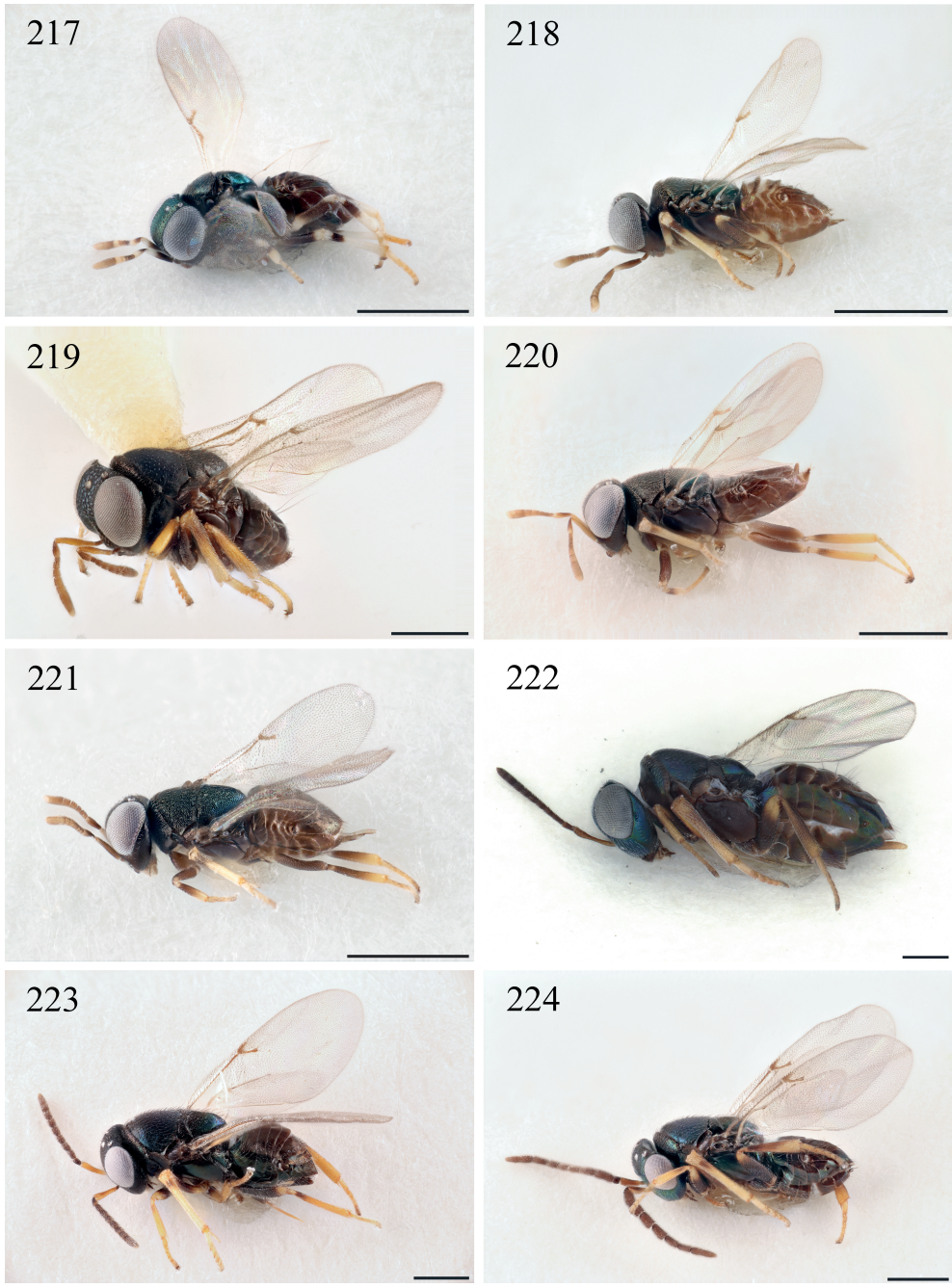


Habitus 201-208. (201) *Protyndarichoides hephaestus*, HT; (202) *Gahaniella chaldenes*, HT; (203) *Gahaniella californica*; (204) *Gahaniella saissetiae*; (205) *Gahaniella saissetiae*, ♂; (206) *Pronomitus mitratus*; (207) *Prionomitus mitratus*, ♂; (208) *Sectiliclava isis*.



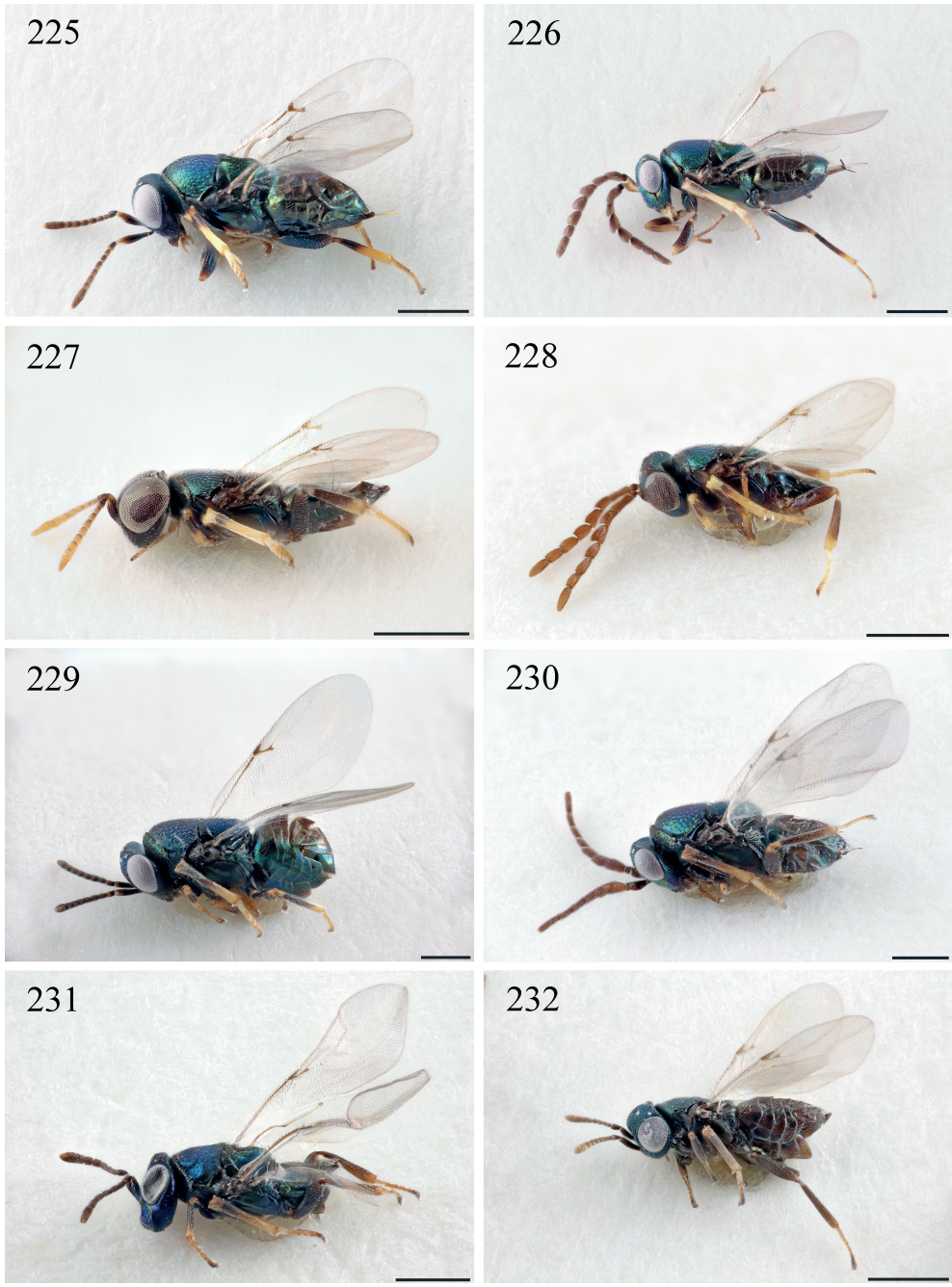
Habitus 209-216. (209) *Sectiliclava isis*, ♂; (210) *Sectiliclava megleos*, HT; (211) *Sectiliclava arion*, HT; (212) *Sectiliclava pulchriceps*; (213) *Sectiliclava rojasorum*, HT; (214) *Sectiliclava rojasorum*, ♂; (215) *Trechnites merops*; (216) *Trechnites merops*, ♂.

No habitus images: *Sectiliclava helikes*, *Sectiliclava fusui*.



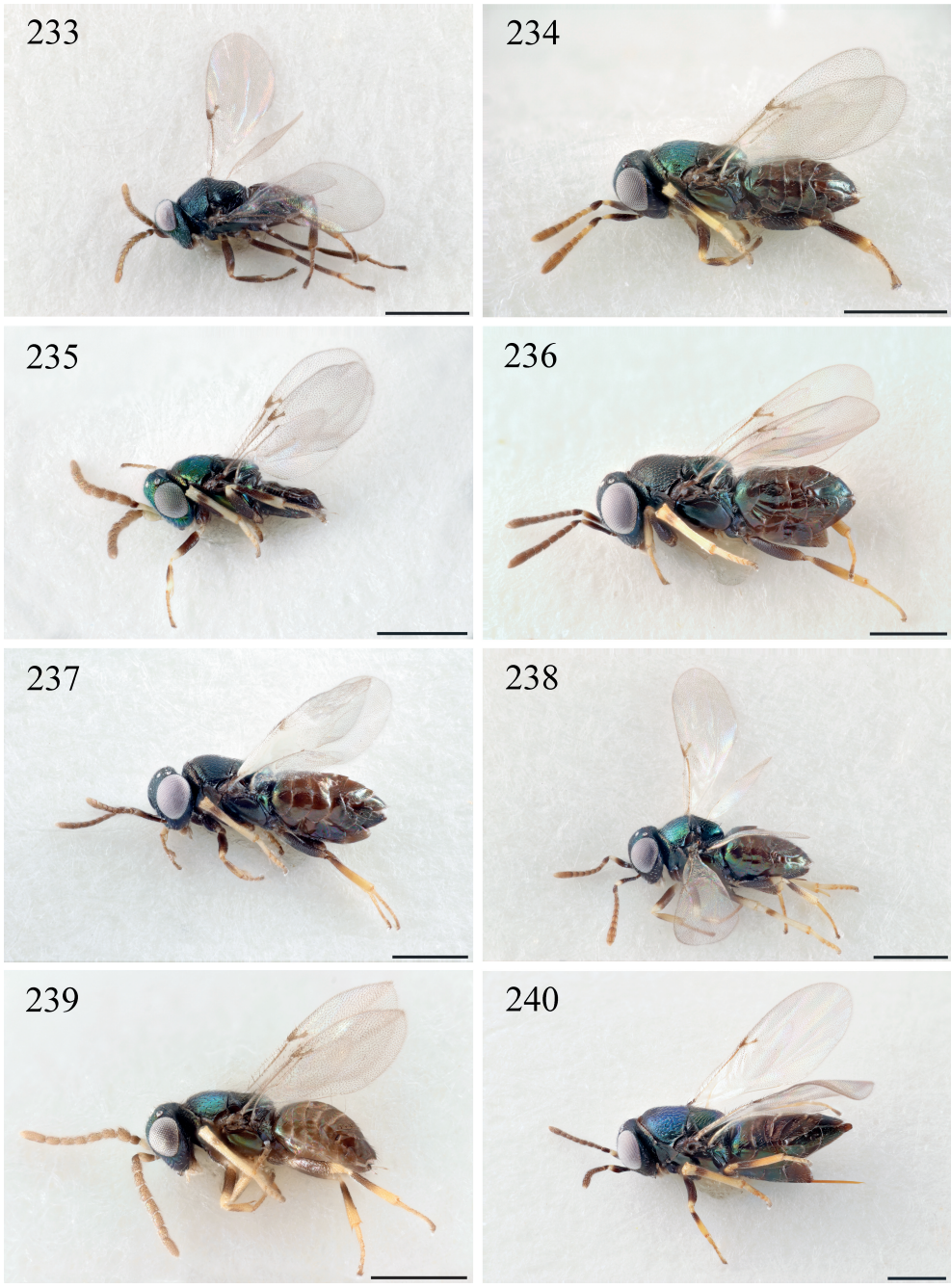
Habitus 217-224. (217) *Trechnites thelxines*, HT; (218) *Trechnites thelxines*, ♂; (219) *Trechnites kale*, HT; (220) *Trechnites spondes*, HT; (221) *Trechnites spondes*, ♂; (222) *Psyllaephagus domitius*, HT; (223) *Psyllaephagus ufens*; (224) *Psyllaephagus ufens*, ♂.

No habitus images: *Trechnites thyones*, *Psyllaephagus heles*.



Habitus 225-232. (225) *Psyllaephagus othrys*; (226) *Psyllaephagus othrys*, ♂; (227) *Psyllaephagus trioziphagus*; (228) *Psyllaephagus trioziphagus*, ♂; (229) *Psyllaephagus creusa*; (230) *Psyllaephagus creusa*, ♂; (231) *Psyllaephagus epulo*; (232) *Psyllaephagus pilosus*.

No habitus images: *Psyllaephagus alisanos*, *Psyllaephagus kallichoa*.



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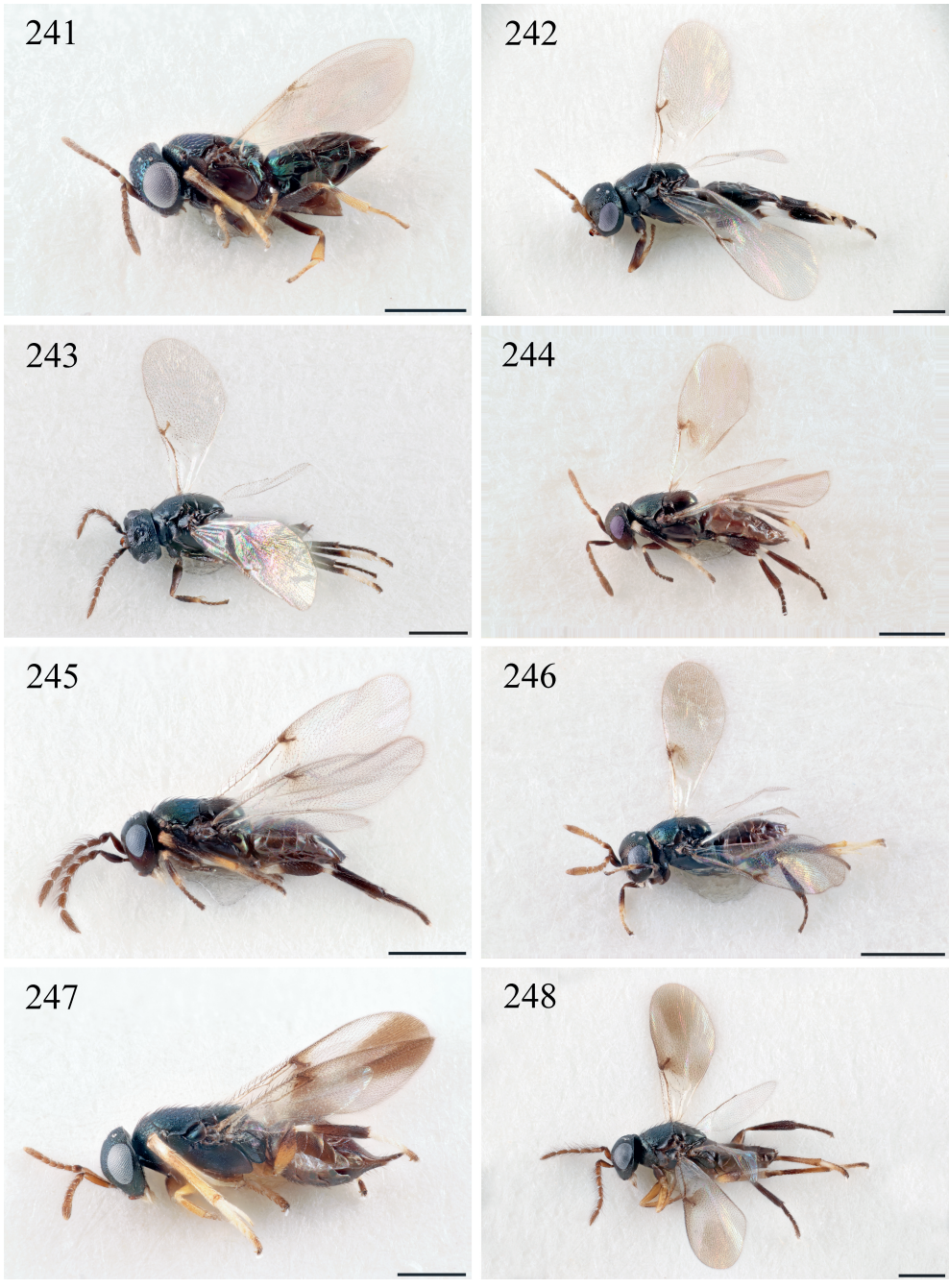

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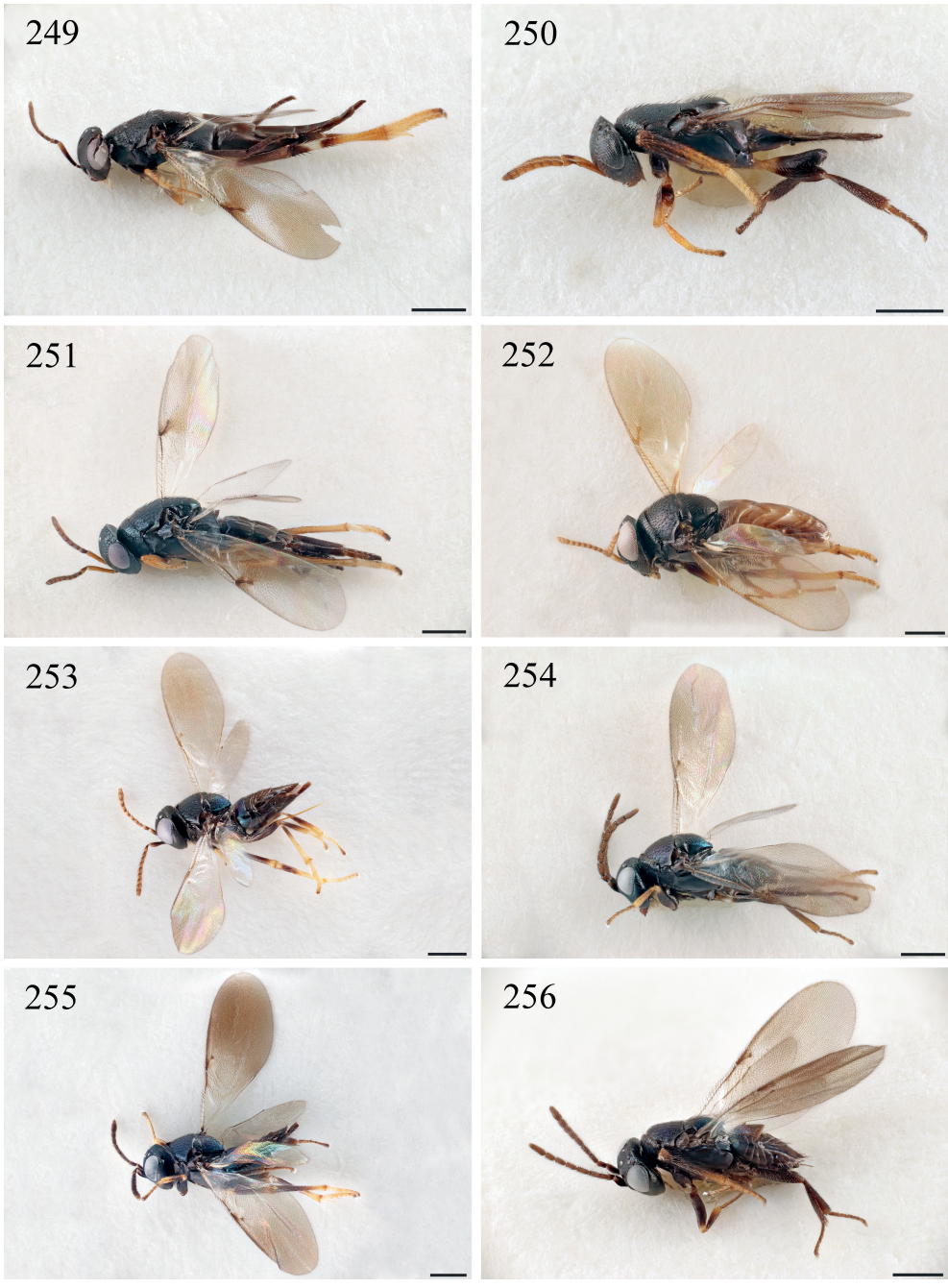
No habitus images: *Psyllaephagus moros*, *Psyllaephagus phelys, Cercobelus pleiades*, *Cercobelus tartarus*.



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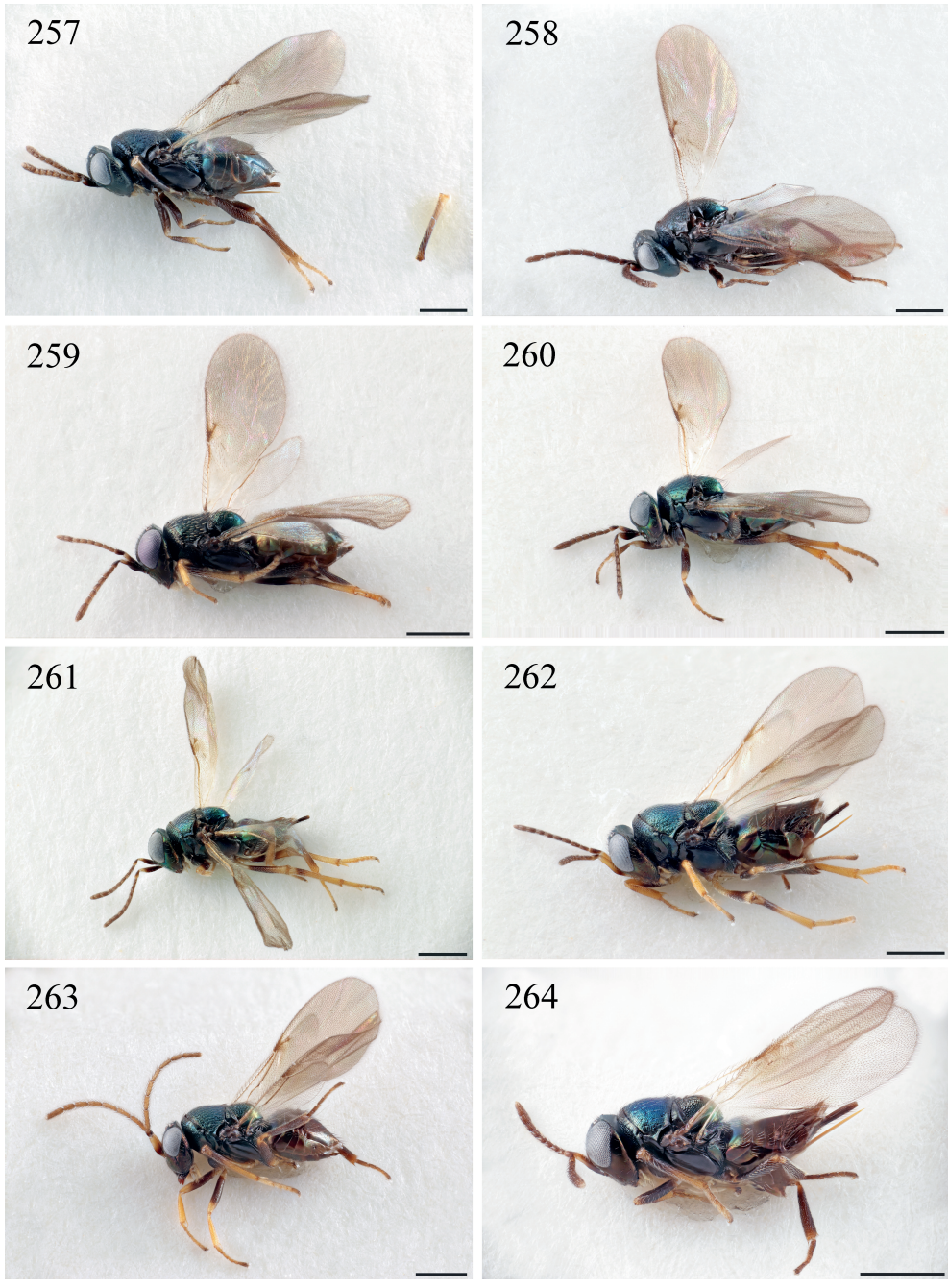

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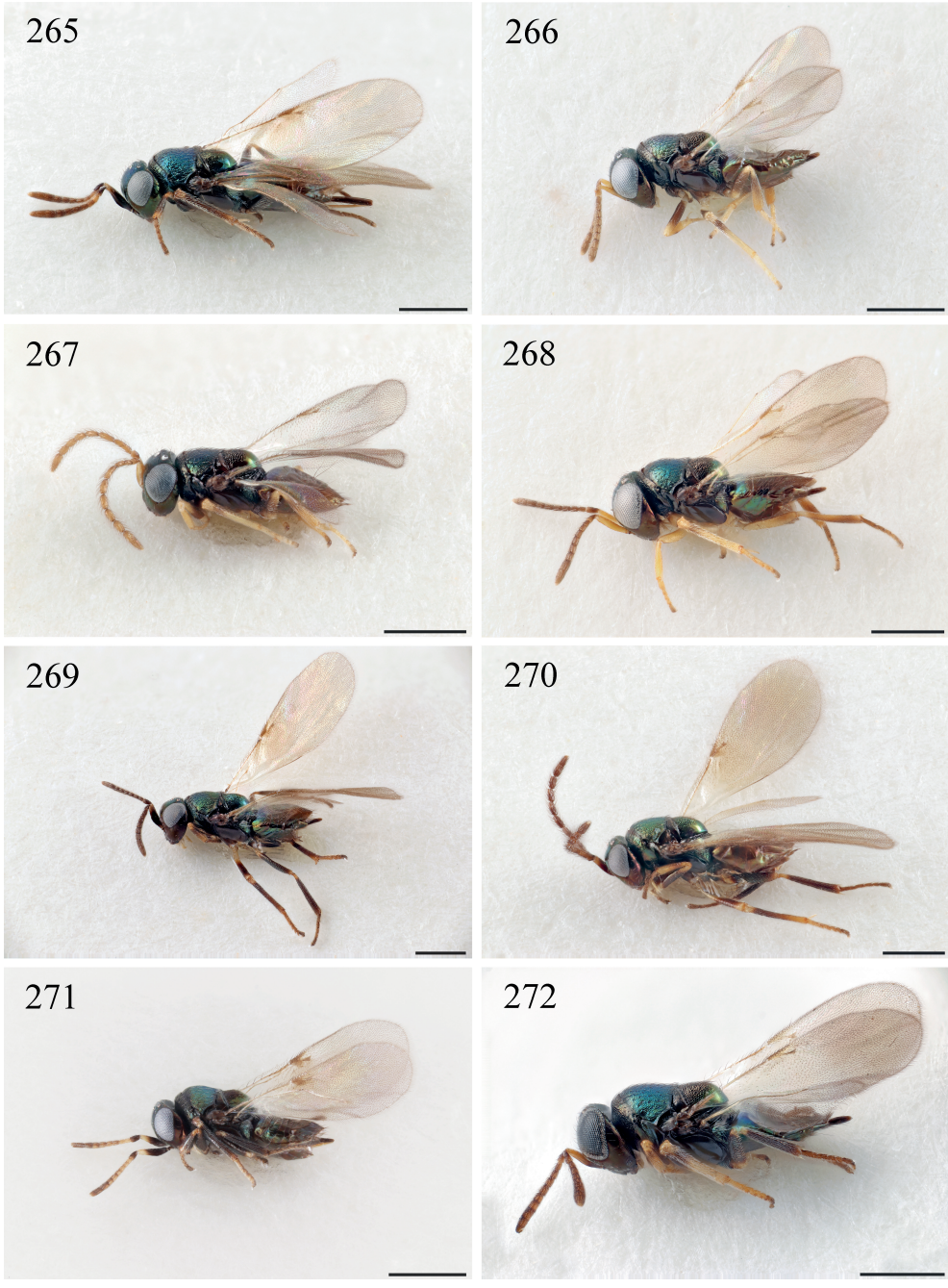
No habitus images: *Dalek thanatos*.



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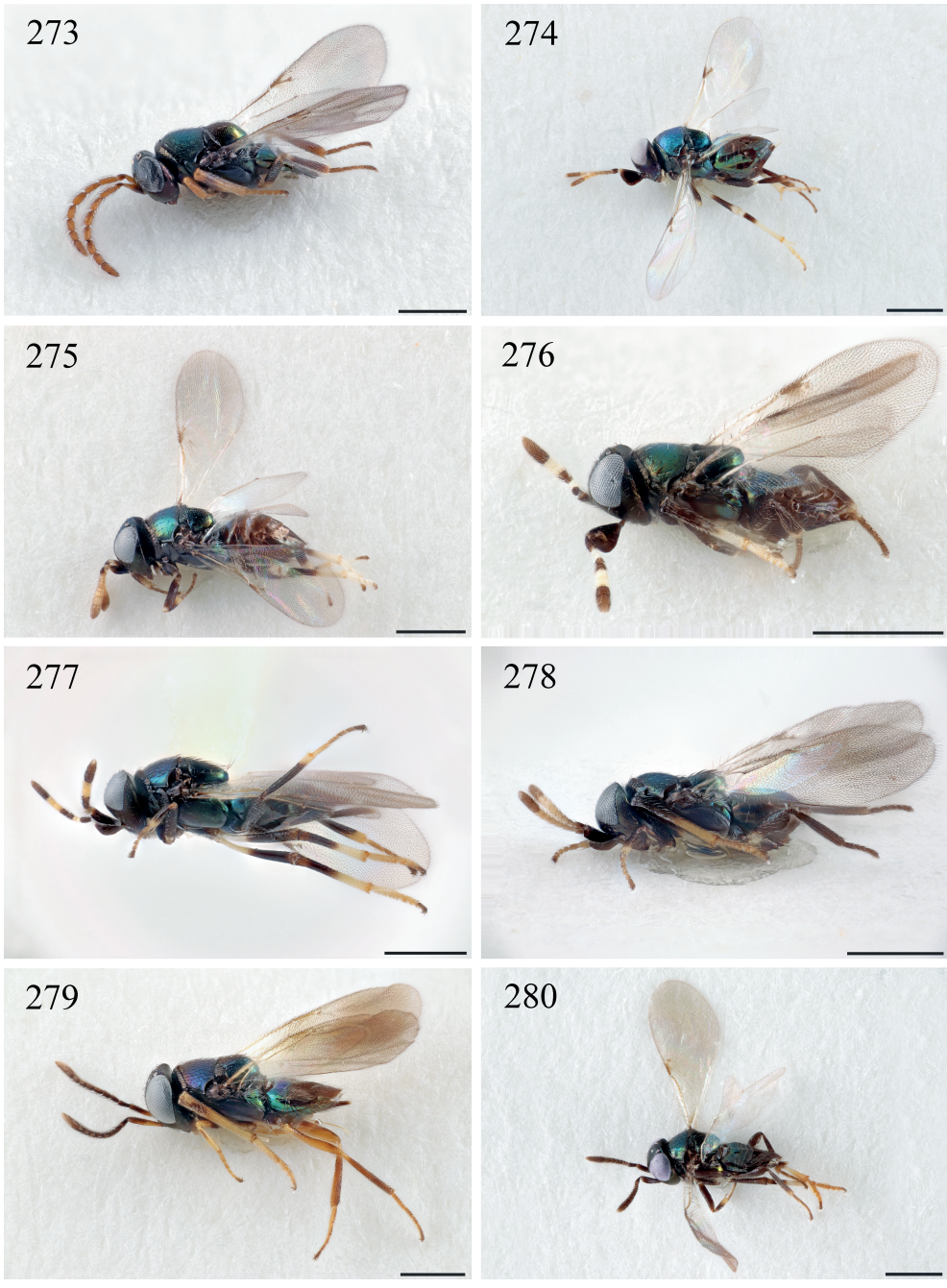
No habitus images: *Dalek pomona*, *Dalek elana*.



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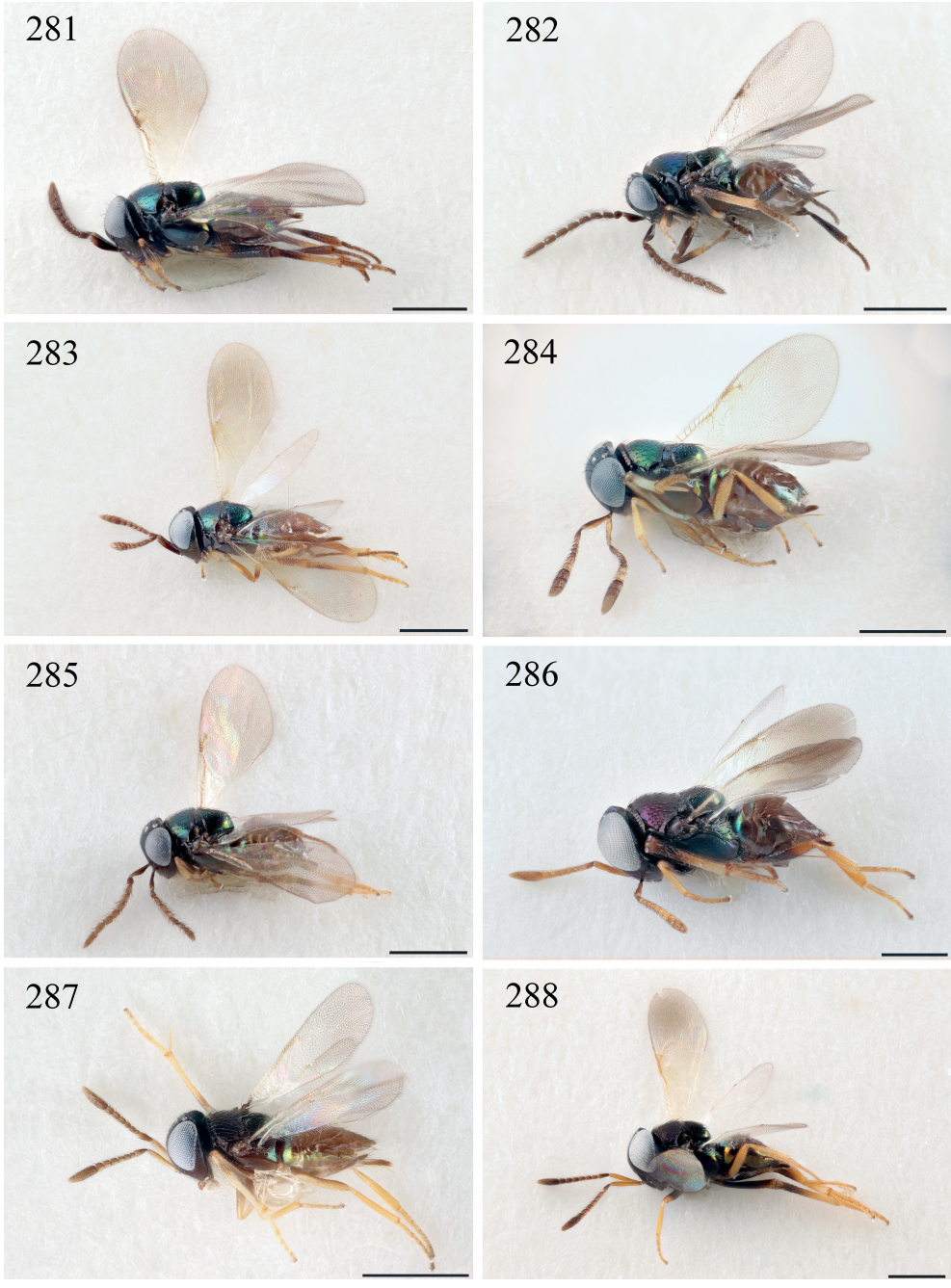

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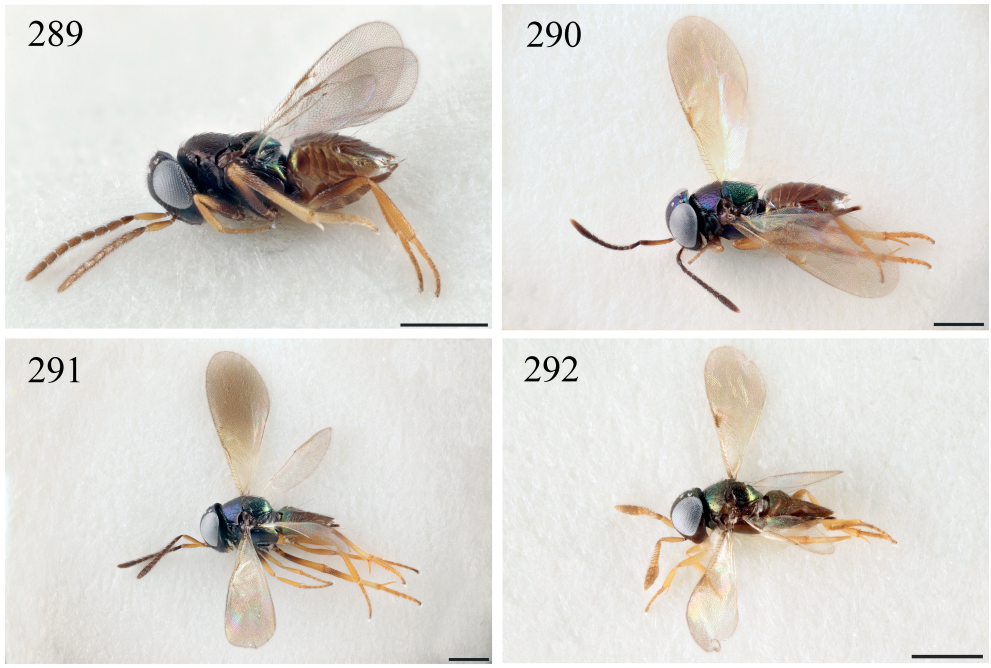

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