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Damselflies of the genus *Argia* Rambur, 1842 (Odonata: Coenagrionidae) from Mexico, Central America and the Lesser Antilles with descriptions of five new species

ROSSER W. GARRISON^{1,2} & NATALIA VON ELLENRIEDER^{1,3}

¹Plant Pest Diagnostics Center, California Department of Food & Agriculture, 3294 Meadowview Road, Sacramento, CA 95832-1448, U. S. A.

² argiavivida@gmail.com;  <https://orcid.org/0000-0001-8586-2723>

³ natalia.ellenrieder@gmail.com;  <https://orcid.org/0000-0002-1159-2019>



Male of *Argia annae* photographed at a roadside seepage near Puente Texolo, Veracruz State, Mexico, on 17 June 2009 by Rosser W. Garrison



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Abstract

A total of 73 species of *Argia* Rambur, 1842 are reported as present from Mexico, Central America and the Lesser Antilles, of which five are new to science and are described here: *Argia annae* **n. sp.** (holotype ♂: MEXICO, Veracruz, Puente Texolo, roadside seepages near bridge, 19.4028°N, 96.9867°W, 1065 m, 17 June 2009, Rosser W. Garrison &

Natalia von Ellenrieder leg., in CSCA), *Argia gonzalezi* **n. sp.** (holotype ♂: MEXICO, Chiapas, 3.5 mi east of Rayón, stream, approximately 17.2058°N, 92.9700°W, 1676 m, 16 July 1965, Dennis R. Paulson leg., in CNIN), *A. noveloi* **n. sp.** (holotype ♂: MEXICO, Veracruz, Puente Texolo, 19.4028°N, 96.9867°W, 1065 m, 26 August 1988, Rosser W. Garrison leg., in INECOL), *A. paludicola* **n. sp.** (holotype ♂: U. S. A., Arizona, Apache County, Bog Tank, north of Highway 260, 34.0467°N, 109.683°W, 1400 m, 1 July 2016, Pierre Deviche leg., in CSCA) and *A. paulsoni* **n. sp.** (holotype ♂: COSTA RICA, San José, 7.5 km northeast of Londres, on road to Rancho Tinamú Lodge, 9.4856°N, 83.9911°W, 700 m, 5 July 2019, William A. Haber leg., in UNH). Redescriptions of male and female are provided for the following species: *Argia calida* (Hagen, 1861), *A. chelata* Calvert, 1902, *A. deami* Calvert, 1902, *A. fulgida* Navás, 1934, *A. herberti* Calvert, 1902, *A. johannella* Calvert, 1907, *A. mayi* González-Soriano, 2012, *A. percellulata* Calvert, 1902, *A. pocomana* Calvert, 1907, *A. rogersi* Calvert, 1902, *A. talamanca* Calvert, 1907, *A. terira* Calvert, 1907, *A. underwoodi* Calvert, 1907, and *A. variabilis* Selys, 1865. All 73 species are measured, illustrated, and distinguished from their congeners. The following synonymies are suggested based on examination of type material: *A. wilsoni* Calvert, 1902, a junior synonym of *A. calida* (Hagen, 1861), *A. plana* Calvert, 1902, a junior synonym of *A. funebris* (Hagen, 1861), and *A. trifoliata* Fraser, 1942 (Fig. 736), a junior synonym of *A. variegata* Förster, 1914. Lectotypes are designated for *Agrion calidum* Hagen, 1861, *Agrion funebris* Hagen, 1861, and *Argia variabilis* Selys, 1865. Keys to the 73 known *Argia* species from Mexico, Middle America and the Lesser Antilles are provided as well as distribution maps based on an examination of over 16,000 specimens.

Key words: Dragonfly, Neotropics, keys, diagnoses, distribution maps

Resumen

Un total de 73 especies de *Argia* Rambur, 1842 son registradas de México, América Central y las Antillas Menores, de las cuales cinco son nuevas para la ciencia y son descritas aquí: *Argia annae* **n. sp.** (holotipo ♂: MÉXICO, Veracruz, Puente Texolo, charcos de filtración a los lados del camino cerca del puente, 19.4028°N, 96.9867°O, 1065 m, 17 de Junio 2009, Rosser W. Garrison & Natalia von Ellenrieder leg., en CSCA), *Argia gonzalezi* **n. sp.** (holotipo ♂: MÉXICO, Chiapas, 3.5 mi al este de Rayón, arroyo, aproximadamente 17.2058°N, 92.9700°O, 1676 m, 16 de Julio 1965, Dennis R. Paulson leg., en CNIN), *A. noveloi* **n. sp.** (holotipo ♂: MÉXICO, Veracruz, Puente Texolo, 19.4028°N, 96.9867°W, 1065 m, 26 de Agosto 1988, Rosser W. Garrison leg., en INECOL), *A. paludicola* **n. sp.** (holotipo ♂: U. S. A., Arizona, Condado Apache, Bog Tank, al norte de ruta 260, 34.0467°N, 109.683°W, 1400 m, 1 de Julio 2016, Pierre Deviche leg., en CSCA) y *A. paulsoni* **n. sp.** (holotipo ♂: COSTA RICA, San José, 7.5 km al noreste de Londres, en ruta al hospedaje Rancho Tinamú, 9.4856°N, 83.9911°W, 700 m, 5 de Julio 2019, William A. Haber leg., en UNH). Redescripciones de machos y hembras son proporcionadas para las siguientes especies: *Argia calida* (Hagen, 1861), *A. chelata* Calvert, 1902, *A. deami* Calvert, 1902, *A. fulgida* Navás, 1934, *A. herberti* Calvert, 1902, *A. johannella* Calvert, 1907, *A. mayi* González-Soriano, 2012, *A. percellulata* Calvert, 1902, *A. pocomana* Calvert, 1907, *A. rogersi* Calvert, 1902, *A. talamanca* Calvert, 1907, *A. terira* Calvert, 1907, *A. underwoodi* Calvert, 1907, y *A. variabilis* Selys, 1865. Las 73 especies son medidas, ilustradas y distinguidas de sus congéneres. Las siguientes sinonimias son sugeridas sobre la base de examinación de material tipo: *A. wilsoni* Calvert, 1902 sinónimo junior de *A. calida* (Hagen, 1861), *A. plana* Calvert, 1902 sinónimo junior de *A. funebris* (Hagen, 1861), y *A. trifoliata* Fraser, 1942 (Fig. 736) sinónimo junior de *A. variegata* Förster, 1914. Se designan lectotipos para *Agrion calidum* Hagen, 1861, *Agrion funebris* Hagen, 1861, y *Argia variabilis* Selys, 1865. Claves diagnósticas para las 73 especies de *Argia* conocidas de México, América Central y las Antillas Menores son provistas, así como mapas de distribución basados en la examinación de más de 16.000 ejemplares.

Palabras clave: Libélulas, Neotrópico, claves, diagnosis, mapas de distribución

Introduction

Argia Rambur, 1842 is the most species-rich genus of Odonata in the New World with 139 species described to date. They occur from S Canada south to Central Argentina and inhabit almost every type of freshwater aquatic habitat (usually lotic or semilotic, although a few occur near lakes and ponds) from sea level to high elevations (Garrison *et al.* 2010). Their distinctive habits make them easily recognizable from almost all other zygopterans. Adults have a bouncing flight and often alight on bare patches of earth, rocks, stones or boulders in or near streams. Once settled, they usually clap their wings once or twice before returning them to their resting position (Bick & Bick 1978). Most adult males are patterned in blue or violet and black although some have a brilliant cupreous thoracic coloration accompanied by brilliant red eyes. Females are often less colorful or paler than their male counterparts. Members of

the genus are easily distinguished from all other Coenagrionidae by the combination of wings stalked well before level of the anal crossvein, tibial spines longer than interval separating them, and males with a specialized pair of pad-like structures (tori) on the declivous posterodorsal surface of abdominal segment 10 (Garrison 1994). Females most often have a raised laminate process along the posterior margin of the mesostigmal plate; their morphology often varies intra- and interspecifically. Almost any collection of neotropical Odonata will include members of this complex genus and their speciose nature makes identification challenging.

This paper is the eighth of a series (Garrison 1994, 1996, 2019; Garrison & Ramón Cabrera 2019; Garrison & von Ellenrieder 2007, 2015, 2017, 2018) treating members of the genus *Argia*. Here we provide an up-to-date treatment of all 73 species, five of them new, known to us from Mexico, Central America and the Lesser Antilles (Table 1).

Previous treatments of species of *Argia* occurring in Middle America began with the early descriptions by Rambur (1842), Hagen (1861) and Hagen in Selys (1865) but the greatest advances treating the Middle American components of this complex genus were those of Calvert (1895, 1899, 1901, 1902, 1907) who included 48 taxa, 28 of them new, in his seminal works on the Middle American fauna. Calvert (1901, 1902, 1907) included keys to both sexes but noted the difficulty in providing an adequate and easily workable key noting that “The shape of the male appendages and of the female mesostigmal laminae is mostly so difficult of accurate description that I have relied entirely upon figures (Tab. IV.) to display it.” and “The key here offered has very little pretension to expressing natural relationships. It is only given in the belief that it is better than no key at all, and as being the least unsatisfactory of those which I have successively drawn up and discarded.” Garrison (1994) treated 29 species occurring in the United States, and subsequently five other species, *A. anceps* (Danforth *et al.* 2013), *A. carlcooki* (Behrstock *et al.* 2004), *A. harknessi* (Bailowitz & Danforth 2007), *A. lacrimans* (Cole 1998; Bailowitz & Danforth 2007) and *A. oculata* (via photo, P. Deviche pers. comm.) were also found in Arizona. A more recent treatment of all species known from the United States and bordering states of Mexico was provided by Westfall & May (2006), including extensive keys to sexes, illustrations and detailed descriptions of all 39 species. Garrison’s (1994) treatment of the Nearctic fauna included three species, *Argia bipunctulata* (Hagen, 1861), *A. emma* Kennedy, 1915 and *A. tibialis* (Rambur, 1842) that are thus far not known to occur in neighboring Mexico or Central America. A few papers have listed species from Mexico and Central America (Paulson 1982), all of Mexico by state (González-Soriano 1993; González-Soriano & Novelo-Gutiérrez 1996; González-Soriano & Novelo-Gutiérrez 2007) but more frequently parts of Mexico (Novelo-Gutiérrez *et al.* 1988; Mendoza Trejo & González-Soriano 1989; Novelo-Gutiérrez & Peña-Olmedo 1991; Alonso-Eguía *et al.* 2002; Paulson 2002a, b; Behrstock *et al.* 2004; Behrstock *et al.* 2007a, b; Cuevas-Yañez 2007; Upson *et al.* 2007; González-Soriano *et al.* 2008; Bailowitz *et al.* 2009; Behrstock 2009; Escoto-Moreno *et al.* 2009; Gómez-Anaya & Novelo-Gutiérrez 2010; González-Soriano & Paulson 2011; González-Soriano *et al.* 2011; Escoto-Moreno *et al.* 2014, 2015; González-Soriano *et al.* 2016; Ortega-Salas & González-Soriano 2019; Escoto-Moreno *et al.* 2020; Escoto-Moreno *et al.* 2021; García-Miranda & Carrillo-Muñoz 2021), Belize (Boomsma 1993; Measey 1994; Boomsma & Dunkle 1996), Honduras (Dunkle 1988, 1991), El Salvador (Gloyd 1981; Paulson 1984; Westfall 1986), Nicaragua (Maes *et al.* 1988; Maes 1989; Abbott *et al.* 2002), Costa Rica (Brooks 1989; Ramírez *et al.* 2000; Garrison & von Ellenrieder 2013) and Panama (Donnelly 1992; Suhling 1999; Paulson 2013a, 2013b) but only three, González-Soriano & Novelo-Gutiérrez (1991), Novelo-Gutiérrez (1991) and Peña-Olmedo & Novelo-Gutiérrez (1993), provided regional keys to the species within a localized area. Caesar & Wenzel (2009) and Torres-Pachón *et al.* (2017) presented molecular phylogenies of mostly North American species of *Argia* based on molecular and morphological data, the former paper dealing with adults, the latter with larvae. We have commented on their results when our morphological analysis does not seem to support them.

The present paper is essentially a revision of Calvert’s (1901, 1902, 1907) treatment of this genus and includes all the remaining species treated by Garrison (1994) and updated in Westfall & May (2006) that are also known from Mexico, but we do not repeat descriptions and only include updated information and updated diagnoses relevant to other Neotropical species. We have, however, felt it best to include new and more accurate illustrations of all these species known to occur both in the United States and Mexico preferably choosing examples from Mexico or Central America. For completeness of the geographic area of coverage, we also include the two species known from the Lesser Antilles, even though they correspond to a different biogeographic lineage, probably more closely related to the Guianan fauna. At the time of Garrison’s (1994) treatment, no habitus illustrations of adults, except for Dunkle (1990), had been published. That problem has been rectified by the recent field guides of Abbott (2005a, 2011),

Bailowitz *et al.* (2015), Paulson (2009, 2011), and Paulson & Haber (2021). The illustrations in Abbott (2011), executed with great care by Anthony Klein, and photographs in Bailowitz *et al.* (2015) are particularly noteworthy. The recent field guide to the Odonata of Costa Rica (Paulson & Haber 2021) has added photographs of all known species from that country.

Virtually no work has been done concerning the morphology of the male genital ligula since Kennedy (1919a) illustrated them for a large number of species of *Argia* in his thesis. Kennedy (1920) proposed five new subgenera within *Argia* based entirely on the morphology of this structure. Even though these subgenera do not necessarily reflect natural groups and are not recognized as valid today, we find them to be of practical use. Two of them, *Leptargia* and *Micrargia*, were comprised entirely of South American species and are not further considered here. The other three pertinent to our study area were as follows (Kennedy 1920):

Cyanargia Type species—*Argia lacrimans*. Genital ligula with a flagellum attached to inner surface of terminal segment: Also included *A. tonto*.

Heliargia Type species—*Argia vivida*. Internal fold of genital ligula small or lacking, terminal segment irregularly triangular or even with a short attenuate tip. External fold present: Also included *A. plana*, *A. funebris*, *A. immunda*, *A. deami*, probably also *A. talamanca*, *A. underwoodi* and *A. terira*.

Chalcargia. Type species—*Argia oenea*. Genital ligula with apex bifid: Also included *A. orichalcea* Hagen in Selys (South American), *A. harknessi*, *A. barretti*, *A. calida*, *A. percellulata*, *A. insipida*, *A. ulmeca*, *A. adamsi*, *A. pipila*, *A. oculata*, *A. difficilis* Selys, 1865 (South American), *A. rogersi*, *A. jocosa* Hagen in Selys, 1865 (South American), *A. tezpi*, *A. translata*, *A. sedula*, *A. gerhardi* Calvert, 1909 (South American), *A. frequentula*, *A. cuprea*, *A. pulla*, *A. nigrior* Calvert, 1909 (South American), *A. indicatrix*, *A. gaumeri*, *A. popoluca*, *A. cupraurea* and *A. johannella*.

Methods

We examined over 16,000 specimens for this study. Specimens were first sorted to species, based primarily on morphology of the caudal appendages and genital ligula (males) and mesostigmal laminae (females). Other characters, including number of post-quadrangular cells and body color and patterning, also were used in allocating specimens to taxa. The main morphological structures of diagnostic value in this genus and their terminology were described by Garrison (1994) in his study of the North American species and are not repeated here. However, structures associated with mesostigmal plates (female) and S10 (male) are labeled in figures 493–591 and 661–753, respectively, for reference. Several examples of both males and females when available were prepared for detailed examination by relaxing specimens and carefully spreading the male caudal appendages so that the mesal and ventral parts of the cercus could be seen. Caudal appendages prepared for illustration purposes were submerged in tap water and cleaned thoroughly with a fine paint brush, as these structures were often encrusted with detritus or with water-soluble shellac-like exudates, both of which obscure important details; the illustrations in figures 661–753 are based on specimens in which the appendages were relaxed, cleaned, and spread. When using the keys, we strongly suggest that the male appendages be similarly spread to allow for a correct identification.

The genital ligula was found to be usually species-specific, and our first key uses it as a primary character, as it allows for a more reliable identification when coupled with morphology of the male caudal appendages. Its disadvantage stems from its hidden nature; this structure must be teased from under the overlying vesica spermalis to be seen. We advocate the following procedure for its removal and examination in dried specimens. Under a binocular dissecting microscope, first apply a small wet piece of paper towel or cotton on the venter of S2–3 to soften the integument and allow movement of the vesica and extraction of the genital ligula. Once softened, usually after 2–3 hours, insert a pair of watch forceps anteriorly into the genital pocket gently but firmly, holding the base and with a gentle rocking motion both forward and backward gradually flexing the ligula within the genital pocket. Then insert the forceps under the ligula carefully, flexing it away from under the vesica. Using a pair of watch forceps, fasten the specimen against a small piece of balsa wood by cross pinning with 0.20 mm minutens and applying a small rectangular piece of glassine paper over the wings, using minutens to affix it to the wood. After the specimen is firmly attached to the wood, use 0.10 minutens to carefully flex the distal segment to about 45° away from the basal segment to hold the extended terminal segment in place so that the ental and entolateral surfaces can

be observed and illustrated. The specimen on the balsa wood is placed in an acetone bath for an hour or so before removing and allowing it to dry. The hyaline membranous ectal hood, when small, can be difficult to see in some species (e. g., Figs. 638, 639, 641) when the hood is appressed against the ligula stem. The genital ligula may need to be temporarily softened and manipulated with a fine (0.10) minuten to verify the presence of the dorsal hood. Further details on this procedure are given in Garrison (2021a). We provide illustrations of the genital ligula (lateral, ectal and sometimes entolateral) for 56 of the 73 species known from Middle America and the Lesser Antilles, indicating for the remaining 17 species which illustrated species they most closely resemble.

Species are treated alphabetically. For each species account we include: 1) reference to all figures and maps; 2) key “shortcut” locators for each of the three keys; 3) a more or less complete chronological synonymy encompassing papers dealing with Mexico, Central America and those of the SW United States in chronological order under each taxon by author, year, and page number followed in parentheses by comments including references to figures and photos; 4) type data for all species group names and their depository as far as known; 5) specimens examined (but excluding listings from earlier papers; e. g., Garrison & von Ellenrieder 2015, 2017, 2018); 6) a brief characterization of males and females, 7) full descriptions for new species or redescrptions of poorly known or inadequately described species; 8) diagnoses; 9) remarks when available; 10) distribution; and 11) notes on habitat when available. Species that were included in Westfall & May (2006) are not redescrbed although we have added additional comments (e. g., information on genital ligula).

Calvert’s treatment of the genus *Argia* in his *Biologia Centrali-Americana* was published from December 1901 to January 1902. His key to males and females, the latter including only one species, *A. percellulata*, was published in 1901; the remainder of the key to females and descriptions of species were published in January 1902. Previous authors have regarded the descriptions of all species treated during that time frame as 1902, even though diagnostic characters and introduction of new names at least for males were published in 1901. We agree with this assessment and use 1902 as the year for Calvert’s descriptions during the 1901–1902-time frame. We cite only the second updated editions of Förster (2001) and Westfall & May (2006). We have endeavored to include all pertinent references for each name dealing with the Mexican and Central American fauna as well as a few references relating to their taxonomy or identification from the U. S. states (Arizona, New Mexico, Texas) bordering Mexico. Synonymies exclude references to various catalogs and references to widespread species occurring throughout the United States.

Nomenclature follows Garrison (1994) and Garrison *et al.* (2010). Abbreviations used throughout the text are as follows: Fw: forewing; Hw: hindwing; Pt: pterostigma; pq: postquadrangular cells; px: postnodal crossveins; S1–10: abdominal segments 1 to 10; The term “inner branch” when referring to the cercus may refer to the inner distal tooth (e. g., Figs. 664a, 681a) or to an inner medial lobe (e. g., Figs. 662c, d, 684d, 685d, 696d) of the cercus, even though these parts are not necessarily homologous. In the illustrations of some structures, different views are indicated as follows: female mesostigmal plates and pronotum: a: anterior, b: anterior closeup, c: dorsal, d: dorsal close up, e: posterior, f: dorsal edge, g: laterodorsal, h: lateral, i: mediodorsal, j: pronotum dorsal; genital ligulae: a: lateral; b: ectal; c: entolateral; d: ental; e: detail; f: ectolateral; male appendages: a: mediodorsal; b: lateral; c: dorsal; d: posterior.

Illustrations were made with the aid of a camera lucida coupled to a Zeiss SteREO discovery V20 stereomicroscope. Multiple drawings are included to illustrate observed variability of characters. Macrophotographs of the head, thorax, and parts of the abdomen of dried specimens were edited with Adobe Photoshop to match colors from photographs of live specimens. Coloration depicted for these illustrations should be considered approximate and may not match live individuals, especially in terms of intensity of pale colors. All photographs were rendered from fully mature specimens; teneral and juvenile specimens normally possess lighter pale colors, and females of some species may be dichromatic (brown or blue) in their pale coloration. Photographs, scans, and illustrations are not to scale. Further details on the preparation and methods used in this paper are given by Garrison (2021b). Due to the large number of species treated here, we have provided full body scans (Figs. 855–1033, not to scale) based on similar genital ligula morphology and overall coloration that may further aid in identifying unknown specimens within clusters of similar species.

Measurements are given in millimeters; dimensions are given as average $\pm$ standard deviation followed by range in square brackets and were taken from ten specimens of each sex from their entire range of distribution when available; Hw measurement excludes basal sclerites; total length includes appendages and ovipositor (excluding styli), but abdomen length excludes them (Table 2).

Maps were created electronically using ArcView 10.0. Latitude/longitude coordinates provided in the original labels are indicated in parentheses; approximate coordinates culled from Brown (1941) and Google Earth when not provided in the original labels are indicated in curly brackets { }. We also culled locality data that we considered reliable from the Portal de Datos Abiertos UNAM, Colecciones Universitarias for Mexico (<https://datosabiertos.unam.mx/biodiversidad/>), the Arizona Dragonflies website (<http://azdragonfly.org/>), and Odonata Central (<https://www.odonatacentral.org/#/>) for New Mexico and Texas, although none of these records are listed under Specimens examined. Maps show distributions only within Mexico and Central America; full extent of distribution range for more widespread species is not shown. A checklist of the presence of *Argia* species by country for Mexico, Central America and the Lesser Antilles is summarized in Table 3. Data output (e. g., Specimens examined) was accomplished using the free software Linnaeus (www.linnaeus.me).

The following abbreviations for collections are used throughout the paper:

ACR	Andrew C. Rehn collection, Sacramento, California, U. S. A.
BMNH	British Museum of Natural History, Dept. of Entomology, London, U. K.
BYU	Monte L. Bean Life Science Museum, Brigham Young University, Provo, Utah, U. S. A.
CAS	California Academy of Sciences, San Francisco, California, U. S. A.
CEUA	Universidad de Antioquia, Medellín, Antioquia, COLOMBIA
CNIN	Colección Nacional de Insectos, Universidad Nacional de México, Mexico City, MEXICO
CMNH	Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, U. S. A.
CSCA	California State Collection of Arthropods, Sacramento, California, U. S. A.
CUMZ	Cambridge University Museum of Zoology, Cambridge, U. K.
DD	Doug Danforth collection, Bisbee, Arizona, U. S. A.
DTU	Duy Tan University, Da Nang, VIETNAM
FAAL	Frederico A. A. Lencioni collection, São Paulo, BRAZIL
FMNH	Field Museum of Natural History, Chicago, Illinois, U. S. A.
FNS	Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt-am-Main, GERMANY
FSCA	Florida State Collection of Arthropods, Gainesville, Florida, U. S. A.
HZ	Haomiao Zhang collection, Kunming Institute of Zoology, Chinese Academy of Sciences, Kunming, CHINA
INBIO	Instituto Nacional de Biodiversidad, Heredia, COSTA RICA
INECOL	Instituto de Ecología, Xalapa, Veracruz, MEXICO
JJ	Jim Johnson collection, Vancouver, Washington, U. S. A.
JJD	Jerrell J. Daigle collection, Tallahassee, Florida, U. S. A.
KPMNH	Kanagawa Prefectural Museum of Natural History, Kanagawa, JAPAN
LJ	Laurent Juillerat collection, Chézard-St-Martin, SWITZERLAND
LUOMUS	Finnish Museum of Natural History, Helsinki, FINLAND
MCZ	Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, U. S. A.
MHNN	Muséum d'Histoire Naturelle de Nantes, Nantes, FRANCE
MHNS	Muséum d'Histoire Naturelle, Neuchâtel, SWITZERLAND
MJ	Biodiversity Inventory for Conservation NPO (BINCO), Glabbeek, BELGIUM
MNB	Museum für Naturkunde, Berlin, GERMANY
MNHN	Museum National d'Histoire Naturelle, Paris, FRANCE
MZB	Museum Zoologicum Bogoriense, West Java, INDONESIA
MZLU	Department of Biology, Evolutionary Ecology Unit, Lund University, Lund, SWEDEN
ONHI	Oklahoma Natural Heritage Inventory, The University of Oklahoma, Norman, Oklahoma, U. S. A.
PD	Pierre Deviche collection, Arizona State University, Tempe, Arizona, U. S. A.
PSU	Penn State University, State College, Pennsylvania, U. S. A.
RB	Richard A. Bailowitz collection, Tucson, Arizona, U. S. A.
RBINS	Institut Royal des Sciences Naturelles, Brussels, BELGIUM
RMNH	Naturalis Biodiversity Center (formerly Rijksmuseum van Natuurlijke Historie), Leiden, THE NETHERLANDS

RV	Reagan Villanueva collection, Davao, PHILIPPINES
RWG	Rosser W. Garrison collection, Sacramento, California, U. S. A.
SEMC	Snow Entomological Museum collection, University of Kansas, Lawrence, Kansas, U. S. A.
UCB	University of California, Berkeley, California, U. S. A.
UCD	University of California, Davis, California, U. S. A.
UFMG	Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais, BRAZIL
UMMZ	Museum of Zoology, University of Michigan, Ann Arbor, Michigan, U. S. A.
UNH	Universidad Nacional, Heredia, COSTA RICA
USFQ	Universidad San Francisco de Quito, Quito, ECUADOR
USNM	National Museum of Natural History, Smithsonian Institution, Washington, D. C., U. S. A.
UT	University of Texas, Austin, Texas, U. S. A.
WAH	William H. Haber collection, Monteverde, COSTA RICA

The genus *Argia* from Mexico, Central America, and Lesser Antilles

The morphology of the genital ligula was found to be more diverse than what Kennedy (1919a) illustrated or indicated. Our examinations show its distal segment to be of great aid in allowing identification of many species and species-groups. The genital ligula appears to be a more conservative character to indicate relationships compared to the male caudal appendages and may indicate natural groups. Even though these groups are practical for diagnostic purposes, we believe that it would not be appropriate to apply subgeneric names to them without performing a comprehensive phylogenetic analysis first.

Our groups of the Middle American species of *Argia* based on morphology of the genital ligula distal segment are as follows (* = not illustrated):

1. Distal segment lacking a flagellum or strap-like process, paired lateral lobes absent: *A. munda*; or present: *A. anceps*, *A. annae*, *A. deami*, *A. elongata*, *A. extranea*, *A. funebris*, *A. haberi*, *A. noveloi*, *A. rudolphi*, *A. sabino*, *A. tarascanana*, *A. terira*, *A. variabilis*, *A. vivida*, *A. westfalli**. One species (*A. variabilis*) with a short accessory spatulate terminal lobe and another (*A. extranea*) with a small ventrally directed digit-like process.
2. Distal segment with a single linear or slightly curved apical strap-like process: *A. funcki*, *A. lugens*; or apical cylindrical flagellum-like process, sclerotized entirely: *A. carlcooki*, *A. immunda*, *A. paulsoni*, *A. pocomana**, *A. schorri*, *A. talamanca* and *A. underwoodi*, or partially: *A. agrioides**, *A. alberta**, *A. apicalis*, *A. fumipennis*, *A. funcki*, *A. hinei**, *A. leonora*, *A. lugens*, *A. nahuana*, *A. pallens*, *A. paludicola*, lacking an overlying membranous hood at base. A pair of lateral lobes are present at the base of distal segment.
3. Distal segment with a single strap-like process attached to ental surface of short ovoid basal membranous hood: *A. concinna*, *A. moesta*, *A. telesfordi*; or a single soft flexible flagellum attached to ental surface of long trowel-shaped basal membranous hood: *A. chelata*, *A. lacrimans**, *A. pima*, and *A. tonto*. This structure and especially the soft flexible flagellum in dried specimens are often distorted; our illustration for *A. chelata* (Figs. 604a–c) is from a specimen preserved in ETOH, and that for *A. pima* (Figs. 637a–c) from a specimen softened in hot water and drawn while submerged in ETOH. A pair of lateral lobes are present at the base of distal segment.
4. Distal segment with a coiled bifid flagellum arching entally towards first segment, attached to ental surface of a narrow digit-like to quadrate short basal membranous hood, with two pairs of lateral lobes, the more basal pair including a small laterally extended lobe near flexure on each side (these often hidden by membranous terminal fold), and the more apical pair represented by a flexible chitinized multispinose branch, arising from a narrow stem extending laterad of the ligula on each side: *A. barretti**, *A. calverti*, *A. cupraurea**, *A. cuprea*, *A. fulgida*, *A. harknessi**, *A. insipida*, *A. oenea*, *A. percellulata*, *A. pipila**.
5. Distal segment with a coiled bifid flagellum attached to ental surface of digit-like, broad to narrow membranous hood (hood absent in *A. gonzalezi* and *A. medullaris*), with a pair of basal lateral lobes in most species (absent in *A. johannella*) but lacking any multispinose branches: *A. adamsi*, *A. calida*, *A. carolus*, *A. frequentula**, *A. garrisoni**, *A. gaumeri**, *A. gonzalezi**, *A. johannella*, *A. herberti*, *A. mayi*, *A. medullaris*, *A. oculata*, *A. popoluca*, *A. pulla*, *A. rhoadsi*, *A. rogersi*, *A. sedula*, *A. tezpi*, *A. translata*, *A. ulmea*.

Keys to males of *Argia* known from Mexico, Central America and the Lesser Antilles

Two sets of keys are provided below. The first is based primarily on morphology of the exposed genital ligula, supplemented by characters of the caudal appendages and coloration when necessary. Examination of structures on the genital ligula may require relatively high (80X) magnification using both LED reflected and transmitted (from beneath) light sources. The second set of keys is based primarily on morphology of the caudal appendages coupled with body coloration and should allow for identification of most specimens, although postmortem effects and variability in color patterns, especially regarding extension of pale/dark abdominal markings, render it less effective when identifying preserved specimens. Diagnostic details of the genital ligula should be examined when identifications are in doubt.

Keys to groups of males of *Argia* known from Mexico, Central America and the Lesser Antilles based on morphology of distal segment of genital ligula

Reference to illustrations is necessary to determine species based on morphology of genital ligula. While we have endeavored to illustrate typical examples for each species, allowances should be made for postmortem and preservation distortions especially pertaining to membranous parts of the distal segment. This key is essential when identifying males that have lost the abdominal appendages.

1. Distal segment lacking any flagellum or strap-like process (e. g., Figs. 593, 596, 609, 627, 657–660) **Key G-1**
- 1'. Distal segment with a flagellum or strap-like process (e. g., Figs. 592, 597, 601, 602, 608, 614) 2
- 2(1'). Distal segment with a single apical linear or curved flagellum-like or strap-like process, lacking a basal overlaying membranous hood (e. g., Figs. 602, 614, 618, 622, 623, 635) [NOTE: do not confuse terminal fold at flexure for basal hood] . . . **Key G-2**
- 2'. Distal segment with a single strap-like process or flagellum, or a bifid coiled flagellum attached to the underside of a basal membranous hood (e. g., Figs. 592, 601, 603, 620, 653), if basal hood absent then flagellum bifid (Figs. 625, 641) 3
- 3(2'). Distal segment with a single strap-like process or soft flexible flagellum (Figs. 604, 605, 637, 650, 653) [NOTE: The soft flexible flagellum in dried specimens often distorted; this structure best seen when distal segment is flexed at about 45°] **Key G-3**
- 3'. Distal segment with a bifid flagellum, usually coiled (e. g., Figs. 612, 625, 632, 641, 642, 654) 4
- 4(3'). Distal segment with a pair of chitinated multispinose branches arising from a narrow stem extending laterad of the ligula (e. g., Figs. 606, 607, 612, 632) in addition to a pair of lateral lobes at base near flexure (often hidden by membranous terminal fold) **Key G-4**
- 4'. Distal segment lacking a pair of multispinose lateral branches (e. g., Figs. 642, 654), although a pair of lateral lobes is usually present **Key G-5**

Key G-1 (distal segment lacking a flagellum or strap-like process)

1. Distal segment membranous, trowel-shaped, lacking any lateral lobes (Fig. 627); Arizona, New Mexico and Texas in the United States, south through Chihuahua, Durango, Sonora, Jalisco and Veracruz in Mexico (Fig. 770) **munda**
- 1'. Distal segment not trowel-shaped, with lateral lobes (e. g., Figs. 593, 596, 609, 657) 2
- 2(1'). Distal segment with a small anteapical process on its ental surface (Figs. 611a, c, 657a, c) 3
- 2'. Distal segment lacking an anteapical process on its ental surface (e. g., Figs. 593c, 609a, c, 610a, c, 616a, c, 643a, c, 659a, c, 660a, c) 4
- 3(2). Distal segment anteapical ental process digitiform (Fig. 611); paraproct in lateral view longer than high, with dorsal branch usually shorter than ventral branch (Fig. 680b); SE Arizona in the United States south through Oaxaca and Veracruz in Mexico (Fig. 771) **extranea**
- 3'. Distal segment anteapical ental process spatulate (Fig. 657); paraproct in lateral view about as long as high, with dorsal branch much longer than ventral branch (Fig. 751b); Sinaloa in Mexico south to Guatemala (Fig. 774) **variabilis**
- 4(2'). Distal segment anterior to lateral lobes narrow, subrectangular, about twice as long as wide or longer and roughly parallel-sided in ectal view (Figs. 609b, 649b, 651b) 5
- 4'. Distal segment anterior to lateral lobes shaped otherwise in ectal view (e. g., Figs. 593b–595b, 629b, 658b–660b) 7
- 5(4). Distal segment with a basal sclerotized keel-shaped boss in ectal view (Figs. 609b, 649b); wings usually hyaline; S4–6 blue with distal 0.25 black (Figs. 48, 136, 137) 6
- 5'. Distal segment lacking a basal sclerotized boss in ectal view (Fig. 651b); wings amber; S4–6 black (Figs. 141, 142); Costa Rica and Panama (Fig. 784) **terira**
- 6(5). Distal segment with basal boss bisected posteriorly in ectal view (Fig. 649b); ventral branch of paraproct well developed, triangular (Figs. 738a, b); S7 mostly black dorsally (Fig. 380) (Arizona and Sonora populations) or pale dorsally with a black

- lateral stripe (Fig. 381); SE Arizona in the United States south through Chiapas in Mexico (Fig. 775) **tarascana**
- 6'. Distal segment with basal boss not bisected posteriorly in ectal view (Fig. 609b); ventral branch of paraproct represented by a low bluntly curved bump (Figs. 678a, b); S7 mostly pale dorsally (Fig. 305); Chihuahua [see discussion] south to Mexico and Michoacán in Mexico (Fig. 775) **deami**
- 7(4'). Distal segment in ectal view with lateral lobes broadly explanate and bilobed, and apex of segment digitiform (Figs. 658b–660b), sometimes prolonged entally (primarily in specimens from the Sierra Nevada Mountains and areas to the E within the US; Fig. 658a); S British Columbia and W Alberta in Canada south through Montana, Washington and N Arizona in the United States and Baja California in Mexico (Fig. 772) **vivida**
- 7'. Distal segment in ectal view with lateral lobes not bilobed, visible (e. g., Figs. 593b, 610b, 616b) or not readily visible (e. g., Figs. 615b, 629b) in ectal view, and apex of segment capitate or bluntly rounded 8
- 8(7'). Distal segment in lateral view with ental tip slightly (e. g., Figs. 615a, 644a) to distinctly (Figs. 594a, 595a, 629a) enlarged, wider than preceding portion 9
- 8'. Distal segment in lateral view with ental tip not enlarged, not distinctly wider than preceding portion (Figs. 596a, 610a, 616a, 643a) 11
- 9(8). Distal segment in lateral view with lateral lobes falcate, and clearly visible in ectal view (Fig. 593b) [NOTE: the following three species cannot be separated based on morphology of genital ligula; see diagnosis under *anceps*] **anceps**, **fissa**, **westfalli**
- 9'. Distal segment in lateral view with lateral lobes broadly triangular at base (Fig. 629a), extending entally and usually not entirely visible in ectal view (Fig. 629b) 10
- 10(9'). Distal segment in lateral view with apex slightly enlarged, bluntly triangular in lateral view, and basal boss semicircular (Fig. 615a); in dorsal view cercus roundly quadrate, with distal side shorter than medial side, distance between cerci longer than width of each cercus (Figs. 687c, 689c); ventral branch of paraproct shorter than dorsal branch in lateral view (Figs. 687b, 689b); pale coloration blue (Fig. 65; populations E of Rocky Mountains in the United States and NE Mexico) or violaceous (Fig. 64; populations W of Rocky Mountains in the United States, W Mexico south through Veracruz to Honduras); central United States through Arizona and Texas south to Honduras (Fig. 772) **funbris**
- 10'. Distal segment in lateral view with apex slightly enlarged, bluntly triangular, and basal boss triangular projecting distally (Fig. 644a); in dorsal view cercus rhomboidal, with distal side about as long as medial side, distance between cerci less than width of each cercus (Fig. 729c); ventral branch of paraproct shorter than dorsal branch in lateral view (Fig. 729b); pale body coloration indigo (Arizona, Figs. 126–128) or blue (Jalisco); SE Arizona in the United States south to Jalisco in Mexico (Fig. 775) **sabino**
- 10''. Distal segment in lateral view with apex greatly enlarged, roundly capitate, and basal boss bluntly quadrate (Fig. 629a); in dorsal view cercus roundly trapezoidal with distal side longer than medial side, distance between cerci slightly longer than to about equal to width of each cercus (Fig. 711c); ventral branch of paraproct longer than dorsal branch in lateral view (Fig. 711b); pale coloration violaceous (Figs. 96, 349); Veracruz and Puebla in Mexico (Fig. 773) **noveloi**
- 11(8'). Distal segment with non-sclerotized boss transverse, best seen in ectal view (Fig. 643b), forming a slightly raised costate ridge in lateral view (Fig. 643a); cerci approximate, with their medial surfaces nearly contiguous in normal position (Fig. 728c); Atlantic slope of central Mexico in Tamaulipas, Hidalgo, Puebla and Veracruz (Fig. 773) **rudolphi**
- 11'. Distal segment with sclerotized boss directed longitudinally, best seen in lateral view (Fig. 610a) or absent (Figs. 596a, 616a); cerci not approximate, their medial surfaces separated by about the width of each cercus in normal position (Figs. 666c, 679c, 693c) 12
- 12(11'). Distal segment with a sclerotized boss (Fig. 610a); paraproct ventral branch much longer than dorsal branch (Fig. 679b); Chiapas and Los Tuxtlas region of S Veracruz in Mexico south through Panama (Fig. 771) **elongata**
- 12'. Distal segment lacking a raised sclerotized boss (Figs. 596a, 616a); paraproct ventral branch shorter than dorsal branch (Fig. 666b) to vestigial (Fig. 693b) 13
- 13(12'). Distal segment in ectal view with distance from base of arcuate lateral lobe to apex comparatively long, apex blunt, spatulate (Fig. 616b); wings usually slightly amber (Fig. 274); ventral branch of paraproct small (Fig. 693b); Costa Rica (Fig. 782) **haberi**
- 13'. Distal segment in ectal view with distance from base of arcuate lateral lobe to apex comparatively short, apex pointed (Fig. 596b); wings hyaline; ventral branch of paraproct well developed (Fig. 666b); Nuevo León and Jalisco south through Veracruz and Puebla in Mexico (Fig. 773) **annae**

Key G-2 (distal segment with a single apical flagellum or strap-like process, lacking a basal membranous hood)

1. Distal segment with a short flagellum-like process, distance between its base (distal to attachment of lateral lobes) and its apex about equal to distance between its base and flexure, with ental portion convex in lateral view and with large roughly trapezoidal lateral lobes curved entodistally (Figs. 602, 618); black lateral subbasal streaks on S3–6 present, giving each segment a lateral color pattern of anterior to posterior alternating sequence of pale, dark, pale, dark (Figs. 41, 78); 3 Fw pq 2
- 1'. Distal segment with a long flagellum-like or strap-like process, distance between its base (distal to attachment of lateral lobes) and its apex much longer than distance between its base and flexure, with ental portion linear in lateral view and lateral lobes variable (e. g., Figs. 613, 614, 628, 635, 646); lateral color pattern of each S3–6 variable but lacking alternating sequence of pale, dark, pale, dark (e. g., Figs. 29, 30, 34, 103, 116–119); 3 to 6 Fw pq 3
- 2(1). Apical flagellum-like process abruptly narrowing before apex in lateral view (Fig. 618a); pale coloration violaceous; dorsolateral

- subbasal streaks often united dorsally so that each S4–6 in dorsal view has an alternating pale, dark, pale, dark pattern (Fig. 78); South Dakota in the United States south to Honduras (Fig. 781) *immunda*
- 2'. Apical flagellum-like process gradually narrowing towards apex in lateral view (Fig. 602a); pale coloration blue; dorsolateral subbasal streaks usually separated dorsally so that each S4–6 in dorsal view is pale with a black apical ring (Fig. 41); S Arizona in the United States south to Oaxaca in Mexico (Fig. 781) *carlcooki*
- 3(1'). Distal segment with large sacroid lateral lobes and with an entally directed flared process on each side distal to them (Fig. 648); paraproct in lateral view with ventral branch vestigial or small and cercus with inner branch forming a posteroventrally directed tooth (Figs. 721b, 722b, 732b, 735b, 737b); S Mexico south through Costa Rica [NOTE: the following two species cannot be separated based on morphology of the genital ligula: *pocomana*, *talamanca*] 4
- 3'. Distal segment lacking an entally directed flared process on each side distal to lateral lobes (e. g., Figs. 597, 622, 635, 646); paraproct and cercus variable 5
- 4(3). Cercus in dorsal view with distal margin between inner and outer branches U-shaped, deeply concave (Figs. 721c, 722c); black middorsal stripe subequal in width to pale antehumeral stripe (Fig. 115); Jalisco in Mexico south through Panama (Fig. 785) *pocomana*
- 4'. Cercus in dorsal view with distal margin between inner and outer branches shallowly concave (Fig. 732c) or almost linear (Fig. 737c); black middorsal stripe reduced to a narrow line no wider than middorsal carina (Figs. 131–134) to one fourth as wide as antehumeral stripe (Fig. 135); Costa Rica south to Pacific slope of Colombia (Fig. 785) *talamanca*
- 5(3'). Distal segment with distal portion of lateral lobes curved at about a right angle appearing roundly geniculate in lateral view (Figs. 635a, 656a) 6
- 5'. Distal segment with lateral lobes not curved at a right angle in lateral view, these lobes quadrate (Figs. 614, 646), ovoid (Fig. 597), digitiform (Figs. 613, 622, 628, 634) or falcate (Figs. 623, 626) 7
- 6(5). Distal segment lacking a raised sclerotized boss (Fig. 635); medial margin of cercus in mediodorsal view slightly concave or almost linear (Fig. 717a); humeral stripe forked along its dorsal 0.25; S4–7 blue dorsally along basal 0.80 of each segment (Figs. 107, 357); smaller species (Hw 19.6–20.7; abdomen length 25.9–27.6; total length 32.8–35.3); Costa Rica (Fig. 782) *paulsoni*
- 6'. Distal segment with a raised sclerotized boss (Fig. 656); medial margin of cercus in mediodorsal view convex (Fig. 750a); humeral stripe not forked; S4–7 entirely black (Figs. 159, 393); larger species (Hw 21.3–26.1; abdomen length 28.1–32.8; total length 35.5–47.7); Costa Rica and Panama (Fig. 784) *underwoodi*
- 7(5'). Flagellum-like process long, linear, with a small ventral pedunculate process at basal 0.25–0.30 distal to basal small entolaterally directed quadrate lateral lobes (Fig. 646); torus small, confined to ventral margin of torifer, and torifer slightly concave and subtriangular, contiguous with its opposite along its entire medial margin, and both completely concealing bilobed epiproct in dorsal view (Fig. 730c); Costa Rica (Fig. 783) *schorri*
- 7'. Flagellum-like or strap-like process curved entally, lacking a small ventral pedunculate process distal to lateral lobes (Figs. 614, 622); torus large, often transverse (e. g., Fig. 663c), or small, subcircular and narrower than width of epiproct in dorsal view (Fig. 709c), or apically convex (Fig. 739c); torifer, if contiguous with its opposite, then not along its entire medial margin (Fig. 739c); epiproct fully exposed in dorsal view 8
- 8(7'). Distal segment with lateral lobes quadrate (Fig. 614a); larger species (Hw 33–38 mm); mostly orange (Figs. 62, 63) to dark brown (Fig. 61); Mexico south through El Salvador (Fig. 780) *funcki*
- 8'. Distal segment with lateral lobes ovoid (Fig. 597), digitiform (Figs. 613, 622, 628, 634) or falcate (Figs. 623, 626); smaller species (Hw 16–32 mm); violaceous (Figs. 57–60) to mostly black (Figs. 84, 85) 9
- 9(8'). Distal segment with lateral lobes represented by flattened ovoid flaps connected medially and diverging distally (Fig. 597); cercus in mediodorsal view with inner branch represented by a long, ventrally pointed tooth, followed distally by a smaller blunt tooth (Fig. 667a); thoracic black middorsal stripe confined to middorsal carina (Figs. 34, 35); SE Canada south to Florida and west to Arizona in the United States, and Nuevo León in Mexico (Fig. 799) *apicalis*
- 9'. Distal segment with lateral lobes not as above, these digitiform (Fig. 613, 622, 628, 634) or bluntly falcate (Fig. 623a); cercus in mediodorsal view with inner branch not represented by a long ventrally pointed tooth (e. g., Figs. 696a, 705a); thoracic black middorsal stripe variable 10
- 10(9'). Distal segment with a relatively broad (Fig. 623b) apical strap-like process, and lateral lobes falcate and membranous (Fig. 623a) [NOTE: lobes may be difficult to see if partially hidden by terminal fold; these lobes are best seen in entolateral view]; South Dakota south to Texas and west to California in the United States south through S Mexico (Fig. 780). *lugens*
- 10'. Distal segment with a flagellum-like process, and lateral lobes digitiform and sclerotized or darkened (Figs. 613, 622, 628, 633b, 634) [NOTE: the following eight species cannot be separated based on morphology of the genital ligula; see Key to males based on appendage morphology, couplet 9] *agrioides*, *alberta*, *fumipennis*, *hinei*, *nahuana*, *leonorae*, *pallens*, *paludicola*

Key G-3 (distal segment with a single flagellum or strap-like process and a basal membranous hood)

1. Distal segment with a strap-like process attached to underside of a short ovoid basal hood (e. g., Figs. 605, 626) 2
- 1'. Distal segment with a soft flexible flagellum attached to underside of a long trowel shaped basal hood (Figs. 604, 637, 653) 3
- 2(1'). Distal segment with basal hood narrower than strap-like process at base (Fig. 626b); lateral lobes falcate and membranous (Fig. 626a); SE Canada south to Florida and California in the United States and Michoacán in Mexico (Fig. 780) *moesta*
- 2'. Distal segment with basal hood wider than strap-like process at base (Figs. 605b, d); lateral lobes digitiform and not sclerotized

- or darkened (Fig. 605d); Lesser Antilles [NOTE: the following two species cannot be separated based on morphology of the genital ligula; see diagnosis under *concinna*] ***concinna*, *telesfordi***
- 3(1'). Distal segment lateral lobes entirely membranous, represented by a small low broadly-based triangle directed entally (Fig. 653a, c); humeral stripe not forked (Figs. 146–149); Arizona and New Mexico in the United States south through Hidalgo and Mexico in Mexico (Fig. 777) ***tonto***
- 3'. Distal segment lateral lobes partially (along outer margin; Figs. 604a, c, d) to entirely (Fig. 637) sclerotized, falcate and directed basally (Figs. 604a, c, d) or auriculate and directed outwardly (Fig. 637b); humeral stripe forked (Fig. 112); Arizona in the United States south through Costa Rica 4
- 4(3'). Distal segment lateral lobes falcate, with only outer margin sclerotized, directed basally, and located at about basal 0.25 of segment (Figs. 604a, c, d); cercus chelate, with a ventral lobe appressed distally to cercus (best seen in mediodorsal view, Fig. 674a); inner branch of cercus longer than outer branch (Fig. 674c); S8–10 usually with (rarely without) a ventral black stripe (Fig. 299); S Mexico south through W Panama (Fig. 778) ***chelata***
- 4'. Distal segment lateral lobes auricular, entirely sclerotized, directed outwardly, and located at about basal 0.33 of segment (Fig. 637b); cercus not chelate, no ventral lobe appressed distally to cercus (Figs. 703a, 719a); inner branch of cercus subequal to (Fig. 719c) or shorter than (Fig. 703c) outer branch; S8–10 lacking a ventral black stripe (Figs. 338, 360) [NOTE: the following two species cannot be separated based on morphology of the genital ligula; see Key M5, couplet 15] ***lacrimans*, *pima***

Key G-4 (distal segment with a bifid flagellum and a pair of lateral multispinose branches)

1. Dorsum of mesothorax dark with metallic copper or red reflections (Figs. 40, 46, 47, 55, 56, 101, 102) 2
- 1'. Dorsum of mesothorax blue with black middorsal and humeral stripes (Figs. 36, 37, 73, 80, 110, 111, 113, 114) 7
- 2(1). Dorsum of S2–6 entirely black except for a narrow basal blue ring (Figs. 47, 55) 3
- 2'. Dorsum of S2–6 with the basal half or more blue (Figs. 40, 46, 56, 102) or violet (Fig. 101) 4
- 3(2). Basal membranous hood of distal segment broadly campanulate basally in ectal view (Fig. 612b); Costa Rica and Panama south to Colombia and Ecuador west of the Andes (Fig. 791) ***fulgida*** (in part)
- 3'. Basal membranous hood of distal segment linear, digitiform in ectal view (Fig. 607b); Texas in the United States and Sonora in Mexico south through Honduras (Fig. 790) ***cuprea***
- 4(2'). Basal membranous hood of distal segment subquadrate, about as long as wide (Fig. 632b); labrum pale except for dark medial spot (as in Fig. 26); paraproct with both branches small and of about the same size, separated by an acute angle (Fig. 713b); Arizona and Texas in the United States and Baja California in Mexico south to central Panama (Fig. 790) ***oenea***
- 4'. Basal membranous hood of distal segment longer than wide (Figs. 601b, 606b, 612b); basal half or more of labrum dark metallic (Fig. 25); paraproct with dorsal and ventral branches unequal in size, strongly divergent, separated by an obtuse angle (Figs. 671b, 676b, 683b) 5
- 5(4'). Basal membranous hood of distal segment in ectal view relatively broad, its sides largely parallel (Fig. 601b); medial margin of cercus in mediodorsal view strongly arched, with apical portion curved ventrally at about 90° (Fig. 671a); larger species (Hw 23.8–27.6 mm; total length 40.8–47.0 mm); Costa Rica and Panama (Fig. 791) ***calverti***
- 5'. Basal membranous hood of distal segment in ectal view not parallel sided (Figs. 606b, 612b); medial margin of cercus in mediodorsal view linear (Fig. 676a) or arched with apical portion curved ventrally at about 45° (Fig. 683a); smaller species (Hw 18.4–23.4 mm; total length 36.1–43.0 mm) 6
- 6(5'). Basal membranous hood of distal segment in ectal view gradually narrowing apically (Fig. 606b); medial margin of cercus in mediodorsal view approximately linear (Fig. 676a); S Guatemala south through Colombia and east to Venezuela (Fig. 791) ***cupraurea***
- 6'. Basal membranous hood of distal segment in ectal view campanulate, abruptly narrowing apically in lateral view (Fig. 612b); medial margin of cercus in mediodorsal view arched ventrally at about 45° (Fig. 683a); Costa Rica and Panama south to Colombia and Ecuador west of the Andes (Fig. 791) ***fulgida*** (in part)
- 7(1'). Paraproct with ventral branch vestigial and usually with two subequal digitiform lobes close together on posterodorsal margin (Fig. 694b); SE Arizona in the United States south to Oaxaca along W Mexico (Fig. 792) ***harknessi***
- 7'. Paraproct with ventral branch well developed and lacking two subequal digitiform lobes close together on posterodorsal margin (Figs. 668b, 700b, 701b, 718b, 720b) 8
- 8(7'). Basal membranous hood of distal segment in ectal view subquadrate, slightly longer than wide (Fig. 636b); paraproct in lateral view with tip of dorsal branch directed anterodorsally and ventral branch small, narrow (Fig. 718b); S2–4, 8 black except for a narrow blue basal ring (Figs. 110, 358, 359); Puebla and Veracruz in Mexico south to Guatemala (Fig. 792) ***percellulata***
- 8'. Basal membranous hood of distal segment in ectal view elongate, at least twice as long as wide (Fig. 620b); paraproct in lateral view with tip of dorsal branch directed posterodorsally and ventral branch robust, subequal in size to dorsal branch (Figs. 668b, 700b, 701b, 720b); S2–4, 8 mostly blue dorsally (Figs. 37, 80, 113, 294, 336, 361, 362) [NOTE: the following three species cannot be separated based on morphology of the genital ligula; see diagnosis under *barretti*] ***barretti*, *insipida*, *pipila***

Key G-5 (distal segment with a bifid flagellum and lacking a pair of lateral multispinose branches)

1. Ental surface of distal segment distal to flexure enlarged in the form of a semicircular or keel-like medio-longitudinal membranous process (Figs. 630a, c, 642a, 654a) 2
- 1'. Ental surface of distal segment distal to flexure smooth, with no semicircular or keel-like membranous process (e.g., Figs. 592a, 598a, 625a, 655a) 4
- 2(1). Distal segment with lateral lobes membranous (Figs. 654a–c); ental process keel-like, expanded laterally with its distal portion forming a shallow concave process; basal hood long, narrow, digit-like (Fig. 654b); torus small, largely confined to lateral portion of torifer (Figs. 743a, c, 744a); cercus in dorsal view unbranched, its posterior margin almost linear (Figs. 743c, 744c); widespread from SE Ontario in Canada south through NW Argentina (Fig. 793) *translata*
- 2'. Distal segment with lateral lobes sclerotized, darkened (Figs. 630a–c, 642a–c); ental process semicircular; basal hood represented by a pair of small lateral digit-like processes (Figs. 642a–c) or saddle-like (Figs. 630a–c); torus transversely elongate, occupying posterior portion of torifer (Figs. 712a, c, 727a, c); in dorsal view cercus divided (Fig. 712c), or rounded (Fig. 727c) 3
- 3(2'). Basal hood saddle-like with an ectal lobe and paired (left and right) rounded lobes overlying and partially covering ental keel laterally (Figs. 630a, c), but left and right basal hood lobes greatly reduced in more southerly populations, Fig. 631a; lateral lobes capitate (Figs. 630, 631); in dorsal view, cercus divided (Fig. 712c); postocular spots present (Figs. 97, 98, 100); SE Arizona south through Bolivia (Fig. 794) *oculata*
- 3'. Basal hood represented by paired (left and right) small digit-like processes along each side flagellum base (Fig. 642); lateral lobes digitiform, not widened distally (Fig. 642); in dorsal view, distal margin of cercus convex, not divided apically (Fig. 727c); postocular spots absent (Figs. 123, 124); Costa Rica and Panama (Fig. 783) *rogersi*
- 4(1'). Flagellum base arching entally towards basal segment (Figs. 592a, c, 598a, c, 599a, 603a, c, 655a, c); basal membranous hood broad, quadrate or broadly elongate (Fig. 592b, 598b, 603b, 617b, 655b); lateral lobes present (Figs. 592a, c, 598–600, 603, 617, 655a, c) 5
- 4'. Flagellum base linear, not arching entally towards basal segment (Figs. 619a, 621a, 624a, 625a, 638–641a, 652a); basal membranous hood absent (Fig. 625b) or narrow and digit-like (Figs. 619b, 621b, 624b, 638–641b, 652b); lateral lobes present (Figs. 619, 624, 625, 638–640, 641a, 647, 652) or absent (Fig. 621) 8
- 5(4). Basal membranous hood broadly elongate (Fig. 592b); lateral lobes appressed at base of distal segment with tips broadly capitate (Figs. 592a, c); Honduras south to Bolivia and Acre State in Brazil (Fig. 795) *adamsi*
- 5'. Basal membranous hood quadrate (Figs. 598b, 603b, 617b, 655b); lateral lobes aciculate, falcate, or bluntly pointed (Figs. 598–600, 603, 617, 655a, c) 6
- 6(5'). Lateral lobes small and subtriangular, about as wide as long (Figs. 617a, c); cercus in dorsal view subquadrate, its distal margin almost linear (Fig. 695c); Sonora through W flank of Mexico south to N Guatemala (Fig. 796) *herberti*
- 6'. Lateral lobes aciculate (Figs. 598–600, 603, 655a, c), much longer than wide; with a narrow U-shaped concavity at base of inner margin separating lateral lobe from lateral margin of distal segment (Figs. 598–600) or with inner margin appressed along lateral margin of distal segment (Figs. 603, 655a, c); cercus in dorsal view divided into inner and outer branches (Figs. 669c, 673c, 690c, 745c–749c) 7
- 7(6'). Lateral lobe with a narrow U-shaped concavity at base of its inner margin separating lateral lobe from lateral margin of distal segment (Figs. 598–600); inner branch of cercus digitiform, narrower than half the width of outer branch and subequal in length in dorsal view (Figs. 669c, 690c) [NOTE: the following two species cannot be separated based on morphology of the genital ligula; see diagnosis under *calida*] *calida*, *garrisoni*
- 7'. Lateral lobe with inner margin appressed along lateral margin of distal segment (Figs. 603, 655a, c); inner branch of cercus about as wide as outer branch and slightly to distinctly longer in dorsal view (Figs. 673c, 745c–749c) [NOTE: the following two species cannot be separated based on morphology of the genital ligula; see diagnosis under *carolus*] *carolus*, *ulmeca*
- 8(4'). Flagellum bifid along its distal 0.20 only (Fig. 625b); thoracic black middorsal stripe slightly wider than middorsal carina (Figs. 71, 90); S2–9 blue dorsally, ventrolaterally each segment with an uninterrupted longitudinal black stripe (Figs. 71, 90, 326, 343) [NOTE: the following two species cannot be separated based on morphology of the genital ligula; see diagnosis under *gonzalezi*] *gonzalezi*, *medullaris*
- 8'. Flagellum bifid along its distal 0.50 to its entire length (Figs. 619b, 621b, 624b, 638–641b, 652b); thoracic and abdominal color otherwise 9
- 9(8'). Distal segment lacking lateral lobes (Fig. 621); paraproct elongate, spatulate with apical half abruptly curved mediodorsally (Figs. 702a, b); Honduras south to Panama (Fig. 797) *johannella*
- 9'. Distal segment with lateral lobes although these may be small (Figs. 619, 624, 638–640, 641a, 647, 652); paraproct variable, apical half not abruptly curved mediodorsally (e.g., Figs. 698a, 699b, 706a, b, 731a, b) 10
- 10(9'). Distal segment with small, entirely membranous digitiform lateral lobes, located distal to base of flexure (Figs. 647a, b); paraproct divided into two branches, the ventral triangular branch longer, its dorsal margin serrate (Fig. 731b); SE Canada south through S Mexico (Fig. 797) *sedula*
- 10'. Distal segment with entirely (Figs. 619, 638–640, 652) to partially (Fig. 641) sclerotized lateral lobes, located distal to base of flexure (Figs. 638, 639) or at base near flexure (e.g., Figs. 640, 641a); paraproct unilobate (Fig. 726b), trilobate (Figs. 682b, 691b, 725b) or, if bilobate, both branches subequal and dorsal margin of ventral branch not serrate (e.g., Fig. 741b) 11
- 11(10'). Distal segment with lateral lobes not appressed and lying parallel to base of segment (Figs. 619, 624, 638, 639); paraproct divided into two subequal acute branches (Fig. 723b) or with ventral branch vestigial (Figs. 699b, 706b); S Mexico south to Ecuador 12

- 11'. Distal segment with lateral lobes appressed and lying parallel to base of segment (Figs. 640, 641a, 652); paraproct variable. 13
- 12(11). Distal segment with lateral lobes short and broadly based, armed with a small spine or tubercle (Fig. 638f) (sometimes hidden by terminal fold, Fig. 639e); basal membranous hood shorter, terminating well before bifurcation of flagellum (Figs. 638b, 639b); paraproct divided into two subequal acute branches (Fig. 723b); S Mexico south to Ecuador (Fig. 782) ... **popoluca**
- 12'. Distal segment with lateral lobes falcate, lacking a small spine or tubercle (Figs. 619, 624); basal membranous hood longer, terminating at or distal to bifurcation of flagellum (Figs. 619b, 624b); paraproct with ventral branch vestigial or very small (Figs. 699b, 706b) [NOTE: the following two species cannot be separated based on morphology of the genital ligula; see Key to males based on appendage morphology, couplet 10] **indicatrix, mayi**
- 13(11'). Distal segment with lateral lobes entirely sclerotized and terminating in a slightly arcuate spine (Fig. 652); Fw usually with five pq (Fig. 282); Arizona and New Mexico in the United States south through W Mexico to Costa Rica (Fig. 793) .. **tezpi**
- 13'. Distal segment with lateral lobes entirely or partially sclerotized and terminating in a digit-like process (Figs. 640, 641a); Fw usually with three (Fig. 280) or four pq (Fig. 281) 14
- 14(13'). Distal segment with lateral lobes digitiform and sclerotized only at tip (Fig. 641a); cercus in dorsal view with distal margin almost linear (Fig. 726c); Texas in the United States to NE Mexico (Fig. 799) **rhoadsii**
- 14'. Distal segment with lateral lobes spatulate and entirely sclerotized (Fig. 640); cercus in dorsal view with distal margin slightly emarginate (Figs. 682c, 691c) or with U-shaped cleft between inner and outer branches (Fig. 725c) [NOTE: the following three species cannot be separated based on morphology of the genital ligula; see diagnosis under *frequentula*] **frequentula, gaumeri, pulla**

Key to groups of males of *Argia* known from Mexico, Central America and the Lesser Antilles based primarily on appendage morphology and color pattern

These keys are based primarily on morphology of the caudal appendages coupled with body coloration and should allow identification of most specimens, although postmortem effects and variability in color patterns, especially regarding extension of pale/dark abdominal markings, render their use less effective in identifying preserved specimens. Diagnostic details of the genital ligula are included in these keys and should be employed when identifications are in doubt. Proper exposure of the caudal appendages by relaxing and spreading them may be necessary for character discrimination, as most preserved specimens have the cercus resting against the paraproct, and diagnostic structures of the medial surface will not be visible. Reference to illustrations should help determine specimens in the following keys. Our mediodorsal illustrations have been drawn with the right cercus distal and medial margins at the same focus. According to the degree of spreading of the cerci, specimens may differ from the illustrated view of the epiproct, opposite (left) cercus, and paraprocts, and their shape may appear different in specimens that have not been relaxed.

1. Dorsum of mesothorax dark with metallic copper or red reflections (Figs. 40, 46, 47, 55, 56, 101, 102); when mature, eyes bright red in life (e.g., Figs. 6, 9, 10, 18). **Key M-I**
- 1'. Dorsum of mesothorax pale, usually with dark middorsal stripe of varying width (e. g., Figs. 38, 39, 41–45, 48–54, 57, 58, 62, 63, 86–91, 98–100, 103–108), or in some old males, entire dorsum dark (Figs. 61, 84) or pruinose (Figs. 92, 109–111); when mature, eyes not bright red in life, either black or some shade of blue, or less commonly purple, green or brown (e.g., Figs. 802–854) 2
- 2(1'). Inner branch of cercus represented by a long, ventrally pointed tooth, followed distally by a smaller blunt tooth in mediodorsal view (Fig. 667a); black middorsal stripe a mere line, not wider than middorsal carina (Figs. 34, 35) and S2–5 mostly black middorsally (Fig. 35); lateral lobes of distal segment of genital ligula represented by flattened ovoid flaps connected medially and diverging distally (Fig. 597); SE Canada south to Florida and Arizona in the United States and Nuevo León in Mexico (Fig. 799) **apicalis**
- 2'. Inner branch of cercus represented by a small ventral tooth (e. g., Fig. 702a) or a mesoventrally directed blunt lobe (e. g., Fig. 674a); black middorsal stripe variable but if narrow (Figs. 146–149), then S2–5 mostly pale middorsally (Fig. 146); lateral lobes of distal segment of genital ligula, if present, not as above (e. g., Figs. 596, 598–600) 3
- 3(2'). Paraproct elongate, spatulate with apical half abruptly curved mediodorsally (Figs. 702a, b); Honduras south to Panama (Fig. 797) **johannella**
- 3'. Paraproct with apical half not curved abruptly mediodorsally (e. g., Figs. 673b, 704b) 4
- 4(3'). Torifer slightly concave and subtriangular with small apical rim-like torus, contiguous with its opposite along its entire medial margin, completely concealing bilobed epiproct in dorsal view (Fig. 730c); Costa Rica (Fig. 783) **schorri**
- 4'. Torifers and tori in dorsal view not entirely concealing epiproct, which is visible at least partially (e. g., Figs. 675c, 739c) .. 5
- 5(4'). Cercus in dorsal view forcipate with inner branch forming a medially directed curved robust tooth (Fig. 673c), in lateral view directed posteriorly and longer than to subequal to paraproct (Fig. 673b); Costa Rica (Fig. 783) **carolus**
- 5'. Cercus in dorsal view not forcipate (e. g., Fig. 745c), if appearing forcipate in dorsal view (Fig. 674c), then directed ventrally

	in lateral view and subequal or shorter than paraproct (e. g., Figs. 674b, 745b)	6
6(5').	Cercus chelate, with a ventral lobe appressed distally to roof of cercus (best seen in mediodorsal view, Fig. 674a); S Mexico south through W Panama (Fig. 778)	<i>chelata</i>
6'.	Cercus not chelate, no ventral lobe appressed distally to roof of cercus (e. g., Figs. 675a, 745a)	7
7(6').	Paraproct with two subequal digitiform lobes close together on posterodorsal margin (Figs. 682a, b, 691a, b, 694a, b, 725a, c)	Key M-2
7'.	Paraproct lacking two subequal digitiform lobes close together on posterodorsal margin (e. g., Figs. 678a, b, 698a, 699b, 706a, b)	8
8(7').	Paraproct divided into dorsal and ventral branches, and ventral branch longer than dorsal branch (Figs. 679a, b, 680a, b, 711a, b, 744a, b)	Key M-3
8'.	Paraproct unilobate (Figs. 686a, b, 705a, b, 726a, b), or, if divided into dorsal and ventral branches, then ventral branch subequal to or shorter than dorsal branch (e. g., Figs. 684a, b, 706a, b, 707a, b, 712a, b, 713a, b, 723a, b, 743a, b)	9
9(8').	Cercus in posterior view with a recessed black decumbent tooth (Figs. 662d, 684d, 685d, 704d, 710d, 714d) or a black convex ridge (Fig. 696d) on distal margin between inner and outer branches; largely pale species (Figs. 29, 57–60, 77, 83, 94, 95, 103–105, 288, 314, 315, 332, 339, 347, 348, 355)	Key M-4
9'.	Cercus in posterior view lacking a recessed black tooth or ridge on distal margin between inner and outer branches (e. g., Figs. 666d, 688d, 699d, 724d, 732d, 752d); color variable	10
10(9').	Cercus with inner branch recessed and not visible in dorsal view (Fig. 698c), inner branch located at about 0.50–0.70 of cercus, and outer branch distinctly longer than inner branch in mediodorsal view, cercus appearing as a hand with index finger pointed (Fig. 698a); Veracruz in Mexico south through Peru and east to central Venezuela and Amazonas State in Brazil (Fig. 798)	<i>indicatrix</i>
10'.	Cercus variable, but never appearing as a hand with index finger pointed in mediodorsal view (e. g., Figs. 700a–703a)	11
11(10').	Paraproct ventral branch, in both lateral and inner mediodorsal views, distinctly smaller than dorsal branch, from about twice as small as dorsal branch (e. g., Figs. 718a, b, 721a, b, 722a, b, 750a, b, 753a, b) to vestigial (e. g., Figs. 681a, b, 706a, b, 708a, b, 740a, b) or absent (e. g., Figs. 686a, b, 705a, b, 726a, b)	Key M-5
11'.	Paraproct ventral branch, in both lateral and inner mediodorsal views, more or less subequal to dorsal branch, from about one and a half times smaller (Figs. 666a, b, 675a, b, 687a, b, 700a, b, 712a, b, 727a, b, 739a, b, 745a, b) to equal (Figs. 661a, b, 697a, b, 701a, b, 742a, b) or slightly larger (Figs. 668a, b, 689a, b), to distinctly larger than ventral branch (Figs. 716a, b)	Key M-6

Key M-1 (metallic species)

1.	Dorsum of S2–6 entirely black except for a narrow basal blue ring (Figs. 47, 55)	2
1'.	Dorsum of S2–6 with the basal half or more blue (Figs. 40, 46, 56, 102) or violet (Fig. 101)	3
2(1).	Basal membranous hood of distal segment broadly campanulate basally in ectal view (Figs. 612b); Costa Rica and Panama south to Colombia and Ecuador west of the Andes (Fig. 791)	<i>fulgida</i> (in part)
2'.	Basal membranous hood of distal segment linear, digitiform in ectal view (Fig. 607b); Texas in the United States and Sonora in Mexico south through Honduras (Fig. 790)	<i>cuprea</i>
3(1').	Labrum pale except for dark medial spot (Fig. 26); paraproct with both branches small and of about the same size, separated by an acute angle (Fig. 713b); basal membranous hood of distal segment subquadrate, about as long as wide (Fig. 632b); Arizona and Texas in the United States and Baja California in Mexico south to central Panama (Fig. 790)	<i>oenea</i>
3'.	Basal half or more of labrum dark metallic (Fig. 25); paraproct with dorsal and ventral branches unequal in size, strongly divergent, separated by an obtuse angle (Figs. 671b, 676b, 683b); basal membranous hood of distal segment longer than wide (Figs. 601b, 606b, 612b)	4
4(3').	Medial margin of cercus in mediodorsal view strongly arched, with apical portion recurved ventrally at about 90° (Fig. 671a); basal membranous hood of distal segment in ectal view relatively broad, its sides largely parallel (Fig. 601b); larger species (Hw 23.8–27.6 mm; total length 40.8–47.0 mm); Costa Rica and Panama (Fig. 791)	<i>calverti</i>
4'.	Medial margin of cercus in mediodorsal view linear (Fig. 676a) or arched with apical portion curved ventrally at about 45° (Fig. 683a); basal membranous hood of distal segment in ectal view not parallel sided (Figs. 606b, 612b); smaller species (Hw 18.4–23.4 mm; total length 36.1–43.0 mm)	5
5(4').	Medial margin of cercus in mediodorsal view approximately linear (Fig. 676a); basal membranous hood of distal segment in ectal view gradually narrowing apically (Fig. 606b); Guatemala south through Colombia and east to Venezuela (Fig. 791)	<i>cupraurea</i>
5'.	Medial margin of cercus in mediodorsal view arched ventrally at about 45° (Fig. 683a); basal membranous hood of distal segment in ectal view campanulate, abruptly narrowing apically in lateral view (Fig. 612b); Costa Rica and Panama south to Colombia and Ecuador west of the Andes (Fig. 791)	<i>fulgida</i> (in part)

Key M-2 (paraproct with two subequal digitiform lobes on posterodorsal margin)

1.	Cercus in medioposterior view with inner branch directed posteroventrally (Figs. 694a, 725a), in dorsal view divided forming two subequal branches separated by a U-shaped cleft (Figs. 694c, 725c)	2

- 1'. Cercus in medioposterior view with inner branch recessed, directed ventrally (Figs. 682a, 691a), in dorsal view with distal margin slightly emarginate (Figs. 682c, 691c) 3
- 2(1). Torus about as wide as space between tori (Fig. 725c); smaller species (Hw 13.2–18.4; abdomen length 20–26.3; total length 25.5–32.1); genital ligula distal segment lacking a pair of lateral multispinose branches in addition to lateral lobes (Fig. 640); Sonora in N Mexico south to Peru and east to Venezuela and N Brazil (Fig. 801) ***pulla***
- 2'. Torus much narrower than space between tori (Fig. 694c); larger species (Hw 20.7–24.5; abdomen length 27.5–33.7; total length 35.7–43.4); genital ligula distal segment with a pair of lateral multispinose branches in addition to lateral lobes (as in Fig. 620a); SE Arizona in the United States south to Oaxaca along W Mexico (Fig. 792) ***harknessi*** (in part)
- 3(1'). Pale coloration blue and S8–10 mostly pale (Fig. 325); flexor surface of femur and extensor surface of tibia blue in fully mature specimens; Veracruz in Mexico and Yucatán Peninsula south to N Honduras (Fig. 800) ***gaumeri***
- 3'. Pale coloration violaceous and S8–10 with a black lateral stripe ventrally (Fig. 311); legs entirely black, occasionally with a thin pale line on extensor surface of tibia; San Luis Potosí in Mexico south to Panama (Fig. 800) ***frequentula***

Key M-3 (paraproct bilobed with ventral branch longer than dorsal)

1. Cercus inner branch apical and decumbent in mediodorsal view (Figs. 731a, 744a); torus poorly defined, and torifers diverging distally at about 45° from each other (Figs. 731c, 743c); distal segment of genital ligula with a bifid flagellum (Figs. 647, 654); dorsum of S4–7 largely black with pale basal rings (Figs. 130, 150, 151, 376, 388, 389) 2
- 1'. Cercus inner branch subapical, recessed along mesal margin in mediodorsal view (Figs. 679a, 680a, 711a); torus well developed, occupying most of torifer, and torifers approximately parallel to each other (Figs. 679c, 680c, 711c); distal segment of genital ligula lacking flagella (Figs. 610, 611, 629); dorsum of S4–7 largely pale with dark dorsolateral postbasal streaks (Figs. 49, 50, 96, 306–309, 349) 3
- 2(1). In dorsal view cercus linear, twice as long as wide, and torifers adjacent at base along 0.33 of their length (Fig. 731c); dorsal margin of ventral branch of paraproct serrate (Figs. 731a, b); SE Canada south through S Mexico (Fig. 797) ***sedula***
- 2'. In dorsal view cercus bluntly pointed, less than twice as long as wide, and torifers separated at base (Fig. 743c); dorsal margin of ventral branch of paraproct linear, not serrate (Figs. 744a, b); widespread from SE Ontario in Canada south through NW Argentina (Fig. 793) ***translata*** (in part)
- 3(1'). Pale coloration violaceous (Figs. 96, 349); cercus posterior margin convex in dorsal view (Fig. 711c), with inner branch represented by a decumbent tooth at about 0.50 (Fig. 711a); tip of cercus in lateral view dome-like, exposing ventral surface of cercus (Fig. 711b); Veracruz and Puebla in Mexico (Fig. 773) ***noveloi***
- 3'. Pale coloration blue (Figs. 49, 50, 306–309); cercus posterior margin broadly emarginate or linear in dorsal view (Figs. 679c, 680c), with inner branch represented by a decumbent tooth at basal 0.30 to 0.50 (Figs. 679a, 680a); tip of cercus in lateral view not exposing ventral surface of cercus (except for decumbent tooth) (Figs. 679b, 680b) 4
- 4(3'). Cercus in mediodorsal view with outer branch often represented by a tubercle, this area immediately preceded by a recessed area; inner branch represented by a decumbent tooth at approximately basal 0.30 of margin (Fig. 680a); ventral branch of paraproct less than 1.5 times as long as dorsal branch (Fig. 680b); distal segment of genital ligula with a small digitiform anteapical process arising on its ental surface (Figs. 611a, c); sides of S8–9 marked with black (Fig. 309); SE Arizona in the United States to Oaxaca, Tamaulipas south to Veracruz in Mexico (Fig. 771) ***extranea*** (in part)
- 4'. Cercus in mediodorsal view with outer branch not produced into tubercle, no recessed area preceding this area; inner branch represented by a decumbent tooth at approximately 0.50 of margin (Fig. 679a); ventral branch of paraproct about 1.7–2 times as long as dorsal branch (Fig. 679b); distal segment of genital ligula lacking an ental anteapical process (Figs. 610a, c); sides of S8–9 pale or mostly so (Figs. 306–308); S Veracruz to Chiapas in Mexico south through Panama (Fig. 771) ***elongata***

Key M-4 (cercus with a recessed black decumbent tooth or convex ridge between inner and outer branches)

1. Cercus in posterior view with a black convex ridge between inner and outer branches (Fig. 696d); dorsal branch of paraproct with a small anteapical tooth (Figs. 696a, b); S California, Arizona, New Mexico, and Texas in the United States south through Sinaloa in Mexico (Fig. 788) ***hinei***
- 1'. Cercus in posterior view with a black tooth between inner and outer branches (Figs. 662d, 684d, 685d, 704d, 710d, 714d); dorsal branch of paraproct sometimes ending on an apical tooth but lacking an anteapical tooth (Figs. 662b, 684b, 704b, 710b, 714b) 2
- 2(1'). Inner branch of cercus directed mesoventrally and clearly visible in dorsal view, so that cercus appears distinctly wider at apex than at base (Fig. 710c); S Oregon, California, Arizona, New Mexico, and Texas in the United States, south to central Mexico (Fig. 786) ***nahuana***
- 2'. Inner branch of cercus directed ventrally or ventrolaterally and not clearly visible in dorsal view, so that cercus appears about as wide at apex as at base (Figs. 662c, 684c, 704c, 714c) 3
- 3(2'). Tooth between inner and outer branches small, inconspicuous, less prominent than inner branch in posterior view (Fig. 704d); smaller species (Hw 16–18 mm); 3 Fw pq; pale coloration blue (Fig. 83); Texas in the United States south through Nuevo León in Mexico (Fig. 788) ***leonorae***

- 3'. Tooth between inner and outer branches easily visible, as prominent as inner branch in posterior view (Figs. 662d, 684d, 685d) or, if not (Fig. 714d) pale coloration pink violet (Figs. 103–105); larger species (Hw 17–25 mm); usually 4 Fw pq, rarely 3 or 5 4
- 4(3'). Space separating tori about as wide as or wider than width of each torus (Fig. 662c); pale coloration blue (Fig. 29); central and S Oregon, California, and Arizona in the United States and Baja California in Mexico (Fig. 787) *agrioides*
- 4'. Space separating tori narrower than width of each torus (Figs. 684c, 714c); pale coloration violaceous (Figs. 57–60), or pink-violet (Figs. 103–105) 5
- 5(4'). In dorsal view space between cerci as wide as or narrower than width of each cercus at base, and tooth between inner and outer branches of cercus not easily visible (Fig. 684c); in posterior view tooth separated from outer branch by a shallow concavity (Figs. 684d, 685d); humeral stripe usually forked (Figs. 57–60); widespread from Arizona east through E United States, N and central Mexico (Fig. 787) *fumipennis violacea*
- 5'. In dorsal view space between cerci wider than width of each cercus at base, and tooth between inner and outer branches of cercus easily visible (Fig. 714c); in posterior view tooth separated from outer branch by a deep U-shaped concavity (Fig. 714d); pink-violet species (Figs. 103–105); SW United States south to Guatemala (Fig. 786) *pallens*

Key M-5 (paraproct ventral branch distinctly smaller than dorsal branch)

1. Paraproct ventral branch absent or vestigial (Figs. 681a, b, 686a, b, 694a, b, 705a, b, 706a, b, 708a, b, 726a, b, 735b, 737a, b, 740a, b) 2
- 1'. Paraproct ventral branch small but distinct (Figs. 721a, b, 722a, b, 732a, b, 750a, b) 11
- 2(1). Medial margins of cerci in dorsal view contiguous or nearly so (Fig. 681c); inner branch represented by a decumbent tooth located at basal 0.30–0.40 of cercus in mediodorsal view (Fig. 681a); S half of Costa Rica south through cordilleran region of Colombia (Fig. 776) *fissa*
- 2'. Medial margins of cerci in dorsal view separated by a gap about as wide as basal width of each cercus or wider (Figs. 686c, 694c, 705c, 706c, 708c, 726c, 737c, 740c); inner branch of cercus, represented by a decumbent tooth or lobe, located at distal 0.60 (Fig. 726a) to subapical or apical (Figs. 686a, 694a, 705a, 706a, 708a, 733a, 734a, 737a, 740a) in mediodorsal view 3
- 3(2'). Tori in dorsal view transversely elongate, about three times as wide as long, separated from each other by a distance shorter than the width of each torus (Figs. 706c, 726c, 737c) 4
- 3'. Tori in dorsal view approximately circular or elliptical, twice as long as wide or less, separated from each other by a distance as long as width of each torus or longer (Figs. 686c, 694c, 705c, 708c, 740c) 6
- 4(3). Cercus in lateral view distinctly shorter than paraproct and with inner branch represented by a subapical decumbent tooth, located at distal 0.60 of cercus (Fig. 726b); in dorsal view cerci separated from each other by a distance subequal to width of each cercus (Fig. 726c); cerci in dorsal view partially overlapping epiproct (Fig. 726c); S Texas and NE Mexico (Fig. 799) *rhoadsi*
- 4'. Cercus in lateral view subequal to paraproct in length and with inner branch, represented by a decumbent tooth or lobe, subapical or apical (Figs. 706b, 735b, 737b); in dorsal view cerci separated from each other by a distance longer than width of each cercus (Figs. 706c, 737c); cerci in dorsal view not partially overlapping epiproct (Figs. 706c, 737c) 5
- 5(4'). S5–6 pale dorsally with continuous black ventral stripe uniting above at apical fifth; genital ligula distal segment with a bifid flagellum (Fig. 624); Coahuila south to Oaxaca in W Mexico (Fig. 798) *mayi*
- 5'. S5–6 black dorsally with pale basal ring; genital ligula distal segment with a single flagellum, large sacoid lateral lobes and an entally directed flared process on each side distal to them (Fig. 648); Costa Rica south to Pacific slope of Colombia (Fig. 785) *talamanca* (in part)
- 6(3'). Cercus in dorsal view narrower basally than distally, with distal margin trilobate (Figs. 693c, 740c); genital ligula distal segment lacking a flagellum (Figs. 616, 651) 7
- 6'. Cercus in dorsal view about as wide basally as distally, with distal margin bifid (Fig. 694c) or more or less evenly curved (Figs. 686c, 705c, 708c); genital ligula distal segment with a bifid flagellum (as in Fig. 620) or an apical strap-like process (Figs. 614, 623, 626) 8
- 7(6). Cercus in dorsal view with a deep U-shaped concavity between outer and inner branches (Fig. 740c); genital ligula distal segment lacking a basal sclerotized boss in ectal view (Fig. 651b); Costa Rica and Panama (Fig. 784) *terira*
- 7'. Cercus in dorsal view with a shallow concavity between outer and inner branches (Fig. 693c); genital ligula distal segment with a basal sclerotized boss in ectal view (Fig. 616b); Costa Rica (Fig. 782) *haberi* (in part)
- 8(6'). Cercus in dorsal view bifid, with a deep U-shaped concavity between outer and inner branches (Fig. 694c); genital ligula distal segment with a bifid flagellum (as in Fig. 620); SE Arizona in the United States south to Oaxaca along W Mexico (Fig. 792) *harknessi* (in part)
- 8'. Cercus in dorsal view with distal margin more or less evenly curved (Figs. 686c, 705c, 708c); genital ligula distal segment with an apical strap-like process (Figs. 614, 623, 626) 9
- 9(8'). Torus small, circular or almost so (Fig. 708c); smaller species (Hw 21.3–26.8); Hw usually with four or five pq; usually one row of cells posterior to CuA (as in Fig. 276); if mesepisterna dark, then covered by blue pruinosity (Fig. 92); genital ligula distal segment with strap-like process narrow and darkened (Fig. 626); SE Canada south to Florida and west to California in the United States and Michoacán in Mexico (Fig. 780) *moesta*
- 9'. Torus transverse (Figs. 686c, 705c); larger species (Hw 27.3–36.1); Hw usually with five to seven pq; usually two rows of

- cells posterior to CuA (e. g., Fig. 273); if mesepisterna dark, then covered by black (Fig. 84) or matte brown (Fig. 61); genital ligula distal segment with strap-like process relatively broad and not darkened (Figs. 614, 623) 10
- 10(9'). Tori separated from each other by distance shorter than width of each torus (Fig. 705c); pale coloration tan or blue, becoming entirely sooty black in old males (Fig. 84); smaller species (Hw 27.3–31.1; abdomen length 32.4–38.4; total length 42.3–49.5); South Dakota south to Texas and west to California in the United States south through S Mexico (Fig. 780) *lugens*
- 10'. Tori separated from each other by distance longer than width of each torus (Fig. 686c); pale coloration orange or brick red, becoming entirely matte brown in old males (Fig. 61); larger species (Hw 31.3–36.1; abdomen length 38.8–46.4; total length 50.4–58.9); Sonora in Mexico south to El Salvador (Fig. 780) *funcki*
- 11(1'). Tori separated from each other by distance greater than width of each torus (Figs. 678c, 693c, 695c, 703c, 718c, 719c) . 12
- 11'. Tori separated from each other by distance subequal to shorter than width of each torus (Figs. 664c, 721c, 722c, 732c, 738c, 750c, 753c) 17
- 12(11). Ventral branch of paraproct represented by a distinct, narrow-based, angulate lobe (Figs. 695a, b, 718a, b); genital ligula distal segment with a bifid flagellum (Figs. 617, 634) 13
- 12'. Ventral branch of paraproct represented by a low, broadly based, obtuse lobe (Figs. 678a, b, 693a, b); genital ligula distal segment with a single flagellum (as in Fig. 637) or lacking a flagellum (Figs. 609, 616) 14
- 13(12). Cercus in dorsal view about as long as wide, and with distal margin between inner and outer branches slightly concave to almost linear (Fig. 695c); genital ligula distal segment with one pair of lateral lobes (Fig. 617); smaller species (Hw 21.7–25.6; abdomen length 27.3–32.7; total length 35.2–41.7); Sonora W flank of Mexico south to N Guatemala (Fig. 796) *herberti*
- 13'. Cercus in dorsal view about twice as long as wide, and with a deep U-shaped concavity between inner and outer branches on distal margin (Fig. 718c); genital ligula distal segment with two pairs of lateral lobes, the more distal pair represented by chitinated multispinose branches (Fig. 636 and as in Fig. 632); larger species (Hw 26.2–30.1; abdomen length 36–41; total length 45.8–52.1); Puebla and Veracruz in Mexico south to Guatemala (Fig. 792) *percellulata*
- 14(12'). In lateral view, cercus and paraproct subequal in length, and paraproct dorsal and ventral branches separated by a V-shaped angle (Figs. 703b, 719b); genital ligula distal segment with a single flagellum (Fig. 637); larger species (Hw length 22.4–28.9; abdomen length 29.5–36.4; total length 37.7–46.8) 15
- 14'. In lateral view, cercus shorter than paraproct, and paraproct dorsal and ventral branches separated by a shallow concavity (Figs. 678b, 693b); genital ligula distal segment lacking a flagellum (Figs. 609, 616); smaller species (Hw length 20.4–23.3; abdomen length 24.7–30.2; total length 32.1–38.4) 16
- 15(14). Cercus in dorsal view with inner branch (tooth) visible so that cercus appears equally branched (Fig. 719c); Arizona in the United States through NW Mexico south to Nayarit (Fig. 777) *pima* (in part)
- 15'. Cercus in dorsal view with inner branch (tooth) obscured, strongly decumbent and not easily visible, so that cercus appears unequally branched (Fig. 703c); SE Arizona in the United States south through S Mexico (Fig. 778) . . . *lacrimans* (in part)
- 16(14'). Cerci separated by a distance equal to twice the width of each cercus in dorsal view (Fig. 678c); wings hyaline; genital ligula distal segment anterior to lateral lobes narrow, subrectangular, about three times as long as wide and roughly parallel-sided in ectal view (Fig. 609b); smaller species (abdomen length 24.7–28; total length 32.1–36); Chihuahua [see discussion] south to Mexico and Michoacán in Mexico (Fig. 775) *deami*
- 16'. Cerci separated by a distance equal to the width of each cercus in dorsal view (Fig. 693c); wings usually slightly amber (Fig. 274); genital ligula distal segment anterior to lateral lobes approximately elliptical, about twice as long as wide (Fig. 616b); larger species (abdomen length 28.3–30.2; total length 36.8–38.4); Costa Rica (Fig. 782) *haberi* (in part)
- 17(11'). Distal margin of cercus in dorsal view entire (Figs. 664c, 666c, 728c, 753c); genital ligula distal segment lacking a flagellum (Figs. 593, 596, 643). 18
- 17'. Distal margin of cercus in dorsal view bifid (Figs. 721c, 722c, 732c, 750c); genital ligula distal segment with (Figs. 648, 656) or without (Fig. 649) an apical flagellum 21
- 18(17). Cercus in dorsal view wider than long (Figs. 666c, 728c); postfrons (horizontal portion of frons) largely black (Figs. 33, 125); genital ligula distal segment in ectal view triangular anteriorly to lateral lobes, gradually narrowing to tip (Figs. 596b, 643b) 19
- 18'. Cercus in dorsal view longer than wide (Figs. 664c, 753c); postfrons (horizontal portion of frons) largely pale (Figs. 31, 166, 167); genital ligula distal segment in ectal view parallel sided anteriorly to lateral lobes with tip abruptly widened (Fig. 593b) 20
- 19(18). Cerci approximate, their inner surfaces nearly touching in normal position, separated by a distance shorter than width of epiproct (Fig. 728c); S7 mostly black dorsally (Fig. 373); pale color violaceous-blue (Fig. 125); genital ligula distal segment with a transverse non-sclerotized boss best seen in ectal view (Fig. 643b), forming a slightly raised costate ridge in lateral view (Fig. 643a); Atlantic slope of central Mexico in Tamaulipas, Hidalgo, Puebla and Veracruz (Fig. 773) *rudolphi* (in part)
- 19'. Cerci not approximate, their inner surfaces separated by a distance greater than width of epiproct (Fig. 666c); S7 mostly blue dorsally (Figs. 291, 292); pale color blue (Figs. 32, 33); genital ligula distal segment lacking a raised sclerotized boss (Fig. 596b); Nuevo León and Jalisco south through Veracruz and Puebla in Mexico (Fig. 773) *annae* (in part)
- 20(18'). Cercus in dorsal view with medial margin convexly curved (Fig. 753c); in mediodorsal view decumbent tooth located at distal 0.70 of cercus, giving medial margin of cercus a slightly angulate appearance at level of tooth (Fig. 753a); humeral stripe not forked in more northerly Mexican states (Fig. 166) or forked (Fig. 167) in populations from Chiapas; E flank of Mexico from Nuevo León south to Chiapas (Fig. 776) *westfalli*
- 20'. Cercus in dorsal view with medial margin linear or slightly concave (Fig. 664c); in mediodorsal view decumbent tooth

- located at about 0.50–0.60 of cercus, medial margin of cercus linear (Figs. 664a, 665a); humeral stripe variable but never forked (Fig. 31); S Arizona in the United States and N Mexico south to N half of Costa Rica (Fig. 776) **anceps**
- 21(17'). Ventral branch of paraproct represented by an angulate to rounded lobe directed posteroventrally, its ventral margin separated from ventral margin of paraproct by a distinct concavity in lateral view (Figs. 738b, 750b); each torus about as wide as epiproct in dorsal view (Figs. 738c, 750c); genital ligula distal segment lacking an apical strap-like process (Fig. 649) or with a flagellum-like process and with geniculate lateral lobes, lacking an entally directed flared process on each side distal to lateral lobes (Fig. 656) 22
- 21'. Ventral branch of paraproct represented by a low obtuse lobe directed dorsoposteriorly, its ventral margin contiguous with ventral margin of paraproct in lateral view (Figs. 721b, 722b, 732b); each torus distinctly wider than epiproct in dorsal view (Figs. 721c, 722c, 732c); genital ligula distal segment with an apical strap-like process and large saccoid lateral lobes, with an entally directed flared process on each side distal to them (Fig. 648) 23
- 22(21). Cercus in dorsal view about twice as long as wide, and distance between cerci equal to about twice each cercus width (Fig. 750c); genital ligula distal segment with a long apical flagellum-like process (Fig. 656); Costa Rica and Panama (Fig. 784) **underwoodi**
- 22'. Cercus in dorsal view about as long as wide, and distance between cerci subequal to each cercus width (Fig. 738c); genital ligula distal segment lacking an apical strap-like process, subrectangular, roughly parallel-sided in ectal view anterior to lateral lobes (Fig. 649b); SE Arizona in the United States south through Chiapas in Mexico (Fig. 775). **tarascana** (in part)
- 23(21'). Distal margin of cercus with a deep U-shaped concavity between inner and outer branches in dorsal and mediodorsal views (Figs. 721a, c, 722a, c); black middorsal stripe subequal in width to pale antehumeral stripe (Fig. 115); Jalisco in Mexico south through Panama (Fig. 785) **pocomana**
- 23'. Distal margin of cercus between inner and outer branches in dorsal and mediodorsal views with a shallow concavity (Figs. 732a, c, 733a, 734a) or almost linear (Figs. 737a, c); black middorsal stripe reduced to a narrow line no wider than middorsal carina (Figs. 131–134) to one fourth as wide as antehumeral stripe (Fig. 135); Costa Rica south to Pacific slope of Colombia (Fig. 785) **talamanca** (in part)

Key M-6 (paraproct ventral and dorsal branches subequal or ventral branch larger than dorsal)

1. Epicranium entirely black, postocular spots lacking (Figs. 21, 123, 124); labrum entirely black (Figs. 123, 124) or largely so with a pair of small ill-defined mediolateral pale spots (Fig. 21); cercus in dorsal view roughly rounded with a small subapical medially directed tooth on inner margin (Fig. 727c); Costa Rica and Panama (Fig. 783) **rogersi**
- 1'. Epicranium not entirely black, postocular spots present (e. g., Figs. 22, 125) or large parts of epicranium pale (e. g., Figs. 50, 64); labrum predominantly pale (e. g., Figs. 22, 125); cercus variable 2
- 2(1'). Cercus in dorsal view rounded (Figs. 687c, 689c), rhomboidal (Figs. 692c, 728c, 743c, 751c, 752c) or bluntly pointed (Figs. 707c, 709c), its distal margin convex or more or less linear, lacking a concavity between inner and outer branches (Figs. 687c, 689c, 692c, 707c, 709c, 728c, 743c, 751c, 752c) 3
- 2'. Cercus in dorsal view bifid, its distal margin with a distinct concavity between inner and outer branches, which can be deep (Figs. 661c, 668c, 669c, 690c, 700c, 701c, 720c, 739c, 741c, 742c, 745c–749c) or shallow (Figs. 663c, 672c, 675, 697c, 703c, 712c, 715c, 716c, 717c, 719c, 723c, 729c, 738c) 12
- 3(2). Cercus inner branch represented by an apical tooth, decumbent in mediodorsal view (Figs. 687a, 689a, 709a, 743a, 744a, 752a) 4
- 3'. Cercus inner branch represented by a subapical tooth, recessed along mesal margin in mediodorsal view (Figs. 666a, 680a, 692a, 707a, 728a, 751a) 7
- 4(3). In dorsal view torus small, occupying distal margin of torifer, and tori separated by distance greater than the width of each torus (Figs. 709c, 743c) 5
- 4'. In dorsal view torus large, occupying most of torifer, and tori separated by distance subequal to or shorter than the width of each torus (Figs. 687c, 689c, 752c) 6
- 5(4). Rear of head black; dorsum of S5–6 primarily black except for pale basal ring on each segment (Figs. 150, 151); genital ligula distal segment with a bifid flagellum (Fig. 654); shorter wings (Hw 20–23.4); widespread from SE Ontario in Canada south through NW Argentina (Fig. 793) **translata** (in part)
- 5'. Rear of head pale; dorsum of S5–6 primarily pale (Fig. 93); genital ligula distal segment lacking a flagellum (Fig. 627); longer wings (Hw 23.7–26.7); Arizona, New Mexico and Texas in the United States, south through Chihuahua, Durango, Sonora, Jalisco and Veracruz in Mexico (Fig. 770) **munda**
- 6(4'). Decumbent portion of cercus in posterior view shorter, abruptly narrowing into apical inner tooth (Fig. 688d); lateral lobes of genital ligula distal segment unilobed, directed entally and not visible in ectal view (Fig. 615c); central United States through Arizona and Texas south to Honduras (Fig. 772) **funnebris**
- 6'. Decumbent portion of cercus in posterior view longer, gradually narrowing into apical inner tooth (Fig. 752d); lateral lobes of genital ligula distal segment bilobed, directed entolaterally and visible in ectal view (Figs. 658b–660b); S British Columbia and W Alberta in Canada south through Montana, Washington, California, N Arizona in the United States and Baja California in Mexico (Fig. 772) **vivida**
- 7(3'). S3–7 with a continuous parallel sided black ventral stripe (Figs. 71, 90, 326, 343); inner branch of cercus in mediodorsal view represented by a tooth located at approximately 0.60–0.70 of margin (Figs. 692a, 707a); genital ligula distal segment with a

	bifid flagellum (Fig. 625)	8
7'.	S3–7 lacking a continuous parallel sided black ventral stripe (Figs. 32, 33, 50, 125, 292, 309, 373), or if present, not parallel sided (Fig. 160, 394); inner branch of cercus in mediodorsal view represented by a tooth located at approximately 0.20–0.60 of margin (Figs. 666a, 680a, 728a, 751a); genital ligula distal segment lacking a flagellum (Figs. 596, 611, 643, 657)	9
8(7).	Cercus in dorsal view subrectangular, with inner and outer margins subequal in length, and space between cerci about three times the basal width of each cercus (Fig. 692c); cercus in lateral view subequal in length to paraproct (Fig. 692b); S Mexico south through Guatemala (Fig. 774)	<i>gonzalezi</i>
8'.	Cercus in dorsal view broadly triangular, with inner margin longer than outer margin, and space between cerci about as wide as or shorter than the basal width of each cercus (Fig. 707c); cercus in lateral view distinctly shorter than paraproct (Fig. 707b); Guatemala south through Ecuador (Fig. 774)	<i>medullaris</i>
9(7').	Cerci approximate, their inner surfaces nearly touching in normal position, separated by a distance shorter than width of epiproct (Fig. 728c); pale color violaceous-blue (Fig. 125); genital ligula distal segment with a transverse non-sclerotized boss, best seen in ectal view (Fig. 643b), forming a slightly raised costate ridge in lateral view (Fig. 643a); Atlantic slope of central Mexico in Tamaulipas, Hidalgo, Puebla and Veracruz (Fig. 773)	<i>rudolphi</i> (in part)
9'.	Cerci not approximate, their inner surfaces separated by a distance greater than width of epiproct (Figs. 666c, 680c, 751c); pale color blue (Figs. 32, 33, 50, 160, 161); genital ligula distal segment lacking a transverse boss (Figs. 596, 611, 657)	10
10(9').	Inner branch of cercus in mediodorsal view represented by a tooth located at approximately 0.50–0.60 of margin (Fig. 666a); postfrons (horizontal portion of frons) largely black (Figs. 3, 33); black humeral stripe forked (Figs. 32, 33); no ventral black stripe on S8–9 (Fig. 292); genital ligula distal segment lacking an anteapical ental process (Fig. 596); Nuevo León and Jalisco south through Veracruz and Puebla in Mexico (Fig. 773)	<i>annae</i> (in part)
10'.	Inner branch of cercus in mediodorsal view represented by a tooth located at approximately 0.30–0.50 of margin (Figs. 680a, 751a); postfrons (horizontal portion of frons) largely pale (Figs. 50, 160, 161); black humeral stripe not forked (Figs. 50, 160, 161); ventral black stripe on S8–9 present (Figs. 309, 394); genital ligula distal segment with an anteapical process on its ental surface (Figs. 611, 657)	11
11(10').	Paraproct in lateral view longer than high (Fig. 680b); genital ligula distal segment with a digitiform anteapical ental process (Figs. 611a, c); SE Arizona in the United States to Oaxaca, Tamaulipas south to Veracruz in Mexico (Fig. 771)	<i>extranea</i> (in part)
11'.	Paraproct in lateral view about as long as high (Fig. 751b); genital ligula distal segment with a spatulate anteapical process on its ental surface (Fig. 657); Sinaloa in Mexico south to Guatemala (Fig. 774)	<i>variabilis</i>
12(2').	In dorsal view, inner branch of cercus directed posterolaterally forming an acute angle with outer branch, and concavity between inner and outer branches deep (Figs. 661c, 668c, 669c, 690c, 700c, 701c, 720c, 739c, 741c, 742c, 745–749c) . .	13
12'.	In dorsal view, inner branch of cercus directed posteriorly or posteromedially forming an obtuse angle with outer branch, and concavity between inner and outer branches shallow (663c, 672c, 675c, 697c, 703c, 712c, 715c–717c, 719c, 723c, 729c, 738c)	23
13(12).	In dorsal view, distance between tori subequal or shorter than width of each torus (Figs. 661c, 690c, 739c, 742c)	14
13'.	In dorsal view, distance between tori larger than width of each torus (Figs. 668c, 669c, 700c, 701c, 720c, 741c, 745–749c)	17
14(13).	In dorsal view, distance between cerci equal to or shorter than width of each cercus (Figs. 661c, 690c, 739c); mesepisternum mostly black, with pale antehumeral stripe much narrower than black middorsal stripe (Figs. 28, 69, 140); genital ligula distal segment ending on an apical strap-like process lacking a basal membranous hood (Fig. 650) or with a bifid flagellum attached to inner surface of a basal membranous hood (Fig. 592)	15
14'.	In dorsal view, distance between cerci about twice as long as width of each cercus (Fig. 742c); mesepisternum mostly pale, with black restricted to middorsal carina (Figs. 146–149); genital ligula distal segment with a single flagellum attached to inner surface of a basal membranous hood (Figs. 653); Arizona and New Mexico in the United States south through Hidalgo and Mexico in Mexico (Fig. 777)	<i>tonto</i>
15(14).	Pale occipital bar absent (Figs. 1, 11); tori separated from each other by a distance subequal to width of each torus in dorsal view, barely overlapping epiproct (Figs. 661c, 690c); inner branch of cercus in mediodorsal view directed posterolaterally (Figs. 661a, 690a); genital ligula distal segment with a bifid flagellum attached to inner surface of a basal membranous hood (Fig. 592)	16
15'.	Pale occipital bar present (Fig. 22); tori almost touching each other in dorsal view, strongly overlapping epiproct (Fig. 739c); inner branch of cercus in mediodorsal view directed ventroposteriorly (Fig. 739a); genital ligula distal segment ending on an apical strap-like process lacking a basal membranous hood (Fig. 650); Grenada and St. Vincent, Lesser Antilles (Fig. 779)	<i>telesfordi</i>
16(15).	Labrum bordered entirely by a wide black stripe; dorsum of S2–6 black with a large anterior triangular blue spot (Figs. 27, 28); basal membranous hood of genital ligula distal segment broadly elongate and lateral lobes appressed at base of distal segment with tips broadly capitate (Figs. 592a, c); Honduras south to Bolivia and Acre State in Brazil (Fig. 795)	<i>adamsi</i> (in part)
16'.	Labrum pale with narrow black stripes along base and distal margin only; dorsum of S2–6 black with a very narrow basal violaceous ring (Fig. 69); basal membranous hood quadrate and lateral lobes aciculate (as in Fig. 598); Nuevo Leon, Tamaulipas, and San Luis Potosí in Mexico (Fig. 796)	<i>garrisoni</i>
17(13').	Cercus outer branch in dorsal view spatulate, about twice as broad as inner branch (Figs. 669c, 741c)	18
17'.	Cercus outer branch in dorsal view not spatulate, about as broad as inner branch or much narrower (Figs. 661c, 668c, 700c, 701c, 720c, 745c–749c)	19

- 18(17). Antehumeral stripe yellow and narrow, almost a mere line; pale color on sides of thorax yellow-tan (Figs. 143–145); usually five pq in Fw; genital ligula distal segment with basal membranous hood digitiform in ectal view (Fig. 652b); Arizona and New Mexico in the United States south through W Mexico to Costa Rica (Fig. 793) **tezpi**
- 18'. Antehumeral stripe blue and almost half as wide as black middorsal stripe; pale color on sides of thorax blue (Figs. 38, 39); usually four pq in Fw; genital ligula distal segment with basal membranous hood quadrate in ectal view (Fig. 598b); N Veracruz in Mexico south to Guatemala (Fig. 796) **calida**
- 19(17'). Postfrons (horizontal portion of frons) entirely black (Fig. 1); pale antehumeral stripe narrower than black middorsal stripe (Figs. 27, 28, 155–157); genital ligula terminal segment with one pair of lateral lobes (Figs. 592a, c, 655a, c) 20
- 19'. Postfrons (horizontal portion of frons) largely pale (Figs. 37, 80, 113); pale antehumeral stripe broader than black middorsal stripe (Figs. 37, 80, 113, 114); genital ligula distal segment with a pair of chitinized multispinose branches arising from a narrow stem extending laterad of the ligula (Fig. 620) in addition to a pair of lateral lobes at base near flexure (often hidden by membranous terminal fold) 21
- 20(19). Pale antehumeral stripe narrowing dorsally abruptly to about a third of its maximum width and usually ending before dorsal portion of mesepisternum (Figs. 155–157); genital ligula distal segment with basal membranous hood quadrate in ectal view (Fig. 655b) and lateral lobes with tips falcate (Fig. 655a, c); Mexico south through Colombia (Fig. 795) **ulmeca**
- 20'. Pale antehumeral stripe gradually narrowing dorsally to about half of its maximum width and extending along full height of mesepisternum (Figs. 27, 28); genital ligula distal segment with basal membranous hood broadly elongated in ectal view (Fig. 592b) and lateral lobes broadly capitate (Fig. 592a, c); Honduras south to Bolivia and Acre in Brazil (Fig. 795) **adamsi** (in part)
- 21(19'). Outer branch of cercus strongly reduced, usually with a small circular patch clearly differentiated from remainder of cercus in dorsal view (Figs. 700c, 701c); S Nicaragua south through Trinidad, Venezuela, the Guyanas, Colombia, and Amazonas in Brazil (Fig. 792) **insipida**
- 21'. Outer branch of cercus in dorsal view well developed, although shorter or subequal to inner branch, lacking a small circular patch clearly differentiated from remainder of cercus (Figs. 668c, 720c) 22
- 22(21'). Inner branch of cercus subequal or slightly longer than outer branch in dorsal and mediodorsal views (Figs. 668a, c); paraproct ventral branch as long as dorsal branch and directed posteriorly in lateral view (Fig. 668b); dorsal blue on S6 extends to apical third; Texas in the United States south through Puebla in Mexico (Fig. 792) **barretti**
- 22'. Inner branch of cercus distinctly longer than outer branch in dorsal and mediodorsal views (Figs. 720a, c); paraproct ventral branch shorter than dorsal branch and directed posterodorsally in lateral view (Fig. 720b); dorsal blue on S6 generally limited to basal half to fifth; S Veracruz in Mexico south through N Nicaragua (Fig. 792) **pipila**
- 23(12'). Cercus about three times as long as wide in dorsal view (Fig. 723c); paraproct dorsal branch in lateral view directed posteriorly (Fig. 723c); S Mexico south to Ecuador (Fig. 782) **popoluca**
23. Cercus about two times as long as wide to as long as wide in dorsal view (e. g., Figs. 675c, 703c, 738c); paraproct dorsal branch in lateral view directed dorsally or dorsoposteriorly (e. g., Figs. 675b, 703b, 738b) 24
- 24(23'). Paraproct dorsal and ventral branches rounded (Figs. 672a, b, 675a, b, 697a, b, 719a, b, 703a, b, 729a, b) 25
- 24'. Paraproct dorsal branch angulate, and ventral branch rounded (Figs. 663a, b, 715a, b, 716a, b) or angulate (Figs. 712a, b, 717a, b, 738a, c) 30
- 25(24). Anteclypeus entirely black; torifer region in mediodorsal view distinctly raised (Fig. 675a); paraproct dorsal branch poorly developed forming a gently rounded lobe (Figs. 675a, b); Dominica and Guadeloupe, Lesser Antilles (Fig. 779) **concinna**
- 25'. Anteclypeus pale or brown, never black; torifer region in mediodorsal view not raised (Figs. 672a, b, 697a, b, 719a, b, 703a, b, 729a, b); paraproct dorsal branch well developed forming an upright digitiform lobe (Figs. 672a, b, 697a, b, 719a, b, 703a, b) 26
- 26(25'). Fw with three pq; black lateral subbasal streaks on S3–6 present, giving each segment a lateral color pattern of anterior to posterior alternating sequence of pale, dark, pale, dark (Figs. 41, 78); genital ligula distal segment with a short apical flagellum-like process (Figs. 602, 618) 27
- 26'. Fw with four or five pq; black lateral subbasal streaks on S3–6 absent, each segment with lateral color pattern pale with apical black ring (Figs. 82, 112, 126); genital ligula distal segment with a long flexible flagellum attached to ental surface of trowel-shaped basal membranous hood (Fig. 637) or lacking a flagellum (Fig. 644) 28
- 27(26). Pale coloration violaceous (Fig. 78); dorsolateral subbasal streaks often dorsally giving S4–6 each an alternating pale, dark, pale, dark pattern in dorsal view; apical flagellum-like process of genital ligula distal segment abruptly narrowing before apex in lateral view (Fig. 618a); South Dakota in the United States south to Honduras (Fig. 781) **immunda**
- 27'. Pale coloration blue (Figs. 41, 42); dorsolateral subbasal streaks usually separated dorsally rendering S4–6 pale with a black apical ring in dorsal view; apical flagellum-like process of genital ligula distal segment gradually narrowing towards apex in lateral view (Fig. 602a); S Arizona in the United States south to Oaxaca in Mexico (Fig. 781) **carlcooki**
- 28(26'). In dorsal view, distance between cerci shorter than width of each cercus (Fig. 729c); genital ligula distal segment lacking a flagellum (Fig. 644a); SE Arizona in the United States south through Chiapas in Mexico (Fig. 775) **sabino** (in part)
- 28'. In dorsal view, distance between cerci subequal to or wider than width of each cercus (Figs. 703c, 719c); genital ligula distal segment with a long flexible flagellum attached to ental surface of trowel-shaped basal membranous hood (Figs. 637) .. 29
- 29(28'). Cercus in dorsal view with inner branch (tooth) visible so that cercus appears equally branched (Fig. 719c); Arizona in the United States through NW Mexico south to Nayarit (Fig. 777) **pima** (in part)
- 29'. Cercus in dorsal view with inner branch (tooth) obscured, strongly decumbent and not easily visible, so that cercus appears unequally branched (Fig. 703c); SE Arizona in the United States south through S Mexico (Fig. 778) **lacrimans** (in part)
- 30(24'). Cercus about as long as wide in dorsal view (Figs. 729c, 738c); genital ligula distal segment lacking a flagellum or strap like-

	process (Figs. 644a, 649a)	31
30'.	Cercus about one and a half times to twice as long as wide in dorsal view (Figs. 663c, 712a, 715c–717c); genital ligula distal segment with a flagellum or strap like-process (Figs. 630, 631, 634, 635)	32
31(30).	In dorsal view, distance between cerci about equal to width of each cercus (Fig. 738c); genital ligula distal segment anterior to lateral lobes narrow, subrectangular, roughly parallel-sided in ectal view (Fig. 649b); SE Arizona in the United States south through Chiapas in Mexico (Fig. 775)	<i>tarascana</i> (in part)
31'.	In dorsal view, distance between cerci shorter than width of each cercus (Fig. 729c); genital ligula distal segment anterior to lateral lobes elliptical, with convex lateral margins in ectal view (Fig. 645b); SE Arizona in the United States south to Jalisco in Mexico (Fig. 775)	<i>sabino</i> (in part)
32(30').	Paraproct dorsal branch angulate, and ventral branch rounded (Figs. 663a, b, 715a, b, 716a, b); S3–6 laterally pale along basal 0.66 (Figs. 30, 106)	33
32'.	Paraproct dorsal and ventral branches angulate (Figs. 712a, b, 717a, b); S3–6 with a lateroventral black stripe (Fig. 107) or entirely black except for pale basal ring (Figs. 97, 98, 100)	34
33(32).	Cercus in dorsal view with medial margin linear (Fig. 663c); S2–7 black dorsally except for blue basal ring (Figs. 30, 289); more slender species, S3–6 each about six times as long as high; larger species (Hw 16.4–17.7; abdomen length 21.6–23.7; total length 28.1–30.8); usually three pq in Fw (Fig. 271); W United States and NW Sonora and Chihuahua in Mexico (Fig. 789)	<i>albertaina</i>
33'.	Cercus in dorsal view with medial margin strongly convex at base (Figs. 715c, 716c); S2–7 blue dorsally except for apical black ring (Figs. 106, 356); more robust species, S3–6 each about four times as long as high; smaller species (Hw 12.7–14.7; abdomen length 16–17.4; total length 21–23.1); usually four pq in Fw (Fig. 277); Arizona in the United States and Durango in Mexico (Fig. 789)	<i>paludicola</i>
34(32').	Cercus in mediodorsal view with inner branch apical and directed posteriorly (Fig. 717a); dorsum of S3–6 largely pale with black areas limited to a distal ring (Fig. 107); genital ligula distal segment with an apical flagellum-like process, ental surface lacking a semicircular membranous process, and lateral lobes curved distally, roundly geniculate (Fig. 635); Costa Rica (Fig. 782)	<i>paulsoni</i>
34'.	Cercus in mediodorsal view with inner branch subapical and directed ventrally (Fig. 712a); dorsum of S3–6 largely black with pale areas limited to a basal annulus and a tapering pale dorsal stripe extending from annulus to no more than half of each segment, often less (Figs. 97, 98, 100); genital ligula distal segment with a bifid flagellum attached to underside of a basal membranous hood, ental surface enlarged in the form of a semicircular medio-longitudinal membranous process, and lateral lobes capitate (Figs. 630, 631); SE Arizona south through Bolivia (Fig. 794)	<i>oculata</i>

Key to Females

This key is admittedly difficult, as it is based largely on the morphology of the mesostigmal lobes (when present) bordering the posterior margin of the mesostigmal plates. It is therefore imperative that the prothorax be moved anteriorly in order to view these structures. Due to considerable variability in morphology of the mesostigmal plates and associated structures as well as in color pattern, 21 species will key out more than once, with one, *A. tarascana*, keying out seven times. The user should beware of interspecific tandems; just because a female was found in tandem with a male it doesn't necessarily mean that they are conspecific – always key both specimens separately to be sure. For example, we observed some interspecific tandems between *A. annae* and *A. noveloi*, *A. deami* and *A. nahuana*, *A. oenea* and *A. cupraurea*, *A. noveloi* and *A. chelata*, *A. ulmeca* and *A. oculata*. Females of *A. haberi* and *A. paulsoni* are unknown. The following key should work for most females, although it is possible that not all existing variability was encompassed by our analysis. After a particular species name has been reached, identification should be confirmed by comparison of all characters with illustrations, descriptions, diagnoses, and geographic range. A series of aids to recognize and identify some females immediately follows the female key.

1.	With a digitiform accessory mesostigmal lobe, arising from ridge connecting posteromesal corner of mesostigmal plate to mesepisternum (Figs. 568, 573, 574)	2
1'.	Lacking a digitiform accessory mesostigmal lobe arising from ridge connecting posteromesal corner of mesostigmal plate to mesepisternum; mesostigmal lobe variously shaped or absent, if digitiform (Figs. 493, 494, 504, 505, 523, 534, 536, 583–586), then arising from posterior margin of mesostigmal plate	3
2(1).	Ridge connecting posteromesal border of mesostigmal plate to mesepisternum ending lateral to lateral branch of middorsal carina, with a gap present between them (Figs. 568c, d); accessory mesostigmal lobe directed laterally, perpendicular to lateral branch of middorsal carina; with a mesepisternal tubercle posteromedially to mesostigmal lobe (Fig. 568a–e); Costa Rica (Fig. 783)	<i>schorri</i>
2'.	Ridge connecting posteromesal border of mesostigmal plate to mesepisternum ending appressed to lateral branch of middorsal carina, with no gap present between them (Figs. 573c, d, 574c, d); accessory mesostigmal lobe directed medially, parallel to lateral branch of middorsal carina; no mesepisternal tubercle present posteromedially to mesostigmal lobe (Figs. 573, 574); Costa Rica south to Pacific slope of Colombia (Fig. 785)	<i>talamanca</i> (in part)

- 3(1'). Posteromesal margin of mesostigmal plate with a narrow posterolaterally directed mesostigmal lobe (Figs. 523c, 540c); middorsal dark area of thorax consisting of a line along the carina and a separate stripe on each side, or with these black areas confluent only at the anterior or posterior end (Figs. 200, 221); larger species (Hw 29.1–38.9); two rows of cells between CuA and hind margin of wing (Fig. 273) **Key F-1**
- 3'. Posteromesal margin of mesostigmal plate with mesostigmal lobe, if present, directed posteriorly (e. g., Fig. 543c, 544c), posteromesally (e. g., Figs. 564c, 583c–586c), or medially (e. g., Figs. 500c, 516c–520c); middorsal dark area of thorax represented by a single line or stripe (e. g., Figs. 201, 222); usually smaller species (Hw usually shorter than 29, except in some *A. chelata*, *A. lacrimans*, *A. tonto*); usually with only one row of cells between CuA and hind margin of wing (e. g., Fig. 274) 4
- 4(3'). Anterior part of mesepisternum directly posterior to mesostigmal plate with a well-defined pit, the posterior border of which is costate (Figs. 544c, 545c); Arizona, New Mexico and Texas in the United States, south through Chihuahua, Durango, Sonora, Jalisco and Veracruz in Mexico (Fig. 770) **munda**
- 4'. Anterior part of mesepisternum directly posterior to mesostigmal plate undifferentiated (e. g., Figs. 496c, 503c) or with a shallow (Figs. 499c, 564c, 577c, 578c) to deep (Fig. 543c) circular depression of which the posterior border is not costate 5
- 5(4'). Posterolateral corner of mesostigmal plate forming a prominent raised mesostigmal lobe so that lateral portion of mesostigmal plate is subquadrate (Fig. 587c, d); Costa Rica and Panama (Fig. 784) **underwoodi**
- 5'. Posterolateral corner of mesostigmal plate lacking a prominent raised mesostigmal lobe, with lateral portion of mesostigmal plate usually tapering laterally (e. g., Figs. 542c, 543c, 589c) or sometimes approximately rounded (e. g. Figs. 541c, 588c) . 6
- 6(5'). Ventral side of mesostigmal lobe in posterior view with a transverse costate ridge formed by extension of posterior margin of mesostigmal plate to mid-level of underside of mesostigmal lobe; costate ridge disjunct from lateral branch of middorsal carina (Fig. 501e) **Key F-2**
- 6'. Ventral side of mesostigmal lobe in posterior view smooth (e. g., Figs. 495e, 510e–512e) or, if a transverse swelling or tubercle is present (e. g., Figs. 497e, 554e), then not costate, or if a costate ridge is present, then located not on ventral side of mesostigmal lobe but on mesepisternum, originating at or near medial margin of mesostigmal lobe near lateral branch of middorsal carina and extending laterally on mesepisternum (e. g., Figs. 514c, 537e, 538e) 7
- 7(6'). Pale postocular spots transversely linear, parallel-sided, as wide as pale postocular bar, and narrowly separated from pale occipital bar thus giving the appearance of a narrow transverse pale stripe extending from eye to eye (Figs. 185, 256) . **Key F-3**
- 7'. Pale postocular spots, if present, not parallel-sided, wider than postocular bar (e. g., Figs. 183, 184, 186, 187, 257–260). . . 8
- 8(7'). Middorsal thoracic carina branching at level of distal margin of mesostigmal lobes (Figs. 531c, 560c, 561c) **Key F-4**
- 8'. Middorsal thoracic carina branching posteriorly to distal margin of mesostigmal lobes (e. g., Figs. 530c, 533c, 562c) . . . 9
- 9(8'). Dorsal surface of mesostigmal lobe with short arcuate ridge overlying its median portion, and mesostigmal lobe small, broadly arcuate and extending posterolaterally (Figs. 543c, d); SE Canada south to Florida and west to California in the United States and Michoacán in Mexico (Fig. 780) **moesta**
- 9'. Dorsal surface of mesostigmal lobe variously shaped, but without an arcuate ridge overlying its median portion or, if a ridge is present, then lobe digitiform and directed posteromesally (e. g., Figs. 494c, d, 505c, d, 583c–586c) 10
- 10(9'). Lateral (outer) margin of mesostigmal lobe with a smaller accessory lobe at base, often partially (Figs. 494c, d, 504d, 505c, d, 585c, 586c, d) to entirely (Fig. 583c) hidden in dorsal view [be sure to check underside of outer base of mesostigmal lobe in posterior view for swollen portion of accessory lobe] **Key F-5**
- 10'. Lateral (outer) margin of mesostigmal lobe entire, not partially overlapping a smaller lobe (e. g., Figs. 493c, d, 534c, d, 549c, 551c, d, 559c, 577c, d, 579c, 580c, d) 11
- 11(10'). Wings slightly amber to smoky (e. g., Figs. 272, 280, 281) [NOTE: teneral females might not have developed the wing membrane coloration] **Key F-6**
- 11'. Wings hyaline (e. g., Fig. 276) [NOTE: old females might show faint infumation around veins] 12
- 12(11'). Black middorsal stripe of thorax a mere hairline, with medial black occupying less than 0.10 of each mesepisternum (e. g., Figs. 175, 252) **Key F-7**
- 12'. Black middorsal stripe of thorax wider, with medial black occupying 0.20 or more of mesepisternum (e. g., Figs. 191, 192, 211) 13
- 13(12'). Posterior margin of mesostigmal plate smoothly curved, almost linear, with mesostigmal lobe vestigial and barely different from posterolateral portion of mesostigmal plate (Figs. 496c, 503c, 526c, 532c, 533c), or well defined but directed medially and with mesal margin appressed against lateral branch of middorsal carina (Figs. 513, 514, 516–520, 562, 570, 571) . . . 14
- 13'. Posterior margin of mesostigmal plate with mesostigmal lobe forming a distinct angle with posterolateral portion of plate (Figs. 524c, 525c, 559c, 589c), or, if mesostigmal lobe present but mesostigmal plate posterolateral margin smoothly curved (Figs. 500c, 551c, 563c, 572c), then with its mesal margin clearly separated from lateral branch of middorsal carina . . . 15
- 14(13). Mesostigmal lobe vestigial, barely different from posterolateral portion of mesostigmal plate, and with posteromesal margin of plate largely confluent with lateral branch of middorsal carina (Figs. 496, 503, 526, 532) **Key F-8**
- 14'. Mesostigmal lobe well-defined along posteromesal margin of mesostigmal plate and directed medially, and mesal margin of lobe appressed against but not confluent with lateral branch of middorsal carina (e. g., Figs. 513c, 514c, 516–520c, 562c) . . . **Key F-9**
- 15(13'). Erect transversely oval mesostigmal lobes almost approximate, distance between them less than half the width of each lobe, each lobe occupying about 75% (Fig. 588) to 50% (Fig. 566) of entire mesostigmal plate length **Key F-10**
- 15'. Mesostigmal lobes not approximate, distance between them more than half the width of each lobe; each lobe usually occupying

about 50% or less of entire mesostigmal plate length (e. g., Figs. 565, 589)	16
16(15'). In dorsal view, mesostigmal lobe distally wider than basally (e. g., Figs. 524c, d, 537c, d, 542c, d, 557c, d, 579c, d, 589c, d), and usually with lateral (outer) margin of mesostigmal lobe concave (e. g., Figs. 542c, 557c, d, 589c, d), except in <i>annae</i> and some females of <i>medullaris</i> , <i>lacrimans</i> and <i>tonto</i> (e. g., Figs. 498c, d, 580c, d)	Key F-11
16'. In dorsal view, mesostigmal lobe not widened distally, and lateral (outer) margin of mesostigmal lobe forming an obtuse angle with lateroposterior margin of mesostigmal plate (Figs. 512c, 525c, d, 531c, 559c, 565c, 567c, d), rarely almost perpendicular (Figs. 530c, d)	17
17(16'). Labrum entirely black (as in Fig. 21)	Key F-12
17'. Labrum mostly pale or with metallic coloring at least on its basal half (Figs. 17, 19, 23, 24, 26)	18
18(17'). Mesostigmal lobe erect, its posterior margin gently concave in dorsal view (Fig. 556c); medial margin of lobe recurved ventrally (Fig. 556f); 5 or 6 Fw pq (as in Fig. 278); Puebla and Veracruz in Mexico south to Guatemala (Fig. 792)	<i>percellulata</i>
18'. Mesostigmal lobe variable, its posterior margin planar or convex in dorsal view; medial margin of lobe recurved ventrally (e. g., Figs. 502e, 539e, 554e), posteriorly (e. g., Fig. 511e) or not recurved (e. g., Figs. 513e–515e, 531e, 555e); usually 5 or less Fw pq (e. g., Figs. 272, 276, 280)	19
19(18'). Posterior lobe of prothorax with a pair of mediolateral tuberculate processes or swellings giving its posterior margin a trilobate appearance (Fig. 502j), though sometimes not so pronounced in some females; thorax usually with some degree of metallic coloration, most often confined to medial half of mesepisternum (Figs. 178, 186–188, 197, 198, 232, 233); S8–9 laterally with pale midlateral and ventral stripes extending the entire length of each segment (e. g., Figs. 412, 419, 421, 428, 429, 460) . .	Key F-13
19'. Posterior lobe of prothorax lacking a pair of mediolateral tuberculate processes or swellings, its posterior margin usually gently rounded; thorax lacking metallic reflections (e. g., Figs. 179, 185, 196, 231, 234); S8–9 variable laterally.	20
20(19'). With prominent mesepisternal tubercles laterally to mesostigmal lobes (Figs. 530c, 535c, 575c, 577c, 578, 581, 582)	21
20'. Lacking mesepisternal tubercles laterally to mesostigmal lobes (e. g., Fig., 536c), or these low or vestigial (e. g., Fig. 512c)	25
21(20). Paler species, with black middorsal stripe as wide as a fourth or less of mesepisternum and humeral black stripe absent or just a hairline (Figs. 254, 255); SE Arizona in the United south through Chiapas in Mexico (Fig. 775)	<i>tarascana</i> (in part)
21'. Darker species, with black middorsal stripe as wide as half of mesepisternum and humeral black stripe wider than a hairline (Figs. 208, 214, 215, 258, 259, 261–263)	22
22(21'). Underside of mesostigmal lobe with a prominent tubercle (Fig. 578e) [NOTE: Strong light and high magnification are necessary to see this structure]; S10 pale dorsally (Figs. 482, 483); Arizona and New Mexico in the United States south through Costa Rica via W Mexico (Fig. 793)	<i>tezpi</i> (in part)
22'. Underside of mesostigmal lobe lacking a tubercle, forming a concave juncture with mesepisternum (e. g., Fig. 582e) [NOTE: Strong light and high magnification are necessary to see this structure]; S10 with a pair of black spots dorsally (Figs. 439, 444, 445, 485)	23
23(22'). Mesostigmal lobes separated from each other by a distance subequal to twice the width of each lobe or less (Fig. 581c); widespread from SE Ontario in Canada south through NW Argentina (Fig. 793)	<i>translata</i> (in part)
23'. Mesostigmal lobes separated from each other by a distance subequal to three or four times the width of each lobe (Figs. 530c, 535c)	24
24(23'). Mesostigmal lobes directed posteriorly to slightly posterolaterally, forming an almost right angle with posterior margin of mesostigmal plate (Figs. 530c, d); Sonora through W flank of Mexico south to N Guatemala (Fig. 796).	<i>herberti</i>
24'. Mesostigmal lobes directed posteromedially, forming a shallow obtuse angle with posterior margin of mesostigmal plate (Figs. 535c, d); S Nicaragua south through Trinidad, Venezuela, the Guyanas, Colombia, and Amazonas in Brazil (Fig. 792)	<i>insipida</i>
25(20'). Mesostigmal lobe directed posterolaterally in dorsal view (Figs. 549c, 550c, 559c, 567c, 575c)	Key F-14
25'. Mesostigmal lobe directed posteriorly to medially in dorsal view (e. g., Figs. 512c, 536c, 551c)	26
26(25'). Mesal border of mesostigmal lobe recurved ventrally forming a tubercle appressed against anterior margin of mesepisternum (Figs. 522e, 536e, 539e, 554e) [NOTE: Examine this character from dorsoposterior view with good light]	Key F-15
26'. Mesal border of mesostigmal lobe not recurved ventrally, forming a concave juncture with mesepisternum [NOTE: Examine this character from dorsoposterior view with good light]; medial margin of mesostigmal lobe planar (e. g., Figs. 495e, 531e, 558e)	27
27(26'). Mesostigmal lobe directed posteriorly or slightly posteromedially, its mesal margin at an angle with lateral branch of middorsal carina in dorsal view (Figs. 512c, 531c, 551c, 563c, 572c)	28
27'. Mesostigmal lobe directed medially or slightly medioposteriorly, its mesal margin more or less parallel to lateral branch of middorsal carina in dorsal view (e. g., Figs. 495c, 558c)	32
28(27). Mesal margin of mesostigmal lobe forming a shallow concavity with lateral branch of middorsal carina in dorsal view (Fig. 551c); SE Arizona south through Bolivia (Fig. 794)	<i>oculata</i> (in part)
28'. Mesal margin of mesostigmal lobe forming a U-shaped concavity with lateral branch of middorsal carina in dorsal view (Figs. 512c, 531c, 563c, 572c)	29
29(28'). Humeral stripe wide, subequal to half of mesepimeron width (Figs. 244, 253)	30
29'. Humeral stripe narrow, much narrower than half of mesepimeron width (Figs. 189, 209)	31
30(29). Pale occipital bar present, confluent with pale postocular spots (Fig. 244); shorter HW (17.2–21.5); Sonora in N Mexico south to Peru and east to Venezuela and N Brazil (Fig. 801)	<i>pulla</i> (in part)
30'. Pale occipital bar absent (Fig. 253); longer HW (20–24.2); Costa Rica south to Pacific slope of Colombia (Fig. 785)	

- *talamanca* (in part)
- 31(29'). Mesostigmal lobe narrower, longer than wide (Figs. 531b, c, d); lacking a low mesepisternal tubercle laterally to mesostigmal lobe (Fig. 531c); S California, Arizona, New Mexico, and Texas in the United States south through Sinaloa in Mexico (Fig. 788) *hinei* (in part)
- 31'. Mesostigmal lobe wider, about as wide as long (Figs. 512b, c, d); with a low mesepisternal tubercle laterally to mesostigmal lobe (Fig. 512c); Chihuahua [see discussion] south to Mexico and Michoacán in Mexico (Fig. 775) *deami* (in part)
- 32(27'). Mesostigmal lobe dorsal surface oriented mostly dorsally, lobe forming an angle of less than 45 degrees with mesepisternum in lateral view (e. g., Fig. 555h) 33
- 32'. Mesostigmal lobe dorsal surface slanted anteriorly, lobe forming an angle of 60–90 degrees with mesepisternum in lateral view (e. g., Fig. 498h) **Key F-16**
- 33(32). No rounded mesepisternal tubercle under mesostigmal lobe in posterior view (Fig. 555e); smaller species (Hw 13.8–14.8; abdomen length 16.4–17; total length 21.6–22.4); Arizona in the United States and Durango in Mexico (Fig. 789) *paludicola*
- 33'. With a rounded mesepisternal tubercle under base of mesostigmal lobe in posterior view (Fig. 495e); larger species (Hw 16–20.5; abdomen length 21.1–25.4; total length 27.2–33.2); Central and S Oregon, California, and Arizona in the United States and Baja California in Mexico (Fig. 787) *agrioides*

Key F-1 (posteromesal margin of mesostigmal plate with narrow mesostigmal lobe directed posterolaterally)

1. Posterior lobe of mesostigmal plate relatively short and broad, about two times as long as wide (Fig. 523c); larger species (Hw 29.1–32.5; abdomen length 32.4–38.4; total length 45.5–48.3); Sonora in Mexico south to El Salvador (Fig. 780) *funcki*
- 1'. Posterior lobe of mesostigmal plate relatively long and slender, about three times as long as wide (Fig. 540c); smaller species (Hw 34.1–38.9; abdomen length 39.7–44.7; total length 51.2–58.3); South Dakota south to Texas and west to California in the United States south through S Mexico (Fig. 780) *lugens*

Key F-2 (with a transverse costate ridge formed by extension of posterior margin of mesostigmal plate to mid-level of underside of mesostigmal lobe in posterior view)

1. Black markings more extensive (Figs. 177, 411); pale occipital bar usually absent (Figs. 5, 177) or reduced to two small lateral spots; dorsal black on S5–7 often extending laterally to ventral margin (Fig. 411); ovipositor entirely black (Fig. 411); N Veracruz in Mexico south to Guatemala (Fig. 796) *calida*
- 1'. Black markings less extensive (Figs. 202, 433); pale occipital bar usually present (Figs. 12, 202); dorsal black on S5–7 extending laterally about halfway to ventral margin (Fig. 433); base of ovipositor partially pale (Fig. 433); Nuevo León, Tamaulipas, and San Luis Potosí in Mexico (Fig. 796) *garrisoni*

Key F-3 (pale postocular spots transversely linear, not rounded, as wide as pale postocular bar)

1. Mesostigmal lobe wider than long, directed posteromesally (Fig. 508); Dominica and Guadeloupe, Lesser Antilles (Fig. 779) *concinna*
- 1'. Mesostigmal lobe about as wide as long, directed posteriorly or posterolaterally (Fig. 576); Grenada and St. Vincent, Lesser Antilles (Fig. 779) *telesfordi*

Key F-4 (middorsal thoracic carina branching at distal level of mesostigmal lobes)

1. Mesostigmal lobes narrow, digitiform, space between them much greater than width of each lobe (Fig. 531c); S California, Arizona, New Mexico, and Texas in the United States south through Sinaloa in Mexico (Fig. 788) *hinei* (in part)
- 1'. Mesostigmal lobes large, semicircular, their mesal margins almost approximate (Figs. 560c, 561c); S Mexico south to Ecuador (Fig. 782) *popoluca*

Key F-5 (lateral margin of mesostigmal lobe with a smaller accessory lobe)

1. Mesostigmal lobe about as long as wide (Fig. 494); lacking a tubercle on mesepisternum lateroposteriorly to mesostigmal lobe (Fig. 494c); Honduras south to Bolivia and Acre in Brazil (Fig. 795) *adamsi* (in part)

- 1'. Mesostigmal lobe longer than wide (Figs. 504, 505, 583–586); with a tubercle on mesepisternum lateroposteriorly to mesostigmal lobe (Figs. 505c, 583c–586c) 2
- 2(1'). Labrum usually mostly dark (Figs. 180, 182), rarely pale (e. g., Fig. 181); S4–7 almost entirely black, pale basal rings usually absent (Figs. 180–182, 414, 415); S8 primarily black with small lateral pale spots restricted to apical half or less (Figs. 414, 415); Costa Rica (Fig. 783) *carolus*
- 2'. Labrum usually pale (Fig. 264), although generally black in populations in Los Tuxtlas area of Veracruz, Mexico; S4–7 black with lateroventral pale stripes and pale basal rings usually present (Figs. 264, 486); pale spots on S8 larger, united above and usually extending anteriorly to base (Fig. 486); Mexico south through Colombia (Fig. 795) *ulmeca*

Key F-6 (wings slightly amber to smoky)

1. Lateral margin of mesostigmal lobe in dorsal view forming a U-shaped concavity with posteromedial margin of mesostigmal plate (Figs. 506c); S Mexico south through W Panama (Fig. 778) *chelata* (in part)
- 1'. Lateral margin of mesostigmal lobe in dorsal view meeting posteromedial margin of mesostigmal plate at right to convex angle (e. g., Figs. 577c, 578c) 2
- 2(1'). With prominent mesepisternal tubercles laterally to mesostigmal lobes (Figs. 575c, 577c, 578c) 3
- 2'. Lacking mesepisternal tubercles laterally to mesostigmal lobes (e. g., Figs. 534c, 541c, 564c, 569c) or these low or vestigial 5
- 3(2). Paler species, with black middorsal stripe as wide as a fourth or less of mesepisternum, humeral black stripe absent or just a hairline, and sides of S4–7 mostly pale (Figs. 254, 255, 479); SE Arizona in the United States south through Chiapas in Mexico (Fig. 775) *tarascana* (in part)
- 3'. Darker species, with black middorsal stripe as wide as half of mesepisternum, humeral black stripe wider than a hairline, and sides of S4–7 mostly black with lateral and ventrolateral dark stripes (Figs. 257–259, 481–483) 4
- 4(3'). Medial margin of mesostigmal lobe lacking a smaller accessory lobe basally (Fig. 578c); underside of mesostigmal lobe with a prominent tubercle (Fig. 578e) [NOTE: Strong light and high magnification are necessary to see this structure]; Arizona and New Mexico in the United States south through W Mexico to Costa Rica (Fig. 793) *tezpi* (in part)
- 4'. Medial margin of mesostigmal lobe with a smaller accessory lobe basally (Fig. 577), underside of mesostigmal lobe lacking a prominent tubercle [NOTE: Strong light and high magnification are necessary to see this structure]; Costa Rica and Panama (Fig. 784) *terira*
- 5(2'). Raised portion of mesostigmal lobe in anterior view extending for almost entire width of plate; mesostigmal lobe wider than long (Figs. 534, 541) [NOTE: mesostigmal lobes in this group are brittle and are often broken; when in doubt, compare left and right lobes in order to determine true shape of each lobe] 6
- 5'. Raised portion of mesostigmal lobe in anterior view confined to medial half or less of plate; mesostigmal lobe variable in shape (e. g., Figs. 497, 512, 515, 562, 569, 575, 591) or vestigial and small and barely different from posterolateral portion of mesostigmal plate (e. g. Figs. 496, 503, 563) 7
- 6(5). Raised portion of mesostigmal lobe with an inner narrow foliate free lobe extending medially (Fig. 534); wings smoky; Veracruz and Chiapas in Mexico south through Peru and east to central Venezuela and Amazonas in Brazil (Fig. 798) *indicatrix*
- 6'. Raised portion of mesostigmal lobe entire, lacking an inner narrow foliate free lobe extending medially (Fig. 541); wings slightly amber; Coahuila south to Oaxaca in W Mexico (Fig. 798) *mayi*
- 7(5'). Mesostigmal lobe directed posteromesally and elevated, with medial tip perpendicular to mesepisternum and venter of apical part of lobe visible in dorsal view (Fig. 569c); SE Canada south through S Mexico (Fig. 797) *sedula* (in part)
- 7'. Mesostigmal lobe directed posterodorsally, posteromesally, or undifferentiated, with medial tip not perpendicular to mesepisternum and venter of apical part of lobe not visible in dorsal view (e. g., Figs. 497c, 520c, 526c) 8
- 8(7'). With a slight to deep non-costate circular depression on mesepisternum behind each mesostigmal lobe (Fig. 564c); S Texas and NE Mexico (Fig. 799) *rhoadsi*
- 8'. Lacking a conspicuous depression on mesepisternum directly behind mesostigmal lobes (Figs. 520c, 526c) 9
- 9(8'). Posterior margin of mesostigmal plate almost linear, and mesostigmal lobe barely different from posterior margin of mesostigmal plate (Figs. 503, 563) or well developed but medially appressed against lateral branch of middorsal carina (Figs. 516–520, 526, 562) 10
- 9'. Posterior margin of mesostigmal plate with a well-developed and prominent mesostigmal lobe, clearly differentiated from posterolateral portion of mesostigmal margin, and clearly overlying mesepisternum (Figs. 497, 512, 515, 575, 591) 14
- 10(9). Mesostigmal lobe with a slight concave notch medially in dorsal view (Fig. 562) or forming a U-shaped concavity with lateral carina (Fig. 563); Sonora in N Mexico south to Peru and east to Venezuela and N Brazil (Fig. 801) *pulla* (in part)
- 10'. Mesostigmal lobe lacking a concave notch medially in dorsal view and medially appressed against lateral branch of middorsal carina (Figs. 516–520, 526, 532, 533) 11
- 11(10'). Mesostigmal plates separated by a distance smaller than transverse width of each mesostigmal lobe (Figs. 516–520); San Luis Potosí in Mexico south to Panama (Fig. 800) *frequentula* (in part)
- 11'. Mesostigmal plates separated by a distance subequal or larger than transverse width of each mesostigmal lobe (Figs. 503, 526, 532, 533) 12
- 12(11'). Rear of head about half black; Veracruz in Mexico and Yucatán Peninsula south to N Honduras (Fig. 800) *gaumeri* (in part)

12. Rear of head pale 13
- 13(12'). Black humeral stripe forked dorsally (Fig. 179); S Arizona in the United States south to Oaxaca in Mexico (Fig. 781) *carlcooki* (in part)
- 13'. Black humeral stripe not forked dorsally, often a mere line slightly enlarged at ventral half (Fig. 210); South Dakota in the United States south to Honduras (Fig. 781) *immunda* (in part)
- 14(9'). Mesostigmal lobe about as wide as long, directed posteriorly; prominent to low mesepisternal tubercles present (Figs. 512c, 575c) 15
- 14'. Mesostigmal lobe distinctly wider than long, directed slightly posteromesally; mesepisternal tubercles absent (Figs. 497c, 515c, 591c) 16
- 15(14). Medial margin of mesostigmal lobe located externally to anterior end of lateral branch of middorsal carina (Fig. 512c); Chihuahua [see discussion] south to Mexico and Michoacán in Mexico (Fig. 775) *deami* (in part)
- 15'. Medial margin of mesostigmal lobe located medially to anterior end of lateral branch of middorsal carina (Fig. 575c); SE Arizona in the United States south through Chiapas in Mexico (Fig. 775) *tarascana* (in part)
- 16(14'). Mesostigmal lobes strongly elevated, distinctly erect (Fig. 591h); ventral surface of mesostigmal lobe with no swelling or tubercle, this area forming a concave junction with mesepisternum; humeral stripe not forked in N Mexican states (Fig. 270) or forked in populations from Chiapas, Mexico (as in Fig. 167); E flank of Mexico from Nuevo León south to Chiapas (Fig. 776) *westfalli*
- 16'. Mesostigmal lobes not as strongly elevated; ventral surface of mesepisternal lobe with a transverse swelling or tubercle of varying length appressed against mesepisternum but separated from it by a groove (Figs. 497e, 515e), this structure sometimes visible in lateral view [NOTE: Strong light is necessary to see this structure]; humeral stripe never forked (Figs. 172, 194) . 17
- 17(16'). Distance between mesostigmal lobes almost as wide (70–93%, N=8) as each lobe (Fig. 497c); usually with a small gap between medial edge of mesostigmal lobe and lateral branch of middorsal thoracic carina (Fig. 497c); S Arizona in the United States and N Mexico south to N half of Costa Rica (Fig. 776) *anceps*
- 17'. Distance between mesostigmal lobes approximately half (50–63%, N=8) as wide as each lobe (Fig. 515c); medial margin of mesostigmal lobe adjacent to lateral branch of middorsal thoracic carina (Fig. 515c); S half of Costa Rica south through cordilleran region of Colombia (Fig. 776) *fissa*

Key F-7 (hairline black middorsal stripe)

1. Mesostigmal lobe directed posteromesally with medial tip perpendicular to mesepisternum, so that venter of apical part of lobe is visible in dorsal view (Fig. 569c); SE Canada south through S Mexico (Fig. 797) *sedula* (in part)
- 1'. Mesostigmal lobe directed posterodorsally, with venter of apical part of lobe not visible in dorsal view (e. g., Figs. 554c, 575c) 2
- 2(1'). Mesostigmal lobe broadly rounded (Fig. 575), its mesal margin not recurved ventrally forming a tubercle; with a low to prominent mesepisternal tubercle laterally to mesostigmal lobe (Fig. 575c); SE Arizona in the United States south through Chiapas in Mexico (Fig. 775) *tarascana* (in part)
- 2'. Mesostigmal lobe narrower, thumb-like (Figs. 522, 554) to poorly developed (Fig. 499), its mesal margin recurved ventrally forming a tubercle appressed against mesepisternum directly under mesostigmal lobe (Figs. 522e, 554e); lacking a mesepisternal tubercle laterally to mesostigmal lobe (Figs. 499c, 522c, 554c) 3
- 3(2'). Mesostigmal lobe poorly developed (Fig. 499); larger species (abdomen length 26.7–29.7; total length 34.3–37.8); SE Canada south to Florida and Arizona in the United States and Nuevo León in Mexico (Fig. 799) *apicalis*
- 3'. Mesostigmal lobe well developed (Figs. 522, 554); smaller species (abdomen length 22.3–26; total length 29–33.9) 4
- 4(3'). Ventral tubercle formed by recurved mesal margin of mesostigmal lobe usually visible in dorsal view (Figs. 522c, d); black humeral stripe usually forked (Fig. 199); widespread from Arizona east through E United States, N and central Mexico (Fig. 787) *fumipennis violacea* (in part)
- 4'. Ventral tubercle formed by recurved mesal margin of mesostigmal lobe not visible in dorsal view (Figs. 554c, d); black humeral stripe not forked (Fig. 234); SW United States south to Guatemala (Fig. 786) *pallens* (in part)

Key F-8 (mesostigmal lobe absent or barely differentiated)

1. Rear of head largely black; Veracruz in Mexico and Yucatán Peninsula south to N Honduras (Fig. 800) *gaumeri* (in part)
- 1'. Rear of head pale 2
- 2(1'). S8–9 black dorsally or with a pair of dorsolateral black spots (Fig. 406); W United States and NW Sonora and Chihuahua in Mexico (Fig. 789) *albertaina*
- 2'. S8–9 entirely pale dorsally (Figs. 413, 441, 468) 3
- 3(2'). Black humeral stripe usually forked dorsally (Fig. 179); smaller species (Hw 19.5–20.7; TL 31.3–32.5); S Arizona in the United States south to Oaxaca in Mexico (Fig. 781) *carlcooki* (in part)
- 3'. Black humeral stripe usually not forked dorsally, often a mere line slightly enlarged along ventral half (Fig. 210); larger species (Hw 21.3–23.5; TL 33.3–37.7); South Dakota in the United States south to Honduras (Fig. 781) *immunda* (in part)

Key F-9 (mesostigmal lobe smoothly curved with mesal margin appressed against lateral branch of middorsal carina)

1. Pale antehumeral stripe as wide as (Fig. 195) to narrower than (Fig. 196) black area on mesepisternum adjacent to middorsal carina and black humeral stripe; more slender species, with shorter wings (Hw 17.2–21.5) 2
- 1'. Pale antehumeral stripe wider than black area on mesepisternum adjacent to middorsal carina and black humeral stripe (Figs. 190–193, 253); stockier species, with longer wings (Hw 20–26.4) 3
- 2(1). Mesostigmal lobe with a slight concave notch medially in dorsal view (Fig. 562c); Sonora in N Mexico south to Peru and east to Venezuela and N Brazil (Fig. 801) *pulla* (in part)
- 2'. Mesostigmal lobe gently curved, almost linear, lacking a concave notch medially in dorsal view (Figs. 516c–520c); San Luis Potosí in Mexico south to Panama (Fig. 800) *frequentula* (in part)
- 3(1'). Lacking a ventral transverse tubercle at base of mesostigmal lobe but with mediodorsal margin of lobe swollen when viewed posteriorly (Figs. 570e, 571e); black humeral stripe of uniform width, slightly branched at upper fifth (Fig. 253); Costa Rica south to Pacific slope of Colombia (Fig. 785) *talamanca* (in part)
- 3'. With a ventral transverse tubercle at base of mesostigmal lobe when viewed posteriorly (Fig. 513e) or base of mesostigmal lobe lacking a ventral transverse tubercle *and* mediodorsal margin of lobe not swollen when viewed posteriorly (Fig. 514e); black humeral stripe of uniform width at basal half then abruptly narrowing forming a fine line above (Figs. 190–193) 4
- 4(3'). Base of mesostigmal lobe viewed posteriorly lacking a ventral transverse tubercle (Fig. 514e); middorsal thoracic stripe parallel sided (Fig. 192); SE Arizona in the United States to Oaxaca, Tamaulipas south to Veracruz in Mexico (Fig. 771) ... *extranea*
- 4'. Base of mesostigmal lobe viewed posteriorly with a ventral transverse tubercle (Fig. 513e); middorsal thoracic stripe usually constricted at base (Fig. 191); S Veracruz to Chiapas in Mexico south through Panama (Fig. 771) *elongata*

Key F-10 (transversely oval mesostigmal lobes almost approximate)

1. Black middorsal stripe abruptly widened at dorsal 0.50, often with a small pointed ventral offshoot laterally (Fig. 268); each mesostigmal lobe occupying about 75% of entire plate length (Fig. 588c); Sinaloa in Mexico south to Guatemala (Fig. 774) .
..... *variabilis*
- 1'. Black middorsal stripe parallel, not abruptly widened dorsally (Figs. 237, 248, 249); each mesostigmal lobe occupying about 50% or less of entire plate length (Figs. 557c, 566c) 2
- 2(1'). Mesostigmal lobe strongly erect, almost perpendicular to mesepisternum when viewed dorsally (Fig. 566c); S8–10 black ventrally (Fig. 473); Atlantic slope of central Mexico in Tamaulipas, Hidalgo, Puebla and Veracruz (Fig. 773) *rudolphi*
- 2'. Mesostigmal lobe directed posterodorsally, partially overlying mesepisternum when viewed dorsally (Figs. 557c, 567c); S8–10 mostly pale ventrally (Figs. 464, 474) 3
- 3(2'). With a low transverse tubercle on mesepisternum under base of mesostigmal lobe in posterior view, and mesal margin of lobe not recurved ventrally [NOTE: strong light and high magnification are necessary to see this structure] (Fig. 557e); dorsum of S8–9 with paired black markings (Fig. 464); Arizona in the United States through NW Mexico south to Nayarit (Fig. 777) .
..... *pima* (in part)
- 3'. Lacking a tubercle on mesepisternum under base of mesostigmal lobe in posterior view, and mesal margin of lobe recurved ventrally [NOTE: strong light and high magnification are necessary to see this structure] (Fig. 567e); dorsum of S8–9 entirely pale (Fig. 474); SE Arizona in the United States south to Jalisco in Mexico (Fig. 775) *sabino* (in part)

Key F-11 (mesostigmal lobe distally widened)

1. Mesepisternal tubercles lateral to mesostigmal lobes present, well developed (Figs. 575c, 578c, 581c, 582e) 2
- 1'. Mesepisternal tubercles lateral to mesostigmal lobes absent (e. g., Figs. 498c, 557c, 589c) or low (524c) 4
- 2(1). Mesal border of mesostigmal lobe recurved and greatly swollen ventrally forming a prominent tubercle (Fig. 578e) [NOTE: strong light and high magnification are necessary to see this structure]; Arizona and New Mexico in the United States south through W Mexico to Costa Rica (Fig. 793) *tezpi* (in part)
- 2'. Mesal border of mesostigmal lobe with no ventral tubercle, this area forming a concave juncture with mesepisternum (Fig. 582e) [NOTE: strong light and high magnification are necessary to see this structure] 3
- 3(2'). Paler species, with black middorsal stripe as wide as a fourth or less of mesepisternum, humeral black stripe absent or with dorsal portion just a hairline (Figs. 254, 255), sides of S4–7 mostly pale and S10 pale dorsally (Fig. 479); SE Arizona in the United States south through Chiapas in Mexico (Fig. 775) *tarascana* (in part)
- 3'. Darker species, with black middorsal stripe as wide as half of mesepisternum, humeral black stripe wider than a hairline (Figs. 261–263), sides of S4–7 with dark lateroventral streaks and S10 with a pair of black spots dorsally (Fig. 485); widespread from SE Ontario in Canada south through NW Argentina (Fig. 793) *translata* (in part)
- 4(1'). Medial margin of mesostigmal lobe recurved ventroposteriorly (Figs. 507e, f); S Mexico south through W Panama (Fig. 778) *chelata* (in part)
- 4'. Medial margin of mesostigmal lobe straight, not recurved ventroposteriorly (e. g., Figs. 537e, 538e, 557e, 579e, 580e)
..... 5

- 5(4'). Medial edge of mesostigmal lobe well separated from lateral branch of middorsal carina (Figs. 537a, b, c, 557b, 575a, b, c, 579a, b, c, 580a, b, c) 6
- 5'. Medial edge of mesostigmal lobe confluent with or appressed against lateral branch of middorsal carina (Figs. 498a, b, c, 524c, 542a, b, c, 548a, b, c, 589a, b, c) 9
- 6(5). S3–6 with laterodorsal well defined black streaks extending for almost the entire segment length (Figs. 217–219, 237, 260) 7
- 6'. S3–6 with diffuse black streaks or restricted to laterodorsal posterior black spots (Figs. 254, 255); SE Arizona in the United States south through Chiapas in Mexico (Fig. 775) *tarascana* (in part)
- 7(6). Mesostigmal lobes separated from each other by a distance equal to about two to three times the width of each lobe in dorsal view (Figs. 579a, c, 580a, c); mesostigmal lobe usually lacking a tubercle on mesepisternum at its base in posterior view (Fig. 579e) except in specimens from Mexico which can have a low tubercle (Fig. 580e) [NOTE: strong light and high magnification are necessary to see this structure]; Arizona and New Mexico in the United States south through Hidalgo and Mexico in Mexico (Fig. 777) *tonto*
- 7'. Mesostigmal lobes separated from each other by a distance equal to or shorter than one and a half times the width of each lobe (Figs. 537a, c, 557a, c); mesostigmal lobe usually with a tubercle on mesepisternum at its base in posterior view (Figs. 537e, 538e, 557e) [NOTE: strong light and high magnification are necessary to see this structure]; SE Arizona in the United States south through central Mexico 8
- 8(7'). Mesepisternum under base of mesostigmal lobe with a prominent tubercle in posterior view (Fig. 537e), which can be low and small in some specimens from Mexico (Fig. 538e) [NOTE: strong light and high magnification are necessary to see this structure]; humeral stripe usually not forked (Figs. 217–219), or, if forked (as in Figs. 136–139), then posterior branch of fork usually forming an isolated spot separated from stripe over humeral suture; SE Arizona in the United States south through S Mexico (Fig. 778) *lacrimans*
- 8'. Mesepisternum under base of mesostigmal lobe with a low transverse tubercle in posterior view (Fig. 557e) [NOTE: strong light and high magnification are necessary to see this structure]; humeral stripe forked, and posterior branch rarely separated from stripe over humeral suture (Fig. 237); Arizona in the United States through NW Mexico south to Nayarit (Fig. 777) *pima* (in part)
- 9(5'). Dorsolateral depression on middle lobe of prothorax deeper, oblique to suture between prothoracic middle and posterior lobes (e. g., Fig. 491) 10
- 9'. Dorsolateral depression on middle lobe of prothorax shallower, almost parallel to suture between prothoracic middle and posterior lobes (e. g., Fig. 492) 12
- 10(9). Mesostigmal lobe in dorsal view with posterior margin approximately linear, and lobe separated from opposite by a space wider than the width of each lobe (Fig. 524c); central United States through Arizona and Texas south to Honduras (Fig. 772) *funnebris*
- 10'. Mesostigmal lobe in dorsal view with posterior margin broadly convex, and lobe separated from opposite by a space subequal to or narrower than the width of each lobe (Figs. 498c, 542c, 548c, 589c) 11
- 11(10'). Sides of S3–6 mostly pale ventrally with black restricted to posterior third or less of each segment (Fig. 173); Nuevo León and Jalisco south through Veracruz and Puebla in Mexico (Fig. 773) *annae* (in part)
- 11'. Sides of S3–6 with a complete black streak ventrally (Fig. 223); Guatemala south through Ecuador (Fig. 774) *medullaris*
- 12(9'). Posterolateral margin of mesostigmal lobe forming a deep U-shaped concavity with posterior margin of mesostigmal plate (Figs. 548c, d); larger species (Hw 24.5–27.1); Veracruz and Puebla in Mexico (Fig. 773) *noveloi*
- 12'. Posterolateral margin of mesostigmal lobe forming a shallow concavity with posterior margin of mesostigmal plate (Figs. 589c, d); smaller species (Hw 21.8–25.2); S British Columbia and W Alberta in Canada south through Montana, Washington, California, N Arizona in the United States and Baja California in Mexico (Fig. 772) *vivida*

Key F-12 (labrum entirely black)

1. Pale postocular spots absent (Figs. 246, 247); mesostigmal lobe in dorsal view small, as wide as long, occupying the medial fifth of the mesostigmal plate width (Fig. 565c); Costa Rica and Panama (Fig. 783) *rogersi*
- 1'. Pale postocular spots present (Figs. 168, 169, 230, 231); mesostigmal lobe in dorsal view wider than long, occupying the medial third to half of the mesostigmal plate width (Figs. 493c, d, 494c, d, 549c, 551c, d) 2
- 2(1'). In anterior view mesostigmal lobe longer than wide or as long as wide (Figs. 493a, b); ovipositor (excluding styli) extending beyond distal tip of cerci (Figs. 400–402); Honduras south to Bolivia and Acre in Brazil (Fig. 795) *adamsi* (in part)
- 2'. In anterior view mesostigmal lobe wider than long (Figs. 549a–551a); ovipositor (excluding styli) not extending beyond distal tip of cerci (Figs. 458, 459); SE Arizona south through Bolivia (Fig. 794) *oculata* (in part)

Key F-13 (hind lobe of prothorax with mediolateral tuberculate processes or swellings)

1. Mesostigmal lobes small, occupying medial half or less of posterior margin of plate (Figs. 502a, c); larger species (Hw 23.5–28.2, total length 38.2–44.5); Costa Rica and Panama (Fig. 791) *calverti*
- 1'. Mesostigmal lobes large, foliate, occupying medial half or more of posterior margin of plate (Figs. 510a, c, 511a, c, 521a, c,

- 552a, c, 553a, c); smaller species (Hw 18.8–24.7, total length 28.5–39); Arizona and Texas in U. S. A. south through Panama, Colombia, Venezuela, and Ecuador 2
- 2(1'). Labrum lacking metallic coloration (Fig. 19) or with only a medial basal spot (Figs. 26, 232a); dark humeral thoracic stripe usually forked along distal 0.50 or more (Fig. 232a), rarely less (Fig. 233); S3–5 with relatively broad spindle-shaped pale mark dorsally (Fig. 232b); Arizona and Texas in the United States and Baja California in Mexico south to central Panama (Fig. 790) *oenea*
- 2'. Labrum with metallic coloring at least on its basal half (Figs. 24, 186, 187, 197, 198), except for some females of *A. cuprea* where it is entirely pale; dark humeral thoracic stripe usually forked along distal 0.40 or less (Figs. 186–188, 198); S3–5 with a thin pale middorsal line only (e. g., Fig. 420) 3
- 3(2'). Space between tips of mesostigmal lobes in dorsal view narrow, about one to one-and-a-half times as wide as width of each lobe at base (Fig. 510a); mesostigmal lobe longer than wide, parallel sided, erect, its tip unmodified (Figs. 510a, c, d), extending for more than three times the height of the vestigial mesepisternal tubercle when viewed in oblique lateral view (Fig. 510g); Guatemala south through Colombia and east to Venezuela (Fig. 791) *cupraurea*
- 3'. Space between tips of mesostigmal lobes in dorsal view wider, but less than twice as wide as width of each lobe at base (Figs. 511a, c, 521a, c); mesostigmal lobe roundly quadrate, its upper portion thickened, or slightly depressed, or slightly bent posteriorly, its tip extending for less than twice the height of the mesepisternal tubercle when viewed in oblique lateral view (Fig. 521g) 4
- 4 (3'). Mesostigmal lobe with medial margin convex in posterior view (Fig. 511e); Texas in the United States and Sonora in Mexico south through Honduras (Fig. 790) *cuprea*
- 4'. Mesostigmal lobe with medial margin unmodified in posterior view (Fig. 521e); Costa Rica and Panama south to Colombia and Ecuador west of the Andes (Fig. 791) *fulgida*

Key F-14 (mesostigmal lobe directed posterolaterally)

1. Mesostigmal lobe in dorsal view very small, slightly wider than long, occupying basal fourth or fifth of mesostigmal plate (Fig. 559c); Jalisco in Mexico south through Panama (Fig. 785) *pocomana*
- 1'. Mesostigmal lobe in dorsal view wider, occupying about basal half of mesostigmal plate (Figs. 549c, 550c, 567c, 575c) ... 2
- 2(1'). Mesostigmal lobe gently convex (Figs. 549, 550); rear of head and ovipositor largely black, and S8–9 with black markings (Figs. 458, 459); SE Arizona south through Bolivia (Fig. 794) *oculata* (in part)
- 2'. Mesostigmal lobe subquadrate (Figs. 567, 575); rear of head and ovipositor largely pale, and S8–9 entirely pale (Figs. 474, 479) 3
- 3(2'). Mesostigmal lobes separated by a distance shorter than width of each lobe in dorsal view (Fig. 567c); mesal margin of mesostigmal lobe recurved ventrally in posterior view (Fig. 567e) [NOTE: strong light and high magnification are necessary to see this structure]; black middorsal stripe about as wide as half of mesepisternum and humeral black stripe wider than a hairline (Fig. 249); SE Arizona in the United States south to Jalisco in Mexico (Fig. 775) *sabino* (in part)
- 3'. Mesostigmal lobes separated by a distance subequal to twice the width of each lobe in dorsal view (Fig. 575c); mesal margin of mesostigmal lobe not recurved ventrally in posterior view [NOTE: strong light and high magnification are necessary to see this structure]; black middorsal stripe as wide as a fourth or less of mesepisternum and humeral black stripe absent or just a hairline along dorsal half (Figs. 254, 255); SE Arizona in the United States south through Chiapas in Mexico (Fig. 775) *tarascana* (in part)

Key F-15 (mesal margin of mesostigmal lobe recurved ventrally forming a tubercle)

1. Ventral tubercle formed by recurved mesal margin of mesostigmal lobe extending anterolaterally beyond medial margin of lobe in posterior view (Figs. 522e, 554e); black humeral stripe less than a third as wide as pale antehumeral stripe (Figs. 199, 234) 2
- 1'. Ventral tubercle formed by recurved mesal margin of mesostigmal lobe ending at medial margin of lobe in posterior view (Figs. 536e, 539e); black humeral stripe a third or more as wide as pale antehumeral stripe (Figs. 216, 220) 3
- 2(1'). Ventral tubercle formed by recurved mesal margin of mesostigmal lobe not visible in dorsal view (Figs. 554c, b); black humeral stripe not forked (Fig. 234); SW United States south to Guatemala (Fig. 786) *pallens* (in part)
- 2'. Ventral tubercle formed by recurved mesal margin of mesostigmal lobe usually visible in dorsal view (Figs. 522c, d); black humeral stripe usually forked (Fig. 199); widespread from Arizona east through E United States, N and central Mexico (Fig. 787) *fumipennis violacea* (in part)
- 3(1'). Basal area of mesostigmal lobe depressed, forming a shallow concavity (Figs. 536c, d); rear of head largely black, black humeral stripe about as wide as pale antehumeral stripe (Fig. 216); 14–19 px in Fw, 12–15 px in Hw; Honduras south to Panama (Fig. 797) *johannella*
- 3'. Basal area of mesostigmal lobe planar or slightly convex (Figs. 539c, d); rear of head largely pale; black humeral stripe less than a third as wide as pale antehumeral stripe (Fig. 220); 10–13 px in Fw, 8–10 px in Hw; Texas in the United States south through Nuevo León in Mexico (Fig. 788) *leonorae*

Key F-16 (mesostigmal lobe slanted anteriorly)

1. Abdominal segments largely black with pale markings restricted to middorsal areas (Fig. 205), S10 entirely black (Fig. 436); S Mexico south through Guatemala (Fig. 774) *gonzalezi*
- 1'. Abdominal segments pale with black restricted to dorsolateral areas and sometimes ventrolateral areas (Figs. 173, 176, 206, 228, 238), S10 never entirely black (Figs. 408, 410, 438, 456, 465) 2
- 2(1'). Mesostigmal lobe wide, occupying about 0.50 of mesostigmal plate width, and separated from opposite by a space narrower than the width of each lobe (Figs. 498a, c); pale antehumeral stripe narrower than black middorsal stripe (Fig. 173); sides of S8–10 black ventrally (Fig. 408); Nuevo León and Jalisco south through Veracruz and Puebla in Mexico (Fig. 773) *annae* (in part)
- 2'. Mesostigmal lobe narrower, occupying 0.33 or less of mesostigmal plate width, and separated from opposite by a space as wide as each lobe or wider (Figs. 500a, c, 529a, c, 546a, c, 547a, c, 558a, c); pale antehumeral stripe subequal to or broader than black middorsal stripe (Figs. 176, 206, 228, 238); sides of S8–10 pale ventrally (Figs. 410, 438, 456, 465) 3
- 3(2'). Anterior area of mesepisternum smooth, lacking a mesepisternal tubercle laterally to mesostigmal lobe and a concavity underneath it (Figs. 546c, 547c); middorsal thoracic carina branching slightly posterior to distal margin of mesostigmal lobes (Figs. 546c, 547c); S8–9 laterally lacking a complete dark stripe (Fig. 456); smaller species (Hw 18.4–22.5); S Oregon, California, Arizona, New Mexico, and Texas in the United States, south to central Mexico (Fig. 786) *nahuana*
- 3'. Anterior area of mesepisternum with a low mesepisternal tubercle laterally to mesostigmal lobe and a concavity underneath it (Figs. 500c, 529c, 558c); middorsal thoracic carina branching well posterior to level of distal margin of mesostigmal lobes (Figs. 500c, 529c, 558c); S8–9 laterally usually with a dark lateral stripe (Figs. 410, 438, 465); larger species (Hw 22.5–26.4) 4
- 4(3'). Posterolateral margin of mesostigmal lobe in dorsal view slightly concave, entire posterior margin of mesostigmal plate almost linear or at most slightly concave (Fig. 500c); Texas in the United States south through Puebla in Mexico (Fig. 792) *barretti*
- 4'. Posterolateral margin of mesostigmal lobe in dorsal view distinctly concave, clearly differentiated from remainder of mesostigmal plate (Figs. 529c, 558c) [NOTE: the females of the following two species cannot be diagnosed based on morphology or color] 5
- 5(4'). SE Arizona in the United States south to Oaxaca along W Mexico (Fig. 792) *harknessi*
- 5'. S Veracruz in Mexico south through N Nicaragua (Fig. 792) *pipila*

Aids to recognize and identify females

Due to the complexity of the key to females, we provide here shortcuts for a few species comprising suites of unique characters to place a target specimen within the main key and one of the 16 subordinate keys (F-1 to F-16). They should be used with caution due to variability of characters.

1. Postocular spots lacking *and* entire epicranium black (Figs. 246, 247, 985, 986) *and* from Costa Rica and Panama: probably *A. rogersi* (F-12).
2. Labrum entirely black (Fig. 2) *and* black ovipositor extending beyond tips of cerci (Figs. 400–402, 988): probably *A. adamsi* (F-5, F-12) [Note that some females of *A. oculata* (F-12, F-14) also may have an entirely black labium (Fig. 16), but ovipositor does not extend beyond cerci (Figs. 458, 459, 982)].
3. Fw pq = 6 *and* primarily tan or blue (not orange) *and* from Mexico or Guatemala: probably *A. percellulata* (Figs. 236, 967) (F-6).
4. From Lesser Antilles: either *A. concinna* (Figs. 185, 907) or *A. telesfordi* (Figs. 256, 909) (F-3).
5. Two rows of cells between CuA and hind margin of wing (as in Fig. 273) *and* from U. S. A. (*A. lugens* only) or Mexico: probably either *A. funcki* (Figs. 200, 808, 809, 919) or *A. lugens* (Figs. 221, 825, 826, 916) (F-1).
6. Labrum partly or completely metallic (Figs. 23–26): *A. calverti*, *A. cupraurea*, *A. cuprea*, *A. fulgida*, *A. oenea* (F-13).
7. Labrum pale *and* S8–9 laterally with a largely complete parallel pale stripe followed ventrally by a similarly complete parallel dark stripe: either *A. barretti* (Figs. 176, 410, 974), *A. insipida* (Figs. 214, 215, 444, 445, 972) (main key), *A. harknessi* (Figs. 206, 207, 437, 438, 970), *A. pipila* (Figs. 238, 465, 976) (F-16), *A. tezpi* (Figs. 258, 259, 483, 1020, 1021), or *A. translata* (Figs. 261, 485, 979) (F-6, F-11).
8. With an isolated black dumbbell mark traversing the median ocellus *and* from Arizona and NW Mexico: probably *A. sabino* (Figs. 249, 879); less likely *Argia tarascana* (Figs. 254, 255, 872, 873) (F-6, F-7, F-11, F-14).
9. Dark middorsal thoracic stripe with fishhook appearance (Figs. 268, 864): probably *A. variabilis* (F-10).
10. Large pale postocular spots separated from pale occipital bar by a narrow dark hairline *and* Fw pq = 3 (Fig.

280): possibly *A. frequentula* (Figs. 195, 1027) (F-6, F-9), *A. johannella* (Figs. 216, 1009) (F-15) or *A. pulla* (Figs. 244, 1030) (F-6, F-7, F-9).

11. Wings of a uniform amber color (as in Figs. 274, 841) *and* with a deep non-costate circular depression on mesepisternum directly behind mesostigmal lobe (Fig. 564c; easily seen in the field) *and* from S Texas & NE Mexico; probably *A. rhoadsi* (F-6).

Argia adamsi Calvert, 1902

Figs. 1 (head ♂); 2 (head ♀); 27, 28 (head, thorax, S1–4 ♂); 168, 169 (head, thorax, S1–4 ♀); 283–287 (S7–10 ♂); 400–402 (S7–10 ♀); 493, 494 (mesostigmal plates ♀); 592 (genital ligula); 661 (appendages ♂); 795 (map); 987 (body scan ♂); 988 (body scan ♀).

[Key locators: ♂ G-5, couplet 5(4); ♂ M-6, couplets 16(15), 20'; ♀ F-5, couplet 1, F-12, couplet 2(1'); ♀ shortcut 2]

Argia tinctipennis: Kirby 1899: 371 (misidentified material from Panama).

Argia tinctipennis: Calvert 1902: 83 (material from Panama identified by Kirby as *A. tinctipennis* thought to be *A. indicatrix*).

Argia adamsi Calvert 1902: 80, 81, pl. IV, figs. 35, 35 a. (description of ♂, Panama);—Calvert *in* Calvert & Hagen 1902: 105 (catalog);—Calvert 1907: 367, pl. X, fig. 5. (further notes on ♂, ♀ described, Costa Rica);—Calvert 1909: 134 (♀ compared with *A. oculata*);—Ris 1918: 105–107 (key, further notes, Panama);—Soukup 1954: 11 (Peru);—Rácenis 1959: 474 (Peru);—Kimmins 1970: 182 (holotype type data listed);—May 1979: 16 (Panama);—Paulson 1982: 252 (Costa Rica, Panama, South America);—Dunkle 1991: 132 (Honduras, range extension);—Donnelly 1992: 83 (Panama);—Butt 1995: 96 (SE Peru);—Louton *et al.* 1996: 438 (Peru);—Daigle 1996: 10 (Ecuador);—Ramírez *et al.* 2000: 249 (Costa Rica);—Donnelly 2000a: 18 (new for Honduras);—Förster 2001: 11, 54, 58 (key ♂, ♀, fig. C24);—Esquivel 2005: 286 (Costa Rica);—Westfall & May 2006: 165, 175 (figs. 81C, 101A);—Heckman 2008: 370, 381 (key);—Pérez-Gutiérrez & Palacino-Rodriguez 2011: 212 (Colombia);—Garrison & von Ellenrieder 2013: 15, 16 (Costa Rica, fig. 21);—Garrison & von Ellenrieder 2018: 9–12 (Ecuador, diagnosis, figs. 10–12, 36–42, 43, 44, 70, 71, 90, 91, 104, 105, 137, 143, 144);—Bota-Sierra *et al.* 2019: 36 (Colombia, brief description, fig. 20);—Palacino-Rodríguez *et al.* 2020: (Colombia);—von Ellenrieder *et al.* 2020: 11 (Ecuador);—Paulson & Haber 2021: 92 (diagnosis, photos, Costa Rica);—Hämäläinen 2021: 69 (Río Bobonaza, Ecuador).

Argia (Chalcargia) adamsi: Kennedy 1920: 85 (placed in new subgenus).

Argia huallaga Fraser 1946: 450, 451, fig. 2 a (“Yumbatos, Huallaga region, Peru”);—Soukup 1954: 11 (Peru);—Rácenis 1959: 475 (Peru);—Kimmins 1966: 196 (lectotype designated by Kimmins—“The [type] locality given by Fraser is not correct. The part of the paper triangles upon which he wrote his determinations gives the locality as Balsapuerto, not Yumbatos, and the labels have been amended accordingly.”);—von Ellenrieder & Garrison 2007a: 16 (lectotype examined, synonymized with *A. adamsi*).

Primary types. *Argia adamsi*: holotype ♂, PANAMA, Bugaba, 1881–1883, George Charles Champion leg. [examined, in BMNH];—*Argia huallaga*: lectotype ♂, PERU, Huallaga, Balsapuerto, 1932 x, Guillermo Klug leg. [examined, in BMNH; von Ellenrieder & Garrison 2007a].

Specimens examined. 725 ♂♂, 109 ♀♀: **NICARAGUA, Río San Juan**: 2 ♂♂, Refugio Bartola, NE of Lodge at junction of Río San Juan and Río Bartola, 1–2 km, forest streams (yellow and orange trails), 10.97°N, 84.34°W, 30 m, 6 August 2002, W. F. Mauffray [FSCA]; 1 ♂, San Juan River, Refugio Bartola, 10.97°N, 84.34°W, 30 m, 4 May 2001, G. Grether [RWG]. **COSTA RICA, Alajuela**: 1 ♂, 1 ♀, 8 km S of St. Cecilia, Estación Biológica Pitilla {10.9891°N, 85.4258°W}, 680 m, July 1988, S. J. Brooks [BMNH]; **Guanacaste**: 1 ♂, Santa Rosa National Park, Guajiniquil River, L09-101 {10.8546°N, 85.6099°W}, 295 m, 12 July 1989, C. Esquivel-Herrera [UNH]; 1 ♀, Río Piedras, N of Bagaces, DRP 67-88 {10.5364°N, 85.2553°W}, 89 m, 27 July 1967, R. P. Seifert [FSCA]; **Heredia**: 1 ♂, bosque Bioforesta, La Horqueta, Sarapiquí, L03-961 {10.3333°N, 83.95°W}, 70 m, 11 March 2001, C. Esquivel-Herrera [UNH]; 1 ♂, **Finca La Selva** {10.4667°N, 84.0167°W}, 60 m, 28 March 1987, J. Belle [RWG]; 2 ♂♂, **Finca La Selva**, 1.5 mi S of Puerto Viejo, 66-246 {10.4667°N, 84.0167°W}, 60 m, 19 September 1966, D. R. & M. L. Paulson [FSCA]; 1 ♂, Puerto Viejo de Sarapiquí, Río Puerto Viejo and tributaries, **La Selva Biological Station**, small rivulet in sun on sendero oriental, Haber #2664, 10.4314°N, 84.0039°W, 47 m, 5 September 2005, W. A. Haber [RWG]; 1 ♂, 1 ♀, Puerto Viejo, **La Selva Biological Station** {10.4667°N, 84.0167°W}, 60 m, 28 April 1988, C. Esquivel-Herrera; 1 ♂, same data but 21 May 1988; 4 ♂♂, 1 ♀, same data but 20 July 1988; 1 ♂, 1 ♀, same data but 20 July 1988 [UNH]; 2 ♂♂, same data but 26 June 1989, C. Esquivel-Herrera [UNH]; 1 ♂, Sarapiquí, Magsasay (previously known as El Plástico), L-03-582 {10.4017°N, 84.0551°W}, 20 September 1993 [UNH]; **Limón**: 1 ♂, 1 ♀, Estación Hitoy-Cerere, Reserva Biológica Hitoy-Cerere, Río Cerere {9.6303°N, 83.0147°W},

200 m, September 1990, G. Carballo [INBIO]; 2 ♂♂, La Lola, 23.8 mi W of Limón {10.0944°N, 83.3917°W}, 40 m, 23 July 1963, F. G. Thompson [FSCA]; 1 ♂, near Siquirres, Finca La Lola {10.1°N, 83.5°W}, 6 March 1985, A. M. Young [USNM]; 1 ♀, Pandora (Villas de Pandora) {9.7371°N, 82.9624°W}, 23 m, 5 July 1964, F. G. Thompson [FSCA]; 3 ♂♂, Reserva Biológica Hitoy-Cerere, Río Cerere, 9 km SW of Pandora, 86x013 {9.6303°N, 83.0147°W}, 271 m, 10–11 June 1986, T. W. Donnelly [UNH, RWG]; 1 ♀, Río Santa Clara, 1 km E of Guápiles, clear rocky stream and tributaries {10.2036°N, 83.7728°W}, 280 m, 3 March 1987, S. W. Dunkle [RWG]; 1 ♂, Ruta 32 between La Unión and Flores, on dirt road 1 km S, stream through open marshy cow pasture near secondary forest, 10.2047°N, 83.8586°W, 287 m, 26 May 2013, R. W. Garrison & N. von Ellenrieder [RWG]; 1 ♂, Ruta 32 between La Unión and Flores, on dirt road 1.5 km S, rocky river through secondary forest, 10.2007°N, 83.8572°W, 279 m, 27 May 2013, R. W. Garrison & N. von Ellenrieder [RWG]; **Puntarenas**: 2 ♂♂, 2 mi SE of Palmar del Sur {8.9328°N, 83.4483°W}, 11 m, 28 March 1961, W. H. Cross [FSCA]; 1 ♀, 4 mi W of Villa Neily {8.6596°N, 82.9979°W}, 35 m, 3 July 1965, H. G. Real [RWG]; 1 ♂, 5 km NW of Sardinal on road to Guacimal and Monteverde, in tandem with 1540 [female] at 10:50, Haber #1539, 10.1456°N, 84.8506°W, 213 m, 30 November 2004, W. Haber & F. Morrison [RWG]; 1 ♂, 8.1 mi W NW of Esparta, stream 67-4 {9.9833°N, 84.6668°W}, 60 m, 26 June 1967, M. J. Westfall, Jr. & D. N. Westfall [FSCA]; 1 ♂, 1 ♀, bosque Los Negritos about 2 km N of entrance to Miramar, Carretera Interamericana, L-03-1231 {10.0833°N, 84.7167°W}, 60 m, 16 March 1990, C. Esquivel-Herrera & T. B. Herman [UNH]; 1 ♂, La Gamba, Pacific slope, stream gallery forest strip in open landscape {8.703°N, 83.1875°W}, 80 m, March 1990, S. Schneeweih & F. Hofhansl [UNH]; 1 ♂, Ojochal a few kilometers inland main road on main street of town, FCS08-0172, 9.0875°N, 83.6472°W, 40 m, 15 April 2008, F. C. Sibley [FSCA]; 1 ♂, Osa, Sierpe, R. B. Isla del Caño {10.175°N, 84.4°W}, 1400 m, 14 March 1984, A. Solis [INBIO]; 1 ♂, Parque Nacional Carara, L-03-889 {9.775°N, 84.604°W}, 35 m, 18–20 May 1990, C. Esquivel-Herrera; 3 ♂♂, same data but December 1991 [UNH]; 1 ♀, Parque Nacional Manuel Antonio, L-09-17 {9.3833°N, 84.1411°W}, 7 November 1988, C. Esquivel-Herrera [UNH]; 1 ♂, waterfall stream, near Rincón de Osa, 69-11 {8.7°N, 83.4833°W}, 13 m, 10 March 1969, D. R. Paulson [FSCA]. **PANAMA, Bocas del Toro**: 1 ♂, Valle del Risco, road between Valle del Risco and Ojo de Aguas, tributary to Río Risco, 9.2383°N, 82.4486°W, 92 m, 9 May 2017, W. F. Mauffray [FSCA]; **Chiriquí**: 1 ♂, 1 ♀, Chiriquí Mountains, Progreso, 8.45°N, 82.8332°W, 30 m, 16 April 1923, F. M. Gage [RWG]; 1 ♂ (holotype), Bugaba {8.4833°N, 82.6167°W}, 133 m, 1881–1883, G. C. Champion [BMNH]; **Panamá**: 4 ♂♂, 1.7–4.8 mi NW of Gamboa, Pipeline Road, 70x011, 9.1167°N, 79.7°W, 27 m, 31 March 1970, E. S. Morton [FSCA, RWG]; 4 ♂♂, 1 ♀, 2.2 km NW of Gamboa, stream at Pipeline Road, 9.1167°N, 79.7°W, 27 m, 7 August 1979, R. W. & J. A. Garrison [RWG]; 1 ♂, Barro Colorado Island, 9.15°N, 79.85°W, 62 m, 18 March 1969, R. L. Fischer [RWG]; 1 ♂, Cerro Azul, #61, 9.1667°N, 79.4167°W, 646 m, 4 April 1970, E. S. Morton [FSCA]; 4 ♂♂, forest road at Gaillard Highway, at milepost 12, 7.4 km SE of Gamboa, 9.0667°N, 79.6667°W, 75 m, 3 August 1979, R. W. & J. A. Garrison [RWG]; 1 ♂, 1 ♀, same data but 4 August 1979 [RWG]; 3 ♂♂, 1 ♀, same data but 6 August 1979 [RWG]; 1 ♂, 1 ♀, same data but 5 August 1979, J. E. Hafernik, Jr. [RWG]; 1 ♀, Gamboa {9.1°N, 79.7°W}, 60 February 1981, R. Anderson [FSCA]; 1 ♂, Howard, Farfan, 2007-309, 8.9446°N, 79.5847°W, 32 m, 26 June 2007, J.-P. Haenni [LJ]; 2 ♂♂, La Chorrera, 98-146, 8.876°N, 79.7767°W, 78 m, 1–15 April–May 1898, C. H. Dolby-Tyler [BMNH]; 1 ♂, Pipeline Road, Río Agua Salud, 9.1°N, 79.7°W, 78 m, 8–13 July 1967, O. S. Flint, Jr. & M. A. Ortiz B. [USNM]; 1 ♂, Pipeline Road, near Gamboa, 9.1°N, 79.7°W, 9 February 1987, E. S. Ross [CAS]; 10 ♂♂, stream at Limbo Hunt Club, near Pipeline Road, 8 km N of Gamboa, 9.1667°N, 79.7333°W, 105 m, 29 July 1979, R. W. & J. A. Garrison [CNIN, RWG]; **Darién**: 1 ♀, Parque Nacional Darién, Río Perrecénega at Estación Rancho Frío (Pirre Station), 14 km S of El Real, 8.0399°N, 77.75°W, 200 m, 29 March 2002, J. L. Hogue & F. Hertel [RWG]; 1 ♂, 1 ♀, Río Cartí Grande, 2 km W of Nusagandi [sic Navagandi], 9.0167°N, 77.8°W, 12 m, 5 March 1985, O. S. Flint, Jr. & J. Louton [RWG]. **COLOMBIA: Antioquia**, 116 ♂♂, 24 ♀♀, Estación Cristalina, about 28 km W of Puerto Barrio {6.4116°N, 74.5773°W}, 320 m, 1 January–20 February 1917, J. H. Williamson & E. B. Williamson [BMNH, CSCA, RWG, UMMZ]; 1 ♂, Vereda La Cruz, Finca La Brillantina, 6.8911°N, 74.5714°W, 450 m, 27 December 2009, J. Cardona & C. Bota-Sierra [CEUA]; **Caldas**, 2 ♂♂, 1 ♀, La Cachasa, 5.6958°N, 74.6136°W, 180 m, 12 May 2011, C. Moreno & C. Bota-Sierra [CEUA, RWG]; **Chocó**, 1 ♂, Río Acandí, 5.5669°N, 77.3225°W, 23 m, 29 July 2005, C. Bota-Sierra [CEUA]; **Meta**, 3 ♂♂, La Macarena, 2.1881°N, 73.7985°W, 303 m, 26 January 1969, R. E. Dietz [RWG, USNM]; 1 ♂, Quebrada Finca la Esperanza {4.2000°N, 73.5832°W}, 400 m, 19 January 2012, M. Sanchez [RWG]; **Tolima**, 2 ♂♂, Mariquita {5.2011°N, 74.9128°W}, 450 m, 17 February 1917, J. H. Williamson & E. B. Williamson [RWG, UMMZ]. **VENEZUELA: Zulia**, 1 ♀, El Guayabo {10.6222°N, 71.8533°W}, 84 m, 22 April 1920, J. H. Williamson, E. B. Williamson & W. H. Ditzler [UMMZ]; 1 ♂, Río de Oro {9.1329°N,

72.8731°W}, 54 m, 27 January 1974, J. De Marmels [MIZA]; **Táchira**, 1 ♂, 1 ♀, La Fría {8.2186°N, 72.2486°W}, 155 m, 14 April 1920, J. H. Williamson, E. B. Williamson & W. H. Ditzler [RWG]; 2 ♂♂, San Félix, Quebrada La Resbalosa {8.1136°N, 72.2569°W}, 350 m, 13 April 1996, J. De Marmels [MIZA]; 228 ♂♂, 26 ♀♀, Táchira [San Félix] {8.1178°N, 72.2553°W}, 429 m, 4–11 April 1920, J. H. Williamson, E. B. Williamson & W. H. Ditzler [BMNH, CSCA, CUMZ, MCZ, RWG, UMMZ]. **ECUADOR, Esmeraldas**: 4 ♂♂, Urbina, 36.5 km NW of Lita on San Lorenzo Highway, pools/seeps/stream {0.9833°N, 78.6668°W}, 340 m, 3 February 1997, W. F. Mauffray [FSCA]; 1 ♂, same data but 3 February 1997, J. J. Daigle [RWG]; **Manabi**: 1 ♂, Palmar, Río Maicito {0.1658°S, 79.4665°W}, 200 m, 31 March 1935, D. B. Laddey [RWG]; 10 ♂♂, same data but 10 April–14 May 1941 [CSCA, RWG, UMMZ]; **Los Ríos**: 1 ♂, stream 16 km E of Highway E25 from Formosa, 0.7256°S, 79.3483°W, 24 February 2010, K. J. Tennessen [FSCA]; **Pichincha**: 1 ♂, forested and open streams crossing road from Pedro Vicente Maldonado to Río Silanche Preserve, 08-58, Paulson photos D6946-53, W Andean form {0.0833°N, 79.1°W}, 480 m, 1 July 2008, D. R. Paulson [FSCA]; 1 ♂, road to Silanche Bird Sanctuary, stream 1 km N of Highway, rock and gravel bottom, 5 km NW of Pedro Vicente Maldonado (W-571), 0.1703°N, 78.942°W, 550 m, 3 February 2012, W. A. Haber & F. Morrison [WAH]; **Santo Domingo de los Tsáchilas**: 24 ♂♂, 4 ♀♀, Hacienda La Lorena, Santo Domingo de los Colorados (a station about 15 km E of Santo Domingo de los Colorados) {0.3097°S, 79.0388°W}, 700 m, 1 September 1940–8 March 1941, D. B. Laddey [RWG, UMMZ]; **Napo**: 4 ♂♂, 1 ♀, Along trail between main road (Puyo-Baños) and Bombaini-yacú, Río Pastaza watershed {1.5°S, 78°W}, 981 m, 25 March 1941, W. Clarke-Macintyre [CSCA, RWG]; 8 ♂♂, 1 ♀, Concepción-Río Napo {1.6667°S, 77.4168°W}, 400 m, 12–29 December 1939, W. Clarke-Macintyre [RWG, RMNH, UMMZ]; 9 ♂♂, 2 ♀♀, Cotos, plantation on Río Napo, below Napo {2.0333°S, 77.5°W}, 429 m, 28 May–28 June 1934, W. Clarke-Macintyre [RWG, UMMZ]; 14 ♂♂, first stream, ca. 400 m of Río Bombaini-Yacu {1.5°S, 78°W}, 900 m, 24 March 1941, W. Clarke-Macintyre [RWG, UMMZ]; 2 ♂♂, Hacienda Ila, Río Anzu {1.2°S, 77.8332°W}, 700 m, 16 December 1934, W. Clarke-Macintyre [UMMZ]; 3 ♂♂, 1 ♀, Headwaters of Churi-yacu, Río Pastaza watershed {1.0335°S, 77.6833°W}, 900 m, 19–29 May 1941, W. Clarke-Macintyre [CSCA, RWG, UMMZ]; 10 ♂♂, Headwaters, Río Arajuno, Napo watershed, main stream near ford {1.0833°S, 77.5333°W}, 1000 m, 25–26 April 1941, W. Clarke-Macintyre [RWG, UMMZ]; 2 ♂♂, Jatun Sacha Biological Station, 23 km E Puerto Napo, tropical wet forest, streams above flood plain {1.05°S, 77.7833°W}, 522 m, 17 October 1988, S. W. Dunkle [RWG]; 10 ♂♂, Jatun Yacu, Río Napo watershed {1.0167°S, 77.8332°W}, 700 m, 22 February–March 1937, W. Clarke-Macintyre [CSCA, RWG, UMMZ]; 2 ♂♂, La Carolina, Río Anzu {1.2°S, 77.8332°W}, 600 m, 25 September 1942, W. Clarke-Macintyre [UMMZ]; 4 ♂♂, Las Palmas, Río Anzu, Río Napo watershed {1.0667°S, 77.8°W}, 900 m, 16 August 1935, 11 December 1936, W. Clarke-Macintyre [RWG, UMMZ]; 1 ♂, near Río Bombaini-Yacu, Río Pastaza watershed {1.5°S, 78°W}, 900 m, 9 April 1941, W. Clarke-Macintyre [RWG]; 1 ♂, Pano {1.0133°S, 77.8603°W}, 580 m, 12 September 1990, O. S. Flint, Jr. [USNM]; 4 ♂♂, 2 ♀♀, Puerto Napo, 11.2 km E of Highway 45 on road to Jatun Sacha, Río Tiyuyacu, 1.0517°S, 77.7017°W, 522 m, 13 November 1997, W. F. Mauffray [RWG, USNM]; 1 ♂, 2 ♀♀, Río Chinchipino, 27 km E of Puerto Napo on road to Jatun Sacha {1.0733°S, 77.5866°W}, 400 m, 22 July 1996, S. W. Dunkle [RWG]; 1 ♀, Río Chinchipino, E of Jatun Sacha, 1.0733°S, 77.5866°W, 400 m, 13 November 1997, K. J. Tennessen [RWG]; 3 ♂♂, 1 ♀, Río Chucapi, tributary of Río Napo {0.95°S, 77.75°W}, 599 m, 26 September 1934, W. Clarke-Macintyre [RWG, UMMZ]; 2 ♂♂, Río Anzu (vicinity of Napo) {1.0524°S, 77.8033°W}, 900 m, 9 October 1934, April 1937, W. Clarke-Macintyre [RWG, UMMZ]; 1 ♂, 1 ♀, Río Arajuno, Dayuma Camp {1.1°S, 77.5832°W}, 434 m, 22–25 September 1990, J. Belle [RWG]; 25 ♂♂, 1 ♀, Río Bombaini-Yacu, Río Pastaza watershed {1.5°S, 78°W}, 900 m, 24 March 1941, 22 April 1941, W. Clarke-Macintyre [CSCA, RWG, UMMZ]; 1 ♀, Río Ila, near Hacienda Ila {1.2°S, 77.8332°W}, 700 m, 18 August 1934, W. Clarke-Macintyre [RWG]; 10 ♂♂, 1 ♀, Río Jatun-yacu, Ilupulin Creek (vicinity of Napo), headwater tributary Río Napo {1.0167°S, 77.8332°W}, 700 m, January 1935, W. Clarke-Macintyre [RWG, UMMZ]; 1 ♂, Río Sindy on road to Jatun Sacha, 5.3 km E of Puerto Napo {1.05°S, 77.7833°W}, 522 m, 15 June 1995, S. W. Dunkle, [RWG]; 1 ♂, Río Sindy, 6 km E Puerto Napo, road to Jatun Sacha {1.05°S, 77.7833°W}, 390 m, 15 June 1995, K. J. Tennessen [FSCA]; 4 ♂♂, 1 ♀, small rocky rivulet and associated pond 3.5 km SW of Puerto Napo, 1.0592°S, 77.8158°W, 454 m, 22 January 2020, R. W. Garrison & N. von Ellenrieder [CSCA, RWG, USFQ]; 1 ♂, small tributary to Jatun Yacu, volcanic rock and silt bottomed stream with mining and muddy waters, 1.0442°S, 77.8123°W, 452 m, 19 January 2020, R. W. Garrison & N. von Ellenrieder [RWG]; 2 ♂♂, Upper Río Ila, vicinity of Napo, Río Napo watershed {1.2°S, 77.8332°W}, 700 m, 21 November 1934, W. Clarke-Macintyre [UMMZ]; **Orellana**: 1 ♂, small stream about 12 km N of Loreto, Route E20, 0.6217°S, 77.26°W, 367 m, 26 October 2013, K. J. Tennessen [FSCA]; 1 ♂, small stream near Carachupa (south of Route E20), 0.5581°S,

77.1722°W, 303 m, 30 October 2013, K. J. Tennessen [FSCA]; 1 ♂, tributary of Río Payamino, road to Loreto, 1.7 km W junction with Coca Road {0.4667°S, 77.0206°W}, 250 m, 15 June 1995, K. J. Tennessen [RWG]; **Tungurahua**: 1 ♂, Guama Yacu (= Río Guamba) near Agoyán, Río Pastaza {1.4125°S, 78.3712°W}, 2000 m, 9 November 1935, W. Clarke-Macintyre [RWG]; **Pastaza**: 1 ♀, 2–8 mi N of Puyo {1.4°S, 77.8167°W}, 953 m, 9 February 1955, E. I. Schlinger & E. S. Ross [CAS]; 2 ♂♂, 1 ♀, Canelos, Río Bobonaza, Río Pastaza watershed {1.4666°S, 77.9833°W}, 500 m, 10–12 December 1938, W. Clarke-Macintyre [CSCA, UMMZ]; 1 ♂, Puyo {1.4666°S, 77.9833°W}, 1000 m, 18 April 2008, T. & K. Miyashita [Haruki Karube]; 21 ♂♂, 4 ♀♀, Río Huagrayacu, Río Pastaza watershed {1.4167°S, 78.0167°W}, 900 m, 25–28 March, 14–6 May 1941, W. Clarke-Macintyre [CSCA, RWG, UMMZ]; **Morona Santiago**: 1 ♂, Bomboiza, 17 km S of Gualaquiza {3.4333°S, 78.5167°W}, 880 m, 20 September 1990, O. S. Flint, Jr. [USNM]; 5 ♂♂, 1 ♀, Mangosisa, Río Upano {2.5244°S, 77.8947°W}, 850 m, 28 September 1945, L. Gomez Alonzo [CSCA, RWG, UMMZ]; 6 ♂♂, 1 ♀, Río Shicayacu, Río Pastaza watershed {1.0833°S, 78.0689°W}, 900 m, 8 April–16 June 1941, W. Clarke-Macintyre [CSCA, RWG, UMMZ]. **PERU, Loreto**: 1 ♂ (lectotype of *Argia huallaga*) Balsapuerto, October 1932, G. Klug [BMNH]; 1 ♂, Balsapuerto, Río Huallaga {5.8334°S, 76.6°W}, 318 m, April 1939, from P. Nagel 1934 [RWG]; 1 ♂, Muniches, Río Paranapura, on Río Huallaga {5.85°S, 76.1668°W}, 177 m, June 1933, G. G. Klug [UMMZ]; **San Martín**: 4 ♂♂, 20 km NE of Moyobamba, Mishqui-yacu {6.05°S, 76.9667°W}, 1400 m, 15–18 August 1947, F. Woytkowski [UMMZ]; 2 ♂♂, vicinity of Rioja, jungle {6.0333°S, 77.1668°W}, 900 m, 13 September 1936, F. Woytkowski [RWG]; 1 ♂, Río Seco, halfway between Moyobamba and Chachapoyas {5.8961°S, 77.2475°W}, 950 m, May 1939, G. G. Klug [RWG]; 2 ♂♂, Tarapoto {6.5153°S, 76.3656°W}, 374 m, 12–14 February 1947, F. Woytkowski [CSCA, RWG]; **Huánuco**: 2 ♂♂, 10 km N of Cucharas, confluence of Huallaga and Pacay rivers {9.0833°S, 76.0667°W}, 500 m, August 1954, F. Woytkowski [RWG, UMMZ]; 2 ♂♂, 1 ♀, Pumahuasi, 20 km N of Tingo María {8.78°S, 75.83°W}, 12 September, 17 December 1939, F. Woytkowski [CSCA, RWG]; 3 ♂♂, Shapajilla, jungle, {9.2333°S, 75.9667°W}, 630 m, 9–14 May 1939, F. Woytkowski [CSCA, UMMZ]; 1 ♂, Tingo María {8.9667°S, 75.8332°W}, 440 m, 19–24 April 1969, P. M. & P. J. Spangler [USNM]; 2 ♂♂, vicinity of Afilador [El Afilador is a town on the road from Huanuco to Tingo María], jungle {9.4494°S, 75.9693°W}, 670 m, 19–21 May 1937, F. Woytkowski [RWG, UMMZ]; 1 ♂, vicinity of Leonpampa, 110 km E of Huanuco {9.8317°S, 75.2483°W}, 800 m, 21 December 1937, F. Woytkowski [RWG]; **Ucayali**: 18 ♂♂, Boquerón del Padre Abad, NE of Tingo María {9.0733°S, 75.6872°W}, 440 m, 10–24 August 1946, F. Woytkowski [CSCA, RWG, UMMZ]; **Junín**: 1 ♂, small 1–2 foot wide sandy-bottomed creek 1 km from San Ramón, across Río Chanchamayo {11.1425°S, 75.345°W}, 834 m, 1927, Stamkuger [UMMZ]; **Madre de Dios**: 3 ♂♂, 1 ♀, Hotel Amazonas, across from Atalaya, 12.8703°S, 71.376°W, 414 m, 28 June 1993, R. W. Garrison [RWG]; 23 ♂♂, 4 ♀♀, Parque Nacional Manu, Pakitza, various trails around base camp, 11.93°S, 71.255°W, 250 m, various dates ranging from 26 October 1987–6 July 1993, J. A. Louton, N. E. Adams, O. S. Flint, Jr., R. Blahnik, R. W. Garrison [CUMZ, INECOL, RWG, USNM]; **Cusco**: 1 ♂, Camisea River drainage, San Martín C (Shell Oil gas exploration site), 11.7814°S, 72.7017°W, 431 m, 28 February 1997, J. J. Louton [RWG]. **BRAZIL, Acre**: 1 ♂, 1 ♀, Igarapé Akaria [Acuriá] {9.1667°S, 72.6833°W}, 230 m, 11 July 1993, [FSCA]; 2 ♂♂, Alto Paraíso, Rio Machadinho {9.2°S, 72.2167°W}, 290 m, 18 July 1993 [FSCA, RWG]; 1 ♂, Porto Acre, Igarapé Piancó, Reserva Florestal Humaitá, #1177, 9.7506°S, 67.6718°W, 175 m, 28 August 2008, P. S. Ferreira Peruquetti [RWG]; 3 ♂♂, Restauração, E side [base] {9.1°S, 72.3667°W}, 290 m, 21, 24 July 1993 [FSCA, RWG]; 1 ♂, Rio Tejo, N of Akaria [Acuriá] {9.1°S, 72.3667°W}, 290 m, 27 July 1993 [FSCA]. **BOLIVIA, Santa Cruz**: 4 ♂♂, 1 ♀, Río Japacani {17.3333°S, 63.25°W}, from J. Steinbach [FSCA, RWG].

A medium-size species (Table 2); male blue and black (Fig. 987) with cercus bifid with inner branch longer than outer branch (Fig. 661), and female (Fig. 988) with black labium (Figs. 2, 168, 169) and ovipositor often extending beyond tip of cercus (Figs. 400–402).

Diagnosis. Male of *A. adamsi* may be confused with its probable sister species *A. ulmeca*. Both species can be separated by the following characters: genital ligula distal segment with basal membranous hood broadly elongate and lateral lobes broadly capitate (Fig. 592) in *A. adamsi* (genital ligula distal segment with basal membranous hood quadrate and lateral lobes with tips aciculate in *A. ulmeca*, Fig. 655). All males of *A. adamsi* that we have examined from Middle America are blue and black (e. g., Fig. 987); many (but not all, e. g., Fig. 1001) *A. ulmeca*—especially from Central America—are purple and black (e. g., Fig. 1002). In *A. adamsi* the pale antehumeral stripe narrows dorsally gradually to about half of its maximum width and extends along the full height of mesepisternum (Figs. 27, 28), whereas in *A. ulmeca* it narrows dorsally abruptly to about a third of its maximum width and it usually ends before the dorsal portion of mesepisternum (Figs. 155–157). The female mesostigmal lobes for both species

(*A. adamsi*: Figs. 493, 494; *A. ulmeca*: Figs. 583–586) are similar and remarkably variable, but the characters given by Calvert (1907): 3 pq in Hw, labrum usually dark (Figs. 2, 168, 169) in *A. adamsi*; 4 pq in Hw, labrum often pale (Fig. 264) in *A. ulmeca*, serve to differentiate these two species. Female of *A. adamsi* may be confused with some females of *A. oculata* that have a largely black labrum (Fig. 231), but the shape of mesostigmal lobe differs: mesostigmal lobe in *A. adamsi* is broadly digitiform, about as long as wide, its mesal margin meets mesepisternum at a more or less acute angle (Figs. 493, 494), and it often has a small accessory lobe along distal margin of lobe (Fig. 494), whereas in *A. oculata* it is broadly foliate, wider than long, its mesal margin meets mesepisternum at an obtuse angle, and lacks an accessory lobe on distal margin of lobe (Figs. 549, 550). The ovipositor (excluding styli) is entirely black and usually extends beyond distal tip of cercus in *A. adamsi* (Figs. 400–402), while in *A. oculata* it has a pale tip and does not extend beyond distal tip of cercus (Figs. 458, 459). Most females of *A. rogersi* also have a black labrum (Fig. 246), but the pale postocular spots are always lacking in that species (present in *A. adamsi*, Figs. 168, 169), and they are further distinguished by morphology of the mesostigmal lobes (mesostigmal lobe in dorsal view wider than long, occupying the medial third to half of the mesostigmal plate width and directed medially, its mesal margin meeting mesepisternum at a more or less acute angle (Figs. 493, 494) and often with a small accessory lobe along distal margin of lobe in *A. adamsi* (Fig. 494); mesostigmal lobe in dorsal view small, as wide as long, occupying the medial fifth of the mesostigmal plate width and directed posteriorly, its mesal margin meeting mesepisternum at a more or less obtuse angle, and lacking a small accessory lobe along distal margin of lobe in *A. rogersi* (Fig. 565).

Remarks. The original description of *A. adamsi* (Calvert 1902) was based on three males from Panama, and Calvert (1907) later included another 11 males and 2 females from Costa Rica in his redescription. This species was discussed, diagnosed and illustrated in detail by Garrison & von Ellenrieder (2018). As stated by them, *A. adamsi* is a variable species throughout its range; Figs. 27, 28 illustrate different phenotypes known throughout Central America. Paulson & Haber (2021) illustrated a Caribbean form from Costa Rica with greatly reduced pale abdominal markings. The wings in males may be amber or hyaline, and the antehumeral stripe may also possess a yellow cast differing from the remaining pale blue coloration (Fig. 27) while the pale coloration in others may be entirely blue (Fig. 28).

Distribution. *Argia adamsi* and *A. ulmeca* are sympatric throughout large parts of their range (Fig. 795), although *A. ulmeca* extends farther north (Sonora, Mexico) than *A. adamsi* (Honduras). This is a frequently encountered species occurring from Honduras south to Bolivia, from an altitude near sea level to about 2000 m.

Argia agrioides Calvert, 1895

Figs. 29 (head, thorax, S1–4 ♂); 170 (head, thorax, S1–4 ♀); 288 (S7–10 ♂); 403 (S7–10 ♀); 404 (S1–10 ♀); 495 (mesostigmal plates ♀); 662 (appendages ♂); 787 (map); 942 (body scan ♂); 943 (body scan ♀).

[Key locators: ♂ G-2, couplet 10'; ♂ M-4, couplet 4(3'); ♀ Key to groups, couplet 33']

Argia agrioides Calvert 1895: 476 (description ♂, ♀, Baja California, pl. XV, fig. 14);—Calvert 1899: 414 (♀ gizzard, fig. 3);—Calvert 1902: 98 pl. IV, figs. 26, 62, 62s (key, description ♂, ♀, California, Baja California, fig. 14);—Kennedy 1918: 256 (similarity of genital ligula of ♂ from Chico, California to *A. solita*);—Calvert 1947: 604 (lectotype designated for Baja Purissima, ♂ in CAS);—Gloyd 1958: 19 (diagnosis of *A. nahuana* from *A. agrioides*);—Paulson 1982: 252 (U. S. A., Mexico);—González-Soriano 1993: 295 (Mexico);—Garrison 1994: 302 (key, diagnosis, figs. 12, 57);—Westfall & May 2006: 178 (key, description, larva, figs. 89, 98A, 101B);—González-Soriano & Novelo-Gutiérrez 2007: 127 (Baja California);—Paulson 2009: 156 (description, diagnosis, figs., photo 90);—Caesar & Wenzel 2009: 104 (phylogeny within genus *Argia*);—Bailowitz *et al.* 2015: 96 (diagnosis, figs., photos);—Johnson 2016: 24 (new for Idaho);—Torres-Pachón *et al.* 2017: 417 (molecular phylogeny of larvae within *Argia*).

Primary types. *Argia agrioides*: lectotype ♂, MEXICO, Baja California Sur, La Purissima, April 1889, C. D. Haines leg. [not examined, in CAS].

Specimens examined. 148 ♂♂, 56 ♀♀: **U. S. A., Oregon:** 1 ♂, Illinois River Forks State Park near Cave Junction, 42.1594°N, 123.658°W, 450 m, 7 August 1992, R. Orr [RWG]; **California:** 2 ♂♂, Bidwell City Park, by Big Chico Creek, Chico, 39.7438°N, 121.817°W, 60 m, 14–15 June 1975, R. W. Garrison [RWG]; 3 ♂♂, same data but 20 June 2003 [CSCA, MHNN]; 4 ♂♂, Bear Creek at Highway 16, 3.7 mi S of junction Highway 20, 38.9724°N, 122.333°W, 371 m, 20 June 2003, R. W. & J. A. Garrison, N. von Ellenrieder [CSCA, INECOL, RWG]; 1 ♀, Bear

Rally Road, Bear creek, 39.0394°N, 122.409°W, 372 m, 20 June 2003, R. W. & J. A. Garrison & N. von Ellenrieder [CSCA]; 2 ♀♀, NE Corner {41.9942°N, 123.534°W}, 1441 m, 6 September 1960, T. R. Haig [CSCA, RWG]; 1 ♂, McLaughlin NR Hunting Creek Weir, 6 m MT#2; CSCA10L230, Malaise trap, 38.8156°N, 122.374°W, 350 m, 13 June–9 July 2010, P. H. Kerr & C. E. Koehler [RWG]; 1 ♂, Blue Lake, Warner Mountains, 41.1447°N, 120.283°W, 1850 m, 2 June 2001, T. Manolis [RWG]; 2 ♂♂, 1 ♀, Russian River at Highway 101, about 2 mi S of Hopland, 38.9539°N, 123.102°W, 150 m, 13 June 1976, R. W. Garrison [RWG]; 2 ♂♂, 2 ♀♀, Butts Creek, 38.6997°N, 122.452°W, 234 m, 21 June 2003, R. W. & J. A. Garrison, N. von Ellenrieder [CSCA, RWG]; 1 ♀, Conn Dam below Lake Hennessy by Highway 128 {38.4816°N, 122.376°W}, 70 m, 16 June 1978, R. W. Garrison [RWG]; 1 ♂, Napa River by Zinfandel Lane, 4 mi SE of St. Helena, 38.4953°N, 122.426°W, 55 m, 19 June 1976, R. W. Garrison [RWG]; 5 ♂♂, 2 ♀♀, Pope Creek at entrance to Walter Springs, W of Lake Berryessa, 38.6475°N, 122.357°W, 180 m, 10 June 1978, R. W. Garrison [ONHI, RWG]; 2 ♂♂, Lake Clementine trail, just below Lake Clementine Rd., 38.9313°N, 121.029°W, 285 m, 18 July 2021, R. W. Garrison [RWG]; 1 ♂, 1 ♀, Whitewater River, ca. 5 mi N of Highway 10 on Whitewater Canyon Road, 33.9825°N, 116.653°W, 800 m, 17 July 1997, J. Cole [RWG]; 1 ♂, Sacramento Springs {34.8974°N, 114.768°W}, 370 m, 23 May 2001, T. Manolis [RWG]; 1 ♀, Thousand Palms Oasis, Coachella Valley Preserve, Thousand Palms Road ca. 6 mi N of Highway 10, 33.8375°N, 116.309°W, 31 m, 13–14 April 1991, R. W. Garrison [RWG]; 1 ♂, 1st Whitechild mountain, Coyote Canyon, 32.6525°N, 116.854°W, 195 m, 22 June 1950, F. L. Blanc [CSCA]; 5 ♂♂, Del Puerto Canyon at N Fork of Del Puerto Creek, about 24 km W of Patterson on Del Puerto Canyon Road, 37.4384°N, 121.337°W, 270 m, 8–9 June 1975, R. W. & J. A. Garrison [RWG]; 1 ♀, same data but 22 May 1976 [RMNH]; 4 ♂♂, 2 ♀♀, same data but 15 September 1976, R. W. Garrison [MHNN, RWG]; 3 ♂♂, same data but 2–4 May 1977, R. W. & J. A. Garrison [RWG]; 23 ♂♂, 21 ♀♀, same data but 4 June 1977 [RMNH, RWG]; 4 ♂♂, 1 ♀, same data but 15 June 1978, R. W. Garrison [RWG]; 7 ♂♂, 1 ♀, same data but 19 June 2003, R. W. & J. A. Garrison, N. von Ellenrieder [CSCA, RWG]; 2 ♂♂, Shiloh Fishing Access area, at Shiloh Rd. and Tuolumne River, 37.6031°N, 121.134°W, 12 m, 1 July 1977, R. W. Garrison [RWG]; 1 ♂, same data but 6 July 1977 [RWG]; 3 ♂♂, just below Matilija Hot Springs, 34.4831°N, 119.304°W, 430 m, 2 September 1984, R. W. & J. A. Garrison [CUMZ, RWG]; 1 ♂, 1 ♀, Santa Paula Creek about 3 mi N of Santa Paula on Highway 150, 34.3956°N, 119.075°W, 180 m, 21 April 1984, R. W. & J. A. Garrison [RWG]; 2 ♂♂, 1 ♀, Sespe Creek, 4 mi N of Fillmore, 34.4585°N, 118.928°W, 212 m, 5 September 1982, R. W. & J. A. Garrison [BMNH, RWG]; 1 ♂, 1 ♀, same data but 5 September 1982 [BMNH]; 2 ♂♂, same data but 16 October 1982 [RWG]; 3 ♂♂, 1 ♀, Cache Creek at W. W. H. Bill Davis Memorial Picnic Area, by Highway 16, 6 mi N of Rumsey, 38.9158°N, 122.309°W, 339 m, 3 July 1978, R. W. & J. A. Garrison [RWG]; **Arizona:** 1 ♂, Cherry Creek at Road 203, S crossing, 33.804°N, 110.836°W, 920 m, 1 June 2006, R. A. Bailowitz [RWG]; 1 ♂, Cave Creek at end of Ocotillo Road, Cave Creek, 33.839397°N, 111.962949°W, 619 m, 20 May 1977, R. W. Garrison [BYU]; 1 ♂, same data but 10 October 1982, R. W. Garrison [RWG]; 3 ♂♂, same data but 12 May 1984; 1 ♂, same data but 10 August 1984 [RWG]; 6 ♂♂, 1 ♀, same data but 13 July 1998 [RWG]; 1 ♂, same data but 12 May 1984, R. W. Garrison [BMNH]; 1 ♂, same data but 4 August 1992, R. W. Garrison [RWG]; 1 ♂, 1 ♀, same data but 13 July 1998 [RMNH]; 3 ♂♂, 1 ♀, Sycamore Canyon, 3.3 mi WNW of Highway 87 {33.6932°N, 111.539°W}, 540 m, 23 July 1984, R. W. & J. A. Garrison [RWG]; 2 ♂♂, 1 ♀, Big Sandy River by Highway 93, Hualapai mountains, 34.85°N, 113.633°W, 680 m, 8 April 1996, Van Dam family [RWG]; 1 ♂, 1 ♀, Proctor Ranch Road {31.7398°N, 110.885°W}, 830 m, 1 August 1974, R. W. Garrison [RWG]; 1 ♂, 1 ♀, small pools at lower Sabino Canyon, N of Tucson, Coronado National. Forest, 32.3151°N, 110.81°W, 830 m, 1 August 1974, R. W. Garrison [RWG]; 1 ♂, 1 ♀, Agua Fria River at Black Canyon City, 34.0617°N, 112.158°W, 590 m, 5 September 1983, S. W. Dunkle [RWG]; 3 ♂♂, Agua Fria River at Horseshoe Ranch, 5.2 mi E of Highway 17, road 269, 34.2575°N, 112.064°W, 980 m, 14 July 1998, R. W., J. A., P. A. & A. V. Garrison [RV, RWG]; 3 ♂♂, 1 ♀, Santa Maria River at Highway 93, 34.3693°N, 113.185°W, 535 m, 31 July 1987, R. W. Garrison [RWG]; 2 ♂♂, seepage at Bagdad, 34.57°N, 113.175°W, 1137 m, 31 July 1987, R. W. Garrison [RWG]. **MEXICO, Baja California:** 1 ♂, Santa Ana {29.0833°N, 114.083°W}, 470 m, 21 June 1968, N. Leppla *et al.* [RWG]; **Baja California Sur:** 3 ♂♂, arroyo 14 km W of Highway 1 on road to San Javier, SW of Loreto, 25.9756°N, 111.436°W, 165 m, 5 October 1984, R. W. & J. A. Garrison [RWG]; 1 ♂, same data but 31 August 1985 [RWG]; 2 ♀♀, Arroyo San Gregorio, 13 km (by air) WNW La Purisima, Malaise trap, 26.2167°N, 112.25°W, 85 m, 24–25 April 1983, M. Wasbauer [CSCA]; 1 ♂, Las Parras, about 18 km from Highway 1 on road to San Javier, SW of Loreto, 25.967°N, 111.489°W, 442 m, 1 September 1985, R. W. Garrison [RWG]; 6 ♂♂, Primer Agua, 7 km W of Highway 1 and 6 km S of Loreto at km 114, 26.0081°N, 111.404°W, 61 m, 2 October 1984, R. W. & J. A. Garrison [RWG]; 11 ♂♂, 5 ♀♀, Rancho San Enrique, pond and arroyo at km 51, 51 km E of Villa Insurgentes, 25.5417°N,

111.393°W, 417 m, 1–4 October 1984, R. W. & J. A. Garrison [RWG]; 1 ♂, S of San Ignacio, 25.5833°N, 111.65°W, 197 m, 4 April 1982, B. & M. Phelps [CSCA].

A relatively small species (Table 2); male predominantly bright blue (Fig. 942) with inner branch (or lobe) of cercus directed ventrally or ventrolaterally and not clearly visible in dorsal view, and female (Fig. 943) with distal end of mesostigmal lobe elevated over lateral arm of middorsal carina, with a clear space between them and with a rounded mesepisternal tubercle under base of mesostigmal lobe in posterior view (Fig. 495e).

Diagnosis. Both sexes of *A. agrioides* were diagnosed against *A. nahuana*, *A. fumipennis violacea*, and *A. leonorae* by Garrison (1994), and were fully redescribed in Westfall & May (2006). *Argia agrioides* may be distinguished from the sympatric *A. nahuana* as follows: in males of *A. nahuana*, inner branch of cercus is directed mesoventrally and is clearly visible in dorsal view, so that cercus appears distinctly wider at apex than at base (Fig. 710c); in *A. agrioides* inner branch of cercus is directed ventrally or ventrolaterally and is not clearly visible in dorsal view, so that cercus appears about as wide at apex as at base (Fig. 662c). In *A. agrioides*, the epiproct is as wide as each torus (Fig. 662c), while in *A. nahuana*, the epiproct is only about 0.25–0.30 as wide as each torus (Fig. 710c). The dorsal surface of the mesostigmal lobe is slanted anteriorly, with the lobe forming an angle of 60–90 degrees with mesepisternum in lateral view in females of *A. nahuana* (as in Fig. 498h); the dorsal surface of the mesostigmal lobe is oriented mostly dorsally, with the lobe forming an angle of less than 45 degrees with mesepisternum in lateral view in *A. agrioides* (as in Fig. 555h). It is also sympatric with the larger *A. vivida* (Table 2), but both are easily separated by genital ligula, appendage and mesostigmal plate morphology as given in the keys to both sexes. Additionally, *A. agrioides* lacks postbasal black streaks on S3–6 (Figs. 29, 942, 943) whereas *A. vivida* possesses them (Figs. 269, 874–877).

Remarks. No type of *A. agrioides* was designated in the original description. The male originally figured (unlabeled as to locality within Baja California) in Calvert (1895) was later illustrated again by Calvert in 1902 (pl. IV, fig. 62s), who acknowledged that his previous illustration of the appendages was incorrect, and was lodged in the CAS but was destroyed during the San Francisco earthquake and fire in 1906. Calvert (1947) rectified the loss by designating a lectotype from the type series.

The genital ligula, though not illustrated, is like that of *A. pallens* (Fig. 633) and consists of a single flexible flagellum and a pair of falcate lateral lobes basally. Bailowitz *et al.* (2015) provided a diagnostic difference between males of *A. agrioides* and *A. nahuana*, noting that *A. nahuana* is nearly identical to *A. agrioides*, but S2 almost always has a lateral black spot (Fig. 94), not a black stripe as in *A. agrioides* (Fig. 29). This is generally true for males occurring within the United States, but males from farther S in Mexico (Lago de Camécuaro, Fig. 95) are heavily marked with black and most of S2 laterally is black, more so than in typical *A. agrioides*. The humeral stripe varies from unforked to forked (Fig. 29).

Distribution. *Argia agrioides* ranges from central Oregon and S Idaho through California, Nevada, Arizona, and Baja California (Fig. 787) and occurs from near sea level to 1860 m. Seemann (1927) lists *A. agrioides* in her treatment of the species occurring in S California, but her illustration of the left mesostigmal plate strongly suggests that the female at least was actually *A. nahuana*. In Mexico, *A. agrioides* is thus far known only from Baja California and is allopatric with *A. fumipennis violacea*. *Argia nahuana* extends into Baja California where it might be sympatric with *A. agrioides*.

Argia alberta Kennedy, 1918

Figs. 30 (head, thorax, S1–4 ♂); 171 (head, thorax, S1–4 ♀); 271 (wings ♂); 289 (S7–10 ♂); 405 (S1–4 ♀); 406 (S7–10 ♀); 496 (mesostigmal plates ♀); 663 (appendages ♂); 789 (map); 949 (body scan ♂); 950 (body scan ♀).

[Key locators: ♂ G-2, couplet 10'; ♂ M-6, couplet 33(32); ♀ F8, couplet 2(1')]

Argia alberta Kennedy 1918: 257 (description ♂, ♀, pl. V, figs. 5–10);—Johnson 1972a: 84, 87 (♂, ♀, key);—Garrison 1994: 304 (key, diagnosis, figs. 18, 52);—Abbott 2005a: 62 (♂ ♀, key, figs. 13, 15 photo 6d, distribution in New Mexico, Texas, Oklahoma);—Westfall & May 2006: 179 (♂, ♀, key, description, larva, figs. 75A, 85G, 89B, 98B, 101C);—Behrstock *et al.* 2007a: 52 (first record for Mexico);—Caesar & Wenzel 2009: 101 (phylogeny within genus *Argia*);—Paulson 2009: 148 (♂, ♀, description, diagnosis, figs., photo 82);—Abbott 2011: 109 (♂, ♀, figs., diagnosis, distribution in Texas);—Paulson 2011: 154 (description, diagnosis, ♂, ♀, photo);—Bailowitz *et al.* 2015: 98 (diagnosis, figs., photos, second record for Mexico);—Torres-Pachón *et al.* 2017: 413 (molecular phylogeny of larvae within *Argia*).

Primary types. *Argia alberta*: holotype ♂, U. S. A., California, Owen's Valley at Laws, California [not examined, in USNM; Flint 1991].

Specimens examined. 99 ♂♂, 35 ♀♀: **U. S. A., Nebraska:** 20 ♂♂, 10 ♀♀, Niobrara Valley Preserve, at Nature Conservancy headquarters, Niobrara River, 29 mi E of Valentine, 42.7842°N, 100.028°W, 19 July 1998, R. W. & J. A. Garrison [MHNN, RMNH, RWG]; 1 ♂, 13 mi SW of Harrison, Marsh near Niobrara River, 42.5833°N, 103.933°W, 1400 m, 13 July 1991, R. C. Rosche [RWG]; **Nevada:** 1 ♀, Double Springs, 38.9667°N, 118.683°W, 1200 m, 17 August 1996, J. Simpkin [RWG]; 1 ♂, same data but T. Epps [RWG]; **California:** 2 ♂♂, Artesian Well at Mazorka Road, 36.7978°N, 118.141°W, 1146 m, 24 June 2003, R. W. & J. A. Garrison & N. von Ellenrieder [CSCA, RWG]; 3 ♂♂, 2 ♀♀, Buckhorn Springs, 37.2597°N, 118.036°W, 1507 m, 23 June 2003, R. W. & J. A. Garrison & N. von Ellenrieder [CSCA, RWG]; 9 ♂♂, Cartago, Owen's Lake by Lake Street, 36.3222°N, 118.021°W, 1094 m, 25 June 2003, R. W. & J. A. Garrison & N. von Ellenrieder [CSCA, INECOL, RWG]; 1 ♂, 1 ♀, Corral Springs at Deep Springs Lake, 73-57 {37.2757°N, 118.022°W}, 1500 m, 22 August 1973, D. R. Paulson & E. Schäublin [RWG]; 5 ♂♂, 1 ♀, Deep springs (Buckhorn Springs), S of California Highway 168, 37.2832°N, 118.05°W, 1500 m, 29 June 1975, R. W. & J. A. Garrison [RWG]; 1 ♂, Dirty Socks Hot Spring, 5.4 mi NE Olancho on SR 190, 36.3289°N, 117.948°W, 1113 m, 4 August 2000, J. A. Cole [RWG]; 13 ♂♂, 1 ♀, pond at gravel quarry, end of Five Bridges Road, 3 mi N of Bishop, 37.4253°N, 118.403°W, 1259 m, 29 May 1975, R. W. & J. A. Garrison [BYU, CUMZ, RWG]; 3 ♂♂, 1 ♀, same data but 28 June 1975, J. A. Garrison [CSCA, RWG]; 1 ♂, slough and quarry at end of Five Bridges Road, N of Bishop, 37.4253°N, 118.403°W, 1259 m, 24 June 2003, R. W. & J. A. Garrison & N. von Ellenrieder [CSCA]; 4 ♂♂, 4 ♀♀, same data but 29 May 1976, R. W. & J. A. Garrison [RWG]; 1 ♀, slough pond by Fish Slough Road, 7 mi N of Bishop, 37.5075°N, 118.414°W, 1300 m, 30 May 1976, R. W. Garrison [RWG]; 10 ♂♂, 8 ♀♀, Dos Palmas Nature Preserve, NE corner of Salton Sea, ca. 2 mi E of Salton Sea Recreation Area, 33.4972°N, 115.832°W, 0 m, 30 May 1999, R. W., J. A. & P. A. Garrison [CSCA, RWG]; 5 ♂♂, 3 ♀♀, Mojave River at Afton Canyon Campground, 35.0389°N, 116.383°W, 430 m, 12 April 1979, J. E. Hafernik, Jr. [RWG]; **Utah:** 5 ♂♂, slough near Thiokol corporation, by Utah Highway 83, 41.6733°N, 112.447°W, 1300 m, 25 July 1975, R. W. & J. A. Garrison [RWG]; 1 ♂, 1 ♀, Quichapa Lake, Escanante Desert W of Cedar City, saltine playa, in salt grass habitat, 37.6333°N, 113.2°W, 1600 m, 23 July 2003, R. Larsen [BMNH]; **Arizona:** 1 ♂, Lukachukai {36.4187°N, 109.228°W}, 2000 m, 7 July 1972, O. Francke & M. A. Cazier [RWG]; 8 ♂♂, marsh just northeast of junction with Price Canyon Road near road marker 400 on Highway 80, 53 km NE of Douglas, 31.6356°N, 109.189°W, 1400 m, 8 August 1995, R. W. & J. A. Garrison [RWG]; 2 ♂♂, 1 ♀, ponds and swamps at San Bernardino National Wildlife Refuge, 27 km E of Douglas, 31.3364°N, 109.279°W, 1160 m, 9 August 1995, R. W. Garrison [RWG]; **New Mexico:** 1 ♂, Bottomless Lakes State Park, 33.3347°N, 104.333°W, 1063 m, 14 August 1995, S. W. Dunkle [RWG]; 1 ♂, Dry marsh on frontage road just N of Wagon Mound, 36.0247°N, 104.696°W, 1890 m, 22 July 1998, R. W. & J. A. Garrison [RWG].

A small species (Table 2); male pale blue with predominantly dark abdominal segments (Figs. 30, 949) and a linear cercus longer than wide, and female (Fig. 950) with relatively unmodified vestigial mesostigmal lobes (Fig. 496).

Diagnosis. Both sexes were fully described in Westfall & May (2006). The male of *A. alberta* was differentiated from *A. sedula* by Garrison (1994) in his key to United States species as follows: tip of cercus in dorsomedial view weakly divided, the inner branch a decumbent tooth and the outer branch a simple lobe, Fig. 663a (tip of cercus in dorsomedial view truncate, the mesal angle supporting a decumbent tooth in *A. sedula*, Fig. 731a); torus well defined, transverse, Fig. 663c (torus poorly defined, each lying at about 45° to the other in *A. sedula*, Fig. 731c); dorsal margin of lower branch of paraproct smooth in *A. alberta*, Fig. 663b (serrate in *A. sedula*, Fig. 731b). *Argia alberta* is most similar to *A. paludicola* and is diagnosed under that species as well as in the keys to both sexes.

Within its limited range in Mexico (Sonora and Chihuahua), female of *A. alberta* might be confused with *A. extranea*, *A. immunda* and *A. nahuana*. The humeral stripe in female *A. alberta* is forked (Fig. 171), not linear as in *A. extranea* (Fig. 193), *A. immunda* (Fig. 210) and some (but not all, Fig. 228) *A. nahuana*. Female of *A. immunda* almost always has amber wings, not hyaline as in *A. alberta* (as in Fig. 271). The mesostigmal lobe in *A. alberta* is vestigial, barely overlying mesepisternum with the posteromesal margin of the plate largely confluent with the lateral arm of the middorsal carina (Fig. 496); in *A. nahuana*, the mesostigmal lobe is well-defined along posteromesal margin of mesostigmal plate, is directed medially, and mesal margin of lobe is appressed against but not confluent with lateral arm of middorsal carina (Figs. 546, 547).

Habitat. *Argia alberta* is found at seepages, where adults perch on the ground like typical *Argia*, although

sometimes act like an *Enallagma* Charpentier, 1840 or *Ischnura* Charpentier, 1840, perching on tips of reeds or horsetails (R. W. Garrison pers. obs.).

Distribution. This species occurs throughout most of the W United States and extends as far north as Montana and as far east as Ohio. In Mexico, *A. alberta* is thus far known only from two N localities (Fig. 789) in Sonora (springs at El Doctor, 75 km SSE of San Luis Río Colorado; Bailowitz *et al.* 2015) and Chihuahua (Highway 2, ca. 14.2 km NW of Janos Bridge at Río La Palotada; Behrstock *et al.* 2007a). Elevation ranges from near sea level (El Doctor; Bailowitz *et al.* 2015) to about 2000 m.

Argia anceps Garrison, 1996

Figs. 31 (head, thorax, S1–4 ♂); 172 (head, thorax, S1–4 ♀); 272 (wings ♀); 290 (S7–10 ♂); 407 (S7–10 ♀); 497 (mesostigmal plates ♀); 593–595 (genital ligula); 664, 665 (appendages ♂); 776 (map); 802 (field photo ♂); 881 (body scan ♂); 882 (body scan ♀).

[Key locators: ♂ G-1, couplet 9(8'); ♂ M-5, couplet 20'; ♀ F-6, couplet 17(16')]

Argia fissa: Calvert 1899: 381 (description ♂ from Tepic, Mexico);—Calvert, 1902: 89 (all specimens from Middle America in part misidentified as *A. fissa*, pl. IV, figs. 50, 50s *only*);—Calvert 1907: 374 (all specimens from Middle America in part misidentified as *A. fissa*);—Ris 1918: 114 (in part, all specimens from Mexico, Guatemala, Honduras misidentified as *A. fissa*);—Calvert 1947: 607 (Tepic material in CAS);—Kormondy 1959: 310 (Guatemala);—Paulson 1982: 252 (all specimens listed from Middle America in part misidentified as *A. fissa*);—Westfall 1986: 116 (El Salvador);—Dunkle 1988: 45 (Honduras);—Maes *et al.* 1988: 34 (listed from Middle America in part);—Dunkle 1991: 132 (Honduras);—Novelo-Gutiérrez 1992: 41 (larva description, figs. 1, 20, 32, 49, 66, 72, 95a–e);—González-Soriano 1993: 295 (Mexico);—González-Soriano 1996: 163 (Mexico);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico).

Argia anceps Garrison 1996: 33 (description ♂, ♀, figs. 1, 4, 7, 12, 17, 18, 19, 20–22, comparison with *A. fissa*);—Ramírez *et al.* 2000: 249 (Costa Rica);—Förster 2001: 11, 56 (key ♂, fig. C24);—Paulson 2002b: 361 (Nayarit, Mexico);—Abbott *et al.* 2002: 126 (Nicaragua);—Esquivel 2005: 143 (description, photos 42, 43, Mexico to Costa Rica);—Westfall & May 2006: 180 (♂, ♀, key, description, larva, figs. 89C, 100G–H, 101D);—Behrstock *et al.* 2007a: 56 (Chihuahua, Mexico);—Behrstock *et al.* 2007b: 30 (San Luis Potosí, Mexico);—Cuevas-Yañez 2007: 86 (Puebla, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 127 (Mexico);—González-Soriano *et al.* 2008: 310 (Morelos, Mexico);—Upton *et al.* 2007: 29 (Sonora, Mexico);—Caesar & Wenzel 2009: 101 (phylogeny within genus *Argia*);—Escoto-Moreno *et al.* 2009: 154 (Aguascalientes, Mexico);—González-Soriano & Paulson 2011: 300 (Chiapas, Mexico);—González-Soriano *et al.* 2011: 184 (San Luis Potosí, Mexico);—Bailowitz *et al.* 2012: 9 (El Salvador);—Danforth *et al.* 2013: 10 (Arizona);—Garrison & von Ellenrieder 2013: 15 (Costa Rica);—Escoto-Moreno *et al.* 2014: 1051 (Hidalgo, Mexico);—Bailowitz *et al.* 2015: 100 (diagnosis, figs., photos, Arizona, Sonora);—Escoto-Moreno *et al.* 2015: 153 (Nayarit, Mexico);—González-Soriano *et al.* 2016: 156 (Colima, Mexico);—Nava-Bolaños *et al.* 2017: 807 (reproductive isolation, photo 1A);—Garrison & von Ellenrieder 2017: 25 (comparison with *Argia rudolphi* sp. nov., figs. 20, 44, 69, 93, 114, 115, 134–136, 155, 168, photos 181, 182);—Torres-Pachón *et al.* 2017: 417 (molecular phylogeny of larvae within *Argia*);—Rangel-Sánchez *et al.* 2018: 924 (note on widespread distribution in Mexico);—Paulson & Haber 2021: 86 (diagnosis, photos, Costa Rica).

Primary types. *Argia anceps*: holotype ♂, COSTA RICA, San José, San Pedro, dump beside hotel Casa Holanda, 10.035°N, 84.1233°W, 1284 m, 9 August 1979, Rosser W. & Jo A. Garrison leg. [examined, in USNM].

Specimens examined. 211 ♂♂, 53 ♀♀ (see Garrison & von Ellenrieder 2017 for additional material examined not listed here): **U. S. A., Arizona:** 1 ♂, Sabino Creek, just S of Summer (=E Summer Trail) Road; only one seen; taken from tree limb 6+ feet off ground, 32.2864°N, 110.806°W, 780 m, 29 September 2015, R. A. Bailowitz [RWG]. **MEXICO, Veracruz:** 3 ♂♂, 1 ♀, Jalapa {19.5333°N, 96.9168°W}, 1381 m, 2 July 1941, H. S. Dybas [FSCA]; 1 ♀, Barranca de Cayoapa, Tejería, Teocelo {19.3733°N, 96.9267°W}, 750 m, 17 August 1980, J. Llorente [CSCA]; 1 ♂, same data but 13 August—4 September 1981, R. Lopez [UMMZ]; 1 ♂, Dos Ríos {18.9333°N, 97.0333°W}, 1200 m, 1 July 1941, H. S. Dybas [FSCA]; **Guerrero:** 3 ♂♂, 1 ♀, Yoloxochitl {16.8159°N, 98.687°W}, 600 m, 18 May, 3, 24 June 2011, J. D. Smith [FSCA]; **Oaxaca:** 2 ♂♂, ca. 54 km W of Tequisistlán, Highway 190, km 691, little shallow stream in oak woodland {16.4477°N, 96.0093°W}, 944 m, 28 July 1966, R. W. Cruden [CSCA, UMMZ]; **Chiapas:** 1 ♂, Montebello {16.12°N, 91.73°W}, 1475 m, 25 June 1969, R. G. Wind [RWG]. **HONDURAS, Comayagua:** 2 ♂♂, Río Guique bridge and curve, 7.7 km S of Siguatepeque, ca. 7.7 km S of Siguatepeque, pools and boulder rapids, clear, L-03-1332 {14.5325°N, 87.8036°W}, 930 m, 12 December 1987, S. W. Dunkle [UNH]; **COSTA RICA, Guanacaste:** 1 ♂, Parque Nacional Guanacaste, Quebrada Bolaños, L-03-1405 {10.9578°N, 85.4969°W}, 600 m, 8 May 1989, C. Esquivel-Herrera [UNH]; **Heredia:** 1 ♂, Calle Yerbabuena at Río

Pará Blanco, L03-831 {10.0263°N, 84.0108°W}, 1187 m, 24 April 2003, C. Esquivel-Herrera [UNH]; 1 ♂, Santo Domingo de Heredia, on the grounds of the Hotel Bougainvillea {9.98°N, 84.0792°W}, 1187 m, 12 March 1992, A. M. Young & S. Sullivan Borkin [USNM]; **Alajuela**: 1 ♂, disturbed weedy areas within plantation, outskirts of Alajuela, 10.0167°N, 84.2167°W, 757 m, 26 February 1984, A. M. Young, J. Jass & S. Sullivan Borkin [USNM]; 1 ♂, Turrúcares, along Río Siquiares {9.9667°N, 84.3167°W}, 640 m, 19 December 1909, P. P. Calvert [FSCA]; 1 ♀, Turrúcares, L-03-42 {9.9642°N, 84.3325°W}, 610 m, 16 April 1988, C. Esquivel-Herrera [UNH]; **San José**: 1 ♂, 1 ♀, San Pedro, Montes de Oca, #72413 {9.9446°N, 84.0493°W}, 1200 m, 17 July 1988, A. Solis [INBIO]; 1 ♂, 1 ♀, San Pedro Montes de Oca, Quebrada los Negritos {9.9397°N, 84.0525°W}, 1200 m, 5 August 1983, E. A. Rojas M. [RWG]; 2 ♀♀, San José, Museo Nacional, #64479 {9.9329°N, 84.0714°W}, 1100 m, 18 June 1977, A. Berrios [INBIO]; 1 ♂, 1 ♀, near Ciudad Colón, campus Universidad para la Paz, drain of main pond, L-07-144 {9.9187°N, 84.2768°W}, 852 m, 11 August 1988, C. Esquivel-Herrera [UNH]; 1 ♂, Hacienda El Rodeo, 7 km W of Villa Colón, 9.9136°N, 84.2694°W, 859 m, 25 May, T. B. Herman [UNH]; 1 ♂, Alajuelita {9.9016°N, 84.0994°W}, 1130 m, 27 April 1972, R. G. Wind [FSCA]; 2 ♂♂, Santa Ana {9.8683°N, 84.1587°W}, 1980 m, January 1982, T. Brittain [USNM].

A medium-size species (Table 2); male cerulean blue (Figs. 31, 802, 881), female pale (Figs. 172, 882), both sexes with amber wings (Figs. 272, 802).

Diagnosis. Both sexes were fully described by Garrison (1996) and Westfall & May (2006). This is one of three Middle American species (*A. anceps*, *A. fissa*, *A. westfalli*) with a largely bright cerulean blue male (Figs. 31, 802, 854, 881, 883, 885) with paraproct ventral branch absent, vestigial or small, and a largely pale, tan colored female with reduced body markings (Figs. 172, 882, 884, 886) and amber wings in both sexes (Figs. 272, 802, 854). Both sexes of all three species were keyed and diagnosed by Garrison (1996). In summary, the medial margins of cerci in dorsal view are separated by a gap about as wide as basal width of each cercus or wider, and the decumbent tooth on medial margin of cercus in posterior view is located at basal 0.50–0.70 in *A. anceps* (Fig. 664c) and *A. westfalli* (Fig. 753c), whereas in *A. fissa* medial margins of cerci in dorsal view are contiguous or nearly so and the decumbent tooth on medial margin of cercus in mediodorsal view is located at basal 0.30–0.40 (Fig. 681c). The medial margin of cercus in *A. westfalli* in dorsal view is convexly curved, in mediodorsal view decumbent tooth is located at distal 0.70 of cercus, giving medial margin of cercus a slightly angulate appearance at level of tooth (Fig. 753c); in *A. anceps*, medial margin of cercus is linear or slightly concave (Fig. 664c), in mediodorsal view decumbent tooth located at about 0.50–0.60 of cercus and medial margin of cercus is linear (Figs. 664a, 665). *Argia anceps* was also diagnosed against *A. rudolphi* by Garrison & von Ellenrieder (2017), and their differences are summarized here: in male *A. rudolphi*, cerci in dorsal view are wider than long and are approximate (Fig. 728c), postfrons is largely black (Fig. 125), and genital ligula distal segment in ectal view is triangular anteriorly to lateral lobes, gradually narrowing to tip (Fig. 643). In *A. anceps* cerci in dorsal view are longer than wide and are not approximate (Fig. 664c), postfrons is largely pale (Fig. 31), and genital ligula distal segment in ectal view is parallel sided anteriorly to lateral lobes with tip abruptly widened (Fig. 593b).

Female of *A. anceps* is pale with reduced black markings (Figs. 172, 882) and may be confused with females of *A. fissa* (Figs. 194, 884) and *A. westfalli* (Figs. 270, 886). In *A. westfalli*, mesostigmal lobes are strongly elevated, distinctly erect (Fig. 591h) and ventral surface of mesostigmal lobe lacks a swelling or tubercle, this area forming a concave junction with mesepisternum. In *A. anceps* and *A. fissa*, mesostigmal lobes are not as strongly elevated and ventral surface of mesepisternal lobe has a transverse swelling or tubercle of varying length appressed against mesepisternum (Figs. 497e, 515e), but separated from it by a groove, which can sometimes be visible in lateral view. In *A. anceps*, distance between mesostigmal lobes is almost as wide (70–93%, N=8) as each lobe, usually with a small gap between medial edge of mesostigmal lobe and lateral branch of middorsal thoracic carina (Fig. 497c); in *A. fissa*, distance between mesostigmal lobes is approximately half (50–63%, N=8) as wide as each lobe, and medial margin of mesostigmal lobe is adjacent to lateral branch of middorsal thoracic carina (Fig. 515c).

Remarks. As noted by Garrison (1994) and indicated above in the synonymy, *A. anceps* was previously confused with the true *A. fissa*. The specific differences between these two species had been known previously by the late L. K. Gloyd but she did not publish them.

Behrstock *et al.* (2007a) reported four males from Chihuahua, Mexico, that exhibited clear wings. No individuals we have examined have clear wings.

Distribution. *Argia anceps* is one of the most abundant species of *Argia* in Mexico south to NW Costa Rica. It is absent from Mexico's central plateau (Fig. 776). The species has recently been found in Arizona where it is

known from several localities. In Costa Rica it appears to be limited to the N half of the country (Guanacaste, Puntarenas, Alajuela, Cartago, and Heredia) and it is replaced by *A. fissa* to the south. This is primarily a montane species occurring at elevations between 100 and 2029 m; there appear to be only two records below 100 m and they may be questionable.

***Argia annae* Garrison & von Ellenrieder, n. sp.**

Figs. 3 (head ♂); 32, 33 (head, thorax, S1–4 ♂); 173 (head, thorax, S1–4 ♀); 291 (S1–10 ♂); 292 (S710 ♂); 408 (S7–10 ♀); 498 (mesostigmal plates ♀); 596 (genital ligula); 666 (appendages ♂); 773 (map); 803 (field photo ♂); 861 (body scan ♂); 862 (body scan ♀).

[Key locators: ♂ G-1, couplet 13'; ♂ M-5, couplet 19', M-6 couplet 10(9'); ♀ F-11, couplet 11(10'), F-16, couplet 2(1')]

Argia extranea: Calvert 1902: 94 (in part, females from Texolo, Mexico, pl. IV, fig. 3).

Primary types. *Argia annae*: holotype ♂, MEXICO, Veracruz, Puente Texolo, roadside seepages near bridge, 19.4028°N, 96.9867°W, 1,065 m, 17 June 2009, Rosser W. Garrison & Natalia von Ellenrieder leg. [examined, in CSCA].

Etymology. Named *annae* (Latinized name) in honor of the senior author's daughter Anna Victoria Garrison for the companionship and enjoyment that she has given us over the years.

Specimens examined (all types). 99 ♂♂, 38 ♀♀: **MEXICO, Nuevo León:** 5 ♂♂, 1 ♀, Cascada Cola de Caballo, 38 km SW of Monterrey, 62x120 {25.35°N, 100.15°W}, 550 m, 6 September 1962, T. W. Donnelly [FSCA]; **San Luis Potosí:** 1 ♂, 2.3 mi E of Las Pozas de Xilitla, large mountain stream below high waterfall, 21.3786°N, 98.9747°W, 440 m, 1 September 1958, G. H. & A. Beatty [RWG]; 1 ♀, Cascadas in park, Tamasopo {21.9303°N, 99.4169°W}, 42 m, 26 June 1990, K. J. Tennessen [FSCA]; 2 ♀♀, El Salto Falls {22.5857°N, 99.3843°W}, 470 m, 12 June 1963–9 August 1968, R. E. Woodruff [FSCA, RWG]; 2 ♂♂, Puente de Dios, NW of Tamasopo, 21.9303°N, 99.4169°W, 42 m, 21 August 1999, R. W. & J. A. Garrison [RWG]; 1 ♂, same data but 26 June 1990, K. J. Tennessen [FSCA]; 1 ♂, 1 ♀, Tamazunchale, 17 mi S, 21.2667°N, 98.7833°W, 180 m, 19 June 1941, H. S. Dybas [USNM]; 1 ♂, 1 ♀, Waterfall WSW of Tamazunchale {21.2308°N, 98.8333°W}, 883 m, 27 June 1965, D. R. & M. L. Paulson [FSCA]; **Querétaro:** 2 ♂♂, 1 ♀, drainage area, Pinal de Amoles, El Ranchito, road to San Pedro Escanela, 21.1203°N, 99.545°W, 1830 m, 17 July 1997, R. Novelo-Gutiérrez [RWG]; **Hidalgo:** 4 ♂♂, 2 ♀♀, small stream and steep trickle, 25 km NE of Chapulhuacán, Highway 85, km 246 {21.2603°N, 98.8278°W}, 214 m, 22 June 1990, K. J. Tennessen, J. J. Daigle & R. Novelo-Gutiérrez [RWG, FSCA]; 4 ♂♂, 3 ♀♀, stream (cascade) 7 km N of Tlanchinol, 21.0514°N, 98.6678°W, 1300 m, 22–23 July 1992, T. W. Donnelly & G. Harp [RWG]; same data but 20 May 1995, R. Novelo-Gutiérrez [RWG]; 5 ♂♂, 2 ♀♀, stream near Otongo, 5 km S, 9 km W of Tlanchinol, 20.9686°N, 98.7644°W, 1162 m, 22–23 July 1992, T. W. Donnelly & G. Harp [FSCA, RWG]; 13 ♂♂, 10 ♀♀, waterfall 1.1 mi NE of Chapulhuacán {21.2°N, 98.9°W}, 880 m, 27 June 1965, D. R. & M. L. Paulson [FSCA, FSCA, RWG]; **Jalisco:** 1 ♂, 1 ♀, Sierra de Autlán, 19.75°N, 104.345°W, 897 m, 16 September 1991 [RWG]; **Puebla:** 1 ♂, 5 km S of Huapanapán, 18.1083°N, 97.6869°W, 1833 m, 22 October 2004, C. L. Bellamy [RWG]; 2 ♂♂, 2 ♀♀, Sierra de Huauchinango, La Unión, in drainage area, 20.2403°N, 97.8939°W, 596 m, 21 May 1987, R. Novelo-Gutiérrez & A. Gomez [RWG]; 3 ♂♂, 1 ♀, same data but 22–23 July 1987, R. Novelo-Gutiérrez [RWG]; 2 ♂♂, 1 ♀, Teziutlán, km 10 on Teziutlán-Tlapacoyán road, in drainage area, 19.8769°N, 97.3117°W, 1450 m, 14 July 2000, R. Novelo-Gutiérrez [BYU, RWG]; 1 ♂, Zongozolta {19.9866°N, 97.7266°W}, 1121 m, 24 March 2016, J. D. Amith [FSCA]; **Veracruz:** 34 ♂♂, 6 ♀♀, Cascada Texolo, near Xico, 19.4114°N, 96.9926°W, 1256 m, 12 July 1987, M. J. Westfall, Jr. [FSCA]; 3 ♂♂, 2 ♀♀, same data but 20 July 1992, G. L. Harp & T. W. Donnelly [RWG]; 1 ♂, 1 ♀, Puente Texolo, roadside seepages near bridge, 19.4028°N, 96.9867°W, 1065 m, 20 June 1982, E. González-Soriano [CNIN]; 1 ♂, same data but 26 July 1983 [RWG]; 5 ♂♂, 4 ♀♀, same data but 16–17 August 1982, R. W. & J. A. Garrison [RWG]; 2 ♂♂, same data but 26 July 1983, J. C. Michalski [FSCA, RWG]; 2 ♂♂, 10 July 1987, M. J. Westfall, Jr. [FSCA]; 1 ♂, same data but 20 July 1992, T. W. Donnelly [RWG]; 9 ♂♂, 3 ♀♀ (holotype and paratypes), same data but 17 June 2009, R. W. Garrison & N. von Ellenrieder [FSCA, RWG]; 1 ♀, Fortín de las Flores {18.9019°N, 96.9897°W}, 1008 m, R. E. Woodruff [FSCA]; 1 ♂, near Jamapa River, 4 mi N

of Coscomatepec {19.0667°N, 97.0333°W}, 1463 m, 23 June 1966, O. S. Flint, Jr & M. A. Ortiz B. [USNM]; 1 ♂, river near Concordia, S of Jalapa on route 7 {18.8028°N, 96.7225°W}, 360 m, 12 July 1992, S. W. Dunkle [FSCA]; 1 ♂, stream above Río Metlac, 1.9 mi SW and 0.5 mi. N of Fortín del las Flores, 18.9075°N, 97.0125°W, 1000 m, 10 August 1965, D. R. Paulson [FSCA].

A medium-size species (Table 2), with vivid blue male (Figs. 31, 803, 861) and paler blue female (Figs. 172, 862), both with a thickened humeral stripe with an abbreviated dorsal fork (Figs. 861, 862).

Description of male holotype. Head (as in Figs. 3, 33): Labrum, ante- and postclypeus, ante- and postfrons, base of mandibles and genae blue; postfrons with a small midlateral black spot on each side, basally edged with black separated from black on epicranium, the latter interrupted by large blue postocular spots each broadly confluent with compound eyes, blue occipital bar absent, a small triangular pale spot anterolateral to lateral ocellus; antennae black; rear of head pale except for wash of brown on each side of occipital foramen.

Prothorax black with following areas blue: lateral margins of anterior lobe, dorsolateral spot on middle lobe, propleuron except for anterior margin rimmed in black, and extreme lateral margins of posterior lobe. Pale areas of pterothorax vivid blue, with black middorsal stripe of uniform width, about twice as wide as vivid blue antehumeral stripe; anterior half of mesinfraepisternum black, continuous with broad humeral stripe at base, then abruptly narrowing at basal fifth along mesopleural suture, remainder of stripe narrowed at 0.50 with vestige of forked stripe on mesepimeron; upper portion of humeral stripe expanding again at mesopleural fossa; remainder of thorax blue except for vestige of interpleural stripe and a narrow black stripe on metapleural suture (as in Figs. 32, 33). Wings hyaline with venation black; Pt dark brown, surmounting 2 cells in left Fw, 1.7 cells in right Fw, 1 cell in left Hw, 2 cells in right Hw; px Fw 17/17, Hw 17/16; pq cells Fw 4/4, Hw 3/3; RP2 at Fw 7.6/7.6, Hw 6.6/6.6. Coxae and trochanters pale blue except for black on dorsum of trochanters; femora black, flexor surface pale; tibiae black with extensor surface pale, tarsi and armature black.

Abdomen (as in Figs. 32, 33, 291, 292, 861) mostly blue; S1 blue with a black basal ring; S2 blue with a paired irregular triangular black spot dorsolaterally at apical third, its tip almost meeting the other dorsally, annulus black; S3 blue, with a black ring at apical fifth connecting with black annulus but encircling a narrow dorsolateral blue spot laterally; S4–7 similar but with a triangular postbasal black spot and with apical black lacking isolated lateral blue spot; succeeding segments with black becoming more extensive; S7 blue dorsally and laterally with continuous black stripe connecting above at apical fifth; S8–9 blue, S10 blue with posterior margin rimmed in black up to torus; torus pale, its ventral margin rimmed with black; cercus brown; paraproct blue dorsobasally, remainder black.

Genital ligula in ectal view with distal segment with apical tip not enlarged, not distinctly wider than preceding portion ending in a triangular apical lobe (Fig. 596b), in lateral view distal segment lacking a raised sclerotized boss, distal segment in ectal view with distance from base of arcuate lateral lobe to apex comparatively short, apex pointed (Fig. 596a).

Torus large, swollen, transversely oval, occupying entire ventral margin of torifer but not overlapping bilobed epiproct (Fig. 666c); epiproct apically with a narrow cleft, pale, black laterally; cerci not approximate, their inner surfaces separated by a distance greater than width of epiproct (Fig. 666c); cercus entire, subrectangular in dorsal view with outer margin slightly longer than inner margin (Fig. 666c); in mediodorsal view dorsal surface evenly convex with a broadly based distal tooth at basal 0.30 (Fig. 666a); paraproct deeply forked, ventral branch, in both lateral and inner mediodorsal views, about one and a half times smaller than dorsal branch, dorsal branch triangular with tip acuminate, ventral branch a rounded lobe (Fig. 666b).

Dimensions. Hw 23, abdomen 30.5, total length 38.3.

Description of female paratype (MEXICO: Puebla: Teziutlán, km 10 on Teziutlán-Tlapacoyán road, in drainage area, Figs. 173, 408, 862). Similar to male but pale colors a lighter blue. Head with more extensive black on epicranium and on postfrons; pro- and pterothorax as in male but posterior fork of humeral stripe longer; legs largely pale blue with streaks of brown on outer surfaces of femora and inner portion of tibiae; wings as in male; Pt dark brown, surmounting 2 cells in both Fw, 1 cell both Hw; px Fw 19/19, Hw 18/18; pq cells Fw 4/4, Hw 3/3; RP2 at Fw 7/7.8, Hw 8/9.6. S1 as in male; S2 with black lateral stripe running full length of segment, its posterior end enlarged at apical fifth thus constricting dorsal blue; S3 with isolated elongate inverted black lateral triangular postbasal streak beginning at basal eighth, narrowing posteriorly and ending at distal third, this spot isolated from black distal ring conjoining black annulus occupying terminal fifth and encircling a small pale blue spot laterally; S4–6 similar to S3 but postbasal streak connecting with more extensive black terminal ring the black becoming more extensive in S5; S6 entirely black except for small pale basal ring and dorsal blue gradually enlarging laterally but terminating

at distal fourth; S7 entirely black except for dorsal blue narrow hairline extending to basal sixth; S8–9 blue except for ventrolateral black stripe and a small basal spot laterally on each segment; S10 blue, black ventrally; cerci black; ovipositor pale, sternite 8 and ovipositor black. Mesepisternal tubercles absent, mesostigmal lobe distally widened, in dorsal view its mesal margin broadly convex and appressed against lateral branch of middorsal carina and separated from opposite by a space subequal to or narrower than the width of each lobe (Fig. 498c).

Dimensions. Hw 26.5, abdomen 30.0, total length 39.0.

Variation in paratypes. Both sexes vary as to extent of dark markings on thorax and abdomen. The humeral stripe in males is usually as depicted in Figs. 32, 33 but in some is thicker dorsally, although the thicker mesepimeral fork never reaches the antealar carina (Hidalgo, stream near Otongo). Extent of black markings on S6 is variable, ranging from postbasal streak separated from distal annulus (as in Fig. 291) to joining distal annulus basally. In female, posterior fork of humeral stripe, though present, may be vestigial so that upper third of stripe is broadly concave posteriorly (Veracruz, Puente Texolo). In males, paraproct ventral branch is sometimes more or less subequal to dorsal branch in both lateral and inner mediodorsal views. Pt surmounting 1–2 cells in males and females; px: Fw 17–20, Hw 14–18 in males, Fw 15–21, Hw 13–18 in females; pq cells Fw 4–5, Hw 3–5 in males, Fw 4–6, Hw 3–4 in females; RP2 at Fw 7–8, Hw 5–7 in males, 7–9, Hw 6–7 females. Dimensions. ♂: Hw 23.1 ± 1.1 [21.5–24.6], abdomen 30.5 ± 1.4 [27.8–32.1], total length 38.4 ± 1.7 [35.3–40.7]. ♀: Hw 25.1 ± 1.2 [23.8–27.2], abdomen 30.1 ± 1.4 [27.2–31.6], total length 38.4 ± 1.9 [35.2–40.8].

Diagnosis. Male is similar in overall appearance to *A. elongata*, *A. extranea*, *A. funebris* (blue phenotype), *A. vivida* and the violaceous blue *A. rudolphi*. All possess postbasal streaks on S3–6 or 7 (e. g., Figs. 861, 862). The ventral branch of paraproct in both *A. elongata* (Figs. 679a, b) and *A. extranea* (Fig. 680a, b), as well as in the violaceous *A. noveloi* (Figs. 711a, b), is long, well surpassing the dorsal branch in length; in *A. annae*, the ventral branch is subequal to or smaller than the dorsal branch (Figs. 666a, b). The cerci in *A. rudolphi* are approximate, their inner surfaces nearly touching in normal position, and are separated by a distance shorter than width of epiproct (Fig. 728c), S7 is mostly black dorsally (Fig. 373), the pale color is violaceous-blue (Fig. 125), and the genital ligula distal segment has a transverse non-sclerotized boss best seen in ectal view (Fig. 643b), forming a slightly raised costate ridge in lateral view (Fig. 643a). The cerci in *A. annae* are not approximate, their inner surfaces are separated by a distance greater than width of epiproct (Fig. 666c), S7 is mostly blue dorsally (Figs. 291, 292), the pale color blue (Figs. 32, 33), and the genital ligula distal segment lacks a sclerotized boss (Fig. 596). The humeral stripe in both *A. funebris* (Figs. 64–67) and *A. vivida* (Fig. 165) is usually not forked (except mostly forked in Baja Californian and Canadian (Banff) specimens of *A. vivida*, Figs. 163, 164), the dorsal half of this stripe narrows abruptly and is confined to humeral suture up to mesepisternal fossa. The humeral stripe in *A. annae* is thicker, with at least a vestigial presence of the posterior fork (Figs. 173, 861, 862), and the dorsal half of the humeral stripe is never confined to the humeral suture and is only slightly expanded at the mesopleural fossa. The cercus in *A. funebris* in dorsal view is broadly rounded, the lateral and medial margins roughly of the same length and with a small semicircular depression on laterodistal margin (Figs. 687c, 689c). In *A. annae*, the cercus in dorsal view is roughly rectangular, its lateral margin only slightly longer than its medial margin, and it lacks the distolateral semicircular depression (Fig. 666c). *Argia annae* is allopatric with *A. vivida* and differs by the shape of the cercus and paraproct. The cercus in *A. vivida* in dorsal view is more elongate medially, its medial margin slightly longer than lateral margin (Fig. 752c), and in lateral view the cleft between the dorsal and ventral branches of the paraproct is shallow, and the dorsal and ventral branches are subequal in size (Fig. 752b). In *A. annae*, the cercus in dorsal view is more elongate distally than medially, the cleft between the dorsal and branches of the paraproct is U-shaped, and the acuminate dorsal branch is from longer than the lobe-like ventral branch (Fig. 666c) to more or less subequal. The genital ligula in ectal view in both *A. funebris* and *A. vivida* is abruptly widened basally (Figs. 615b, 658b–660b), not triangular as in *A. annae* (Fig. 596b). In posterior view, margins of cercus converge into a broadly triangular tooth in *A. funebris* (Fig. 688d) and *A. vivida* (Fig. 752d); in *A. annae*, the posterior margin is linear with a broadly based tooth along medial fourth (Fig. 666d). Male of *A. annae* is differentiated from *A. haberi* in Key G-1, couplet 13; from *A. extranea* and *A. variabilis* in Key M-6, couplet 10.

Female of *A. annae* may be confused with females of *A. elongata*, *A. extranea*, *A. funebris*, *A. noveloi*, *A. rudolphi*, and *A. vivida*. The posterolateral margin of mesostigmal lobe in *A. funebris* (Fig. 524), *A. noveloi* (Fig. 548), and *A. vivida* (Fig. 589) is angled laterally, forming a shallow to deep U-shaped concavity with posterior margin of mesostigmal plate. The posterolateral margin of mesostigmal lobe in *A. annae* (Fig. 498), *A. elongata* (Fig. 513), *A. extranea* (Fig. 514) and *A. rudolphi* (Fig. 566) is not angled laterally. As in males, the forked (*A.*

annae, Fig. 173) versus not forked (*A. elongata*, Fig. 190, *A. extranea*, Fig. 193) humeral stripe distinguishes the latter two from *A. annae*. They also differ in the morphology of the mesostigmal lobe. The mesostigmal lobe in *A. elongata* (Figs. 513a, b) and *A. extranea* (Figs. 514a, b) in anterior view is low and broadly convex, the apical portion of the lobe is narrower than the basal portion, and the mesal margin of the lobe meets the branch of the middorsal carina at an obtuse angle. In *A. annae* (Figs. 498a, b) and *A. rudolphi* (Fig. 566a) the mesostigmal lobe is erect and semicircular, the apical portion of the lobe is wider than the basal portion and the mesal margin of the lobe meets the branch of the middorsal carina at an acute angle. The mesostigmal plates in *A. rudolphi* are almost approximate, the space between the lobes much smaller than the width of each lobe (Figs. 566a, c). In *A. annae*, the lobes are not approximate, the distance between both lobes is almost as wide as each lobe (Figs. 498a, c). Sides of S2–5 in *A. rudolphi* have a complete black stripe ventrally in addition to the enlarged postbasal streaks (Fig. 248), and these are often connected anteriorly and posteriorly, isolating an elongate pale stripe. In *A. annae*, the ventral black stripe is lacking or is vestigial (Fig. 173). Female of *A. annae* is differentiated from *A. medullaris* in Key F-11, couplet 11; from *A. nahuana*, *A. barretti*, *A. harknessi* and *A. pipila* in Key M-16, couplet 2.

Remarks. Calvert (1902, 1907) considered specimens from mainland Mexico to represent *A. vivida*. As explained by Garrison (1994), true *A. vivida* is thus far known in Mexico only from Baja California. Reference by Garrison (1994: 309) to a species in central Veracruz similar to *A. vivida* refers to *A. annae*. It is unclear whether Calvert included true *A. annae*, as defined here, under his account describing *A. vivida*. However, we believe that he (Calvert 1902: 94) did include females of *A. annae* under his account for *A. extranea* as follows: “It should be remarked here that twenty-three of the females above enumerated from Texolo have the mesostigmal lamina as represented in Fig. 3, Tab. IV., *i. e.* much more conspicuous than in other *A. extranea*, and with black slightly predominating over blue on the thoracic dorsum; their identification as *A. extranea* may, perhaps, be open to question.” The mesostigmal lobe in *A. annae* (Fig. 498) is more erect and more pronounced than in *A. extranea* (Fig. 514). See also remarks under *A. funebris* and *A. noveloi*.

Habitat. We found adults of *A. annae* along roadside seepages near Puente Texolo, Veracruz, where it was common (Fig. 803). The bright blue males were easily visible in sunlit areas. They were sympatric with the violaceous *A. noveloi*, and we collected a heterospecific pair in tandem (♂ *A. annae*, ♀ *A. noveloi*); all fully adult females of *A. annae* that we have seen are blue.

Distribution. *Argia annae* is primarily distributed along the E Sierra Madre Oriental foothills, ranging from Nuevo León south through Puebla. There is only one record from Jalisco, placing it also on the Pacific side of Mexico (Fig. 773). The species occurs at elevations from about 40 to 1830 m.

Argia apicalis (Say, 1840)

Figs. 34 (head, thorax, S1–4 ♂); 35 (thorax ♂); 174 (head, thorax, S1–4 ♀); 175 (thorax ♀); 293 (S7–10 ♂); 409 (S7–10 ♀); 499 (mesostigmal plates ♀); 597 (genital ligula); 667 (appendages ♂); 799 (map); 933 (body scan ♂); 934 (body scan ♀).

[Key locators: ♂ G-2, couplet 9(8’); ♂ Key to groups, couplet 2(1’); ♀ F-7, couplet 3(2’)]

Agrion apicalis Say 1840: 40 (description ♂, ♀, “Inhabits U. S.”).

Agrion apicale: Hagen 1861: 91 (description ♂, ♀).

Argia apicalis: Selys 1865: 414 (42 reprint) (description ♂, ♀);—Calvert 1901: 71 (key ♂);—Calvert 1902: 97 (♀ comparison with *A. immunda*);—Calvert & Hagen 1902: 106, pl. 2, figs. 14, 14a (“Type of Say supposedly lost”, synonymy, figures of appendages);—Kennedy 1902: 166 (key, Plate I, fig. 2, mesostigmal plates);—Bick & Bick 1965a: 32 (color variation);—Bick & Bick 1965b: 461 (demography & behavior);—Johnson & Westfall 1970: 65, 67 (♂, ♀ key, figs. 8a, 9a, d);—Johnson 1972a: 87, 88 (♂, ♀, key, figs. 9D, 10G, H);—Johnson 1972b: 1515 (geographic variation);—Bick & Bick 1978: 6 (wing clapping);—Kiauta & Kiauta 1980: 36 (cytotaxonomy);—Paulson 1982: 252 (U. S. A., Mexico);—Moulton II *et al.* 1987: 288 (figs. 3E, F, SEM of ♀ mesostigmal plates);—Garrison 1994: 305 (key, diagnosis, figs. 6, 47, 70, 71);—Abbott 2005a: 63 (♂, ♀, key, figs. 13, 15, photo 6e, distribution in New Mexico, Texas, Oklahoma);—Danforth 2006: 13 (new record for Arizona);—Westfall & May 2006: 181 (key, description, larva, figs. 85L, 90A, 98C, 101E);—González-Soriano & Novelo-Gutiérrez 2007: 127 (Mexico);—Paulson 2009: 143 (description, diagnosis, figs., photo 79);—Caesar & Wenzel 2009: 101 (phylogeny within genus *Argia*);—Abbott 2011: 113 (description, figs., Texas);—Bailowitz *et al.* 2015: 102 (diagnosis, figs., photos);—Paulson 2011: 149 (description, diagnosis, photo);—Torres-Pachón *et al.* 2017: 416 (molecular phylogeny of larvae within *Argia*).

Primary types. *Argia apicalis*: Say's type is lost.

Specimens examined. 69 ♂♂, 35 ♀♀: **U. S. A., Maryland:** 2 ♀♀, Williamsport, along canal bordering Potomac River near Route 11 overpass, 39.5998°N, 77.8265°W, 105 m, 11 August 2018, N. von Ellenrieder [RWG]; **Pennsylvania:** 1 ♂, Sayre {41.9789°N, 76.5153°W}, 235 m, 27 July 2001, T. Keller [RWG]; **Virginia:** 6 ♂♂, 6 ♀♀, Goose Creek, Leesburg, 39.0561°N, 77.5258°W, 20–25 August 2001 [CSCA]; 18 ♂♂, 7 ♀♀, James River Park, wetlands, 37.5332°N, 77.5°W, 21 August 2001, N. von Ellenrieder & R. W. Garrison [CSCA, RWG]; 2 ♂♂, 2 ♀♀, Reedy Creek Trail, James River, 37.5242°N, 77.4682°W, 21 m, 18 August 2018, R. W. Garrison & P. Evans [RWG]; 3 ♂♂, Joseph Bryan Park, 37.5833°N, 77.4667°W, 22 August 2001, N. von Ellenrieder [CSCA]; 8 ♂♂, 1 ♀, Pocahontas State Park, Swift Creek Lake, 37.3881°N, 77.575°W, 58 m, 29 June 2002, R. W. Garrison & N. von Ellenrieder [CSCA, RMNH, RWG]; 1 ♂, Shenandoah River at route 602 (boat loading), Shenandoah, 38.7142°N, 78.475°W, 23 August 2001, R. W. Garrison [RWG]; **Nebraska:** 1 ♂, 2 ♀♀, Niobrara Valley Preserve, at Nature Conservancy headquarters, Niobrara River, 29 mi E of Valentine, 42.7842°N, 100.028°W, 19 July 1998, R. W. & J. A. Garrison [RWG]; 1 ♂, 3 ♀♀, road W of Smith Falls State Park on Niobrara River, 4 mi S of Route 12, 42.895°N, 100.322°W, 19–20 July 1998, R. W. & J. A. Garrison [RWG]; **Iowa:** 1 ♂, Iowa River, University of Iowa Campus, Iowa City {41.6601°N, 91.5419°W}, 200 m, 25 September 1978, J. A. Garrison [RWG]; **Missouri:** 2 ♀♀, Missouri River at Rocheport {38.9738°N, 92.5634°W}, 180 m, 14 August 1976, E. J. Rogers, Jr. [RWG]; **Oklahoma:** 1 ♀, 3 km SSE of Perry, Perry Lake, Ledger # 57, 36.2694°N, 97.2764°E, 320 m, 2 August 2009, B. D. Smith-Patten & M. A. Patten [ONHI]; **Arkansas:** 1 ♀, Saint Francis National Forest near Storm Creek Lake, #248, 34.6019°N, 90.6131°W, 82 m, 1 July 2005, J. N. Hogue [RWG]; **Texas:** 1 ♂, 2 ♀♀, Plum Creek, 3 mi E of Luling at Highway 90, 29.6719°N, 97.6067°W, 26 August 1976, J. E. Hafernik, Jr. [RWG]; 3 ♂♂, 3 ♀♀, Palmetto State Park, 6 mi S of Luling, near Highway, 183, 29.5894°N, 97.5822°W, 27 August 1976, J. E. Hafernik, Jr. [CSCA, RWG]; 7 ♂♂, same data but 18 August 1975, R. W. Garrison [RWG]; 2 ♂♂, Pecos River at Highway 290, 30.7205°N, 101.807°W, 630 m, 21 July 1977, R. W. Garrison [RWG]; 3 ♂♂, 1 ♀, Mustang Creek by Carlos G. Parker Boulevard, Loop 427, Taylor, 30.5769°N, 97.455°W, 17 June 1978, J. E. Hafernik, Jr. [MHNN, RWG]; 7 ♂♂, 1 ♀, same data but 15–17 August 1975, R. W. Garrison [RWG]; 2 ♂♂, same data but 3 August 1983, J. E. Hafernik, Jr. [RWG]; 1 ♀, Guadalupe River, 4 mi S of Gonzales, 29.4477°N, 97.4105°W, 74 m, 19 August 1977, R. W. Garrison [RWG]; **Arizona:** 1 ♂, Mesquite Cove, 2 mi SE of Duncan, 32.7008°N, 109.09°W, 1120 m, 14 July 2001, S. Upson [RWG].

A medium-size species (Table 2) with black middorsal stripe a mere line in both sexes, not wider than middorsal carina (Figs. 34, 35, 174, 175, 933, 934); male with lateral lobes of distal segment of genital ligula represented by flattened ovoid flaps connected medially and diverging distally (Fig. 597), S2–7 mostly black middorsally (Fig. 34), and inner branch of cercus represented by a long, ventrally pointed tooth, followed distally by a smaller blunt tooth in mediodorsal view (Fig. 667a); female with poorly developed mesostigmal lobe (Fig. 499).

Diagnosis. Both sexes were diagnosed against other species occurring in the United States by Garrison (1994). In males, the mesal margin of cercus in dorsomedial view with a long, ventrally pointed tooth, followed distally by a smaller blunt tooth is unique and is not found in any other species occurring in Mexico and Central America. The genital ligula is also unlike any other species known from Middle America, although it is like that of *A. tibialis* (Rambur), which has thus far not been collected in Mexico. The tan female is largely pale with reduced black markings; the hairline middorsal and humeral thoracic stripes (Figs. 174, 175, 934) in combination with the poorly developed mesostigmal lobes (Fig. 499) will distinguish this sex from any other species. Female *A. immunda* are also largely brown (Fig. 923) but the middorsal thoracic stripe is broader (Fig. 211) and there are generally 3 pq in Fw (normally 4 in *A. apicalis*). Tan females of *A. moesta* (Figs. 224, 912) are larger (Hw 24–28.7; TL 37.5–44.5) and may also resemble *A. apicalis* but there are generally 4–5 Fw pq as well as 1.5–2 cells under the Pt (just 1 in *A. apicalis*).

Distribution. *Argia apicalis* is a well-known largely E United States species and has been treated extensively in several works concerning North American fauna (e. g., Garrison 1994; Westfall & May 2006). It has recently been found in E Arizona (Danforth 2006), and its occurrence in Mexico (Fig. 799) is represented by a single pair collected in Nuevo León (at Río Las Lajas at Highway 40, 2 mi NE of China {25.7277°N, 99.2170°W}, 114 m, 24 June 1965, D. R. Paulson; in FSCA, not seen, D. R. Paulson pers. comm., 10 Sept 2018).

Argia barretti Calvert, 1902

Figs. 36 (thorax ♂); 37 (head, thorax, S1–4 ♂); 176 (head, thorax, S1–4 ♀); 294 (S7–10 ♂); 410 (S7–10 ♀); 500 (mesostigmal plates ♀); 668 (appendages ♂); 792 (map); 973 (body scan ♂); 974 (body scan ♀).

[Key locators: ♂ G-4, couplet 8'; ♂ M-6, couplet 22(21'); ♀ F-16, couplet 4(3'); ♀ shortcut 7]

Argia barretti Calvert 1902: 87 (♂ description, pl. IV, figs. 46, 46s, diagnosis from *insipida*);—Calvert & Hagen 1902: 106 ("Type in Coll. Calvert");—Gloyd 1932: 189 (new record for U. S. A.);—Johnson 1972a: 85, 89 (♂, ♀, key, figs. 9E–G, 10S, T);—Paulson 1982: 252 (U. S. A., Mexico);—González-Soriano 1993: 295 (Mexico);—Garrison 1994: 305 (key, diagnosis, figs. 17, 56, 73);—Abbott 2005a: 67 (♂, ♀, key, figs. 13, 15, photo 7a, distribution in Texas);—Westfall & May 2006: 183 (key, description, larva, figs. 74D, 90B, 98D, 101F);—González-Soriano & Novelo-Gutiérrez 2007: 127 (Mexico);—Novelo-Gutiérrez 2008: 367 (description of larva, figs. 1–12);—Paulson 2009: 169 (♂, ♀, description, diagnosis, figs., photo 101);—Abbott 2011: 127 (♂, ♀, figs., diagnosis, distribution in Texas);—Escoto-Moreno *et al.* 2014: 1046 (Hidalgo, Mexico);—Torres-Pachón *et al.* 2017: 413 (molecular phylogeny of larvae within *Argia*);—Escoto-Moreno *et al.* 2020: 235 (Querétaro, Mexico).

Argia (Chalcargia) barretti: Kennedy 1920: 85 (in subgenus *Chalcargia*).

Primary types. *Argia barretti*: holotype ♂, MEXICO, Nuevo León, Linares, July, Otis W. Barrett leg. [not examined, in ANSP].

Specimens examined. 41 ♂♂, 17 ♀♀: **U. S. A., Texas:** 4 ♂♂, 3 ♀♀, South Fork Guadalupe River near Hunt, 30.0706°N, 99.3375°W, 550 m, 28 June 1985, S. W. Dunkle [BMNH, ONHI, RWG]; 1 ♂, Little Hackberry, Route 55, 10 mi N of Barksdale Creek, 29.8406°N, 100.105°W, 529 m, 13 July 2001, R. W. Garrison [RWG]; 1 ♂, 1 ♀, Nueces River S of Barksdale on Route 55, 29.7211°N, 100.0341°W, 449 m, 22–23 July 1977, R. W. Garrison [CUMZ, RWG]; 1 ♂, 1 ♀, same data but Camp Wood, 6:00 pm, 29 June 1985, J. J. Daigle [RWG]; 2 ♂♂, 1 ♀, same data but 13 July 2001, N. von Ellenrieder & R. W. Garrison [CSCA, RWG]; 3 ♂♂, 1 ♀, Nueces River at Lake Nueces, 3 mi S of Camp Wood, 29.6175°N, 100.009°W, 412 m, 28 July 1992, T. W. Donnelly [RWG]. **MEXICO, San Luis Potosí:** 2 ♂♂, 2 ♀♀, Bridge at Río Huichihuayán, just S of Huichihuayán, 21.4764°N, 98.9682°W, 95 m, 18 August 1999, R. W. & J. A. Garrison [RWG]; 1 ♂, Río Moctezuma approx. 2 km W of Tamazunchale, 21.2578°N, 98.8051°W, 19 April 2007, R. Behrstock [RWG]; **Puebla:** 1 ♂, Río San Marcos, Km 1 carr. 130, tramo Avila Camacho-Petlacotla, {20.3928°N, 97.8914°W}, 236 m, 22 July 1987, R. Novelo-Gutiérrez [RWG].

A relatively large species (Table 2); male mostly blue (Figs. 36, 37, 294, 973) with cercus linear, about twice as long as wide, divided apically and with inner branch subequal or slightly longer than outer branch in dorsal and mediodorsal views (Figs. 668a, c); female similar to male, blue or tan (Figs. 176, 974), with mesostigmal lobe occupying about 0.33 of plate and with posterolateral margin in dorsal view slightly concave, the entire posterior margin of mesostigmal plate almost linear or at most slightly concave (Fig. 500).

Diagnosis. Both sexes of *A. barretti* were diagnosed against other species occurring in the U. S. A. by Garrison (1994) and Westfall & May (2006). *Argia barretti* is most similar in coloration and morphology to three closely related species occurring in Mexico south through N South America: *A. harknessi* (Figs. 968–970), *A. pipila* (Figs. 975, 976), and *A. insipida* (Figs. 971, 972). While all four species are thus far known to be allopatric (Fig. 792), their separation requires close inspection of the male terminal appendages and the female mesostigmal plates. All four species share a similar genital ligula morphology. Males may be separated as follows (contrasting characters for others in parentheses). The ventral branch of the paraproct of males of *A. harknessi* (Figs. 694a, b) is absent or vestigial (well-developed in *A. barretti*, Figs. 668a, b; *A. insipida*, Figs. 700a, b, 701a, b; and *A. pipila*, Figs. 720a, b). The outer branch of cercus in Central American populations of *A. insipida*, Fig. 700c (but not in South American populations, Fig. 701c) is strongly reduced, almost forming a right-angle lobe and with a small circular patch clearly differentiated from remainder of cercus in dorsal view (cercus in dorsal view with outer branch well developed although shorter or subequal to inner branch and lacking a small circular patch clearly differentiated from remainder of cercus in *A. barretti* [Fig. 668c] and *A. pipila* [Fig. 720c]). The inner branch of the cercus in *A. barretti* is subequal or slightly longer than outer branch in dorsal and mediodorsal views (Figs. 668a, c) and paraproct ventral branch is as long as dorsal branch and directed posteriorly in lateral view, Fig. 668b (inner branch of cercus distinctly longer than outer branch in dorsal and mediodorsal views [Figs. 720a, c] and paraproct ventral branch shorter than dorsal branch and directed posterodorsally in lateral view [Fig. 720b] in *A. pipila*).

Females of all four species are difficult to separate, but the following characters will aid in their separation. Prominent mesepisternal tubercles are present in females of *A. insipida*, Figs. 535c, d (low in *A. barretti*, Fig. 500c,

A. harknessi, Fig. 529c, and *A. pipila*, Fig. 558c). The posterolateral margin of mesostigmal lobe of *A. barretti* in dorsal view is slightly concave and the entire posterior margin of mesostigmal plate is almost linear or at most slightly concave, Fig. 500c (posterolateral margin of mesostigmal lobe in dorsal view distinctly concave and clearly differentiated from remainder of mesostigmal plate in *A. harknessi*, Fig. 529c, and *A. pipila*, Fig. 558c).

Habitat. The first author observed numerous tandem pairs ovipositing on emergent vegetation along an inland vegetated shore below a bridge at Río Huichihuayán. Behrstock's Río Moctezuma male has the following notes: grassy river, river high and fast, little good accessible edge, taken from open ground near river, 13:00-13:30 hrs.

Distribution. *Argia barretti* was known only from the unique male holotype for 30 years until another male was reported from Texas by Gloyd (1932). The species has since been collected throughout S Texas and NE Mexico, where it occurs at elevations between 40 and 580 m. *Argia barretti* extends as far S as 97.9°N and is replaced farther south (96.5°N) by *A. pipila*. The E portion of the Trans-Mexican Volcanic Belt (Eje Neovolcánico, ca. 96.8°N), where it extends nearly to the Gulf of Mexico, would appear to act as a geographic barrier separating these two similar species (Fig. 792).

Argia calida (Hagen, 1861)

Figs. 4 (head ♂); 5 (head ♀); 38, 39 (head, thorax, S1–4 ♂); 177 (head, thorax, S1–4 ♀); 295 (S7–10 ♂); 411 (S7–10 ♀); 501 (mesostigmal plates ♀); 598–600 (genital ligula); 669, 670 (appendages ♂); 754, 755 (type labels); 796 (map); 993 (body scan ♂); 994 (body scan ♀).

[Key locators: ♂ G-5, couplet 7(6'); ♂ M-6, couplet 18'; ♀ F-2, couplet 1]

Agrion calidum Hagen 1861: 93 (description ♂ only, Tampico, Mexico).

Argia calida: Hagen in Selys 1865: 390 (18 reprint) (redescription);—Calvert 1902: 75 (♂ description);—Calvert & Hagen 1902: 106 ("Types ♂ in M. C. Z.", pl. 1, figs. 13, 13a);—Calvert 1907: 361 (reference to Calvert & Hagen 1902);—Ris 1919: 103 (brief description ♂ Mexico);—Paulson 1982: 252 (U. S. A., Mexico);—Daigle 1991: 341 (comparison with *Argia garrisoni* sp. nov., figs. 2, 4, 7, 9, 11, 13);—Novelo-Gutiérrez & Peña-Olmedo 1993: 130 (Hidalgo, Mexico);—González-Soriano 1993: 295 (Mexico);—Boomsma & Dunkle 1996: 25 (new for Belize);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Förster 2001: 11, 54 (key ♂);—Westfall & May 2006: 192 (comparison with *A. garrisoni*);—González-Soriano & Novelo 2007: 127 (Mexico);—González-Soriano & Paulson 2011: 303 (Chiapas, Mexico);—González-Soriano *et al.* 2011: 184 (San Luis Potosí, Mexico);—Escoto-Moreno *et al.* 2017: 386 (Hidalgo, Mexico);—Garrison & von Ellenrieder 2019: 23 (designation of lectotype at MCZ).

Argia wilsoni Calvert 1902: 75 (description ♂ Guatemala, pl. IV, figs. 28, 28s);—Garrison & von Ellenrieder 2019: 48 (holotype data in MCZ). **New Synonymy.**

Argia (Chalcargia) calida: Kennedy 1920: 85 (in subgenus *Chalcargia*).

Primary types. *Argia calida*: lectotype ♂ by present designation, MEXICO, Tampico, 1–31 January–December 1854–1855, Henri de Saussure leg. (Fig. 754) [examined, in MCZ; Garrison & von Ellenrieder 2019];—*Argia wilsoni*: holotype ♂, GUATEMALA, Livingston, February–April 1885, H. Wilson leg. (Fig. 755) [examined, in MCZ; Garrison & von Ellenrieder 2019].

Specimens examined. 69 ♂♂, 30 ♀♀: **MEXICO, Tamaulipas**: 1 ♂ (lectotype), Tampico {22.2167°N, 97.85°W}, 14 m, 1–31 January–December 1854–1855, H. de Saussure [MCZ]; **San Luis Potosí**: 22 ♂♂, 10 ♀♀, El Salto {22.5857°N, 99.3843°W}, 470 m, 24 June 1960, G. H. & A. Beatty [PSU, RWG]; 1 ♂, Río Huichihuayán, Highway 85 SW of Huichihuayán, 10:00 am {21.4522°N, 98.9383°W}, 90 m, 23 June 1990, J. J. Daigle [RWG]; 1 ♂, Puente Palictla, Highway 85 S of Ciudad Valles {21.2916°N, 98.7889°W}, 70 m, 28 June 1990, J. J. Daigle [RWG]; 2 ♂♂, stream 5.5 mi NW of Tamazunchale {21.2892°N, 98.7925°W}, 220 m, 26 June 1965, D. R. & M. L. Paulson [FSCA]; **Puebla**: 1 ♂, 1 ♀ (in tandem), Piedras Negras, stream {97.8744 W, 20.3936 N}, 240 m, 25 October 1987, Gomez [RWG]; **Veracruz**: 1 ♂, 1 ♀, Barranca de Cuyoapa, Tejería, Teocelo, 19.3733°N, 96.9267°W, 900 m, 12 September 1982, R. López [RWG]; 1 ♂, Misantla {19.9322°N, 96.8509°W}, 301 m, July 1914, W. Gugelmann [RWG]; 1 ♂, 1 ♀, Ruinas del Tajín {20.4467°N, 97.3772°W}, 134 m, 6 May 1980, M. Galicia [RWG]; 1 ♀, stream 12.2 km E of Córdoba, by Highway 150, 18.8903°N, 96.7925°W, 509 m, 12 August 1976, R. W. & J. A. Garrison [RWG]; **Tabasco**: 3 ♂♂, 4 ♀♀, Tepescuintle {17.4435°N, 91.4006°W}, 25 m, 17, 20–26 August 1962, E. C. Welling M. [CSCA, UMMZ]; 4 ♂♂, same data but 3–13 September 1962 [UMMZ]; **Campeche**: 1 ♂, La Encarnación, Pital {18.05°N, 91.8332°W}, 15 m, 21 September 1937, J. T. Martin [RWG]; 1 ♂, same data but

5 October 1937 [UMMZ]; 1 ♂ same data but 1937 [RWG]; **Chiapas**: 4 ♂♂, Cascada Misol-Ha, km 47, Palenque-Ocotzingo Road, 20 km S of Palenque, 17.3342°N, 91.9769°W, 94 m, 25 September 1983, R. W. Garrison [RWG]; 1 ♂, 10 mi W of Tuxtla Gutiérrez, IORI # 00066494 {-93.3227 W, 16.7595 N}, 1160 m, 9 July 1955, University of Kansas Mexico Expedition [FSCA]. **BELIZE, Orange Walk**: 1 ♂, Gallon Jug {17.5594°N, 89.0391°W}, 144 m, 14 October 1992, T. Boomsma [RWG]; **Cayo**: 4 ♂♂, small creek 6 mi W of Belmopan on W Highway, partly dry, with leaf-bottomed pools and pools with emergent grass, pale antehumeral much reduced {17.2269°N, 88.8667°W}, 59 m, 19 March 1986, S. W. Dunkle [FSCA]; 1 ♂, small stream 3 mi W of Ontario Village on W Highway, narrow shady riffles and wider pools {17.2239°N, 88.9258°W}, 54 m, 20 March 1986, S. W. Dunkle [RWG]; **Toledo**: 1 ♂, Río Temash, {15.9764°N, 88.9419°W}, 11 m, August 1934, J. J. White [RWG]. **GUATEMALA, Izabal**: 1 ♂ (holotype of *Argia wilsoni*), Livingston {15.8333°N, 88.7500°W}, 22 m, February–April 1885, H. Wilson [MCZ]; **Zacapa**: 2 ♂♂, 1 ♀, Los Amates {15.2667°N, 89.1°W}, 80 m, 21 June 1909, E. B. Williamson [RWG].

A medium-size species (Table 2); male blue and black (Fig. 993) with a bifid cercus with outer branch spatulate and about twice as broad as inner branch (Figs. 669, 670), and S8 entirely black (Figs. 295, 993); female similar to male, tan (Fig. 994), with a transverse costate ridge formed by extension of posterior margin of mesostigmal plate to mid-level of underside of mesostigmal lobe in posterior view (Fig. 501e).

Redescription. Due to the brief descriptions of this species given by Hagen (1861, as *Agrion calidum*) and Calvert (1902), the latter based on notes he took on Hagen's type in 1897, we provide a redescription of both sexes here.

Male (Mexico, San Luis Potosí, Puente Palictla, Highway 85, S of Ciudad Valles, Figs. 4, 39, 295, 993): Labrum, base of mandibles, genae, postclypeus blue, anteclypeus black, epicranium matte black except for blue postocular spots, the lateral border of each confluent with eye, and a pair of small brown elongate streaks dorsolateral to lateral ocellus; pale postocular bar absent, rear of head entirely black.

Prothorax mostly black with following blue: dorsolateral spot on middle lobe and propleuron. Middorsal stripe about two-thirds as wide as blue antehumeral stripe, broad black humeral stripe extending to interpleural suture, slightly wider than blue antehumeral, parallel, with a small pair of isolated blue spots at dorsal third, remainder of thorax blue except for narrow black metapleural stripe. Coxae pale brown, legs and armature entirely black. Wings slightly amber, Pt surmounting 1–2 cells; px Fw: 16/17, Hw: 15/15; pq Fw: 4/4, Hw: 4/4, Rp2 at Fw: 8/9, Hw: 7/7.

Abdomen mostly black (Fig. 993); S1 blue with a black dorsolateral spot occupying basal eighth and narrow black apical ring; S2 black dorsolaterally with narrow blue basal ring and blue laterally and a blue oval spot dorsally, S3 black dorsally and extending laterally; S4–7 entirely black except for narrow blue basal ring, with only a small vestige of this ring on S7; S8 black with a small obscure pale lateral spot at distal third; S9–10 blue with black stripe ventrally; appendages black.

Genital ligula (as in Fig. 598) with a broadly rectangular shaped hood with a pair of strongly curved chitinated flagella ventrally, lateral lobe long, narrow and aciculate.

Tori small, transversely oval, each about as wide as epiproct, cercus divided apically, the outer branch spatulate, about twice as wide as narrow inner branch, cleft between branches roundly acute (as in Fig. 669c); paraproct with dorsal and ventral branches subequal (as in Figs. 669a, b, 700a, b).

Dimensions. Hw 21.3, abdomen 29.2, total length 37.1.

Variation in males. Some males from more southerly localities in Mexico (e. g., Fig. 38) have the blue antehumeral stripe reduced to a narrow stripe ending at dorsal fourth of mesepisternum, so that black middorsal and humeral stripes are conjoined dorsally. The heavily sclerotized lateral lobe of the genital ligula differs between populations northwest (Tamaulipas, San Luis Potosí, Puebla, and Veracruz in Mexico) and east (Chiapas and Campeche in Mexico, Belize, Guatemala) of the Isthmus of Tehuantepec as follows: the lateral lobe is slightly arcuate with both anterior and posterior margins parallel, smooth with an acute tip (Figs. 598a, c) in the NW populations, but it is broad basally with a microsculptured posterior margin (Figs. 599, 600) in the E populations. These more easterly populations correspond to the taxon Calvert (1902) named *A. wilsoni*.

Female (Mexico, Veracruz, Ruinas del Tajín, Figs. 4, 177, 411, 994) similar to male but pale areas orange-brown. Postclypeus pale bordered posteriorly with black conjoined laterally with an anteromedially directed offshoot of black; thorax as in male but metapleural humeral stripe represented only by black spot on metapleural fossa; wings hyaline, Pt surmounting 2 cells; px Fw: 16/16, Hw: 14/14; pq Fw: 4/4, Hw: 4/4, Rp2 at Fw: 8/8, Hw: 7/7. S1 orange-brown with a black dorsolateral spot occupying basal half and narrow black apical ring; S2 black dorsolaterally with narrow orange basal ring and orange laterally and a small orange diamond spot dorsally, S3 with

dorsal black extending laterally with an incomplete orange basal ring connected to narrow ventral pale stripe ending at distal fifth; S4–6 similar to S3 but black more extensive, S7 entirely black; S8–9 black with an inverted blue dorsolateral triangular spot at distal third connected dorsally, S10 blue dorsolaterally, black ventrally, ovipositor and cerci entirely black, ovipositor not extending to tip of abdomen, ovipositor teeth enlarged, robust. Mesostigmal lobe ovoid, erect, its medial margin concave with mediobasal margin overlying lateral branch of middorsal carina, its ventral side in posterior view with a transverse costate ridge formed by extension of posterior margin of mesostigmal plate to mid-level of underside of mesostigmal lobe; costate ridge is disjunct from lateral branch of middorsal carina (Fig. 501e).

Dimensions. Hw 22.4, abdomen 28.7, total length 36.9.

Diagnosis. *Argia calida* differs from all other congeners except for *A. garrisoni* in the male by the unique structure of the cercus. The spatulate outer branch is about twice as broad as the inner branch (Figs. 669, 670, 690) in both species. However, the overall pale coloration is blue (Figs. 38, 39, 993) and S8 is entirely black in *A. calida* (Figs. 295, 993), but largely purple (Figs. 69, 812, 995) and S8 largely purple (Figs. 323, 812, 995) in *A. garrisoni*. Males of twelve species also have an entirely or mostly black S8: some *A. adamsi* (Fig. 283), *A. carolus* (Figs. 298, 997), *A. cuprea* (Figs. 304, 959), some *A. funcki* (Figs. 316, 317, 917), some *A. herberti* (Fig. 329), most *A. indicatrix* (Figs. 334, 335), *A. lugens* (Figs. 340, 341, 914, 915), some *A. moesta* (Figs. 345, 910), *A. percellulata* (Figs. 358, 359, 964–966), most *A. tezpi* (Figs. 385, 386, 1019), *A. translata* (Figs. 388, 389, 977, 978) and some *A. ulmeca* (Fig. 390), but they differ by appendage morphology and other characters as indicated in the keys.

The female differs from all other species except for *A. garrisoni* by the unique morphology of the mesostigmal plate: a transverse costate ridge formed by extension of posterior margin of mesostigmal plate to mid-level of underside of mesostigmal lobe in posterior view (Fig. 501e). *Argia calida* and *A. garrisoni* can be reliably separated only by color pattern (black markings more extensive (Figs. 177, 411, 994), pale occipital bar usually absent (Figs. 5, 177) or reduced to two small lateral spots, dorsal black on S5–7 often extending laterally to ventral margin (Fig. 411), ovipositor entirely black (Fig. 411) in *A. calida*; black markings less extensive (Figs. 202, 433, 996), pale occipital bar usually present (Figs. 12, 202), dorsal black on S5–7 extending laterally about halfway to ventral margin (Fig. 433), base of ovipositor partially pale (Fig. 433) in *A. garrisoni*.

Remarks. As the type series of *Agrion calidum* Hagen included other species (e. g., *A. oenea*; see Garrison 1994), to preserve stability of this name we designate here the male with the following labels “Tampico, / T[erres]. Temperees”; “11. *A. calida* ♂ / a renvoyer”; “Hagen [printed]” (Fig. 754), deposited at MCZ as lectotype.

Argia wilsoni was described by Calvert (1902) based on a male from Livingston, Guatemala, and was distinguished from *A. calida* by the absence of pale antehumeral stripe and inferior appendages bifid (pale antehumeral stripe one-third as wide as dark middorsal and inferior appendages bifid in *A. calida*). However, the holotype of *A. wilsoni* does have a pale antehumeral stripe and our illustrations of the appendages of the holotype of *A. wilsoni* (Fig. 670) match those of the lectotype of *A. calida* (Fig. 669). As noted above, the lateral lobe of the genital ligula differs, but we have not been able to find any other differences between both sexes that would support them as separate species. Given that the genital ligula of various species of *Argia* (e. g., *A. adamsi*, *A. fulgida*, *A. oculata*) have been found to vary geographically, we consider *A. wilsoni* to represent a junior subjective synonym of *A. calida*.

According to Daigle (1991), who described *A. garrisoni*, male appendages are slightly larger, outer arm of cercus is more robust dorsally, and outer edge of inner arm is more parallel-sided towards the blunt apex in *A. garrisoni* than in *A. calida*, and when viewed laterally, the appendages are wider apart with the tips more noticeable in *A. calida*. We have compared series of *A. garrisoni* with *A. calida* and we have been unable to corroborate these structural differences. The morphology of the cerci (Figs. 669, 670, 690), and female mesostigmal plates (Figs. 501, 525) are essentially the same, and we have found the genital ligula of *A. garrisoni* to match those of populations of *A. calida* northwest of the Isthmus of Tehuantepec. Both species are sympatric at one locality (Río Huichihuayán), but Daigle (1991) noted that they were possibly allotopic, with males of *A. garrisoni* perching openly on fallen tree branches in the middle of the river’s sunny areas, and males of the more secretive *A. calida* found away from the river in dry, shady gullies, usually perching on the ground or on tree roots, and some seen in heavy, shady underbrush. We are treating *A. garrisoni* as a valid species in this paper but suggest that further studies, especially molecular, might support *A. garrisoni* to be a geographic color variant of *A. calida*, as similar color variants are known for other species of *Argia*: e. g., *A. oculata*, *A. oenea*, *A. rogersi*, *A. ulmeca*.

Habitat. The first author collected several *A. calida* along the shaded banks of the Cascada Mizolja. Specimens collected by S. Dunkle in Belize (small stream 3 mi west of Ontario Village) were collected along narrow shady

riffles and wider pools; one male was perched on a twig about 2.4 m above the ground. At the Río Huichihuayán, males were found away from the river in dry, shady gullies, usually perching on the ground or on tree roots (Daigle 1991).

Distribution. *Argia calida* occurs along the E foothills of the Sierra Madre Oriental in Mexico, extending as far south as Belize and Guatemala (Fig. 796), and ranges in elevation from sea level to 1160 m. The types are recorded from “Tampico,” the same locality as for *A. extranea*, but they may have been collected farther inland from that coastal city, as *A. extranea* is primarily an inhabitant of the foothill regions in Mexico, and except for the Río Huichihuayán locality, it replaces *A. garrisoni* to the south.

Rangel-Sánchez *et al.* (2018), using ecological niche modeling methods, indicated a possible disjunct occurrence of *A. garrisoni* in the southernmost Veracruz region. We believe these specimens were misidentified, and they likely represent more southerly populations of *A. calida* as defined here.

Argia calverti Garrison & von Ellenrieder, 2017

Figs. 6 (head ♂); 23 (labrum ♀); 40 (head, thorax, S1–4 ♂); 178 (head, thorax, S1–4 ♀); 296 (S7–10 ♂); 412 (S7–10 ♀); 502 (mesostigmal plates ♀); 601 (genital ligula); 671 (appendages ♂); 791 (map); 955 (body scan ♂); 956 (body scan ♀).

[Key locators: ♂ G-4, couplet 5(3'); ♂ M-1, couplet 4(3'); ♀ F-13, couplet 1; ♀ shortcut 6]

Argia calverti Garrison & von Ellenrieder 2017: 6 (♂, ♀, description, diagnosis, key, figs. 1, 5, 13, 35, 56, 80, 106, 107, 148, 165, photo 172);—Paulson & Haber: 2021: 84 (diagnosis, photos).

Primary types. *Argia calverti*: holotype ♂, COSTA RICA, Cartago, Reserva Tapantí, 1,310 m, 6 July 1963, F. G. Thompson leg. [examined, in FSCA].

Specimens examined. 45 ♂♂, 19 ♀♀ (see Garrison & von Ellenrieder 2017 for additional material examined not listed here): **COSTA RICA, Guanacaste:** 1 ♂, 1 ♀, Estación Biológica Maritza, Guanacaste National Park, 85.495 W, 10.9568 N, 590 m, July 1988, S. J. Brooks [RWG]; 1 ♂, 1 ♀, same data but [BMNH]; **San José:** 1 ♂, 2 ♀♀, Braulio Carrillo National Park, 83.9631 W, 10.16 N, 742 m, 24 June 1983, K.-D. B. Dijkstra [BYU]; 2 ♂♂, same data but [RWG]; **Limón:** 1 ♀, 11 km SSW of Pocora, Finca Las Brisas, Haber 3934, 83.6326 W, 10.0693 N, 85 m, 31 January 2007, W. Haber, David Wagner & M. Thomas [RWG]; **Puntarenas:** 1 ♂, Monteverde, San Luis Arriba, Río San Luis, along river below waterfall, Haber 9126, 84.7843 W, 10.2781 N, 118 m, 7 August 2013, L. Ramirez [RWG]; 1 ♂, San Luis River valley, trail to San Luis waterfall, Haber 7914, 84.7871 W, 10.2797 N, 115 m, 30 April 2011, L. Ramirez [RWG]; **Cartago:** 2 ♂♂, Tapantí, 83.8017 W, 9.7674 N, 1200 m, 6 July 1963, F. G. Thompson [FSCA]. **PANAMA, Chiriquí:** 1 ♂, Potrerillos, 82.4833 W, 8.65 N, 664 m, 1 April 1934, D. V. Brown [FSCA].

A large species (Table 2); male with red eyes, a brilliant cupreous thoracic dorsum and dorsum of S1–7 largely blue (Figs. 40, 955); female (Fig. 956) with mesostigmal lobes small, occupying medial half or less of posterior margin of plate (Fig. 502).

Diagnosis. Within its range (Costa Rica and Panama, Fig. 791) the male can be distinguished from similar metallic red species with largely blue S2–6 (*A. cupraurea*, *A. oenea*) by its large size (Hw 23.8–27.2 mm; total length 40.8–47.0 mm) compared to *A. cupraurea* (Hw 20.2–22.5 mm; total length 36.1–40.0 mm) and *A. oenea* (Hw 18.5–22.6 mm; total length 33.8–39.7 mm) and by the robust and strongly curved cercus (Fig. 671a) versus the almost linear (Fig. 676a) or slightly arched (Fig. 713a) cercus in *A. cupraurea* and *A. oenea*, respectively. The paraproct of *A. oenea* in lateral view (Fig. 713b) is almost linear with both branches small and of about the same size, almost bilobate; the dorsal or ventral branches of the paraproct of *A. calverti* (Fig. 671b) and *A. cupraurea* (Fig. 676b) are more robust and are strongly divergent. The labrum in *A. oenea* is largely pale (as in Figs. 26, 102) but mostly metallic in *A. calverti* (as in Figs. 23, 40) and *A. cupraurea* (Fig. 46). The hood of the genital ligula in *A. oenea* (Fig. 632b) is quadrate, not linear and digit-like as in *A. calverti* (Fig. 601b) and *A. cupraurea* (Fig. 606b).

Male of *A. fulgida* is unique among metallic species within the distribution range of *A. calverti* in having dorsum of S2–6 entirely black except for a narrow basal blue ring (Figs. 55, 953, but not in South America, Fig. 56); in the other three sympatric metallic species, *A. calverti* (Figs. 40, 955), *A. cupraurea* (Figs. 46, 957), and *A. oenea* (Figs. 102, 961), the dorsum of S2–6 has basal half or more blue (e. g., Figs. 102, 961) or violet (e. g., Figs. 101, 962). S8

in Middle American *A. fulgida* is blue with the posterior half to third black (Fig. 312), differing from the entirely blue S8 in *A. calverti* (Fig. 296), *A. cupraurea* (Figs. 301–303) and *A. oenea* (Figs. 353, 354). The broad explanate hood of the apical segment of the genital ligula in *A. fulgida* (Fig. 611) is shared with that of *A. oenea* (Fig. 632b), and both differ from the largely long linear hood present in *A. calverti* (Fig. 601b) and *A. cupraurea* (Figs. 606b). The genital ligulae of *A. fulgida* and *A. oenea* are similar in possessing a broad campanulate (*A. fulgida*, Fig. 611b) to quadrate (*A. oenea*, Fig. 632b) hood, but differ as follows: in *A. fulgida* the thickened flagella are not fused at base and they do not arch entally toward first segment (Fig. 611c); in *A. oenea*, the bifurcate flagella are fused into a common stem that arches entally toward first segment (Figs. 632a, c).

Female of *A. calverti* can be easily distinguished from other similar species by the short, stubby mesostigmal lobe (Fig. 502), compared to the longer, more foliate lobe in *A. fulgida* (Fig. 521), *A. cuprea* (Fig. 511), *A. cupraurea* (Fig. 509, 510), and *A. oenea* (Figs. 552, 553). Thoracic (Figs. 178, 186–188, 197, 198, 232, 233) and abdominal (Figs. 412, 419–421, 428, 429, 460) coloration of females of all five species is similar (Figs. 954, 956, 958, 960, 963).

Distribution. *Argia calverti* is known from Costa Rica and Panama (Fig. 791), where it is found between 348 and 1310 m.

Argia carlcooki Daigle, 1995

Figs. 41 (head, thorax, S1–4 ♂); 42 (thorax ♂); 179 (head, thorax, S1–4 ♀); 297 (S7–10 ♂); 413 (S7–10 ♀); 503 (mesostigmal plates ♀); 602 (genital ligula); 672 (appendages ♂); 781 (map); 804 (field photo ♂, ♀); 920 (body scan ♂); 921 (body scan ♀).

[Key locators: ♂ G-2, couplet 2'; ♂ M-6, couplet 27'; ♀ F-6, couplet 13(12'), F-8, couplet 3(2'')]

Argia carlcooki Daigle 1995: 467 (♂, ♀, description, diagnosis, key, figs. 1a–e);—Behrstock *et al.* 2004: 11 (new record for Arizona based on photo, key, figs. 2, 58, 11);—Westfall & May 2006: 165, 184 (key, description);—González-Soriano & Novelo-Gutiérrez 2007: 127 (Mexico);—Upton *et al.* 2007: 29 (Sonora, Mexico);—González-Soriano *et al.* 2008: 310 (Morelos);—Paulson 2009: 157 (♂, ♀, description, diagnosis, photos);—Bailowitz *et al.* 2015: 104 (diagnosis, photos);—González-Soriano *et al.* 2016: 156 (Colima, Mexico);—Torres-Pachón *et al.* 2017: 413 (molecular phylogeny of larvae within *Argia*); Smith 2021: 20 (Sonora, Mexico).

Primary types. *Argia carlcooki*: holotype ♂, MEXICO, Morelos, Tehuixtla, Route 6, Río Amacuzac tributary SE of Balneario Los Palma [*sic* Las Palmas], 20 July 1992, Jerrell J. Daigle leg. [not examined, in FSCA].

Specimens examined. 22 ♂♂, 8 ♀♀: **MEXICO, Sonora:** 1 ♂, Roadside Creek near Rancho Tonibabi along Highway 21, 29.8328°N, 109.564°W, 783 m, 26 October 2002, S. Upton [RWG]; 1 ♂, 1 ♀, hot springs 6 mi W of San Pedro de la Cueva {29.2606°N, 109.816°W}, 600 m, 16 March 2003, R. A. Bailowitz [RWG]; **Nayarit:** 1 ♂, Mecatán {21.5333°N, 105.117°W}, 300 m, 17 May 1982, E. González-Soriano [FSCA]; **Guanajuato:** 2 ♂♂, Villagran {20.517°N, 100.983°W}, 1850 m, 16 June 1941, H. S. Dybas [FSCA, RWG]; **Colima:** 3 ♂♂, Salada {19.4333°N, 104.033°W}, 859 m, 7, 11, 31 May 1967, R. G. Wind [BMNH, RWG]; 1 ♂, [no locality given], from L. Conradt [USNM]; **Guerrero:** 1 ♂, Highway 95, km 162, near Iguala {18.3°N, 99.5°W}, 860 m, 15 July 1965, O. S. Flint, Jr. & M. A. Ortiz B. [USNM]; **Michoacán:** 1 ♂, 3 ♀♀, Apatzingán {19.0942°N, 102.44°W}, 329 m, 20, 21 July 1947, T. H. Hubbell [RWG]; 2 ♂♂, Lago de Camécuaro, 13 km E of Zamora, N of Tangancicuaro de Arista, 19.9022°N, 102.2099°W, 1704 m, 17 July 1947, T. H. Hubbell [RWG]; **Morelos:** 4 ♂♂, 2 ♀♀, Balneario Las Palmas, S of Tehuixtla, stream into Río Amacuzac, 18.5475°N, 99.2704°W, 866 m, 20 July 1992, J. J. Daigle, S. W. Dunkle & W. F. Mauffray [FSCA, RWG]; 1 ♀, Río Amacuzac at Tehuixtla & stream, at Balneario Las Palmas {18.5475°N, 99.2704°W}, 866 m, 20 July 1992, K. J. Tennessen [FSCA]; 1 ♂, stream 1 mi S of Cocoyotla, Highway 421 {18.7358°N, 99.4522°W}, 1070 m, 22 July 1992, K. J. Tennessen [FSCA]; **Oaxaca:** 4 ♂♂, 1 ♀, Highway 190, km 698, near El Coyul {16.4869°N, 95.8933°W}, 19 m, 11 July 1966, O. S. Flint, Jr. & M. A. Ortiz, B. [RWG, USNM].

A small species (Table 2); male vivid blue (Figs. 40, 804, 920), and female (Fig. 921) with reduced mesostigmal plate morphology (Fig. 503).

Diagnosis. Both sexes of *A. carlcooki* were diagnosed against *A. immunda* by Daigle (1995) and from other *Argia* occurring in the U. S. A. by Westfall & May (2006). Pale coloration in male *A. carlcooki* is blue (Figs. 41, 42,

297, 804, 920) but violet in *A. immunda* (Figs. 78, 333, 922). Both sexes of *A. carlcooki* (Figs. 41, 179, 920, 921) share with *A. immunda* (Figs. 78, 210, 922, 923) a unique abdominal pattern of an alternating sequence of pale, dark, pale, and dark colors on S3–6. However, in *A. carlcooki* the dorsolateral subbasal streaks are usually separated dorsally so that each of S4–6 in dorsal view is pale with a black apical ring (Fig. 41); in *A. immunda*, the dorsolateral subbasal streaks are often united dorsally so that each of S4–6 in dorsal view has an alternating pale, dark, pale, dark pattern (Fig. 78). The male appendages of both species are apparently indistinguishable. The morphology of the genital ligula differs: in *A. carlcooki* the apical flagellum-like process gradually narrows toward apex in lateral view (Fig. 602a); in *A. immunda* the apical flagellum-like process abruptly narrows before apex in lateral view (Fig. 618a).

Vestigial mesostigmal plates are common to both *A. carlcooki* (Fig. 503) and *A. immunda* (Figs. 532, 533), but the black humeral stripe is forked dorsally in *A. carlcooki* (Figs. 179, 921) and not forked dorsally and often a mere line slightly enlarged at ventral half in *A. immunda* (Figs. 210, 923).

Remarks. Torres-Pachón *et al.* (2017), in their phylogenetic analysis of various species of *Argia*, considered *A. carlcooki* and *A. nahuana* basal to *A. plana* (= *A. funebris*), *A. vivida*, *A. extranea*, *A. immunda*, and *A. bipunctulata* based on larval morphology and mitochondrial genes (16S rRNA and COI). However, based on adult morphology, we consider *A. carlcooki* to be most likely the sister species to *A. immunda*, as they share the morphology of male appendages and genital ligula, female mesostigmal plates and number of Fw pq. The distal segment of the genital ligula in *A. extranea* (Fig. 611), *A. funebris* (Fig. 615) and *A. vivida* (Figs. 658–660) lacks a flagellum or strap-like process and paired lateral lobes; the distal segment in *A. carlcooki* (Fig. 602) and *A. immunda* (Fig. 618) is armed with a shorter flagellum-like process, the distance between its base (distal to attachment of lateral lobes) and its apex about equal to distance between its base and flexure, with ental portion convex in lateral view and with large roughly trapezoidal lateral lobes curved entodistally. The distal segment in both *A. nahuana* (Fig. 628) and *A. bipunctulata* (not illustrated but like *A. fumipennis*, Fig. 613) is armed with a longer flagellum-like or strap-like process, the distance between its base (distal to attachment of lateral lobes) and its apex much longer than distance between its base and flexure, with ental portion linear in lateral view and lateral lobes digitiform.

Distribution. This species extends from S Arizona in the United States south to Oaxaca in Mexico (Fig. 781), ranging from 19 to 1070 m in elevation.

Argia carolus Garrison & von Ellenrieder, 2017

Figs. 7 (head ♂); 43 (head, thorax, S1–4 ♂); 180–182 (head, thorax, S1–4 ♀); 298 (S7–10 ♂); 414, 415 (S7–10 ♀); 504, 505 (mesostigmal plates ♀); 603 (genital ligula); 673 (appendages ♂); 783 (map); 997 (body scan ♂); 998–1000 (body scans ♀).

[Key locators: ♂ G-5, couplet 7'; ♂ Key to groups, couplet 5(4'); ♀ F-5, couplet 2(1')]

Argia carolus Garrison & von Ellenrieder 2017: 12 (description, diagnosis, ♂, ♀, key, figs. 24, 47–49, 73, 96–98, 119, 138, 158, 169, photos 184, 185);—Paulson & Haber: 2021: 102 (diagnosis, photos).

Primary types. *Argia carolus*: holotype ♂, COSTA RICA, San José, Reserva Biológica El Rodeo, 7 km W of Villa Colón {9.90 N, 84.267 W, 795 m}, 10–13 July 1990, Thomas W. Donnelly leg. [examined, in FSCA].

Specimens examined. 35 ♂♂, 14 ♀♀: See Garrison & von Ellenrieder 2017 for material examined (not listed here).

A medium-size species (Table 2); male dark purple (Figs. 43, 997) with unique forcipate cerci with inner branch forming a medially directed robust tooth (Fig. 673c) and in lateral view directed posteriorly and longer than to subequal to paraproct (Fig. 673b); female (Figs. 998–1000) with mesostigmal lobe longer than wide, its lateral margin with a smaller accessory lobe (Figs. 504, 505).

Diagnosis. Within its range (W slope of Costa Rica, Fig. 783) male is unique by elongate forcipate shape of cercus (Fig. 673) and cannot be confused with any other species from Mexico and Central America. The male was diagnosed against its South American (Ecuador) relative, *A. schneideri* Garrison & von Ellenrieder, by Garrison & von Ellenrieder (2017). In the female, the small, mesally directed mesostigmal lobe accompanied by a swollen base and slightly angulate external base is distinctive (Figs. 504, 505). Based on mesostigmal lobe morphology, *A. carolus* keys out with *A. adamsi* and *A. ulmeca*. The mesostigmal lobe in *A. adamsi* is about as long as wide (Figs.

493, 494); this lobe is longer than wide in *A. carolus* (Figs. 504, 505) and *A. ulmeca* (Figs. 583–586). Females of these two latter species can be separated by color pattern: labrum mostly dark (Figs. 180, 182), rarely pale (Fig. 181), in *A. carolus* (labrum usually pale in *A. ulmeca*, Fig. 264, although generally black in populations in Los Tuxtlas area of Veracruz, Mexico), S4–7 almost entirely black, pale basal rings usually absent (Figs. 180–182, 414, 415, 998–1000) and S8 primarily black with small lateral pale spots restricted to apical half or less (Figs. 414, 415, 998–1000) in *A. carolus* (S4–7 black with lateroventral pale stripes and pale basal rings usually present (Figs. 264, 486, 1003), and pale spots on S8 larger, united above and usually extending anteriorly to base in *A. ulmeca* (Figs. 486, 1003).

Remarks. Female varies in pale thoracic coloration from orange-brown (Figs. 180, 181, 999) to dark olive green (Figs. 182, 998) to pale orange (Fig. 1000), as well as in development of black humeral stripe. Pale spots on S8–10 vary in size as shown in Figs. 414, 415, 998–1000.

Distribution. *Argia carolus* is thus far known only from the Pacific slope (Monteverde south to Osa Peninsula) of Costa Rica (Fig. 783), at elevations between 20 and 1590 m, and is likely to be found in W Panama.

Argia chelata Calvert, 1902

Figs. 44 (head, thorax, S1–4 ♂); 183, 184 (head, thorax, S1–4 ♀); 299 (S7–10 ♂); 416 (S7–10); 417 (S1–10 ♀); 506, 507 (mesostigmal plates ♀); 604 (genital ligula); 674 (appendages ♂); 778 (map); 805 (field photo ♂); 896 (body scan ♂); 897, 898 (body scans ♀).

[Key locators: ♂ G-3, couplet 4(3'); ♂ key to groups, couplet 6(5'); ♀ F-6, couplet 1, F-11, couplet 4(1')]

Argia chelata Calvert 1902: 83 (♂ description);—Calvert 1909: 151 (comparison with *A. tupi* n. sp.);—Ris 1918: 114 (notes, Costa Rica, Panama);—Paulson 1982: 252 (Mexico, Panama);—Dunkle 1988: 45 (new for Honduras);—Maes *et al.* 1988: 32 (new for Nicaragua);—Brooks 1989: 50 (Costa Rica);—Hamilton & Montgomerie 1989: 159 (population demography);—Maes 1989: 5 (Mexico to Panama);—González-Soriano 1993: 295 (Mexico);—Boomsma & Dunkle 1996: 25 (new for Belize);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Ramírez *et al.* 2000: 249 (Costa Rica);—Förster 2001: 11, 56 (key ♂, ♀, fig. C24);—González-Soriano & Novelo-Gutiérrez 2007: 127 (Mexico);—von Ellenrieder & Garrison 2007a: 13 (comparison of holotype in BMNH with voucher material in RWG collection);—González-Soriano & Paulson 2011: 307 (Chiapas, Mexico);—Garrison & von Ellenrieder 2013: 15 (Costa Rica, fig. 21, photo 22);—Novelo-Gutiérrez 2013: 479 (larva described);—Escoto-Moreno *et al.* 2014: 1046 (Hidalgo, Mexico);—Escoto-Moreno *et al.* 2017: 386 (Hidalgo, Mexico);—Torres-Pachón *et al.* 2017: 415 (molecular phylogeny of larvae within *Argia*);—Paulson & Haber: 2021: 89 (diagnosis, photos, also recorded from Panama).

Primary types. *Argia chelata*: holotype ♂, Costa Rica, Volcán Irazú, 1877, 6000–7000 feet, H. Rogers leg. [examined, in BMNH; Kimmins 1970; von Ellenrieder & Garrison 2007a].

Specimens examined. 112 ♂♂, 49 ♀♀: **MEXICO, Veracruz:** 1 ♂, 2 ♀♀, Banderillas, Reserva La Martinica, on partially shaded ground and by shaded runnel 19.5831°N, 96.9464°W, 1544–1563 m, 17 June 2009, R. W. Garrison & N. von Ellenrieder [RWG]; 1 ♂, 1 ♀, same data but 8 June 2011, R. Novelo-Gutiérrez [RWG]; 1 ♂, Cataratas Escondidas {18.6794°N, 95.1544°W}, 35 m, 16 April 1996, S. Kawling [RWG]; **Oaxaca:** 7 ♂♂, 5 ♀♀, Montaña de Chinantla, 6.8 mi S of Valle Nacional on Highway 175 to Oaxaca {17.7203°N, 96.3032°W}, 970 m, 13, 27 August 1968, G. H. & A. F. Beatty [RWG]; 1 ♂, 12 mi N of Bochil {17°N, 92.9°W}, 1140 m, 24 August 1967, D. R. & M. L. Paulson [FSCA]; **Chiapas:** 1 ♀, 3.5 mi E of Rayón, stream {17.2058°N, 92.97°W}, 1599 m, 16 July 1965, D. R. Paulson [FSCA]; 2 ♂♂, 1 ♀, Rancho Nuevo, 9 mi S of San Cristobal de las Casas {16.6661°N, 92.5661°W}, 2380 m, 2 August 1966, D. E. Breedlove, J. Emmel [CAS; RWG]; 1 ♂, 1 ♀, stream and marsh 12.9 mi SE of San Cristobal de las Casas {16.5933°N, 92.5192°W}, 2100 m, 16 July 1965, M. L. Paulson & D. M. Thompson [FSCA]; 2 ♂♂, 2 ♀♀, same data but 12 July 1965, D. R. & M. L. Paulson [FSCA]; 1 ♂, Route 190, km 1204, 3 km NW of Teopisca, drainage and irrigation ditches, 66–680 {16.5689°N, 92.4973°W}, 1740 m, 9 August 1966 [UMMZ]; 1 ♂, Reserva de la Biosfera El Triunfo {15.6667°N, 92.8332°W}, 1700 m, 3 July 1993, E. González-Soriano [RWG]. **BELIZE, Cayo:** 1 ♂, 1 ♀, Hidden Valley Inn {16.9833°N, 88.8°W}, 757 m, 17 August 1992, T. Boomsma [RWG]. **GUATEMALA, Izabal:** 1 ♂, Río Sarstoon, river and frontier of S British Honduras and NE Guatemala {15.8833°N, 88.9333°W}, 1720 m, Blancaneaux [BMNH]; **Baja Verapaz:** 1 ♂, 4 km SE of Purulhá, Riachuelo Colorado, 73x032 {15.2667°N, 90.2°W}, 520 m, 4 June 1973, T. W. Donnelly [RWG]; 1 ♂, 1 ♀, Los Ranchitos, Riachuelo Colorado, 15.2144°N, 90.2189°W, 1650 m, 11 June 2007, T. W. Donnelly [FSCA]; 1 ♀, same

data but 4 June 1973 [FSCA]; **Zacapa**: 1 ♂, Zacapa {14.9667°N, 89.5333°W}, 226 m, 8 August 1948, R. Mitchel [RWG]; **Chiquimula**: 1 ♂, Socorro, 3 km NE of San Juan Ermita, 62x063 {14.7794°N, 89.4061°W}, 1100 m, 14 July 1963, T. W. Donnelly [FSCA]; **Chimaltenango**: 1 ♀, Acatenango {14.5519°N, 90.9422°W}, 1586 m, 3 August 1948, H. T. Dalmat [FSCA]. **HONDURAS, Cortés**: 1 ♂, El Danto Camp, river upstream, sunny spot, Cusuco National Park, ODO 16, 15.5244°N, 88.275°W, 1600 m, 8 July 2011, M. Jocque [RWG]; 1 ♂, river at Cortecito Camp, Cusuco National Park {15.5231°N, 88.2814°W}, 1496 m, 19 June 2009, M. Jocque [RWG]; 2 ♂♂, Malaise trap, route to El Danto Camp, Pine River, Cusuco National Park, 15.5186°N, 88.2767°W, 1596 m, 21 July 2008, M. Jocque [RWG]; 1 ♂, 1 ♀, Cantiles Camp, river, Cusuco National Park, 15.4972°N, 88.2114°W, 1607 m, 27 July 2008, M. Jocque [RWG]; 2 ♂♂, Cantiles Camp, river, Cusuco National Park, NAPACU, 15.5133°N, 88.2414°W, 1720 m, 23–30 June 2011, M. Jocque [RWG]; 1 ♂, 1 ♀, same data but small creek close to camp, 16 July 2005 [RWG]; **Francisco Morazán**: 1 ♂, Valle del Zamorano, trickle on Mount Uyuca {14.0361°N, 87.0642°W}, 1400 m, 2 March 1990, S. W. Dunkle [FSCA]. **NICARAGUA, Matagalpa**: 1 ♂, Hotel Selva Negra, FCS03-0941, 12.9994°N, 85.9089°W, 1270 m, 30 August 2003, F. C. Sibley [FSCA]. **COSTA RICA, Puntarenas**: 1 ♂, Monteverde {10.6°N, 85.3°W}, 1600 m, 9 August 1986, J. L. Nation [FSCA]; 2 ♂♂, Monteverde, Río Guacimal and Quebrada Máquina, small clear rocky streams {10.6°N, 85.3°W}, 1600 m, 26 February 1987, S. W. Dunkle [RWG]; 1 ♂, 1 ♀, same data but Río Guacimal and small streams in biological reserve, 86x009, 7 June 1986, T. W. Donnelly [RWG]; 15 ♂♂, 9 ♀♀, Monteverde, Estación Biológica Canadiense, streams in primary cloud forest, CR24, 10.3225°N, 84.8086°W, 1534 m, 6 June 2013, R. W. Garrison & N. von Ellenrieder [BMNH, CSCA, CUMZ, Haomaio Zhang, RWG]; 1 ♂, Monteverde, Estación Biológica Bosque Nuboso, rain pool and swampy stream in forest ca. 2 km from Station along Sendero Pantanoso, CR25, 10.3086°N, 84.7847°W, 1586 m, 7 June 2013, R. W. Garrison & N. von Ellenrieder [RWG]; 1 ♂, 1 ♀, below Monteverde Cloud Forest Reserve, Río Guacimal {10.3333°N, 84.6833°W}, 1380 m, April 1985, L. D. Hamilton [FSCA]; 1 ♂, Monteverde, along ranch road at end of Flor de Mar Road, 10.3189°N, 84.6444°W, 1037 m, 27 June 1997, J. Cole [RWG]; 1 ♂, Monteverde, Río San Luis, stony river through forest, CR22, 10.2781°N, 84.7861°W, 1176 m, 5 June 2013, R. W. Garrison & N. von Ellenrieder [RWG]; 1 ♂, Las Alturas Biological Station, 20 air km NE of San Vito, Cerro Echandi trail, up to 2100 m, to trail marker 34, C. R. Nelson #6254 {8.9952°N, 82.8205°W}, 2100 m, 12 August 1995, B. Brown & M. Metz [BYU]; **Guanacaste**: 1 ♂, Río Cañas at Glenn's, L-03-1176, 9 June 1986–8 September 2003, C. Esquivel-Herrera [UNH]; **Alajuela**: 1 ♀, Parque Nacional Volcán Arenal, Laguna El Pavón, L-03-1155 {10.4393°N, 84.7146°W}, 568 m, 26 March 2001, 11 May 2003, G. Carballo [UNH]; 1 ♀, 10 km N of Los Cártagos {10.2°N, 84.15°W}, 910 m, 15 June 1963, F. G. Thompson [FSCA]; 2 ♂♂, 1 ♀, Carrizal, water source, L-03-1084, 1085 {10.0963°N, 84.1559°W}, 568 m, 6 April 2011, 11 March 2003, G. Caballero & A. Suares [UNH]; **Heredia**: 1 ♂, 1.8 mi N of San Rafael {10.1881°N, 84.123°W}, 1830 m, 6 August 1966, D. R. Paulson [FSCA]; 1 ♂, Volcán Barva, 6.6 km N of San José de la Montaña {10.1°N, 84.1°W}, 2350 m, 20 July 1963, D. M. Thompson [FSCA]; 1 ♂, San Rafael, near Mount Chompipe, L-03-887 {10.07°N, 84.0833°W}, 1058 m, 19 May 1990, Mario Chacón V. [UNH]; 1 ♂, 2 ♀♀, San Rafael, Castillo Country Club, L-03-57 {10.0561°N, 84.0831°W}, 1687 m, 11 April 1988, Mario Chacón V. [UNH]; 3 ♂♂, 1 ♀, Río Para Blanco, at Yerbabuena Road, L03-827, 830 {10.0263°N, 84.0108°W}, 1187 m, 15 October 2002, 24 April 2003, C. Esquivel-Herrera [UNH]; 2 ♂♂, **La Selva** altitudinal transect, L-03-1257 {9.8465°N, 83.5956°W}, 1070 m, 11 April 2001, R. Vargas [UNH]; **San José**: 1 ♀, Braulio Carrillo National Park, Sendero Zurqui, L-03-893 {10.16°N, 83.9631°W}, 800 m, 24 August 1991, C. Esquivel-Herrera [UNH]; 1 ♂, Río Poas, L-03-877 {10.0383°N, 84.2567°W}, 890 m, 17 July 2001, C. Esquivel-Herrera [UNH]; 6 ♂♂, 3 ♀♀, tributary of Río Cascajal at Bajo La Rosa {10.0333°N, 83.95°W}, 1600 m, 3 May 1995, B. O. Huntsman & R. W. Baumann [BYU]; 15 ♂♂, 4 ♀♀, small stream near Hacienda Zurqui and Finca La Reina on Highway 220, NE of San José, 10.0289°N, 84.0253°W, 1405 m, 11–16 August 1979, R. W. & J. A. Garrison [CSCA, RMNH, RWG]; 4 ♂♂, 1 ♀, Coronado, Quebrada Varela, primary and secondary forest, water at 13°C, L-03-1049–1051, 1060, 1061 {10.006°N, 83.9587°W}, 1900 m, 21 August–21 October 2001, C. Esquivel-Herrera [UNH]; 1 ♂, Cascajal de Coronado, Río La Máquina, 1716 m, 6 May 1995, B. O. Huntsman & R. W. Baumann [BYU]; 1 ♂, stream at km 37, Pan American Highway above Tejar, 842 m, 8 May 1995, B. O. Huntsman & R. W. Baumann [BYU]; 1 ♂, Hacienda El Rodeo, 7 km W of Villa Colón, CR7, 9.9136°N, 84.2694°W, 859 m, 28 May 2013, R. W. Garrison & N. von Ellenrieder [RWG]; 1 ♂, Aserri, L-03-084 {9.8747°N, 84.1044°W}, 1550 m, 24 July 2001, C. Esquivel-Herrera [UNH]; 1 ♀, Río Parrita Chiquito, at route 12, 6.5 km SW of junction of 2 {9.703°N, 83.97°W}, 2012 m, 16 August 1990, R. W. Holzenthal, R. Blahnik & F. J. Muñoz [RWG]; 1 ♂, km 118 on Pan American Highway, Bosque del Tolomuco, FCS11-016, 9.4717°N, 83.6968°W, 1710 m, 24 March 2011, F. C. Sibley [FSCA]; 1 ♂, 1 ♀, km 120 on Pan American Highway,

small river W of Vista del Valle hotel, FCS06-0512, 9.47°N, 83.705°W, 1590 m, 26 March 2006, F. C. Sibley [FSCA]; **Cartago**: 1 ♂, Orosi, Volcán Irazú {9.95°N, 83.8332°W}, 1500 m, May 1913, O. Garlepp. [UMMZ]; 1 ♂ (holotype), same data but 1877, H. Rogers [BMNH]; 1 ♂, 1 ♀, Estación Macho, river, L03-426, 1172 {9.7664°N, 83.8597°W}, 10 November 1988, 26 June 1990, C. Esquivel-Herrera [UNH]; Santa Cruz, 9.9646°N, 83.7293°W, 1422 m, 2 June 1991, J. Zloty [RWG]. **PANAMA, Chiriquí**: 1 ♂, Mount Totumas Cloud Forest Lodge, stream at lodge, 12x076, 8.8847°N, 82.6839°W, 1910 m, 13 August 2012, T. W. Donnelly [FSCA]; 6 ♂♂, Lino {8.8°N, 82.4333°W}, 800 m, September 1911, O. Garlepp. [FNS, FSCA, RWG]; 4 ♂♂, Chiriquí Mountains, Boquete {8.7747°N, 82.4319°W}, 1083 m, 14 March 1923, F. M. Gaige [RWG].

A large robust species (Table 2); male blue and black (Figs. 44, 299, 805, 896) with chelate cercus with a large decumbent inner branch hiding the posteriorly directed ventral lobe (Fig. 674a); female similar to male, blue (Figs. 183, 897) or tan (Figs. 184, 898), with a large foliate mesostigmal lobe (Fig. 506a) with a medially recurved margin (Figs. 507e, f).

Redescription. Calvert (1902) had access only to the holotype male. We provide a description of both sexes here.

Male (Costa Rica, Puntarenas, Monteverde, Figs. 44, 299, 896): Labrum, base of mandibles, genae, postclypeus and anterior portion of frons blue, anteclypeus obscure brown, epicranium matte black except for large blue postocular spots, the lateral border of which not confluent with eye, occipital bar and a pair of small brown elongate streaks dorsolateral to lateral ocellus; rear of head pale dorsally, black ventrally. Prothorax mostly black with following blue: transverse central spot on anterior pronotal lobe, dorsolateral spot on middle lobe and propleuron, median and lateral spot on hind margin of posterior pronotal lobe. Black middorsal stripe a little narrower than blue antehumeral stripe, the latter narrowing slightly dorsally; black humeral stripe forked above, lower half about 0.33 as wide as blue antehumeral stripe, the posterior fork twice as thick as anterior, remainder of thorax blue except for narrow black metapleural stripe. Coxae pale blue, legs black, exterior surfaces of tibiae pale, armature entirely black. Wings hyaline, Pt surmounting 1.5–cells; px Fw: 20/19, Hw: 18/18; pq Fw: 5/5, Hw: 4/4, Rp2 at Fw: 9/9, Hw: 8/8. S1 blue with a black dorsolateral spot occupying basal eighth and narrow black apical ring; S2 blue with a narrow black basal spot extending to distal 0.30 and a larger lateral disjunct triangular postbasal spot, its dorsal tip not extending to middorsal line, annulus black, S3 blue with a narrow lateral stripe extending full length and at posterior 0.20 with an enlarged offshoot extending dorsally but not reaching middorsal line; S4–7 similar to S3 but lateral black posteriorly more extensive and meeting dorsally to form a black ring; S8 blue, each side with a black lateral stripe extending the full length of each segment (Fig. 299).

Distal segment of genital ligula (as in Fig. 604) with a soft flexible single flagellum and with a basal membranous hood overlaying flagellum long, trowel-shaped; distal segment lateral lobes falcate, with only outer margin sclerotized, directed basally, and located at about basal 0.25 of segment.

Tori narrow, transversely oval, each about as wide as epiproct; cercus chelate, with a ventral lobe appressed distally to cercus (best seen in mediodorsal view, Fig. 674a); inner branch of cercus longer than outer branch (Figs. 674a–x); paraproct unilobate, ventral branch absent (Fig. 674c).

Dimensions. Hw 28.0, abdomen 29.2, total length 37.

Female (Mexico, Veracruz, Banderillas, Reserva La Martinica, Figs. 183, 417, 897): similar to male but pale areas cerulean blue and head with a pale triangular spot just anterior to pale occipital bar, Pt surmounting 1–2 cells; px Fw: 17/17, Hw: 15/17; pq Fw: 5/5, Hw: 4/4, Rp2 at Fw: 7/8, Hw: 6/7. S1 light blue with a black dorsolateral spot occupying basal half and narrow black apical ring; S2 black dorsolaterally, blue ventrally, middorsally with a blue oval spot dorsally terminating at distal 0.20 (Fig. 417), S3 dorsolaterally black, pale ventrally, an elongate middorsal dorsal blue stripe slightly expanding laterally but terminating at distal fifth; S4–5 similar to S3 but black more extensive, dorsolateral and ventral black stripe connecting anteriorly and posteriorly, thus isolating narrow elongate pale lateral stripe, S6–7 entirely black dorsolaterally further reducing narrow isolated pale lateral stripe, each segment with a narrow blue basal ring and pale middorsal hairline; S8–9 black anteriorly, blue posteriorly with blue extending anteriorly on sides, ventral margin with a black stripe extending full length of each segment, S10 similar but black reduced to a basal ring, ovipositor brown, cerci entirely black, ovipositor not extending to tip of abdomen, ovipositor teeth microserrulate.

Dimensions. Hw 25.2, abdomen 27.7, total length 36.5.

Variation. Both sexes may have pale postocular spots confluent with compound eye; males may have the two black lateral spots on S2 connected forming an irregular lateral stripe; a male from Chiapas lacks the ventral black

stripe on S8–9 but is otherwise typical of the species. In some females, pale lateral stripe on S6–7 may be vestigial or almost absent.

Diagnosis. Male of *A. chelata* differs from all other congeners by the ventral lobe originating at base of cercus and extending posteriorly, almost touching cercus ventral surface, approaching the shape of a chela or claw, though this may be difficult to detect unless the compact appendages are spread. The robust elongate inner branch of the cercus ending in a tooth is also diagnostic. The genital ligula of this species (Fig. 604) is similar to those of *A. lacrimans*, *A. pima* (Fig. 637) and *A. tonto* (Fig. 653). Male of *A. tonto* is purple, and the humeral stripe is not forked (Figs. 146–149), differing from the blue and black male of *A. chelata* with a forked humeral stripe (Fig. 44); the other three species are blue. The humeral stripe in *A. lacrimans* is usually not forked (Figs. 217–219), or, if forked (as in Figs. 136–139), then the posterior branch of fork is weaker than the anterior and may form an isolated spot separated from the anterior branch; the humeral stripe is forked in all examples of *A. chelata* and *A. pima* that we have seen. Male of *A. pima* (Fig. 112) lacks the complete ventral black stripe along ventral margin of S3–5 typical of *A. chelata* (Fig. 44). The female of *A. chelata* differs from all other species by the expansive foliate mesostigmal plates (Fig. 506a) coupled with a medially recurved margin (Fig. 507e, f).

Habitat. We observed oviposition of *A. chelata* at streams within a primary cloud forest at Estación Biológica Canadiense, Monteverde, on 6 June 2013. Adults began to appear at about 10:00 am when dappled sunlight began to shine on parts of the stream. Later, several pairs were seen ovipositing on debris near the water's edge. The bright blue bodies of the male made this species conspicuous. Hamilton & Montgomerie (1989) conducted a mark-recapture study on a population of this species at Monteverde, Costa Rica. Males significantly outnumbered females (87%) at oviposition sites, although sex ratios at emergence were approximately 1:1.

Distribution. *Argia chelata* occurs along the E foothills of the Sierra Madre Oriental in Mexico, extending as far south as W Panama (Fig. 778). The holotype male was collected at Volcán de Irazú, Costa Rica, by H. Rogers, and this species was not further recorded in the literature until 80 years later (Paulson 1982). This is a montane species occurring from about 225 m (Zacapa, Guatemala) to about 2380 m (Rancho Nuevo, 9 mi S of San Cristobal de las Casas). We have one record of a male from Costa Rica, Río Cañas, at about 70 m, which we suspect might represent a specimen mislabeled as to locality.

Argia concinna (Rambur, 1842)

Figs. 8 (head ♂); 45 (head, thorax, S1–4 ♂); 185 (head, thorax, S1–4 ♀); 300 (S7–10 ♂); 418 (S7–10 ♀); 508 (mesostigmal plates ♀); 605 (genital ligula); 675 (appendages ♂); 779 (map); 906 (body scan ♂); 907 (body scan ♀).

[Key locators: ♂ G-3, couplet 2'; ♂ M-6, couplet 25(24); ♀ F-3, couplet 1; ♀ shortcut 4]

Agrion concinnum Rambur 1842: 270 description ♂, ♀, “Du Cap”).

Argia concinna: Selys 1865: 391 (19 reprint) (redescription—“Cap de Bonne-Espérance. Types de Rambur. Collect. Selys”);—Calvert & Hagen 1902: 107 (“Cape of Good Hope. Types in Coll. Selys. No one appears yet to have confirmed or disproven this anomalous habitat.”, pl. 2, figs. 16, 16a);—Ris 1921: 438 (doubts occurrence in South Africa, fig. 77, appendages of type ♂);—Gloyd 1941: 130 (confirmation that species occurs in Lesser Antilles);—Donnelly 1970: 17 (redescription, larva, Dominica);—Paulson 1982: 252 (West Indies);—Goyaud 1994: 54, 55 (Guadeloupe);—Sibley 1999: 21 (Guadeloupe);—Jacquemin 2000: 100 (Guadeloupe);—Donnelly 2000b: 113 (key, Dominica, Guadeloupe);—Mashaal 2000: 124 (Guadeloupe);—Dommanget 2000: 134 (Guadeloupe);—Dommanget & Mashaal 2002: 9 (Guadeloupe, photo);—Grand 2002: 31 (Guadeloupe);—Meurgey & Williamson 2002: 160 (Guadeloupe);—Pont 2003: 162 (Guadeloupe);—Ilbert & Menegaux 2004: 180 (Guadeloupe);—Pont 2004: 201 (Guadeloupe);—Meurgey 2006a: 20 (Guadeloupe);—Meurgey 2006b: 29 (Guadeloupe);—Meurgey 2006c: 61 (key);—Meurgey 2007: 13 (discussion of type locality);—Meurgey 2009: 55 (redescription ♂, ♀, figs. 1, 3, 5–6, 9, 11, 13, 15, 17, 19, 21, 23, diagnosis from *A. telesfordi* n. sp.);—Savart 2010: 171 (Guadeloupe);—Meurgey 2011: 45 (redescription of larva, figs. 1–9);—Meurgey & Picard 2011: 238 (diagnosis, photos, Guadeloupe & Dominica);—Meurgey & Poirion 2012: 310 (Guadeloupe & Dominica);—Meurgey 2013: 306 (Guadeloupe & Dominica).

Primary types. *Agrion concinnum*: syntypes ♂, ♀, “Cap” [examined, in RBINS; von Ellenrieder & Garrison 2007a].

Specimens examined. 22 ♂♂, 12 ♀♀: 1 ♂, 1 ♀ (syntypes), “Cap” [locality in error] [RBINS]. **GADELOUPE, Basse-Terre:** 4 ♂♂, Petit Bourg, riviere Bras David {16.1942°N, 61.6717°W}, 125 m, 15 November 2015, F.

Meurgety [RWG]; 2 ♀♀, Saint Claude, Ravine Boudoute, trace des Etangs {16.0418°N, 61.6972°W}, 544 m, 6 June 2007, F. Meurgety [RWG]; 2 ♂♂, 1 ♀, Grand Etang {16.028°N, 61.6283°W}, 413 m, 7 February 2006, F. Meurgety [RWG]; 4 ♂♂, 1 ♀, Dongo Canal, Vauchelet, D4 {16.0272°N, 61.6183°W}, 330 m, 27 February 2006, J. J. Daigle [RWG]. **DOMINICA, St. Andrew:** 1 ♂, 1 ♀, Deux Branches, Pagua River {15.5111°N, 61.2789°W}, 200 m, 4 April 1964, G. Weber [BMNH]; **St. David:** 1 ♂, Batakua {15.5°N, 61.2667°W}, 190 m, November 1967, N. L. H. Krauss [RWG]; **St. Joseph:** 7 ♂♂, 5 ♀♀, 12 mi N of Roseau, Imperial Road {15.4303°N, 61.3722°W}, 370 m, 21–25 June 1937, C. C. Roys [RWG; UMMZ]; **St. Paul:** 1 ♂, 1.3 mi E of Pont Casse {15.3794°N, 61.3417°W}, 595 m, 3 June 1964, T. W. Donnelly [RWG]; **St. Georges:** 1 ♂, 1 ♀, Goodwill reservoir, Roseau River {15.3056°N, 61.3689°W}, 40 m, 21 November 2006, G. Weber [RWG].

A medium-size species (Table 2) endemic to Guadeloupe and Dominica in the Lesser Antilles, with pale postocular spots transversely linear and as long as pale postocular bar (Figs. 45, 185, 906, 907); male blue and black (Figs. 45, 906) with a bifid cercus with inner branch ending in a blunt tooth (Fig. 675a); female similar to male, tan (Figs. 185, 907).

Description. This well-known species was fully redescribed and illustrated by Meurgety (2009). However, the genital ligula has not been described or illustrated previously. It has a long flexible curved strap-like process (Fig. 605), lateral lobes falcate, hyaline, often covered by terminal fold and difficult to see unless ligula viewed in ental view (Fig. 605d). Chitinized ectal surface of basal segment proximal to flexure in lateral view (Fig. 605a) smooth, lacking a boss. A small membranous hyaline basal hood is present (Figs. 605a, b).

Diagnosis. Male can only be confused with its closest relative *A. telesfordi*, endemic to St. Vincent and Grenada. The tori, epiproct and torifer areas of both differ from other congeners in that these areas are flat, the tori are reduced, and the torifer extends cephalad so that the sides are as long as or longer than the distance between both tori (Figs. 605, 739). Male of *A. concinna* differs from *A. telesfordi* as follows: inner branch of cercus in dorsal view directed posteriorly or posteromedially, forming an obtuse angle with outer branch, and concavity between inner and outer branches shallow in *A. concinna* (Figs. 675c); inner branch of cercus in dorsal view directed posterolaterally, forming an acute angle with outer branch, and concavity between inner and outer branches deep in *A. telesfordi* (Fig. 739c). The lower branch of the paraproct in *A. concinna* is small, rounded and the space between the dorsal and ventral lobes is approximately linear (Fig. 675b); the ventral lobe in *A. telesfordi* is long and acute, and they are separated by a U-shaped cleft (Fig. 739b). The anteclypeus in both sexes of *A. concinna* is entirely black (Fig. 8), but with central area pale in *A. telesfordi* (Fig. 22). Female mesostigmal lobe in *A. concinna* is wider than long and is directed posteromesally (Fig. 508); this lobe in *A. telesfordi* is about as wide as long and is directed posteriorly or posterolaterally (Fig. 576).

Remarks. *Argia concinna* was a poorly known species for almost 100 years before Gloyd (1941) was able to confirm its identity by comparison with specimens from Guadeloupe housed at the UMMZ. However, the type locality for *Agrion concinnum* has still not been resolved (Meurgety 2007, 2009).

Habitat. According to Meurgety & Picard (2011), this species is dependent on running waters of torrential nature, clear, sunny and permanent up to 900 m in seasonal evergreen and ombrophilous forest, gullies more than one m wide, but above all large rivers with flowing waters and rocky or gravelly bottom. More rarely they are in gently sloping streams in grazed areas, where the species can coexist with *Enallagma coecum* (Hagen, 1861). The breeding grounds are open, and the species avoids watercourses that are closed or dominated by the canopy.

Distribution. *Argia concinna* is endemic to the Lesser Antilles, present in Guadeloupe and Dominica (Fig. 779). In Guadeloupe it is localized in Basse-Terre, where it is very widespread and abundant, between 200 and 800 m on leeward side, and between 500 and 900 m on windward side, and small populations can be observed at lower leeward elevation (Meurgety & Picard 2011).

Argia cupraurea Calvert, 1902

Figs. 46 (head, thorax, S1–4 ♂); 186 (head, thorax, S1–4 ♀); 301–303 (S7–10 ♂); 419 (S7–10 ♀); 509, 510 (mesostigmal plates ♀); 606 (genital ligula); 676 (appendages ♂); 791 (map); 957 (body scan ♂); 958 (body scan ♀).

[Key locators: ♂ G-4, couplet 6(5'); ♂ M-1, couplet 5(4'); ♀ F-13, couplet 3(2'); ♀ shortcut 6]

Argia cupraurea Calvert 1902: 71, 73, 85, pl. IV, figs. 24, 42 (description of ♂, ♀, Panama);—Calvert 1907: 371 (further notes on ♂, ♀, Costa Rica);—Calvert 1909: 120, 143 (♂ key, Venezuela);—Ris 1918: 111, 112, 113 (♂, ♀, key, further notes, Panama);—Kimmins 1970: 184 (holotype data);—Paulson 1982: 252 (Costa Rica, Panama, South America);—Dunkle 1991: 132 (Honduras, range extension);—Brooks 1989: 50 (Costa Rica);—De Marmels 1990: 337 (Venezuela);—Donnelly 1992: 83 (Panama);—Donnelly 1995: 18 (Costa Rica);—Ramírez *et al.* 2000: 249 (Costa Rica);—Förster 2001: 11, 54, 58 (key ♂, ♀, fig. C24);—Esquivel 2005: 145 (diagnosis, behavior, Costa Rica);—von Ellenrieder & Garrison 2007a: 15 (holotype examined);—Schneeweih *et al.* 2009: 29 (diagnosis, behavior, Costa Rica);—Pérez-Gutiérrez & Palacino-Rodríguez 2011: 212 (Colombia);—Pérez-Gutiérrez *et al.* 2007: 189 (local assemblage patterns in Colombia);—Amaya-Perilla & Palacino-Rodríguez 2012: 33 (Colombia);—De Marmels 2012: 250 (redescription, diagnosis, figs. 1–10, 13, Venezuela);—De Marmels 2014: 5 (Venezuela);—Garrison & von Ellenrieder 2017: 8 (diagnosis, comparison with other metallic red species, key ♂, ♀, for Middle American metallic red species, figs. 14, 36, 57–60, 82, 108, 149, 166, photos 173, 174 [misidentified as *A. oenea*]);—Garrison & von Ellenrieder 2018: 17 (comparison with *A. fulgida*, key ♂, ♀, for South American metallic red species);—Bota-Sierra *et al.* 2019: 38 (brief diagnosis, photos, Colombia);—Paulson & Haber 2021: 81 (diagnosis, photos).

Primary types. *Argia cupraurea*: holotype ♂: PANAMA, David, 1881–1883, George Charles Champion leg. [examined, in BMNH; Kimmins 1970; von Ellenrieder & Garrison 2007a].

Specimens examined. 341 ♂♂, 154 ♀♀ (see Garrison & von Ellenrieder 2017 for additional material examined not listed here): **COSTA RICA, Limón:** 1 ♂, 1 ♀, Guápiles, in forest, 10.2158°N, 83.7867°W, 268 m, 7 July 1967, M. J. Westfall, Jr. & D. N. Westfall [FSCA]; 1 ♂, 1 ♀, La Lola, 28.3 mi W of Limón, {10.0944°N, 83.3917°W}, 40 m, 23 July 1963, F. G. Thompson [FSCA]. **PANAMA, Panamá:** 1 ♂, La Chorrera Falls {8.876°N, 79.7767°W}, 78 m, 13 April 1912, A. Busck [FSCA]; **Darién:** 1 ♂, Cerro Chucantí, base camp, 8.7919°N, 78.4515°W, 875 m, 13–16 February 2012, L. G. Bezark [RWG]. **COLOMBIA, La Guajira:** 1 ♂, Río Dulce, between Bolivar and Cincinnati {10.9167°N, 72.8332°W}, 180 m, 1 January 1917, E. B. Williamson [UMMZ]; **Valle del Cauca:** 1 ♂, vicinity of La Quiebra, Quebrada El Muesto, Finca El Edén, 6.8703°N, 75.1059°W, 1928 m, 18 October 2016, J. Cardona, L. Urrea & C. Bota-Sierra [RWG]. **VENEZUELA, Yaracuy:** 36 ♂♂, 10 ♀♀, Boquerón, 10.5714°N, 68.8203°W, 91 m, 16–21 March 1920, J. H. Williamson, E. B. Williamson & W. H. Ditzler [BMNH, MCZ, RWG, UMMZ]; **Falcón:** 1 ♀, Palma Sola {10.6039°N, 68.5455°W}, 37 m, 10 March 1920, J. H. Williamson, E. B. Williamson & W. H. Ditzler [UMMZ]; **Táchira:** 15 ♂♂, 21 ♀♀, La Fria, {8.2186°N, 72.2486°W}, 155 m, 12–17 April 1920, J. H. Williamson, E. B. Williamson & W. H. Ditzler [CSCA, RWG, UMMZ]; 13 ♂♂, 5 ♀♀, Táchira [San Félix] {8.1178°N, 72.2553°W}, 429 m, 5–11 April 1920, J. H. Williamson, E. B. Williamson & W. H. Ditzler [RWG, UMMZ].

A medium-size species (Table 2); male red-eyed with a brilliant cupreous thoracic dorsum and dorsum of S1–7 largely blue (Figs. 46, 957); female (Fig. 958) with mesostigmal lobe longer than wide, parallel sided, erect, its tip unmodified (Figs. 510a, c, d), extending for more than three times the height of the vestigial mesepisternal tubercle when viewed in oblique lateral view (Figs. 509g, 510g).

Diagnosis. This species was redescribed by De Marmels (2012) and diagnosed and keyed with other metallic red species for Middle America by Garrison & von Ellenrieder (2017) and again with other metallic red species for South America by Garrison & von Ellenrieder (2018). Male of *A. cupraurea* is one of three metallic red species, the others being *A. calverti* and *A. oenea*, with predominantly blue (Figs. 40, 46, 102, 955, 957, 961) or purple (Figs. 101, 962) dorsum of S2–6 occurring in Middle America. *Argia cupraurea* is diagnosed against *A. calverti* under the former species.

In male *A. cupraurea* basal half or more of labrum is dark metallic (as in Fig. 23), dorsal and ventral branches of paraproct are unequal in size, strongly divergent and separated by an obtuse angle (Fig. 676b), and basal membranous hood of distal segment is subrectangular, much longer than wide (as in Fig. 606b); in male *A. oenea* basal half or more of labrum is largely pale except for dark medial spot (as in Fig. 26), dorsal and ventral branches of paraproct are small and of about the same size, separated by a right angle (Fig. 713b), and basal membranous hood of distal segment subquadrate, about as long as wide (Fig. 632b). Labrum in female of *A. cupraurea* has metallic coloring at least on its basal half (as in Fig. 23), humeral stripe is forked at dorsal fourth (Fig. 958), space between tips of mesostigmal lobes in dorsal view is narrow, about one to one-and-a-half times as wide as width of each lobe at base (Fig. 510a), and mesostigmal lobe is longer than wide, parallel sided, erect and its tip is unmodified (Figs. 510a, c, d) and it extends for more than three times the height of the vestigial mesepisternal tubercle when viewed in oblique lateral view (Figs. 509g, 510g); labrum in *A. oenea* lacks metallic coloration (Fig. 19) or it is present only on a medial basal spot (Figs. 26, 232a), humeral stripe is forked at dorsal half or less (Fig. 963), mesostigmal lobe

in *A. oenea* is wider than long, broadly arcuate (Figs. 552, 553), not so erect, and it is about the same height as the mesepisternal tubercle when present (Fig. 553e).

Remarks. The description of the holotype male was, as De Marmels (2012) noted, based on a male with abdominal segment 7 “black with a basal blue ring” (Calvert 1901: 71, 1909: 120) as in Fig. 303. This led to misidentifications of *A. cupraurea* in Venezuela as the exclusively South American *A. jocosa* Hagen in Selys, as S7 in all Venezuelan males is blue with only the apical fifth or less black (as in Fig. 301). We have seen male *A. cupraurea* with a largely black S7 from Costa Rica (San José, Hacienda El Rodeo) and both S7 black and S7 blue forms have been collected together in Panama (Canal Area). In Costa Rica, S7 is mostly blue in males from the Caribbean slope, but mostly black in males from the Pacific slope (Paulson & Haber 2021). All males of *A. cupraurea* from Colombia that we have examined have a largely blue S7 (e. g., Fig. 957). We have found no differences in females originating from either of the male S7 blue or black populations.

Habitat. In Costa Rica, *A. cupraurea* occurs typically at forest streams, *A. oenea* at more open and usually rocky streams (D. R. Paulson pers. comm.).

Distribution. According to our records *A. cupraurea* extends from Guatemala (Fig. 791) south to Colombia and Venezuela, at an elevation range of 13 to 1083 m.

Argia cuprea (Hagen, 1861)

Figs. 47 (head, thorax, S1–4 ♂); 187, 188 (head, thorax, S1–4 ♀); 304 (S7–10 ♂); 420, 421 (S7–10 ♀); 511 (mesostigmal plates ♀); 607, 608 (genital ligula); 677 (appendages ♂); 790 (map); 959 (body scan ♂); 960 (body scan ♀).

[Key locators: ♂ G-4, couplet 3; ♂ M-1, couplet 2'; ♀ F-13, couplet 4(3'); # shortcut 6]

Agrion cupreum Hagen 1861: 96 (“Cordova, Mexico (Saussure)? Venezuela (Appun).”).

Argia cuprea: Hagen in Selys: 407 [35 reprint] (redescription, Mexico);—Calvert 1901: 71, (key ♂);—Calvert 1902: 73, 84 (key ♀, description ♂, ♀);—Calvert & Hagen 1902: 108 (pl. I, figs. 8, 8a, “Type in M. C. Z.”, synonymy, figures of appendages);—Calvert 1907: 371 (Honduras);—Calvert 1909: 120, 143 (comparison with *A. orichalcea* Hagen in Selys, ♂, ♀, key, further notes, Panama);—Calvert 1919: 164 (Guatemala, “...they are of the “form a” of Dr. Ris”);—Fraser 1946: 448 (figs. 2f, g, appendages);—Paulson 1982: 252 (U. S. A., Mexico, Guatemala, Honduras);—Dunkle 1991: 132 (Honduras);—Novelo-Gutiérrez & Peña-Olmedo 1991: 130 (Hidalgo, Mexico);—González-Soriano 1993: 295 (Mexico);—Peña-Olmedo & Novelo-Gutiérrez 1993: 129, 139 (key ♂, ♀, Hidalgo, Mexico);—Garrison 1994: 307 (key, diagnosis, figs. 1, 66, 68, 80, 98, 106);—Boomsma & Dunkle 1996: 25 (Belize);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Abbott & Stewart 1998: 207 (Texas, Mexico);—Förster 2001: 11, 54, 58 (key ♂, ♀, fig. C24);—Alonso-Eguía *et al.* 2002: 352 (Moctezuma basin, east-central Mexico);—Paulson 2002b: 368 (Nayarit, Mexico);—Abbott 2005a: 69 (♂, ♀, key, figs. 13, 15, photos 7d, e, distribution in Texas);—Westfall & May 2006: 144, 149, 162, 186 (key ♂, ♀, larva, description, figs. 90D, 98F, 101H);—Behrstock *et al.* 2007b: 30 (Tamaulipas, Mexico);—Cuevas-Yañez 2007: 86 (Puebla, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 127 (Mexico);—Upson *et al.* 2007: 29 (Sonora, Mexico);—Caesar & Wenzel 2009: 106 (phylogeny within genus *Argia*);—Abbott 2011: 146 (♂, ♀, figs., diagnosis, distribution in Texas);—González-Soriano & Paulson 2011: 307 (Chiapas, Mexico);—Escoto-Moreno *et al.* 2014: 1051 (Hidalgo, Mexico);—Bailowitz *et al.* 2015: 106 (diagnosis, photos, Sonora);—Escoto-Moreno *et al.* 2017: 386 (Hidalgo, Mexico);—Garrison & von Ellenrieder 2017: 8 (diagnosis, comparison with other metallic red species, key ♂, ♀, for Middle American metallic red species, figs. 9, 30, 31, 53, 81, 87, 103, 126, 127, 145, 166, photo 176);—Torres-Pachón *et al.* 2017: 413 (molecular phylogeny of larvae within *Argia*);—Rangel-Sánchez *et al.* 2018 (estimation of range within Mexico);—Carillo-Muñoz & García-Miranda 2020: 199 (Chimalapas-Uxpanapa Region, Mexico);—Novelo-Gutiérrez & Gómez-Anaya 2021: 437 (description of larva).

Argia cuprea Form a: Ris 1918: 110, 111 (♂, ♀, key ♂, ♀, “Misantla, Vera Cruz”).

Argia (Chalcargia) cuprea: Kennedy 1920: 85 (in subgenus *Chalcargia*).

Primary types. *Argia cuprea*: Apparently lost according to Garrison 1994: “I have been unable to trace the location of the type of *Agrion cupreum*. The original description is a composite of two species, a male from “Cordova, Mexico (Saussure)”, and an unspecified number of specimens from “Venezuela (Appun)”. Later (Hagen in Selys 1865), Hagen corrected his error, limiting the name *cupreum* to a single male from “Mexique”, and all the Venezuelan examples were applied to a new species, *A. orichalcea*. When I visited the MCZ in 1991 to prepare a type catalog of the Odonata, I was able to find 3 ♂♂ and 1 ♀ syntypes of *A. orichalcea*, but I was unable to recognize the male of *Agrion cupreum*.” Garrison & von Ellenrieder (2019) do not list syntypes of this name in their type catalog of Odonata housed in the MCZ.

Specimens examined. 76 ♂♂, 47 ♀♀ (see Garrison & von Ellenrieder 2017 for additional material examined not listed here): **MEXICO, Tabasco:** 3 ♂♂, Tepescuintle {17.4435°N, 91.4006°W}, 25 m, 13–20 September 1962, E. C. Welling M. [UMMZ].

A medium-size species (Table 2); male with red-eyes, a brilliant cupreous thoracic dorsum and dorsum of S1–7 largely black (Figs. 47, 959); female (Fig. 960) with mesostigmal lobe roundly quadrate (Fig. 511b), its upper portion thickened, or slightly depressed, or slightly bent posteriorly (Fig. 511e), its tip extending for less than twice the height of the mesepisternal tubercle.

Diagnosis. This species was diagnosed and keyed with other metallic red species for Middle America by Garrison & von Ellenrieder (2017). *Argia cuprea* and *A. fulgida* are the only species with metallic red males occurring in Middle America with the dorsum of S2–6 entirely black except for a narrow basal blue ring (NOTE: basal 0.66 or more of S2–6 of *A. fulgida* from Colombia and Ecuador are generally blue, Fig. 55). These two species are allopatric, with *A. cuprea* occurring from Texas in the United States and Sonora in Mexico south through Honduras (Fig. 790), and *A. fulgida* in Costa Rica and Panama (Fig. 791) south to W Colombia and Ecuador. The male appendages of both species are essentially the same (Figs. 677, 683). However, the basal membranous hood of distal segment in *A. cuprea* is linear, digitiform in ectal view (Figs. 607b, 608b) while the same structure in *A. fulgida* is broadly campanulate basally in ectal view (Fig. 612c).

The medial margin of the mesostigmal lobe in female *A. cuprea* is convex in posterior view (Fig. 511e), whereas it is unmodified in *A. fulgida* (Fig. 521e). Female *A. cuprea* may be confused with *A. oenea*, but the coloration of the labrum (with metallic coloring at least on its basal half as in Fig. 23), will usually separate them. However, some females of *A. cuprea* have an entirely pale labrum, lacking metallic coloration (as in Fig. 26) or with only a medial basal spot. S3–5 in *A. cuprea* have a thin pale middorsal line only (Fig. 420); S3–5 in *A. oenea* have a relatively broad spindle-shaped pale mark dorsally (Fig. 232b). The species is also diagnosed under *A. calverti*.

Remarks. The similarity of male appendages and overall coloration led earlier authors to identify specimens of *A. fulgida* from Costa Rica and Panama as *A. cuprea*. Despite their overall similarity, the genital ligulae of both species, as diagnosed above, are different. Calvert (1902) and Westfall & May (2006) mentioned that *A. cuprea* possesses mesepisternal tubercles while *A. oenea* lacks them. While true for females of both species known from the U. S. A. and bordering states of Mexico, we have observed mesepisternal tubercles on females of *A. oenea* from various localities within Veracruz (e. g., Figs. 553c, e).

Caesar & Wenzel (2009), in their molecular and morphological analysis of various North American species of *Argia*, failed to recover a monophyletic assemblage of the “metallic” species. Torres-Pachón *et al.* (2017), based on morphology of the larvae, recovered *A. cuprea* within their “percellulata” clade that included (*Argia percellulata* (*Argia cuprea*, *Argia tezpi*) (*Argia joergenseni* Ris, 1918 (*Argia barretti*, *Argia harknessi*))) but was placed within an extensive polytomy based on mitochondrial genes (i.e., 16S rRNA and COI). Based on our examination of the genital ligula structure, which we interpret as a more conservative structure than the male appendages, we consider *A. cuprea* one of the members of those species in which the distal segment consists of two pairs of lateral lobes, the more basal pair including a small laterally extended lobe near flexure on each side (these often hidden by membranous terminal fold) and, uniquely, a more apical pair represented by a flexible chitinized multispinose branch, arising from a narrow stem extending laterad of the ligula on each side. This group consists of the following species: *Argia joergenseni*, *A. limitata* Navás, 1924, *A. philipi* Garrison & von Ellenrieder, 2018 (these three South American), *A. barretti*, *A. calverti*, *A. cupraurea*, *A. cuprea*, *A. fulgida*, *A. harknessi*, *A. insipida*, *A. oenea*, *A. percellulata*, and *A. pipila*. *Argia tezpi* lacks the secondary flexible chitinized multispinose branch.

Distribution. Fraser (1946) in his treatment of South American species of *Argia* identified “a single pair” of specimens as *A. cuprea* Forma c from San Antonio, Peru. Our examination of these specimens deposited at the BMNH showed that they all represent *A. limitata*. *Argia cuprea* occurs mostly on the E flank of Mexico but is also known from Sonora, Nayarit and Jalisco on the W flank, and it extends as far south as Honduras (Fig. 790). Rangel-Sánchez *et al.* (2018), using ecological niche modeling methods postulated a possible occurrence of *A. cuprea* within the Yucatan Peninsula based on 759 records for this species. We have seen no bona fide records of this species from that area, and it is unlikely to occur there because of the lack of streams. Our records (N=62) show this species ranging from near sea level to 1830 m.

***Argia deami* Calvert, 1902**

Figs. 48 (head, thorax, S1–4 ♂); 189 (head, thorax, S1–4 ♀); 305 (S7–10 ♂); 422 (S7–10 ♀); 512 (mesostigmal plates ♀); 609 (genital ligula); 678 (appendages ♂); 775 (map); 868 (body scan ♂); 869 (body scan ♀).

[Key locators: ♂ G-1, couplet 6'; ♂ M-5, couplet 16(14'); ♀ key to groups couplet 31'; F-6 couplet 15(14)]

Argia deami Calvert 1902: 71, 74, 81, pl. IV, figs. 13, 52, 52s. (description of ♂, ♀, “Dublan in Hidalgo (*Barrett, coll. Adams*: 2 ♂♂, 2 ♀♀), Oaxaca (coll. Deam: 4 ♀♀”);—Paulson 1982: 252 (Mexico);—González-Soriano 1993: 295 (Mexico);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 127 (Mexico);—Escoto-Moreno *et al.* 2014: 1051 (Hidalgo, Mexico).

Primary types. *Argia deami*: holotype ♂, MEXICO, Hidalgo, Dublan [see Remarks below], 10 June 1897, Otis W. Barrett leg. [not examined, in ANSP] (<http://clade.ansp.org/entomology/search.php?fam=&aut=&cou=&submitbut=Search&gen=Argia&spe=deami&ssp=&aut=Calvert>)

Specimens examined. 11 ♂♂, 7 ♀♀: **MEXICO, Chihuahua:** 1 ♀, Río Palanganas, Juan Mata Ortiz, ca. 27 km S of Nuevo Casas Grandes, 30.1831°N, 108.0190°W, 17 June 2005, R. A. Behrstock [RWG]; **Michoacán:** 4 ♂♂, 1 ♀, Lago de Camécuaro, 13 km E of Zamora {19.9039°N, 102.2099°W}, 1702 m, 17 July 1947, T. H. Hubbell [CSCA, RWG, UMMZ]; 1 ♂, 1 ♀, same data but N of Tangancicuaro de Arista, 12 May 1949, J. A. Peters [UMMZ]; 1 ♂, 1 ♀, same data but 12 July 1949 [RWG]; Patzcuaro {19.6066°N, 101.6861°W}, 1 September 1938, L. J. Lipovsky [UMMZ]; **Mexico:** 2 ♂♂, San Juan Teotihuacán, Ojo de Agua, # BTCINS0060138, 0141, 6013 {19.7081°N, 99.8972°W}, 2519 m, 12 October 1988, E. González-Soriano [CNIN, RWG]; 1 ♂, same data but 1 December 1982, R. Mendoza [RWG]; 1 ♂, 1 ♀, small canal beside Highway 132, San Juan Teotihuacán de Arista {19.6686°N, 98.8334°W}, 2290 m, 28 August 1958, G. H. & A. F. Beatty [UMMZ]; 1 ♂, same data but 2.7 mi SW of San Juan Teotihuacán de Arista {19.6524°N, 98.8831°W}, 2270 m [UMMZ].

A medium size species (Table 2) with predominantly blue abdominal segments in male (Figs. 48, 305, 868), and mesostigmal lobes about as wide as long (Fig. 512) in female (Fig. 869).

Redescription. As Calvert (1902) noted, this poorly known species is similar to the more widespread *A. tarascan*. We provide a redescription of both sexes here.

Male (MEXICO, Lago de Camécuaro, Figs. 48, 305, 868): Head: Labrum, ante- and postclypeus, ante- and postfrons, base of mandibles and genae blue; antefrons blue with a narrow transverse black stripe anterior to median ocellus and a narrow black ring surrounding median ocellus, narrow black extending laterally from ocellus ending in an enlarged spot, epicranium black with large blue postocular spots not bordering eye and a narrow blue postoccipital bar, groove between lateral ocelli blue; antennae black; rear of head pale. Prothorax black with following areas blue: lateral margins of anterior lobe, dorsolateral spot on middle lobe as well as a narrow geminate spot dorsally, propleuron with anterior margin rimmed in black; extreme lateral margins of posterior lobe. Pale areas of pterothorax blue, with black middorsal stripe slightly widening dorsally, about as third as wide as blue antehumeral stripe, ventrally expanding laterally covering mesostigmal plates except for extreme lateral tip of plate, anterior third of mesinfraepisternum black, continuous with broad humeral stripe at base then abruptly narrowing to a mere line at basal half along mesopleural suture, dorsal portion of humeral stripe expanding again at mesopleural fossa with a short ventral hook; remainder of thorax blue except for vestige of interpleural stripe and a narrow black stripe on metapleural suture (Fig. 48). Wings hyaline with venation black; Pt dark brown, surmounting 2 cells in left Fw, 1.7 cells in right Fw, 2 cells in both Hw; px Fw 16/16, Hw 15/15; pq cells Fw 5/5, Hw 4/4; RP2 at Fw 8/8, Hw 6/7. Coxae and trochanters pale blue except for black on dorsum of trochanters; femora black, interior surface pale; tibiae black with extensor surface pale, tarsi and armature black.

Abdomen mostly blue; S1 blue; S2 blue with an irregular triangular black spot dorsolaterally at apical third, its tip almost meeting the other dorsally, annulus black; S3 blue, laterally with an oval black spot ring at apical fifth almost encircling a narrow dorsolateral blue spot laterally and connecting with black annulus; S4–7 similar with apical fifth black forming a complete ring; S7 blue dorsally and laterally with narrow black stripe expanding distally and connecting above at apical fifth; S8–9 blue, S10 blue with posterior margin rimmed in black up to torus; torus pale, its ventral margin rimmed with black; cercus brown; paraproct blue dorsobasally, remainder black.

Genital ligula in ectal view with distal segment anterior to lateral lobes narrow, subrectangular, about three times as long as wide and roughly parallel-sided in ectal view (as in Fig. 609b), in lateral view distal segment linear, the sides parallel, with a pronounced basal quadrate longitudinal sclerotized boss, not bisected posteriorly in ectal view (as in Fig. 609a), ental surface of distal tip of ligula concave (as in Fig. 609c).

Torus swollen, transversely parallel, occupying entire ventral margin of torifer but not overlapping bilobed epiproct (Figs. 678a, c); epiproct apically raised with a narrow cleft, pale, black laterally; cerci not approximate, their inner surfaces separated by a distance greater than width of epiproct (Fig. 678c); cercus entire, quadrate in dorsal view, with a pronounced apical tooth along posterior margin at medial third; in mediodorsal view dorsal surface evenly convex with posterior margin appearing trifold, posteromesal border angulate, medially with a posteroventral black tooth and apically with the posterolateral margin falcate (Fig. 678a); paraproct with posterior margin almost linear, ventral branch, in both lateral and inner mediodorsal views, represented by a low, broadly based, obtuse lobe, the dorsal branch broadly acuminate with a smaller rounded anteapical tip (Fig. 678b).

Dimensions. Hw 23, abdomen 30.5, total length 38.3.

Female (MEXICO: San Juan Teotihuacán, Figs. 189, 422, 869). Similar to male but pale colors tan. Head with less extensive black; pro- and pterothorax as in male but base of humeral stripe narrower; wings hyaline with venation black; Pt dark brown, surmounting 1.5 cells in all wings; px Fw 15/16, Hw 14/14; pq cells Fw 5/5, Hw 4/4; RP2 at Fw 7/7, Hw 6/6; legs largely pale tan with streaks of brown on outer surfaces of femora and inner portion of tibiae; S1 as in male; S2 with triangular black lateral smaller, isolated above; S3 tan with a black dorsolateral spot not connecting above at apical fourth; S4–7 similar to S3 but black markings progressively slightly more extensive; S8–9 tan; sternite 8, ovipositor and cerci pale.

Mesostigmal lobe about as wide as long (Figs. 512b, c, d); with a low mesepisternal tubercle laterally to mesostigmal lobe (Fig. 512c), medial margin of mesostigmal lobe located externally to anterior end of lateral branch of middorsal carina (Fig. 512c).

Dimensions. Hw 23.3, abdomen 25.7, total length 33.5.

Diagnosis. Male of *A. deami* can be confused with *A. tarascana*, but they differ by the following characters (those for *A. tarascana* in parentheses): ventral branch of paraproct represented by a low bluntly curved bump, Figs. 678a, b (ventral branch well developed, triangular, Figs. 738a, b); posteromedial margin of cercus in mediodorsal view prominent and distinctly angulate, Fig. 678a (posteromedial margin of cercus in mediodorsal view forming a gently rounded lobe, Fig. 738a); tori separated from each other by distance longer than width of each torus, Fig. 678c (tori separated from each other by distance subequal to shorter than width of each torus, Fig. 738c); distal segment of genital ligula with basal boss not bisected posteriorly in ectal view, Fig. 609b (distal segment with basal boss bisected posteriorly in ectal view, Fig. 649b); S7 mostly pale dorsally, Fig. 305 (S7 mostly black dorsally, Fig. 380 [Arizona and Sonora populations] or pale dorsally with a black lateral stripe, Fig. 381). *Argia deami* might also be confused with *A. lacrimans* and *A. pima*, but the cercus in *A. deami* is shorter than the paraproct in lateral view, and paraproct dorsal and ventral branches are separated by a shallow concavity (Figs. 678a, b), the genital ligula distal segment lacks a flagellum (Fig. 609), and it is smaller (Hw length 20.4–22.8; abdomen length 24.7–28.0; total length 32.1–36.0). In *A. lacrimans* (Figs. 703a, b) and *A. pima* (Figs. 719a, b), the cercus and paraproct are subequal in length in lateral view, the paraproct dorsal and ventral branches are separated by a V-shaped angle, the genital ligula distal segment is armed with a single flagellum (Fig. 637), and it is larger (Hw length 22.4–28.9; abdomen length 29.5–36.4; total length 37.7–46.8).

Female of *A. deami* is similar to *A. tarascana* but differs as follows: medial margin of mesostigmal lobe of *A. deami* is located externally to anterior end of lateral branch of middorsal carina, Fig. 512c (medial margin of mesostigmal lobe located medially to anterior end of lateral branch of middorsal carina, Fig. 575c). Within its range, *A. deami* is sympatric with the smaller *A. nahuana* at Camécuaro Lake, and we noted a heterospecific tandem (male *A. deami* with female *A. nahuana*). These two species differ as follows: wings slightly amber, middorsal thoracic carina branching well posterior to distal margin of mesostigmal lobes (Fig. 512c), mesostigmal lobe about as wide as long (Figs. 512b, c, d), with a low mesepisternal tubercle laterally to mesostigmal lobe (Fig. 512c), medial margin of mesostigmal lobe located externally to anterior end of lateral branch of middorsal carina (Fig. 512c) in *A. deami*; wings hyaline, middorsal thoracic carina branching slightly posterior to distal margin of mesostigmal lobes (Figs. 546c, 547c), mesostigmal lobe wider than long (Figs. 546b, c, d), lacking a low mesepisternal tubercle laterally to mesostigmal lobe (Fig. 546c), medial margin of mesostigmal lobe meeting lateral branch of middorsal carina (Fig. 547c) in *A. nahuana*. The narrow black humeral stripe is not forked in *A. deami*, and there are no dorsolateral nor basal spots present on S3–6 (Figs. 305, 869); in *A. nahuana*, the black humeral stripe is often (but not always) forked and there are generally dorsolateral and basal spots present on S3–6 (Figs. 228, 941).

Remarks. The type locality for *A. deami* was stated by Calvert to be Dublan, Hidalgo, Mexico. Selander & Vaurie (1962) were unable to find such a locality within Hidalgo, nor did we based on searches on the web. There is,

however, a Dublan (Colonia Dublán) in Chihuahua at approximately 30.40°N, 107.90°W and 1440 m a. s. l. Calvert (1908a) in his gazetteer lists Dublan as lying on the Central Plateau at about 2070 m and in the Biología Centrali-Americana records *Hetaerina vulnerata* Hagen in Selys and *Hyponeura* (now *Argia*) *lugens* as also occurring in Dublan. *Argia lugens* is known to occur in Chihuahua, and we have identified a female of *A. deami* from the Río Palanganas in the same state. We suggest that the type locality for *A. deami* be corrected to Dublan (or Colonia Dublán), Chihuahua, Mexico.

We examined two of the four paratypes of *A. deami* from Oaxaca that are currently housed in the UMMZ. Close examination of these two females show that they represent *A. tarascana*. We suggest that the other two females of the type series, not examined by us, also represent *A. tarascana*. *Argia deami* is one of the least-known species of *Argia* originally described by Calvert, and subsequent literature records simply list the species either from Mexico or from various states in Mexico. González-Soriano & Novelo-Gutiérrez (1996) list *A. deami* from Hidalgo based on Calvert's record of this species from Dublan. According to our records, this species ranges from Chihuahua south to Mexico in Mexico (Fig. 775).

Habitat. Behrstock's female of *A. deami* from Río Palanganas was found perched in willow at a clear, shallow, dry season main channel with mostly cobble substrate, algae in shallows, a few riffles and mud bars; fringing willows and other streamside vegetation present where not grazed. One male from Ojo de Agua was collected in tandem with a female of *A. nahuana*.

Distribution. *Argia deami* is a Mexican endemic, extending from Chihuahua through Michoacán south to Mexico state (Fig. 775) at elevations from 1445 to 2519 m.

Argia elongata Garrison & von Ellenrieder 2017

Figs. 49 (head, thorax, S1–4 ♂); 190 (head, thorax, S1–4 ♀); 191 (thorax); 306–308 (S1–10 ♂); 423 (S7–10 ♀); 513 (mesostigmal plates ♀); 610 (genital ligula); 679 (appendages ♂); 771 (map); 806 (field photo ♂); 857 (body scan ♂); 858 (body scan ♀).

[Key locators: ♂ G-1, couplet 12(11'); ♂ M-3, couplet 4'; ♀ F-9, couplet 4']

Argia extranea: Calvert 1902: 93–94 (in part, material S of Mexico misidentified, pl. IV, fig. 56i);—Calvert 1907: 375 (in part, material S of Mexico misidentified);—Ris 1918: 116 (in part, material S of Mexico misidentified);—Calvert 1919: 164 (Guatemala);—Garrison 1982: 6 (Costa Rica);—Paulson 1982: 252 (in part, Costa Rica and Panama);—Paulson 1984: 51 (El Salvador);—Dunkle 1988: 45 (Honduras);—Maes *et al.* 1988: 32 (Nicaragua);—Maes 1989: 5 (Nicaragua);—Dunkle 1991: 132 (Honduras);—Donnelly 1992: 83 (Panama);—Garrison 1994: 309 (in part, material S of Mexico misidentified);—Boomsma & Dunkle 1996: 25 (Belize);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Chiapas);—Suhling 1999: 51 (Panama, misidentified);—Ramírez *et al.* 2000: 249 (Costa Rica);—Förster 2001: 11, 56, 59 (key ♂, ♀, fig. C24);—Westfall & May 2006: 189 (in part, Panama);—Heckman 2008: 347, 348, 380 (Central America, Surinam, Colombia).

Argia sp. nr. *extranea* Abbott *et al.* 2002: 127 (Nicaragua).

Argia sp. Esquivel 2005: 152–153 (S Mexico to Panama).

Argia n. sp. nr *extranea* Bailowitz *et al.* 2012: 9 (El Salvador).

Argia n. sp. (*extranea* group) Garrison & von Ellenrieder 2013: 16 (Costa Rica).

Argia elongata Garrison & von Ellenrieder 2017: 14 (description, diagnosis, key, figs. 17, 39, 40, 63–66, 89, 111, 132, 151, 167, photos 177, 178);—Paulson & Haber: 2021: 88 (diagnosis, photos).

Primary types. *Argia elongata*: holotype ♂, COSTA RICA, Cartago, Río Reventazón, SE of Turrialba by Highway 10 (9.8821°N, 83.6469°W, 561 m), 10 August 1979, Jo A. Garrison & Rosser W. Garrison leg. [examined, in CSCA].

Specimens examined. 558 ♂♂, 258 ♀♀ (see Garrison & von Ellenrieder 2017 for additional material examined not listed here): **MEXICO, Veracruz:** 1 ♂, Arroyo Claro, Sierra Santa Marta, 9 km E of Tebanca {18.3429°N, 94.8915°W}, 1100 m, 29 August 1988, M. J. Westfall, Jr. [FSCA]; **Chiapas:** 1 ♂, San Carlos {16.6332°N, 93.05°W}, 602 m, 29 April 1969, R. G. Wind [UMMZ]; 1 ♂, same data but 15 March 1969 [UMMZ]. **GUATEMALA, Chiquimula:** 1 ♂, Chiquimula {14.8°N, 89.55°W}, 419 m, November 1930, J. J. White [FSCA]; 1 ♂, 1 ♀, Padre Miguel, 69x034 {14.5667°N, 89.45°W}, 889 m, 21 August 1969, T. W. Donnelly [RWG]. **COSTA RICA, Guanacaste:** 1 ♂, 1 ♀, small stream 5 km N of Santa Elena {10.9667°N, 85.6833°W}, 30 m, 27 February 1987, S. W. Dunkle [RWG]; 1 ♀, Parque Nacional Guanacaste, Quebrada Bolaños, L-03-1405 {10.9578°N, 85.4969°W}, 600

m, 8 May 1989, C. Esquivel-Herrera [UNH]; 1 ♀, 2.6 mi NW of Tilarán, Quebrada Azul, 67–183 {10.5°N, 85°W}, 430 m, 28 July 1967, D. R. & M. L. Paulson [FSCA]; **Alajuela**: 2 ♂♂, 1 ♀, Río Vara Blanca at Cascada La Paz {10.2066°N, 84.1638°W}, 1425 m, 11 May 1995, B. O. Huntsman & R. W. Baumann [BYU]; 1 ♂, 2 ♀♀, disturbed weedy areas within plantation, outskirts of Alajuela, 14:00–15:30 hrs, 10.0167°N, 84.2167°W, 757 m, 26 February 1984, A. M. Young, J. Jass & S. Sullivan Borkin [USNM]; **San José**: 1 ♂, 2 ♀♀, tributary of Río Cascajal at Bajo La Rosa {10.0333°N, 83.95°W}, 1600 m, 3 May 1995, B. O. Huntsman & R. W. Baumann [BYU]; 3 ♂♂, San Pedro Montes de Oca {9.9397°N, 84.0525°W}, 1200 m, September 1982, W. G. Eberhard [UMMZ]; 1 ♀, Río San Ramón, 3 km W of San Isidro {9.3565°N, 83.7206°W}, 657 m, 11 May 1995, B. O. Huntsman & R. W. Baumann [BYU]; 1 ♀, tributary of Río San Isidro, 2 km N of Quebrada {0°N, 0°E}, 660 m, 10 May 1995, B. O. Huntsman & R. W. Baumann [BYU]; **Heredia**: 3 ♂♂, 2 ♀♀, Santo Domingo de Heredia, on the grounds of the Hotel Bougainvillea, 9.98°N, 84.0792°W, 1187 m, 8–12 March 1992, A. M. Young & S. Sullivan Borkin, [USNM]; **Cartago**: 1 ♂, 1 ♀, Cachi {9.8333°N, 83.8°W}, 1181 m, 4 March 1990, A. M. Young [USNM]; 1 ♂, Río Orosí at Orosí {9.8°N, 83.85°W}, 1500 m, 8 May 1995, B. O. Huntsman & R. W. Baumann [BYU]; 1 ♀, Orosí {9.8°N, 83.85°W}, 1500 m, January 1982, T. Brittain [USNM]; 1 ♀, Estación Biológica Río Macho, L-03-900 {9.7669°N, 83.8625°W}, 1590 m, 3 July 1990, C. Esquivel-Herrera [UNH]; **Puntarenas**: 4 ♀♀, Las Alturas Biological Station, 20 air km NE of San Vito, Cerro Echandí trail, up to 2100 m to trail marker 34, C. R. Nelson #6258 {8.9952°N, 82.8205°W}, 2100 m, 15 August 1995, B. Brown & M. Metz [BYU]; 2 ♀♀, San Vito, IORI 00067407/413 {8.8333°N, 82.9667°W}, 996 m, 29 September–1 October 1986 [FSCA]. **PANAMA, Chiriquí**: 4 ♂♂, 1 ♀, Finca Hartmann, creek behind house, 8.8431°N, 82.7623°W, 1540 m, 17–22 February 2012, L. G. Bezark [RWG].

A medium-size species (Table 2), with vivid violaceous blue male (Fig. 49) with black postbasal streaks (Figs. 806, 857) and bilobed paraproct with ventral branch longer than dorsal (Fig. 679b), paler tan coloration in the female (Figs. 191, 858), and in both sexes black middorsal stripe constricted ventrally (Fig. 191) and a broad humeral stripe at base abruptly narrowing at basal fifth along mesopleural suture and abruptly forming a thin hairline at 0.50 before expanding again at mesopleural fossa (Figs. 857, 858).

Diagnosis. This species was described and diagnosed against its closest relative, *A. extranea*, by Garrison & von Ellenrieder (2017), from which we abstract the following. In male *A. elongata*, distal segment of genital ligula lacks a small digitiform appendage on its ental tip (Figs. 610a, c); the decumbent tooth on the cercus in medioposterior view is at approximately 0.50 of margin, its distal margin is not produced into a tubercle, and there is no shallow recessed area preceding this area (Fig. 679a); the ventral branch of paraproct is usually distinctly longer than upper branch (Fig. 679b); the middorsal thoracic stripe usually constricted at base (as in Fig. 191) and the sides of S8–9 are unmarked or mostly so (Figs. 306–308). In male *A. extranea*, the distal segment of genital ligula has a small digitiform appendage on its ental tip (Figs. 611a, c), the decumbent tooth on the cercus in medioposterior view is at approximately basal 0.30 of margin, with distal margin often produced into a tubercle, and this area is immediately preceded by a shallow recessed area when viewed dorsally or medioposteriorly (Fig. 680a), the dorsal and ventral branches of the paraproct are usually subequal (Fig. 680b), the middorsal thoracic stripe is not constricted at base (as in Fig. 192), and the sides of S8–9 are marked with black (Fig. 30). In female *A. elongata*, there is a ventral transverse tubercle (Fig. 513e) at the base of the mesostigmal lobe when viewed posteriorly, and the middorsal thoracic stripe is usually constricted at base (Fig. 191). In female *A. extranea*, the base of mesostigmal lobe viewed posteriorly lacks a ventral transverse tubercle (Fig. 514e), and the middorsal thoracic stripe is parallel sided (Fig. 192).

Remarks. Garrison & von Ellenrieder (2017) discussed the application of the various names assigned to both *A. elongata* and *A. extranea*. Their key to distinguish females of these two species contained an error; the characters pertaining to the swollen versus non swollen transverse ridge should be interchanged there.

Habitat. *Argia elongata* is found in rocky to muddy rivers and streams and open areas near trickles and ponds, from primary forest to disturbed habitats. It is often the most common species of *Argia* to be found within its range.

Distribution. *Argia elongata* and *A. extranea* are allopatric, with *A. elongata* occurring from Chiapas and Los Tuxtlas region of S Veracruz in Mexico south through Panama, *A. extranea* occurring from SE Arizona in U. S. A. south through Oaxaca and Tamaulipas and Orizaba-Cordoba-Veracruz City region of Veracruz in Mexico (Fig. 771). *Argia elongata* is primarily a montane species generally occurring above 100 m. Of over 350 localities recorded, only 15 yielded collections under 100 m; the highest elevation we have recorded is 2133 m.

Argia extranea (Hagen 1861)

Figs. 50 (head, thorax, S1–4 ♂); 192 (head, thorax, S1–4 ♀); 193 (thorax); 309 (S1–10 ♂); 424, 425 (S7–10 ♀); 514 (mesostigmal plates ♀); 611 (genital ligula); 680 (appendages ♂); 756, 757 (type labels); 771 (map); 807 (field photo ♂); 859 (body scan ♂); 860 (body scan ♀).

[Key locators: ♂ G-1, couplet 3(2); ♂ M-3, couplet 4(3'); M-6, couplet 11(10'); ♀ F-9, couplet 4(3')]

Agrion extraneum Hagen, 1861: 92 (♂ description, Tampico, Mexico);—Garrison & von Ellenrieder 2019: 31 (holotype data in MCZ).

Argia extranea: Hagen in Selys 1865: 400 [27 reprint] (description ♂, ♀ in part, Tampico);—Calvert 1899: 380 (♂ description, pl. XXV, fig. 8);—Calvert 1902: 93–94 (in part, material S of Mexico misidentified, pl. IV, figs. 4, 56, only);—Calvert & Hagen 1902: 108 (pl. I, figs. 6, 6a);—Ris 1918: 116 (in part, all material except from Cuernavaca and Misanthla misidentified);—Calvert 1947: 607 (specimens in CAS, ANSP);—Paulson 1982: 252 (in part, US and Mexico);—Novelo-Gutiérrez & Peña-Olmedo 1991: 130 (Hidalgo, Mexico);—González-Soriano 1993: 295 (Mexico);—Peña-Olmedo & Novelo-Gutiérrez 1993: 132, 137, 139 (Hidalgo, Mexico, figs. 35, 57, key);—Garrison 1994: 308 (diagnosis, key, figs. 31, 55, 87);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Alonso-Eguía *et al.* 2002: 352 (Moctezuma basin, Mexico);—Paulson 2002b: 362 (Nayarit, Mexico);—Westfall & May 2006: 188 (description ♂, ♀, key, figs. 77, 81F, 82C, 85C, 86A, 98H, 102A);—Behrstock *et al.* 2007a: 56 (Chihuahua, Mexico);—Cuevas-Yañez 2007: 86 (Puebla, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 127 (Mexico);—Upton *et al.* 2007: 29 (Sonora, Mexico);—González-Soriano *et al.* 2008: 310 (Morelos);—Heckman 2008: 347, 348, 380 (key, in part, North America);—Bailowitz *et al.* 2009: 16 (Nayarit, Mexico);—Caesar & Wenzel 2009: 104 (phylogeny within genus *Argia*);—Escoto-Moreno *et al.* 2009: 154 (Aguascalientes, Mexico);—Paulson 2011: 154 (description, diagnosis, ♂, ♀, photos);—González-Soriano *et al.* 2011: 184 (San Luis Potosí, Mexico);—Bailowitz *et al.* 2013: 15 (Arizona);—Escoto-Moreno *et al.* 2014: 1051 (Hidalgo, Mexico);—Bailowitz *et al.* 2015: 108 (diagnosis, photos);—Escoto-Moreno *et al.* 2015: 153 (Zacatecas, Mexico);—González-Soriano *et al.* 2016: 156 (Colima, Mexico);—Escoto-Moreno *et al.* 2017: 386 (Hidalgo, Mexico);—Nava-Bolaños *et al.* 2017: 805 (premating mechanisms, heterospecific tandems, photo 1B);—Torres-Pachón *et al.* 2017: 417 (molecular phylogeny of larvae within *Argia*);—Rangel-Sánchez *et al.* 2018: 924 (estimation of distribution in Mexico);—García-Miranda & Carrillo-Muñoz 2021: 335 (Puebla, Mexico).

Argia mista Navás 1934b: 70 (description ♂);—Garrison 1994: 308 (synonymy);—Garrison & von Ellenrieder 2017: 20 (synonymy).

Primary types. *Argia extranea*: holotype ♂, MEXICO, Tampico, 1–31 January–December 1854–1855, Henri de Saussure leg. (Fig. 756). Hagen's brief description implies that he had only one male [examined, in MCZ];—*Argia mista*: holotype ♂, MEXICO, S. Juan de Sehoutuacaln [probably San Juan Teotihuacán], 14. XI. 1931 (Fig. 757). Navás' brief description implies that he had only one male [examined, in MNHN].

Specimens examined. 163 ♂♂, 80 ♀♀ (see Garrison & von Ellenrieder 2017 for additional material examined not listed here): **MEXICO, Oaxaca:** 1 ♀, stream 14 mi E of El Camarón, 67–228 {16.4983°N, 95.7967°W}, 850 m, 26 August 1967, D. R. & M. L. Paulson [RWG].

A medium-size species (Table 2); male vivid violaceous blue (Figs. 50, 807, 859), with black postbasal streaks and bilobed paraproct with ventral branch longer than dorsal (Fig. 680b), paler tan coloration in female (Figs. 193, 860) and in both sexes black middorsal stripe not constricted (Fig. 193) and humeral stripe broad at base, abruptly narrowing at basal fifth along mesopleural suture, and abruptly forming a thin hairline at 0.50 before expanding again at mesopleural fossa (Figs. 859, 860).

Diagnosis. Male was described by Calvert (1899), and both sexes were described and diagnosed by Garrison (1994), Westfall & May (2006) and Garrison & von Ellenrieder (2017). *Argia extranea* is similar to the more southerly *A. elongata* and is diagnosed under that species.

Remarks. Garrison & von Ellenrieder (2017) key to distinguish females of *A. elongata* and *A. extranea* contains an error; the characters pertaining to the swollen versus non swollen transverse ridge should be interchanged. Only figures 56 and 56s of Calvert (1902) pertain to *A. extranea*; his figure 56i pertains to *A. elongata* and Figure 56ii pertains to *A. noveloii*.

In their phylogenetic analysis based on molecular and morphological data, Caesar & Wenzel (2009) placed *A. extranea* in a clade with *A. plana* (= *A. funebris*) and *A. vivida* and we agree that these three species are closely related by morphology. According to Torres-Pachón *et al.* (2017), their combined morphological and molecular phylogenetic analysis of larvae place *A. extranea* within the “carlcooki” group including *A. plana* (= *A. funebris*), *A. vivida*, *A. immunda* and *A. bipunctulata* [(*A. carlcooki* (*A. plana* ((*A. vivida*, *A. extranea*) (*A. immunda*, *A. bipunctulata*)))))]. We do not consider it likely that *A. bipunctulata* is part of this clade, due to different morphology

of male appendages and genital ligula, and we consider *A. carlcooki* and *A. immunda* to be most likely sister species as explained under the former species.

Distribution. *Argia extranea* is the N (SE Arizona in U. S. A. south through Oaxaca and Tamaulipas and Orizaba-Cordoba-Veracruz City region of Veracruz in Mexico) counterpart to the S (Chiapas and Los Tuxtlas region of S Veracruz in Mexico south through Panama) allopatric *A. elongata* (Fig. 771). *Argia extranea* is primarily an inhabitant of the moist foothills of the Sierra Madre Occidental, del Sur, and Oriental, and it appears to be absent from the central plateau. Specimens have been collected year-round at various localities at elevations ranging from near sea level to 2280 m (Altiplanicie Mexicana), but of over 300 localities recorded, only eight yielded collections under 100 m (Garrison & von Ellenrieder 2017).

Argia fissa Selys, 1865

Figs. 51 (head, thorax, S1–4 ♂); 194 (head, thorax, S1–4 ♀); 310 (S7–10 ♂); 426 (S7–10 ♀); 515 (mesostigmal plates ♀); 681 (appendages ♂); 776 (map); 883 (body scan ♂); 884 (body scan ♀).

[Key locators: ♂ G-1, couplet 9(8'); ♂ M-5, couplet 2(1); ♀ F-6, couplet 17']

Argia fissa Selys 1865: 461 [29 reprint] (description ♂, ♀, Bogota, Nouvelle Grenade. (Coll. de Selys.);—Calvert & Hagen 1902: 109 (pl. II, figs. 13, 13a);—Calvert, 1902: 89 (in part, all specimens from Chiapas south, pl. IV, fig. 12 only);—Calvert 1907: 374 (all specimens from Chiapas south);—Ris 1918: 115 (in part, all specimens from Guatemala, south);—Schmidt 1943: 233 (in part, Costa Rica, Colombia, Peru);—Rácenis 1959: 475 (Peru);—Paulson 1982: 252 (in part, all specimens listed except from Mexico);—Westfall 1986: 116 (El Salvador);—Dunkle 1988: 45 (Honduras);—Maes *et al.* 1988: 34 (in part, all records listed except from Mexico);—Maes 1989: 5 (in part, all records listed except from Mexico);—Dunkle 1991: 132 (Honduras);—Donnelly 1992: 83 (Panama);—Garrison 1994: 331 (mention and comparison with *A. sabino*);—Garrison 1996: 45 (figs. 2, 5, 10, 13, 15, comparison with *A. anceps*);—Ramírez *et al.* 2000: 249 (Costa Rica);—Förster 2001: 11, 56, 59 (key ♂, ♀, fig. C24);—Esquivel 2005: 143 (listed Costa Rica to Peru);—Urrutia 2005: 33 (Colombia);—Westfall & May 2006: 180 (briefly mentioned in comparison with *A. anceps*);—Pérez-Gutiérrez *et al.* 2007: 2012 (Colombia);—von Ellenrieder & Garrison 2007a: 15 (syntype in RBINS examined);—Heckman 2008: 342, 379 (key, fig. 3.1.388);—Hoffmann 2009: 39 (Peru, after Ris 1918);—Pérez-Gutiérrez & Palacino-Rodriguez 2011: 2012 (Colombia);—Garrison & von Ellenrieder 2013: 15 (Costa Rica);—Pérez-Gutiérrez *et al.* 2013: 98 (Colombia, photos);—Garrison & von Ellenrieder 2017: 25 (comparison with *Argia rudolphi* sp. nov., figs. 21, 45, 70, 94, 116, 156, 168, photo 183);—Garrison & von Ellenrieder 2019: 31 (syntypes ♂, ♀ in MCZ);—Paulson & Haber 2021: 87 (diagnosis, figs., Costa Rica).

Argia charalana: Navás 1935: 33–34 (1–2 reprint) (Colombia: Pensilvania, 1913, 1918; Villavicencio, Septiembre de 1912; Pandi, Agosto de 1911; Medina, Enero de 1918);—Garrison & von Ellenrieder 2018: 20 (synonymy with *A. fissa*).

Primary types. *Argia fissa*: syntypes ♂, ♀, COLOMBIA, St. Fe de Bogota, 1863, Lindig leg. [examined, in MCZ and RBINS; von Ellenrieder & Garrison 2007a; Garrison & von Ellenrieder 2019];—*Argia charalana*: holotype ♂, COLOMBIA, Charalá (Santander), Marzo de 1915 [not examined, lost].

Specimens examined. 87 ♂♂, 39 ♀♀ (see Garrison & von Ellenrieder 2017 for additional material examined not listed here): **COSTA RICA, San José:** 1 ♂, 16 km SE of San Isidro del General on Route 244, stream, FCS18-0318, IORI # 00082242 {9.2455°N, 83.6395°W}, 621 m, 20 July 2018, F. C. Sibley [FSCA]; **Puntarenas:** 1 ♂, Tinamaste, ca. 2 km S on road to Tumbas, Quebrada Tumbas, IORI # 00079211, 9.2836°N, 83.7785°W, 502 m, 20 January 2018, W. F. Mauffray [FSCA]; 1 ♂, Las Alturas de Cotón, Research Station, tributary to Río Cotón, IORI # 00079255, 8.9393°N, 82.8348°W, 1321 m, 22 January 2018, W. F. Mauffray [FSCA]; 1 ♂, 5 km SE of Agua Buena on Route 237, forest stream, FCS18-0292, 8.7136°N, 82.9346°W, 1048 m, 18 July 2018, F. C. Sibley [FSCA]. **PANAMA, Chiriquí:** 2 ♂♂, Volcán, W off Calle 5A Sur, outlet from Balneario La Fuente, IORI # 00077964, 8.7724°N, 82.6446°W, 1380 m, 3 April 2017, W. F. Mauffray [FSCA, RWG]; 1 ♂, Volcán, W of Reserva de la Biósfera La Amistad, laguna de volcán menor, IORI # 00077972, 8.7658°N, 82.6758°W, 1344 m, 3 April 2017, W. F. Mauffray [FSCA]; **Panamá Oeste:** 1 ♂, Mata Ahogado, 1 km S of Alto del María, small streams and seepages, IORI # 00077370, 8.6506°N, 80.0925°E, 1015 m, 21 May 2016, W. F. Mauffray [FSCA]; 1 ♂, 1 ♀, El Valle, Mata Ahogado, small stream, IORI # 00077376, 8.6241°N, 80.0966°E, 730 m, 22 May 2016, W. F. Mauffray [FSCA]; 3 ♂♂, 1 ♀, La Laguna de San Carlos, IORI # 00077707/08, 8.6251°N, 80.0501°W, 800 m, 10 February 2011, W. F. Mauffray [FSCA, RWG]; 1 ♂, La Laguna, IORI # 00084888, 8.6015°N, 80.0589°W, 515 m, 8 February 2011, W. F. Mauffray [FSCA]; 1 ♂, same data but SE on Road Las Lajas, tributary to Río Teta, IORI # 00077696, 8.6071°N, 80.0436°W, 580 m, 10 September 2016, W. F. Mauffray [FSCA]. **COLOMBIA, Cundinamarca:** 2 ♂♂, 1 ♀

(syntypes), Santa Fé de Bogotá, 1863, Linding [MCZ, RIBN]; **Valle del Cauca**: 1 ♂, near El Queremal {3.5245°N, 76.7071°W}, 1500 m, 25 January 1986, M. Suarez-Toledo [FSCA].

A medium-size species (Table 2), with cerulean blue male (Figs. 51, 883), largely pale tan female with reduced markings (Figs. 194, 884), and amber wings in both sexes (as in Fig. 272).

Diagnosis. *Argia fissa* is similar to *A. anceps* and *A. westfalli*. Both sexes of all three species were keyed and diagnosed by Garrison (1996), and their differences are summarized under *A. anceps*.

Distribution. The distribution of *A. fissa* in Costa Rica appears to be limited to the S half of the country (SW San José and Puntarenas) being replaced by *A. anceps* to the north (Guanacaste, Alajuela, Cartago, Heredia and NW Puntarenas), and it extends farther south into Panama and Colombia (Fig. 776), at elevations between 160 to 1602 m. Ris (1918) lists a pair from Callao [District?], Peru (approximately 12°2'S 77°8'W), in the Stockholm Museum, and the species was subsequently listed from that country by Rácenis (1959), Esquivel (2005), and Hoffmann (2009). We have seen no records of *A. fissa* for Ecuador, nor have we seen any specimens from Peru. We suspect that the pair from Peru were misidentified and that they might represent *A. inculta* Hagen in Selys.

Argia frequentula Calvert, 1902

Figs. 52 (head, thorax, S1–4 ♂); 53, 54 (♂ thx); 195 (head, thorax ♀); 196 (thx ♀); 311 (S7–10 ♂); 427 (S7–10 ♀); 516–520 (mesostigmal plates ♀); 682 (appendages ♂); 800 (map); 1026 (body scan ♂); 1027 (body scan ♀).

[Key locators: ♂ G-5, couplet 14'; ♂ M-2, couplet 3'; ♀ F-6, couplet 11(10'); F-9 couplet 2'; ♀ shortcut 10]

Argia pulla: Calvert 1902: 79 (in part, plate IV. fig. 33s).

Argia frequentula Calvert 1907: 365 (♂, ♀, San Pedro Sula, Guatemala, comparison with *A. pulla*, pl. X, figs. 9–11);—Calvert 1908a: xxix (clarification of holotype data);—Ris 1918: 104 (Mexico S through Panama);—Fraser 1946: 453 (briefly compared with *A. infrequentula* n. sp.);—Calvert 1947: 607 (“One male, eight females of lot (a), Tepic, Oct., ‘94, prove to be *Argia frequentula* Calvert, Biol. Centr.-Amer; Neur. 364, 365, 1907, although not listed there”; in CAS);—Paulson 1982: 252 (Mexico south through Panama);—Dunkle 1998: 45 (Honduras);—Novelo-Gutiérrez *et al.* 1988: 19 (Quintana Roo, Mexico);—Novelo-Gutiérrez 1991: 259 (Quintana Roo, Mexico);—González-Soriano 1993: 295 (Mexico);—Measey 1994: 45 (Belize);—Boomsma & Dunkle 1996: 25 (Belize);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Ramírez *et al.* 2000: 249 (Costa Rica);—Förster 2001: 11 (Guatemala S through Panama);—Alonso-Eguía *et al.* 2002: 352 (River Moctezuma Basin);—Garrison *et al.* 2003: 30 holotype ♂ in UMMZ);—Esquivel 2005: 148 (Costa Rica);—Cuevas-Yañez 2007: 86 (Puebla, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 127 (Mexico);—González-Soriano & Paulson 2011: 307 (Chiapas, Mexico);—Garrison & von Ellenrieder 2013: 15 (Costa Rica);—Escoto-Moreno *et al.* 2014: 1046 (Hidalgo, Mexico);—Garrison & von Ellenrieder 2019: 32 (paralectotypes in MCZ);—Paulson & Haber: 2021: 106 (diagnosis, photos).

Primary types. *Argia frequentula*: holotype ♂, HONDURAS, San Pedro, 28 February 1905, Edward. B. Williamson leg. [examined, in UMMZ; Garrison *et al.* 2003].

Specimens examined. 240 ♂♂, 166 ♀♀: **MEXICO, San Luis Potosí**: 6 ♂♂, 2 ♀♀, Río Coy, Highway 85, S of Ciudad Valles {21.9833°N, 99.0167°W}, 70 m, 24 June 1990, G. A. & K. J. Tennessen [FSCA]; 1 ♂, 1 ♀, Headwaters of Río Coy, 28 km S of Ciudad Valles, 21.7331°N, 98.9781°W, 42 m, 21 August 1999, R. W. & J. A. Garrison [RWG]; 1 ♂, 3 ♀♀, Río Ojitipa, NW of Palmira Viejo, 21.6983°N, 99.0081°W, 41 m, 19 August 1999, R. W. & J. A. Garrison [RWG]; 1 ♀, W of Highway 85 at headwaters of Río Huichihuayán, 21.4594°N, 98.9767°W, 182 m, 19 April 2007, M. Overton [RWG]; 3 ♂♂, 5 km S of Xilitla turnoff, 30 km N of Tamazunchale, 63x091 {21.36°N, 99.0342°W}, 100 m, 5 September 1963, T. W. Donnelly [FSCA]; **Veracruz**: 1 ♂, 14 mi N of La Laja, stream at Tampico-Tuxpán Road {21.8571°N, 97.7391°W}, 90 m, 9 August 1957, G. H. & A. Beatty [FSCA]; 3 ♂♂, E of Puente Nacional on Highway 140 at Hotel Balneario, rocky stream with pools {20.4566°N, 101.526°W}, 330 m, 13 July 1992, W. F. Mauffray [FSCA]; 1 ♂, 8.6 mi S of La Tinaja, Río Coyolucán {18.75°N, 96.44°W}, 90 m, 14 August 1965, D. R. & M. L. Paulson [FSCA]; 1 ♀, Río Otapa, 8 km S of La Tinaja, 18.6858°N, 96.4361°W, 90 m, 13 August 1976, R. W. & J. A. Garrison [RWG]; 1 ♂, 4 ♀♀, Arroyo near Playa Escondida, about 30 km NE of Catemaco, 18.6794°N, 95.1544°W, 35 m, 23 July–28 August 1982, R. W. Garrison [RWG]; 4 ♂♂, 6 ♀♀, Río Máquinas, Villa Cariño, 18.6241°N, 95.0919°W, 18 m, 14 June 2009, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, 1 ♀, Estación de Biología Tropical Los Tuxtlas near Catemaco {18.5869°N, 95.0731°W}, 120 m, 15 July 1992, S. W. Dunkle [FSCA]; 1 ♂, 1 ♀, vicinity of Lagunas Azul and Emilia, Los Tuxtlas Station, about 30 km

NE of Catemaco, 18.5781°N, 95.0922°W, 200 m, 7–14 August 1982, R. W. Garrison [RWG]; 2 ♂♂, 1 ♀, same data but 27 August 1988, S. W. Dunkle & M. J. Westfall, Jr., [FSCA]; 1 ♀, same data but pond between Río Piso and Playa Escondida, 3 September 1977, P. Villeda [UMMZ]; 2 ♂♂, 2 ♀♀, Arroyo on road to Jicacal Beach and pond near Rancho La Esperanza {18.5627°N, 95.0571°W}, 28 August 1988, M. J. Westfall, Jr. [FSCA]; 1 ♂, pond by Río La Palma, 25 km N of Catemaco, 18.5619°N, 95.0592°W, 18 m, 5 August 1982, R. W. Garrison [RWG]; 1 ♀, same data but 7–14 May 1981, C. M. & O. S. Flint, Jr. [USNM]; 1 ♂, 1 ♀, same data but 17 July 1992, W. F. Mauffray [FSCA]; 4 ♂♂, 1 ♀, Agua Caliente, 1 km SE of Sontecomapán, 18.4933°N, 95.0119°W, 4 m, 30 August 1988, M. J. Westfall, Jr. & R. W. Garrison [RWG]; 1 ♂, 1 ♀, same data but 18 July 1992, W. F. Mauffray & K. J. Tennessen [FSCA]; 1 ♀, Río Coscoapán, 19.4 km E of Sontecomapan, 18.4892°N, 94.99°W, 13 m, 16 August 1976, R. W. & J. A. Garrison [RWG]; 1 ♀, E of Sontecomapán at Coscoapán village, E tributary to Río Coscoapán {18.4886°N, 94.99°W}, 20 m, 16 July 1992, W. F. Mauffray [FSCA]; 3 ♀♀, stream 2 km E of Coyame, 8 km ENE of Catemaco, 18.4417°N, 95.0036°W, 300 m, 15–18 August 1976, R. W. & J. A. Garrison [BYU, RWG]; 1 ♀, stream at Coyame {18.4381°N, 95.0241°W}, 400 m, 1 July 1965, D. R. & M. L. Paulson [FSCA]; 4 ♂♂, 3 ♀♀, Salto de Eyipantla, 8 km S of San Andres Tuxtla, near Highway 180, 18.3842°N, 95.2064°W, 150 m, 15 June 2009, R. W. Garrison & N. von Ellenrieder [BYU, CSCA, RWG]; 1 ♂, 4 mi from Corral Nuevo, along small stream {18.1015°N, 95.0666°W}, 4 July 1963, R. E. Woodruff [FSCA]; 1 ♀, 16.9 mi SW of Coatzacoalcos, stream on Highway 180 {18.0047°N, 94.5996°W}, 60 m, 2 July 1965, D. R. & M. L. Paulson [FSCA]; **Morelos**: 1 ♀, Alpuyeca, S of Cuernavaca on Highway 95 {18.8303°N, 99.2272°W}, 1020 m, 23 July 1963, R. E. Woodruff [FSCA]; **Oaxaca**: 1 ♀, Tolosa {17.2018°N, 95.0499°W}, 52 m, 24 December 1898, C. C. Deam [UMMZ]; 1 ♂, 1 ♀, 11 mi N of Matías Romero, Highway 185 {17.0044°N, 95.014°W}, 85 m, 30 April 1965, H. V. Weems, Jr. [FSCA]; 1 ♂, Tehuantepec {16.3203°N, 95.2411°W}, 41 m, 23 December 1898, C. C. Deam [UMMZ]; **Tabasco**: 1 ♂, 1 ♀, Teapa {17.55°N, 92.95°W}, 95 m, January 1888, H. H. Smith [UMMZ]; 45 ♂♂, 26 ♀♀, Tepescuintle {17.4435°N, 91.4006°W}, 25 m, 12 August–27 September 1962, E. C. Welling M. [CSCA RWG UMMZ]; **Chiapas**: 1 ♂, 1 ♀, small stream below Palenque ruins, 17.4869°N, 92.0181°W, 64 m, 24 September 1983, R. W. Garrison [RWG]; 1 ♂, Cascada Misol-Ha, km 47, Palenque-Ocotzingo Road, 20 km S of Palenque, 17.3342°N, 91.9769°W, 94 m, 25 September 1983, R. W. Garrison, [RWG]; 1 ♀, Montebello {16.12°N, 91.73°W}, 1475 m, 26 May 1969, R. G. Wind [UMMZ]. **BELIZE, Corozal**: 1 ♂, 1 ♀, Little Belize {18.2081°N, 88.4021°W}, 8 m, 7 October 1992, T. T. Boomsma [RWG]; **Orange Walk**: 1 ♂, 1 ♀, Gallon Jug {17.5594°N, 89.0391°W}, 144 m, 1 October 1992, T. Boomsma [RWG]; 1 ♀, Chan Chich, 5 km W of Gallon Jug {17.5378°N, 89.1033°W}, 119 m, 10 May 1993, E. M. Fisher [RWG]; **Cayo**: 1 ♂, 1 ♀, Roaring Creek at W Highway, small clear river with rapids {17.2669°N, 88.8125°W}, 40 m, 19 March 1986, S. W. Dunkle [RWG]; 1 ♂, Belize River and small tributary, just E of Roaring Creek stream {17.2619°N, 88.7906°W}, 40 m, 27 March 1986, S. W. Dunkle [FSCA]; 2 ♂♂, Belmopan {17.2514°N, 88.767°W}, 72 m, 1 January 1974, L. Jack & P. Kiefer [RWG]; 1 ♂, 1 ♀, small creek 6 mi W of Belmopan on W Highway, partly dry, with leaf bottomed and pools with emergent grass {17.2272°N, 88.8617°W}, 45 m, 19 March 1986, S. W. Dunkle [FSCA]; 1 ♂, stream 3 mi W of Ontario Village, 2.7 mi E of Georgeville on W Highway {17.2239°N, 88.9258°W}, 54 m, 24 March 1986, S. W. Dunkle [FSCA]; 1 ♂, tributary to Belize River, 1 mi W of Ontario Village on W Highway {17.2237°N, 88.9069°W}, 90 m, 30 May 1993, W. F. Mauffray [FSCA]; 1 ♂, 1 ♀, small stream 14.3 mi SE of Belmopan on Hummingbird Highway, varied habitats, pond and stream areas with clay or rock bottom {17.1492°N, 88.7094°W}, 59 m, 25 March 1986, S. W. Dunkle [FSCA]; 3 ♂♂, 1 ♀, stream 2 mi S of San Ignacio on road to Cristo Rey, limestone riffles and pools {17.1356°N, 89.0468°W}, 90 m, 22 March 1986, S. W. Dunkle [FSCA, RWG]; 1 ♂, 1 ♀, W Branch of Belize River at San Jose Soccots, wide clear river with limestone riffles {17.0877°N, 89.129°W}, 90 m, 24 March 1986, S. W. Dunkle [FSCA]; 1 ♂, 2 ♀♀, Privassion Creek on Chiquibul Road, N of Augustine, small river and very small tributary {17.0341°N, 88.9992°W}, 290 m, 22 March 1986, S. W. Dunkle [FSCA]; 1 ♂, same data but 9 December 1992, T. Boomsma [RWG]; 3 ♂♂, Río Frio at Augustine and stream on Navel Road 4 km E of Chiquibul Road, Mountain Pine Ridge, 16.9667°N, 89.9833°W, 500 m, 22–25 July 1983, T. W. Donnelly [FSCA]; 2 ♂♂, 2 ♀♀, same data but small forest stream partly in a cleared area, riffle and quiet stretches, 23 March 1986, S. W. Dunkle [FSCA, UNH]; **Stann Creek**: 5 ♂♂, 4 ♀♀, 40 km W of Dangriga, Middlesex Village, Toucan Ridge Ecology and Education Society, 17.0522°N, 88.5656°W, 186 m, 10–13 January 2016, L. G. Bezark [RWG]; 1 ♂, 1.6 mi S of Silk Grass, mi 9.6 on S Highway at freshwater creek {16.8625°N, 88.3473°W}, 23 m, 3 June 1993, W. F. Mauffray [FSCA]; 1 ♂, Alabama, Cockscorn Jaguar Wildlife Preserve, tributaries to and along South Stann Creek {16.75°N, 88.45°W}, 85 m, 3 June 1993, W. F. Mauffray [FSCA]; 1 ♂, South Stann Creek at S Highway {16.7091°N, 88.3656°W}, 370 m, 9 June 1993, S. W. Dunkle [FSCA]; 1 ♂, Savannah Forest Station, 1 mi N of

Swassey Branch on S Highway {16.5176°N, 88.4888°W}, 25 m, 8 June 1993, W. F. Mauffray [FSCA]; 1 ♂, Silver Creek Village, S Highway and South Stann Creek {16.28°N, 88.8897°W}, 28 m, 9 June 1993, W. F. Mauffray [FSCA]; **Toledo**: 1 ♂, Melvins Banks, 1 mi N of Bladden River, roadside borrow pits {16.4449°N, 88.6247°W}, 30 m, 8 June 1993, W. F. Mauffray [FSCA]; 1 ♂, Río Blanco E of Río Blanco Village {16.2297°N, 89.1086°W}, 252 m, 6 June 1986, S. W. Dunkle [FSCA]; 2 ♀♀, 0.5 km W of Blue Creek Village, 16.2053°N, 89.0468°W, 65 m, 7–9 January 2016, L. G. Bezark [RWG]; 2 ♂♂, 2 ♀♀, Punta Gorda {16.0833°N, 88.8°W}, 18 m, May 1933, J. J. White [FSCA, UMMZ]. **GUATEMALA, El Petén**: 1 ♀, Flores {16.9289°N, 89.8698°W}, 140 m, 2 May 2012, L. Stange [FSCA]; **Izabal**: 5 ♂♂, 4 ♀♀, Livingston {15.8333°N, 88.75°W}, 0 m, 16–20 February 1905, E. B. Williamson, [RWG, UMMZ]; 2 ♂♂, Puerto Barrios, Section 13 {15.7167°N, 88.6°W}, 2 m, 10 January 1905 [RWG, UMMZ]; 1 ♀, Puerto Matías de Galvez {15.6768°N, 88.6121°W}, 60 m, 22 June 1964, F. G. Thompson & D. A. Dean [FSCA]; **Zacapa**: 11 ♂♂, 3 ♀♀, Los Amates {15.2517°N, 89.0985°W}, 80 m, 16 January–13 February 1905, E. B. Williamson [RWG, UMMZ]; 3 ♂♂, Gualán {15.1041°N, 89.3607°W}, 138 m, 11–12 January 1905, E. B. Williamson [RWG, UMMZ]; **El Progreso**: 1 ♀, Sanarate {14.8041°N, 90.1982°W}, 830 m, 10 February 1905, E. B. Williamson [UMMZ]; **Chiquimula**: 2 ♂♂, Río Lucía Sazo at Padre Miguel {14.5667°N, 89.45°W}, 800 m, 18 July 1962, T. W. Donnelly [FSCA]; 2 ♂♂, same data but 5 km S of Quetzaltepeque, 12 July 1963 [FSCA]. **HONDURAS, Colón**: 1 ♂, Trujillo {15.9167°N, 85.9542°W}, 26 July 1968 [FSCA]; **Atlántida**: 1 ♂, 2 ♀♀, river few km E of Peru, E of La Ceiba {15.7833°N, 86.8°W}, 7 m, 10 March 1990, S. W. Dunkle [FSCA]; **Cortés**: 13 ♂♂, 5 ♀♀ (holotype and paratypes), San Pedro Sula {15.5°N, 88.0333°W}, 83 m, 19 January–28 February 1905, E. B. Williamson [FSCA, RWG, UMMZ]; **Francisco Morazán**: 1 ♂, El Rancho, between Zamorano and Tegucigalpa, small rocky stream {14.0753°N, 87.0652°W}, 1116 m, 11 December 1987, S. W. Dunkle [FSCA]; 1 ♂, 1 ♀, Zamorano, Escuela Agrícola Panamericana (EAP), 30 km ESE of Tegucigalpa, ponds and Río Yeguari with riffles and pools {14.0134°N, 87.0094°W}, 799 m, 16 December 1987, S. W. Dunkle [FSCA]. **NICARAGUA, Matagalpa**: 1 ♂, 10.8 mi NE of Matagalpa {12.9994°N, 85.8165°W}, 883 m, 23 August 1964, F. G. Thompson [FSCA]; **Río San Juan**: 1 ♂, Río San Juan, Refugio Bartola, 10.97°N, 84.34°W, 30 m, 4 May 2001, G. Grether [RWG]; 3 ♀♀, same data but Río San Juan at Río Bartola, notes JNH #215, 10.97°N, 84.34°W, 30 m, 4–9 April 2004, J. N. Hogue & F. Hertel [RWG]; 4 ♀♀, same data but NE of Lodge at junction of Río San Juan and Río Bartola, grassy edges and open areas adjacent to Río San Juan and small stream and slough adjacent to man-made pond, 10.97°N, 84.34°W, 30 m, 7–10 August 2002, W. F. Mauffray [FSCA]. **COSTA RICA, Guanacaste**: 4 ♀♀, Liberia, Parque Central and Río Liberia, L-06-33/ 39/ 43 {10.6295°N, 85.4381°W}, 150 m, 29 March 1988, C. Esquivel-Herrera [UNH]; 2 ♂♂, 2 ♀♀, rocky stream, S inlet at N end of Lago Arenal, 14.3 km NW of Tilarán {10.5259°N, 84.9716°W}, 594 m, 28 February 1987, S. W. Dunkle [FSCA]; 1 ♀, Filadelfia de Guanacaste, South Farm, banana field {10.438°N, 85.5546°W}, 17 m, 6 November 1909, P. P. Calvert [FSCA]; **Heredia**: 3 ♂♂, 9 ♀♀, Estación La Selva, OET, L-01-49/ 76/ 139/ 151/ 202/ 216/ 226/ 239/ 351/352/ 399 {10.4667°N, 84.0167°W}, 60 m, 25 February 23 August 1988, C. Esquivel-Herrera [UNH]; 2 ♂♂, 2 ♀♀, same data but 11 June 1991, J. Zloty [RWG]; 1 ♂, same data but 3 September 1996, L. LaPierre [RWG]; 2 ♂♂, 1 ♀, same data but 21–23 September 1966, 66-248, D. R. & M. L. Paulson [FSCA]; 1 ♂, 2 ♀♀, same data but 1 July 1967, M. J. Westfall, Jr. & D. N. Westfall [FSCA, RWG]; 2 ♀♀, Finca La Selva, Puerto Viejo {10.45°N, 84°W}, 60 m, 10 August 1987, J. Brambila [FSCA]; 3 ♂♂, 6 ♀♀, same data but L01-74/ 364-370/ 394-395, 549-002-018, 22 February–20 July 1988, C. Esquivel-Herrera [BMNH, UNH]; 1 ♂, same data but L-03-1392, 30 June 1990 [UNH]; 5 ♂♂, 1 ♀, La Rambla, Río Frío, L-03-702/ 703, 8 April 1990, C. Esquivel-Herrera [UNH]; 1 ♂, small river 9.7 km SE of Puerto Viejo {10.3828°N, 83.9242°W}, 66 m, 2 March 1987, S. W. Dunkle [FSCA]; 4 ♂♂, 1 ♀, La Horqueta, ditch at road, CR4, 10.3394°N, 83.9575°W, 78 m, 27 May 2013, N. von Ellenrieder & R. W. Garrison [CSCA, BMNH, RWG]; **Limón**: 1 ♀, Tortuguero National Park, Cerro Tortuguero, L03-132 {10.5833°N, 83.5269°W}, 50 m, 30 January 1988, C. Esquivel-Herrera [UNH]; 1 ♀, Finca de Olmar Sanchez & Aracelli, 3 km N of Highway crossing to Guápiles on road to Puerto Viejo, Sarapiquí, clean stream in open area, L03-1250 {10.2223°N, 83.7758°W}, 63 m, 15 July 1991, C. Esquivel-Herrera [UNH]; 1 ♂, 1 ♀, Guápiles, in forest, 6–7 July 1967, M. J. Westfall, Jr. & D. N. Westfall, [FSCA, RWG]; 3 ♂♂, Río Santa Clara, 1 km E of Guápiles, clear rocky stream and tributaries {10.2167°N, 83.7833°W}, 268 m, 3 March 1987, S. W. Dunkle [FSCA, RWG]; 2 ♂♂, 1 ♀, dirt road 1 km S of Highway 32 between La Unión and Flores, stream through open marshy cow pasture near secondary forest, CR3, 10.2047°N, 83.8586°W, 287 m, 26 May 2013, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, Río Parismina near Iroquois, medium large clear rocky river {10.1944°N, 83.6461°W}, 78 m, 5 March 1987, S. W. Dunkle [FSCA]; 1 ♂, 1 ♀, 7.5 km ESE of Guácimo, Guácimo pasture, Río Parismina and tributaries, marsh and stream habitats, 10.1844°N, 83.6292°W, 100 m, 10 March 2006, D. L. Wagner,

M. Thomas & W. W. A. Haber [RWG]; 3 ♂♂, La Lola, 28.3 mi W of Limón {10.0944°N, 83.3917°W}, 40 m, 23 July 1963, F. G. Thompson [FSCA]; **Alajuela**: 2 ♂♂, ponds and streams 1 mi N of La Marina {10.3631°N, 84.3803°W}, 550 m, 5 July–1 October 1966, D. R. & M. L. Paulson [FSCA]; **Cartago**: 1 ♂, Juan Viñas, Reventazón Valley {9.8867°N, 83.752°W}, 762 m, 23 July 1909, P. P. Calvert [FSCA]; 1 ♀, same data but 800 m, 66–240, 1 September 1966, D. R. & M. L. Paulson [FSCA]; 1 ♀, same data but weedy clearing over brook near Juan Viñas, 3 May 1910, P. P. Calvert [FSCA]; 2 ♂♂, 1 ♀, Río Reventazón, SE of Turrialba, by Highway 10, 9.8821°N, 83.6469°W, 561 m, 10 August 1979, R. W. & J. A. Garrison [RWG]; 1 ♂, Turrialba, brook, 640 m, 25 July 1909, P. P. Calvert [FSCA]; 2 ♂♂, Cachi, Valley of Río Naranjo {9.8333°N, 83.8°W}, 1160 m, 8 March 1910, P. P. Calvert [FSCA]; **Puntarenas**: 3 ♂♂, stony & muddy creek ca 11 km N of Sardinal, CR28, 10.1606°N, 84.8533°W, 246 m, 8 June 2013, R. W. Garrison & N. von Ellenrieder [HZ, RWG]; 1 ♂, stony & muddy creek ca 11 km N of Sardinal, CR29, 10.1556°N, 84.8514°W, 214 m, 8 June 2013, R. W. Garrison & N. von Ellenrieder [RWG]; 9 ♂♂, 8.1 mi WNW of Esparta, stream {9.9833°N, 84.6668°W}, 60 m, 26 June 1967, M. J. Westfall, Jr. & D. N. Westfall [FSCA, RWG, USNM]; 1 ♂, wide sandy gravel stream between Playa Hermosa and Quebrada Amarilla on Highway 34, CR20, 9.5828°N, 84.5722°W, 35 m, 1 June 2013, R. W. Garrison & N. von Ellenrieder [RWG]; 1 ♀, Parque Nacional Manuel Antonio, L-03-200 {9.3833°N, 84.1411°W}, 15–24 February 1982, C. Esquivel-Herrera, [UNH]; 3 ♂♂, vicinity of Rincón de Osa, 66–282 {8.7°N, 83.4833°W}, 13 m, 9 November 1966, D. R. & M. L. Paulson [RWG]; 1 ♂, 1 ♀, Parque Nacional Corcovado, Estación Biológica Los Patos to Sirena Pavo, L-03-716, 70 m, 2 December 1990, J. Azofeifa [UNH]; 3 ♂♂, Río km 20, 12 km E of Golfito on Highway 14, sandy stream, CR11, 8.6172°N, 83.0644°W, 25 m, 31 May 2013, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 7 ♂♂, 1 ♀, Quebrada Diecinueve, 11 km E of Golfito on Highway 14, sandy stream, CR12, 8.6156°N, 83.0656°W, 25 m, 31 May 2013, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, Río Coloradito, L03-244 {8.5993°N, 82.9168°W}, 150 m, April 1981 [UNH]; **San José**: 1 ♀, San José {9.9681°N, 84.0697°W}, 1140 m, 7 May 1960 [FSCA]; 2 ♂♂, 1 ♀, Hacienda El Rodeo, 7 km west of Villa Colón, CR7, 9.9136°N, 84.2694°W, 859 m, 28 May 2013, R. W. Garrison & N. von Ellenrieder [RWG]. **PANAMA, Chiriquí**: 2 ♀♀, David, San Pablo, Quebrada Sira, bridge to Cola {8.4811°N, 82.4168°W}, 17 September 2011, G. Caballero S. [UNH].

A small species (Table 2) with violet or purple male (Fig. 1026) and pale blue (Fig. 1027) or tan female.

Diagnosis. Body markings and color of preserved specimens of *A. frequentula* are so similar to those of *A. pulla* that both may be confused. The descriptions of *A. pulla* by Calvert (1899) and Westfall & May (2006) will pertain to this species also. In the field, mature males of both species can be distinguished by eye color: black above and green below in *A. frequentula*, entirely dark blue to purple in *A. pulla*. *Argia frequentula* is one of four species, also including *A. gaumeri*, *A. harknessi* and *A. pulla*, in which the male has two subequal digitiform lobes on the posterodorsal margin of the dorsal branch of the paraproct. *Argia harknessi* is a larger species (Hw 20.7–24.5; abdomen length 27.5–33.7; total length 35.7–43.4), the two dorsal lobes of the paraproct are small with the anterior lobe larger than the posterior one (Figs. 694a, b) and the cercus is linear, with a deep U-shaped cleft between the inner and outer branch of which the inner is more prominent and longer than the outer (Figs. 694a, c). The other three species are smaller (Hw 13.2–20.2; abdomen length 20–28.2; total length 25.5–35.2), the two dorsal lobes of the paraproct are subequal in size, the cercus is directed posteroventrally, with a recessed tooth along the medioposterior margin, and the U-shaped cleft between inner and outer branch is shallow when present (Figs. 682a, b; 691a, b; 725a, b). Male of *A. gaumeri* is blue, Fig. 70 (violet in *A. frequentula*, Fig. 52 and *A. pulla*, Fig. 120), Fw generally with 4 pq (3 in *A. frequentula* and *A. pulla*, as in Fig. 280), the posterior portion of the epicranium is largely black with pale occipital bar absent or reduced and postocular spots isolated from one another, Fig. 70 (the posterior portion of the epicranium is largely occupied by large pale postocular spots and occipital bar, separated from each other by a narrow black line in *A. frequentula*, Fig. 52, and *A. pulla*). Male of *A. frequentula* and *A. pulla* approach one another closely, and care must be exercised in their discrimination. The inner branch or medial tooth of the cercus in *A. frequentula* is recessed, directed ventrally (Fig. 682a), the posterior margin slightly emarginate and with the inner and outer branches or lobes approximately subequal in length in dorsal view (Fig. 682c). The inner branch or medial tooth of *A. pulla* is directed posteroventrally (Fig. 725a), the posterior margin divided forming two subequal branches or lobes separated by a shallow U-shaped cleft and the outer branch is longer than the inner in dorsal view (Fig. 725c).

Mesostigmal plates of female *A. frequentula* are separated by a distance smaller than the transverse width of each mesostigmal lobe (Figs. 516–520); in *A. gaumeri* (Fig. 526), *A. harknessi* (Fig. 529) and *A. pulla* (Figs. 562, 563), the mesostigmal plates are separated by a distance subequal or larger than the transverse width of each mesostigmal

lobe. Calvert (1907) stated that he was unable “...to certainly distinguish between the females of *frequentula* and *johannella*, unless the following character suffices: in the former the costal and distal sides of the Pt are subequal, while the latter has the costal side distinctly longer than the distal.” However, females may be distinguished by the mesal border of mesostigmal lobe in dorsoposterior view planar, not recurved ventrally, in *A. frequentula*, forming a concave juncture with mesepisternum (Fig. 517e). In *A. johannella*, the mesal border of the mesostigmal lobe is recurved ventrally forming a tubercle appressed against anterior margin of mesepisternum (Fig. 536e).

Habitat. This is a common primarily lowland species that can be found along various stream habitats. It is much more likely to be in streams with forest cover than is *A. pulla* (D. R. Paulson pers. comm.).

Distribution. *Argia frequentula* occurs primarily along the E flank of Mexico from about 21.98°N (San Luis Potosí) south through NW Panama (8.48°N, Chiriquí) (Fig. 800), from sea level to 1475 m. It was recorded from Quintana Roo in Mexico (Novelo-Gutiérrez *et al.* 1988; Novelo-Gutiérrez 1991), but we have not examined any specimens from the Yucatan Peninsula.

Argia fulgida Navás, 1934

Figs. 9, 10 (head ♂); 24 (labrum ♀); 25 (labrum ♂); 55, 56 (head, thorax, S1–4 ♂); 197, 198 (head, thorax, S1–4 ♀); 312, 313 (S7–10 ♂); 428, 429 (S7–10 ♀); 521 (mesostigmal plates ♀); 612 (genital ligula); 683 (appendages ♂); 791 (map); 953 (body scan ♂); 954 (body scan ♀).

[Key locators: ♂ G-4, couplets 3(2), 6'; ♂ M-1, couplets 2(1), 5'; ♀ F-13, couplet 4'; ♀ shortcut 6]

Argia fulgida: Navás 1934a: 137 (♂ description, Muzo, Colombia, July 1918);—Mauffray & Tennesen 2019 (Ecuador, photo ♂);—Paulson & Haber 2021: 85 (diagnosis, photos).

Argia cuprea: Brooks 1989: 50 (Costa Rica, misidentification);—Donnelly 1992: 83 (Panama, misidentification);—Donnelly 1995: 18 (Costa Rica, misidentification);—Ramírez *et al.* 2000: 249 (Costa Rica, misidentification);—Förster 2001: 11, 54, 58 (in part, Costa Rica, Panama, misidentification, key);—Esquivel 2005: 145 (in part, misidentification, comparison with *A. cupraurea*).

Primary types. *Argia fulgida*: holotype ♂, COLOMBIA, Muzo, VII. [19]18 [examined, in MNHN].

Specimens examined. 112 ♂♂, 49 ♀♀ (see Garrison & von Ellenrieder 2017 for additional material examined not listed here): **COSTA RICA, Alajuela:** 10 ♂♂, 1 ♀, 8 km S of Santa Cecilia, Estación Biológica Pitilla, shaded stream riffle {10.9891°N, 85.4258°W}, 680 m, July 1988, S. J. Brooks, [BMNH, CSCA, RWG]. **ECUADOR, Manabi:** 3 ♂♂, 2 ♀♀, Palmar {0.1658°S, 79.4665°W}, 200 m, 31 March–25 April 1935, D. B. Laddey [RWG, UMMZ]; **Santo Domingo de los Tsáchilas:** 1 ♂, Hacienda La Lorena, Santo Domingo de los Colorados, a station about 15 km E of Santo Domingo de los Colorados {0.3097°S, 79.0388°W}, 700 m, 6 March 1941, D. B. Laddey [RWG]; **Bolivar:** 3 ♂♂, stream 5 km E of Caluma {1.5942°S, 79.2308°W}, 480 m, 5 March 2010, K. J. Tennesen [FSCA, RWG]; **Cañar:** 1 ♂, Cochincay, 20.2 km E of province border on Highway 70, rocky stream {2.4676°S, 79.2849°W}, 200 m, 3 November 1997, W. F. Mauffray [FSCA]; **El Oro:** 1 ♂, Piedras {3.6333°S, 79.9168°W}, 300 m, 3–4 July 1941, D. B. Laddey [RWG]; **Loja:** 1 ♂, small stream on road from Gonzama to Cariamanga (W-739), 4.2364°S, 79.455°W, 1786 m, 18 January 2014, W. Haber, F. Morrison, R. Vargas, M. Veit & E. Wyman [RWG].

A medium-size species (Table 2); male with red eyes, a brilliant cupreous thoracic dorsum and dorsum of S1–7 largely black in Middle America (Figs. 55, 953; but not in all South American specimens, Fig. 56); female (Fig. 954) with mesostigmal lobe roundly arcuate (Fig. 521), its medial margin unmodified (Fig. 521e), and its tip extending slightly higher than pronounced mesepisternal tubercle.

Redescription. Navás' (1934a) original description of the holotype from Muzo, Colombia, which is brief, in Latin, and devoid of illustrations, is the only available description of this species. We provide here a redescription of the Middle American male color form and a first description of the female.

Male (Costa Rica: Heredia, **La Selva Biological Station**, 10 km SW of Horquetas, Figs. 9, 55, 312, 953): Entire face with metallic cupreous-red reflections except for the following: base of mandibles and genae dark orange, small postocular spots blue, small pale spot anterolateral to lateral ocellus; antennae black; rear of head including margin black except for narrow pale border along eye margin. Prothorax entirely metallic cupreous-red except for blue anterior lobe. Mesothorax with mesepisternum brilliant cupreous-red, mesepimeron and mesinfraepisternum metallic dark purple; metepisternum and metepimeron blue interrupted by dark stripe along metapleural suture.

Wings hyaline with venation black; Pt black, surmounting 1 cell in all wings; px Fw: 17/17, Hw 15/15; pq Fw 5/6, Hw 4/4; RP2 at Fw 8/8, Hw 7/7. Coxae and trochanters pale brown anteriorly becoming blue posteriorly; femora, tarsi and armature black, tibiae black. Abdomen mostly black; S1 black at basal 0.40 dorsally and laterally, remainder blue; S2 black dorsally, blue laterally, dorsal black with a rectangular extension laterally at basal 0.60, annulus black; S3 black with a narrow blue basal ring connecting below with a narrow pale lateral stripe extending to apical 0.30; S4–7 similar to S3 but pale lateral stripe reduced on S4, vestigial on S5 and absent on S6–7; S8 black except for dorsolateral blue spot on basal 0.60; S9–10 blue dorsally black laterally; torus pale, appendages black.

Genital ligula distal segment (as in Fig. 612) with dorsal membranous shield digit-like and broadly campanulate basally, ental process absent, ventrally with a stiff coiled bifid flagellum originating at base of hood, with two pairs of lateral lobes, the more basal pair including a small laterally extended lobe near flexure on each side, and the more apical pair represented by a flexible chitinated multispinose branch, arising from a narrow stem extending laterad of the ligula on each side.

Torus small, transversely oval, occupying entire ventral margin of torifer and not overlapping bilobed epiproct (as in Fig. 683c); base of epiproct and area around base black, apical portion of epiproct pale; cercus (as in Figs. 683a, c) robust, longer than wide, about subequal to paraproct, slightly convex dorsally, branched apically with distal margin of shorter outer branch ending at approximate right angle to longer slightly decumbent inner branch; in dorsal view (as in Fig. 683c), medial margin slightly convex basally, slightly concave distally; cercus ventrally concave; paraproct bilobed, its ventral branch narrow, bluntly pointed, its base at about 120° from acutely pointed anteriorly directed dorsal branch.

Dimensions. Hw 22.8, abdomen 30.0, total length 40.0.

Female (Ecuador: Bolivar, Playas de San Juan Montalvo, near Balzapamba, Figs. 197, 428). Head: labrum with distal half ochre, basal half metallic cupreous-red (as in Fig. 24); anteclypeus ochre; postclypeus metallic cupreous with a pair of narrow ochre dorsolateral stripes basally; antefrons bisected medially by a black line connecting with dorsal black of postfrons, genae and base of mandibles pale ochre; postfrons and remainder of epicranium metallic cupreous; a pair of pale small spots anterolateral to lateral ocelli and postocular spots blue; rear of head black except for narrow pale border along eye margin. Prothorax metallic cupreous, anterior lobe pale blue, lateral 0.20 of posterior margin of hind lobe and propleuron pale ochre. Pterothoracic dorsum black with cupreous reflections and with a pale ochre antehumeral stripe about a fourth as wide as dark middorsal, the former widening slightly ventrally; entire metepimeron metallic cupreous, interrupted above with a pair of small pale ochre spots, mesinfraepisternum with anterior 0.70 black, remainder ochre; metathorax ochre except for narrow black stripe at metapleural suture; venter of thorax ochre. Wings hyaline with venation black; Pt black, surmounting 1 cell in Fw and right Hw, 1.5 in left Hw; px Fw: 14/15, Hw 12/12; pq Fw 5/5, Hw 4/4; RP2 at Fw 6/7, Hw 6/6. S1 pale olive with basal ring of black and with narrow posterior black ring; S2 largely black with cupreous metallic reflections with narrow pale middorsal line ending at apical 0.20, laterally pale with a narrow brown stripe and followed below by a narrower pale longitudinal stripe bordering ventral margin, annulus black; S3–7 similar to S2; S8 like S7 but pale lateral stripe slightly expanding posteriorly, posterior portion of sternum pale; S9 similar to S8 but with dorsal black divided middorsally forming a pair of lobes ending at apical 0.60 and with pale blue area connecting with pale lateral stripe, S10 largely pale blue; cerci black, ovipositor pale except for black ventral margin.

Mesostigmal lobe (as in Fig. 521) erect, forming a prominent upright lobe occupying medial 0.40 of slightly raised plate; medial margin of lobe well separated from branching middorsal carina by a low carina extending from medial base of lobe; medial margin of lobe not recurved in mediolateral view (as in Fig. 521e); mesostigmal lobe accompanied by a well-developed mesepisternal tubercle posterodistal to outer margin of erect lobe (as Figs. 521a, b, c, e).

Dimensions. Hw 24.0, abdomen 28.8, total length 37.6.

Diagnosis. *Argia fulgida* was diagnosed and keyed with other metallic red species for Middle America by Garrison & von Ellenrieder (2017) and is diagnosed under *A. cuprea*.

Remarks. The similarity of male appendages and overall coloration led earlier authors to identify specimens of this species from Costa Rica and Panama as *A. cuprea*. Garrison & von Ellenrieder (2017) noted that the Central American populations (Fig. 791) resemble the more northerly *A. cuprea* (Fig. 790), while most (but not all) specimens from South America are largely blue (Fig. 56).

Distribution. *Argia fulgida* extends from Costa Rica and Panama south to Colombia and Ecuador west of the Andes (Fig. 791). In Middle America its elevation ranges from 78 to 750 m.

Argia fumipennis violacea (Hagen, 1861)

Figs. 57, 58 (head, thorax, S1–4 ♂); 59, 60 (thorax ♂); 199 (head, thorax, S1–4 ♀); 314, 315 (S7–10 ♂); 430 (S7–10 ♀); 522 (mesostigmal plates ♀); 613 (genital ligula); 684, 685 (appendages ♂); 787 (map); 944, 945 (body scans ♂); 946 (body scan ♀).

[Key locators: ♂ G-2, couplet 10'; ♂ M-4, couplet 5(4'); ♀ F-7 couplet 4(3'); F-15 couplet 2']

Agrion violaceum Hagen, 1861: 90 (description of ♂, ♀);—Garrison & von Ellenrieder 2019: 47 (lectotype data).

Argia violacea: Hagen in Selys 1865: 404 [32 reprint] (redescription ♂, ♀);—Calvert 1902: 72, 74, 98 (key);—Calvert & Hagen 1902: 116 (pl. I, figs. 17, 17a, types in MCZ);—Kennedy 1902: 166 (key, pl. I, fig. 2, mesostigmal plates);—Gloyd 1958: 20 (Texas);—Cruden 1968: 209 (chromosome number);—Kiauta 1972: 82 (chromosome number).

Argia fumipennis violacea: Gloyd 1968b: 1 (synonymy of *A. fumipennis* with *A. violacea*);—Johnson 1972a: 86, 91 (key ♂, ♀);—Kiauta & Kiauta 1980: 39, 51 (cytotaxonomy and evolutionary history, figs. 8–15);—Bick & Bick 1982: 99 (behavior);—Pritchard 1982: 230 (summary of Kiauta & Kiauta 1980);—Justus *et al.* 1990: 146 (SEM mesostigmal plates);—González-Soriano & Novelo-Gutiérrez 1991: 77, 87 (key, first record for Mexico, Durango);—Novelo-Gutiérrez & González-Soriano 1991: 112, 125 (key, larva, diagnosis);—Novelo-Gutiérrez 1992: 43 (description & diagnosis larva, figs. 2, 19, 38, 56, 69, 77, 87);—Garrison 1994: 311 (key ♂, ♀, diagnosis, figs. 15, 43, 96, 74, 85, lectotype designated);—González-Soriano 1993: 295 (Mexico);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Abbott 2005a: 70 (♂, ♀, key, figs. 13, 15, photos 8a, 8b, distribution in New Mexico, Texas, Oklahoma);—Westfall & May 2006: 147, 189 (key, description, figs. 82F, 85E, 87D, 88B, 91D, 98I, 102B);—Behrstock *et al.* 2007a: 56 (as *A. fumipennis* from Chihuahua, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 127 (as *A. fumipennis*, Mexico);—Upton *et al.* 2007: 29 (Sonora, Mexico);—Behrstock 2009: 3 (Coahuila, Mexico);—Caesar & Wenzel 2009: 106 (phylogeny within genus *Argia*);—Escoto-Moreno *et al.* 2009: 154 (Aguascalientes, Mexico);—Paulson 2009: 151 (♂, ♀, description, diagnosis, photos);—Abbott 2011: 138 (♂, ♀, figs., diagnosis, distribution in Texas);—Paulson 2011: 155 (♂, ♀, description, diagnosis, photos);—Escoto-Moreno *et al.* 2014: 1051 (Hidalgo, Mexico);—Bailowitz *et al.* 2015: 110 (diagnosis, photos);—Escoto-Moreno *et al.* 2015: 153 (Zacatecas, Mexico);—Torres-Pachón *et al.* 2017: 417 (molecular phylogeny of larvae within *Argia*);—García-Miranda & Carrillo-Muñoz 2021: 335 (Puebla, Mexico).

Primary types. *Argia violaceum*: lectotype ♂, U. S. A., Virginia, Berkeley Springs, Osten Sacken leg. The type locality is in the present state of West Virginia (Roble 1994). [examined, in MCZ; Garrison 1994; Garrison & von Ellenrieder 2019].

Specimens examined. 140 ♂♂, 39 ♀♀: **U. S. A., New Hampshire:** 1 ♂, Groton, Spectacle Pond, boat ramp area on NW corner, 43.7132°N, 71.8336°W, 254 m, 26 July 2007, S. D. Gaimari [RWG]; **Ohio:** 1 ♂, Worthington {40.078°N, 83.0318°W}, 225 m, 20 June 1965, J. P. & L. Donahue [RWG]; **Nebraska:** 1 ♂, Niobrara Valley Preserve, at Nature Conservancy headquarters, Niobrara River, 29 mi E of Valentine, 42.7842°N, 100.028°W, 19 July 1998, R. W. & J. A. Garrison [MHNN]; 8 ♂♂, Boardman Creek at Road 16C, Merritt Reservoir State Recreation Area, W of Highway 97, about 26 mi SW of Valentine, 42.5825°N, 100.916°W, 18 July 1998, R. W. Garrison [RWG]; **New York:** 1 ♂, 1 ♀, Dryden Lake {42.4627°N, 76.2777°W}, 360 m, 27 August 1973, K. J. Tennessen [RWG]; 3 ♂♂, pond's edge, Hawkins Pond County Park, 42.0048°N, 75.6503°W, 425 m, 25 July 2019, R. W. Garrison, [RWG]; **New Jersey:** 1 ♀, small lake on Lacey Road near Whiting {39.9271°N, 74.3387°W}, 30 m, 19 August 1973, K. J. Tennessen, [RWG]; **West Virginia:** 2 ♂♂, 2 ♀♀ (lectotype and paralectotypes), Berkeley Springs {39.6270°N, 78.2272°W}, O. Sacken [MCZ]; 2 ♂♂, swamp on I-64, N of Clintonville, 37.9061°N, 80.6381°W, 730 m, 21 June 2002, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, Greenbrier River by Route 3, 37.6439°N, 80.8025°W, 751 m, 21 June 2002, R. W. Garrison & N. von Ellenrieder [CSCA]; 1 ♂, pond by Route 3, W of Hinton, 37.6841°N, 80.8842°W, 452 m, 21 June 2002, R. W. Garrison & N. von Ellenrieder [RWG]; 1 ♂, Greenbrier River at Alderson, 37.7253°N, 80.6436°W, 471 m, 22 June 2002, R. W. Garrison & N. von Ellenrieder [CSCA]; 3 ♂♂, 1 ♀, second creek on Highway 3, 4 km NW of Gap Mills, 37.5764°N, 80.42°W, 454 m, 22 June 2002, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; **Virginia:** 1 ♂, Beaverdam Dam, Leesburg, 39.0267°N, 77.5417°W, 20 August 2001, N. von Ellenrieder [CSCA]; 1 ♂, Richmond, Three Lakes Park, 37.6167°N, 77.4167°W, 22 August 2001, N. von Ellenrieder [CSCA]; **Oklahoma:** 1 ♂, 10 km N of Kenton, North Carrizo Creek Ledger #1611, 36.9956°N, 102.972°W, 1329 m, 3 June 2015, B. D. Smith-Patten & M. A. Patten [RWG]; 1 ♀, Doc Hollis Lake, Ledger #1570, 36.9897°N, 99.7914°E, 500 m, 10 May 2015, B. D. Smith-Patten & M. A. Patten [ONHI]; 1 ♀, Optima National Wildlife Refuge, Ledger #582, 36.6669°N, 101.1358°E, 840 m, 25 May 2013, B. D. Smith-Patten & M. A. Patten [ONHI]; 1 ♂, 3 km SSE of Perry, Perry Lake, Ledger #57, 36.2694°N, 97.2764°E, 320 m, 2 August 2009, B. D. Smith-Patten & M. A. Patten [ONHI]; 1 ♀, 10 km E

of Seminole, Sportsman Lake, Ledger #556, 35.2147°N, 96.5628°E, 260 m, 12 May 2013 [ONHI]; **Arkansas**: 2 ♂♂, small borrow pit at junction of US-270 & Farm Road 929 {34.7284°N, 94.0102°W}, 260 m, 30 May 1981, S. W. Dunkle [RWG]; **Alabama**: 1 ♂, 1 ♀, Champion Creek and Calvert Prong, N of Oneonta along Highway 75 {33.9858°N, 86.4423°W}, 230 m, 14 June 1984, R. W. Garrison [RWG]; 2 ♂♂, 1 ♀, Butler Creek County, Highway 61, 34.9858°N, 87.6156°W, 165 m, 15 June 1984, R. W. Garrison [RWG]; 1 ♂, 1 ♀, strip-mine pond No. 9, 7 July 1976, K. J. Tennessen [RWG]; **Georgia**: 1 ♂, Savannah River at South Carolina State line at Route 28 {33.5924°N, 82.1232°W}, 60 m, 30 August 1978, S. W. Dunkle [RWG]; **New Mexico**: 8 ♂♂, 4 ♀♀, Bottomless Lakes State Park, 33.3347°N, 104.333°W, 1063 m, 29 July–2 August 1984, R. W. & J. A. Garrison [RWG]; 9 ♂♂, 2 ♀♀, Sitting Bull Falls, Guadalupe Mountains, 32.2431°N, 104.696°W, 1386 m, 24 August 1998, R. W. & J. A. Garrison [RMNH, RWG]; **Texas**: 1 ♀, Christoval {31.1975°N, 100.493°W}, 15 July 1928, Jack Beamer [UMMZ]; 7 ♂♂, San Saba River, 0.7 mi E of Fort Mc Kavel by Highway 130, 30.8347°N, 100.0939°W, 637 m, 14 July 2001, N. von Ellenrieder & R. W. Garrison [CSCA, RWG]; 1 ♂, Limpia Canyon, 9.4 mi NE of Fort Davis on Highway 17, 30.6833°N, 103.7901°W, 1300 m, 31 July 1984, R. W. & J. A. Garrison [RWG]; 2 ♂♂, 2 ♀♀, Davis Mountains, Limpia Creek, 3 mi NE of Fort Davis by Highway 17, 30.6245°N, 103.865°W, 1450 m, 31 July 1984, R. W. Garrison [RWG]; 2 ♂♂, rest area by Highway 150, near Shepherd, Sam Houston National Forest, 30.55°N, 95.0832°W, 60 m, 28 July 1977, R. W. Garrison [MZB, RWG]; 3 ♂♂, Davis Mountains, Calamity Creek Ranch, 6.5 mi S of Fort Davis on Highway 17, 30.52°N, 103.941°W, 1500 m, 31 July 1984, R. W. & J. A. Garrison [RWG]; 2 ♂♂, 12 mi SE of Fort Davis, 30.4981°N, 103.753°W, 1349 m, 6 July 1980, J. E. Hafernik, Jr. [RWG]; 1 ♂, 1 ♀, clear stream about 15 mi S of Alpine on Highway 118 {30.1875°N, 103.58°W}, 1520 m, 26 July 1997, S. W. Dunkle [RWG]; 1 ♂, Little Hackberry, Route 55, 10 mi N Barbsdoke creek, 29.8406°N, 100.105°W, 529 m, 13 July 2001, N. von Ellenrieder [CSCA]; 2 ♂♂, Nueces River S of Barksdale on Route 55, 29.7211°N, 100.0341°W, 449 m, 22–23 July 1977, R. W. Garrison, [RWG]; 4 ♂♂, Frio River at Highway 1120, near Leahey, 29.6944°N, 99.7542°W, 460 m, 23 July 1977, R. W. Garrison [RWG]; **Arizona**: 1 ♂, Oak Creek, Sedona {34.8681°N, 111.76°W}, 1286 m, 19 June 1988, G. L. Harp [RWG]; 1 ♂, Agua Fria River at Bloody Basin Road, 5.2 mi E of I-17, Road 269, 34.2575°N, 112.064°W, 990 m, 1 August 1992, R. W. Garrison [RWG]; 7 ♂♂, 1 ♀, same data but 14 July 1998, R. W., J. A., P. A. & A. V. Garrison [BMNH, RMNH, RWG]; 5 ♂♂, Seven Springs Picnic Ground, about 12 mi N of Carefree, Tonto National Forest, 33.9675°N, 111.8647°W, 1012 m, 17 August 1974, R. W. Garrison [RWG]; 7 ♂♂, same data but 22 July 1984, R. W., J. A. Garrison & N. von Ellenrieder [CSCA, RWG]; 8 ♂♂, pond at St. David by Highway 80, 31.8906°N, 110.213°W, 1120 m, 22 July 1987, R. W. Garrison [RWG]; 5 ♂♂, 3 ♀♀, Mesa Draw, stream and associated habitats in Leslie Canyon by Leslie Canyon Road, 17 mi N of Douglas {31.5901°N, 109.508°W}, 1420 m, 6 August 1992, R. W. Garrison & J. Cole [RWG]; 4 ♂♂, same data but 22 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 2 ♂♂, 2 ♀♀, Patagonia Mts., Harshaw Creek, 31.51°N, 110.682°W, 1359 m, 23 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, Big Tank, about 4 mi NE of Ruby, 31.494°N, 111.185°W, 1300 m, 2 August 1993, Van Dam family [RWG]; 2 ♂♂, 1 ♀, Bog Hole, nr. Cattle pond, 31.4761°N, 110.63°W, 1544 m, 23 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 12 ♂♂, 7 ♀♀, Scotia Canyon, Coronado National Forest, Huachuca Mountains, 31.4492°N, 110.401°W, 1821 m, 24 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, 1 ♀, San Pedro River at Hereford Road, 31.4383°N, 110.108°W, 1267 m, 13 June 1984, S. W. Dunkle [CUMZ]; 3 ♂♂, 1 ♀, springs just E of San Bernardino Slaughter Ranch, 17 mi E of Douglas, 31.3347°N, 109.252°W, 1130 m, 24 July 1987, R. W. Garrison [RWG]; 1 ♂, 1 ♀, same data but artesian wells, ponds and Black Wash, 1140 m, 20 August 1987, S. W. Dunkle [RWG]; 1 ♂, San Bernardino Slaughter Ranch, Black Drough, 31.3342°N, 109.261°W, 1129 m, 21 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA]. **MEXICO, Durango**: 2 ♂♂, km 21 Camino Suchil-Reserva de la Biosfera La Michilia, Corralitos, 23.592°N, 104.066°W, 2006 m, 26 August 1987, E. González-Soriano [RWG]; **Jalisco**: 1 ♀, Teocaltiche, 21.4333°N, 102.5669°W, 1700 m, 23 August 1970, B. Villegas [UCD].

A medium-size species (Table 2), with violaceous male (Figs. 57–60, 315, 944, 945) and tan female (Fig. 946).

Diagnosis. Both sexes of *A. f. violacea* were diagnosed against *A. agrioides*, *A. leonorae*, *A. hinei*, *A. nahuana*, and *A. pallens* by Garrison (1994). Both sexes of all these species were fully described in Westfall & May (2006). The chief diagnostic characters among the six species, abstracted from Garrison (1994), are repeated below.

Fully adult males of *A. f. violacea* are largely violaceous, except for blue S9–10 (Figs. 57–60, 944, 945), not blue as in *A. agrioides* (Figs. 29, 942); the torus in *A. agrioides* (Fig. 662) is comparatively narrower than in *A. f. violacea* (Fig. 685); black markings on the sides of S8–10 are lacking or are reduced to small, incomplete streaks in

A. agrioides (Fig. 288), these marks are usually more extensive and often run the length of S8–10 in *A. f. violacea* (Figs. 314, 315). In *A. hinei*, the distal end of the cercus forms a transverse ventral costate ridge that is best seen in posterior view (Fig. 696d). In *A. f. violacea*, a well-defined tooth is present at the distal margin of the cercus (Figs. 684d, 685d). The apical margin of the upper branch of the paraproct in *A. hinei* (Fig. 696b) is rounded with a small anteapical tooth; no anteapical tooth is present in *A. f. violacea* (Fig. 684b). In *A. hinei*, dark lateral markings along S8–10 are restricted to a few areas along the posterior parts of S8–9 (Figs. 332, 935) but they tend to run the full length of S8–9 in *A. f. violacea* (Figs. 314, 315, 944, 945).

Male of *A. leonorae* is also blue (Fig. 937), is smaller (HW 15.7–17.3 mm) than *A. f. violacea* (HW 17.6–20.7 mm), and its fore wings almost always have only 3 Fw pq cells, compared to 4 in *A. f. violacea* (some specimens from Oklahoma have 3 Fw pq; Smith & Patten 2021). In *A. leonorae* the inner branch of the cercus is small and difficult to see, and the distal tooth is smaller than the inner branch when viewed posteriorly (Fig. 704d). In *A. f. violacea*, the inner branch is prominent, extends ventromesally, and the distal tooth is as prominent as the inner branch (Figs. 684d, 685d).

Male of *A. nahuana* is blue (Figs. 94, 95, 939, 940), the inner branch of cercus in posterior view is directed mesoventrally, and distance between tip of inner branch and tooth is about twice the distance between tooth and outer branch of cercus (Fig. 710d). *Argia f. violacea* is violaceous (Figs. 944, 945), the inner branch of the cercus in posterior view is directed ventrally, and the distance between outer branch and tooth is subequal to distance between tooth and inner branch of cercus (Figs. 684d, 685d).

Some males of *A. f. violacea* from Arizona and New Mexico are similar to *A. pallens*. The cerci will need to be relaxed and spread apart from the paraprocts, and the tips of the cerci must be cleaned with a fine brush so that the armature can be seen. The space between cerci in *A. f. violacea* in dorsal view is as wide as or narrower than width of each cercus at base, and tooth between inner and outer branches of cercus is not easily visible (Fig. 684c); in posterior view the tooth is separated from outer branch by a shallow concavity (Figs. 684d, 685d). In *A. pallens*, the space between cerci is wider than the width of each cercus at base, and the tooth between inner and outer branches of cercus is easily visible (Fig. 714c); in posterior view the tooth is separated from outer branch by a deep U-shaped concavity (Fig. 714d). In the field, *A. pallens* has a delicate pinkish-violet color (Figs. 103–105) unlike the strictly violaceous color in *A. f. violacea* (Figs. 57–60). Most (but not all, Figs. 58, 945) *A. f. violacea* have some black markings on the epicranium (Figs. 57, 944), and the humeral stripe is usually (but not always, Figs. 58, 59, 945) forked (Figs. 57, 60, 944). In *A. pallens*, the epicranium is usually entirely pale (Figs. 103, 104, 947), and the narrow humeral stripe is almost never forked (Figs. 103, 104, 947). Four males of *A. pallens* from Encarnación River in Jalisco, Mexico (Fig. 105) are the only ones we have seen that possess a forked humeral stripe.

The genital ligula of *A. f. violacea* is briefly characterized under *A. carlcooki* and is illustrated here (Fig. 612).

Females of *A. f. violacea* can be separated from *A. agrioides*, *A. hinei*, *A. leonorae*, *A. nahuana*, and *A. pallens* primarily by the morphology of the mesostigmal plates.

Female of *A. agrioides* differs from *A. f. violacea* in the morphology of the mesostigmal lobe where it meets the mesepisternum. In *A. agrioides*, this area is relatively undifferentiated, or there may be a low, slightly tumid area (Fig. 495e); but a well-defined tubercle is present in the same location for specimens of *A. f. violacea* from W United States and Mexico (Fig. 522e). The distal extremity of the lateral branch of the carina is in close proximity to the mesal margin of the mesostigmal lobe in *A. agrioides* (Fig. 495c). That of *A. f. violacea* is separated from the lobe by a distance about equal to the width of each lateral branch (Fig. 522c).

In *A. hinei* the mesostigmal lobe is narrower (Fig. 531b) and lacks a tubercle on its ventral surface, this area forming a concave juncture with mesepisternum (Fig. 531e); the mesostigmal lobe is broader (Fig. 522b) and has a ventral tubercle in *A. f. violacea* (Fig. 522e).

Females of *A. leonorae* are smaller (Hw 16.9–20.0 mm) and have 3 Fw pq, the ventral tubercle formed by recurved mesal margin of mesostigmal lobe ends at the medial margin of lobe in posterior view (Fig. 539e), and the black humeral stripe is a third or more as wide as pale antehumeral stripe (Fig. 220). Females of *A. f. violacea* are larger (Hw 19.3–22.1), have 4 Fw pq, the ventral tubercle formed by recurved mesal margin of mesostigmal lobe extends anterolaterally beyond the medial margin of lobe in posterior view (Fig. 522e), and black humeral stripe is less than a third as wide as pale antehumeral stripe (Fig. 199).

The mesostigmal plates in female of *A. nahuana* are transversely longer than the interval separating them (Figs. 547a, c), the mesal border of mesostigmal lobe is not recurved ventrally and forms a concave juncture with mesepisternum (Fig. 547e). In *A. f. violacea*, the mesostigmal plates are transversely shorter than the interval

separating them (Figs. 522a, c) and the mesal border of mesostigmal lobe is recurved ventrally forming a tubercle appressed against anterior margin of mesepisternum (Fig. 522e).

The ventral tubercle formed by recurved mesal margin of mesostigmal lobe in *A. f. violacea* is usually visible in dorsal view (Figs. 522c, d) and the black humeral stripe is usually forked (Fig. 199), whereas in *A. pallens* the ventral tubercle formed by recurved mesal margin of mesostigmal lobe is not visible in dorsal view (Figs. 554c, d) and the black humeral stripe is not forked (Fig. 234).

Remarks. Specimens of *A. f. violacea* from the Bottomless Lakes in New Mexico have the most reduced black markings of any that we have seen and are similar in markings to *A. pallens*, with almost no markings on the epicranium (Figs. 58, 945).

Distribution. This is a common and widespread subspecies in much of the United States, and much has been published on it. There are fewer records for Mexico, from Sonora, Chihuahua, Coahuila, Durango, and Jalisco south to Hidalgo (Fig. 787) although it is probably more widespread. In Mexico, it is found at altitudes between about 450 and 2300 m (Behrstock 2009).

Argia funcki (Selys, 1854)

Figs. 61–63 (head, thorax, S1–4 ♂); 200 (head, thorax, S1–4 ♀); 273 (wings ♂); 316–318 (S7–10 ♂); 431 (S1–4 ♀); 523 (mesostigmal plates ♀); 614 (genital ligula); 686 (appendages ♂); 780 (map); 808 (field photo ♂, ♀); 809 (field photo ♀); 810 (field photo ♂); 917, 918 (body scans ♂); 919 (body scan ♀).

[Key locators: ♂ G-2, couplet 8(7'); ♂ M-5, couplet 10'; ♀ F1, couplet 1; ♀ shortcut 5]

Hyponeura funcki Selys 1854: 275 (brief description ♂, ♀);—Selys 1865: 381 (9 reprint) (description ♂, ♀);—Calvert 1901: 67 (description ♂, ♀, comparison with *H. lugens*);—Calvert & Hagen 1902: 105 (types in RBINS).

Argia funckii: Gloyd 1968a: 272 (synonymy of *Hyponeura* Selys, diagnosis of *A. funckii* from *A. lugens* & *A. moesta*);—Paulson 2002a: cover photo.

Argia funcki: Paulson 1982: 252 (Mexico, Guatemala);—Mendoza Trejo & González-Soriano 1989: 138 (Mexico City, Mexico as per Calvert 1901);—González-Soriano 1993: 295 (Mexico);—Peña-Olmedo & Novelo-Gutiérrez 1993: 123, 138 (key ♂, ♀, Hidalgo, Mexico, figs. 37, 60);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Paulson 2002b: 362 (Nayarit, habits, possible geographic variation);—Esquivel 2005: 286 (Mexico, Guatemala);—Novelo-Gutiérrez & Gómez-Anaya 2006: 261 (description of larvae, habits, comparison with *A. lugens*, Hidalgo, Michoacán, Mexico);—Westfall & May 2006: 190 (key, description ♂, ♀, larva, fig. 104.2);—Upton *et al.* 2007: 30 (Sonora, Mexico);—von Ellenrieder & Garrison 2007a: 5, 16 (mention of likely error in type locality; 2 ♂♂, 1 ♀ syntypes in RBINS examined);—Caesar & Wenzel 2009: 101 (phylogeny within genus *Argia*);—Gómez-Anaya & Novelo-Gutiérrez 2010: 292 (Michoacán, Mexico);—González-Soriano & Paulson 2011: 307 (Chiapas, Mexico);—Escoto-Moreno *et al.* 2014: 1051 (Hidalgo, Mexico);—Bailowitz *et al.* 2015: 112 (diagnosis, photos);—Torres-Pachón *et al.* 2017: 413 (molecular phylogeny of larvae within *Argia*);—Rangel-Sánchez *et al.* 2018: 924 (estimated range in Mexico).

Primary types. *Argia funcki*: Syntypes 2 ♂♂, 1 ♀, COLOMBIA, Cumana, Nicholas Funck leg. [examined, in RBINS; von Ellenrieder & Garrison 2007a; locality in error, see remarks].

Specimens examined. 48 ♂♂, 44 ♀♀: 2 ♂♂, 1 ♀ (syntypes), “Cumaná” [locality in error; see remarks], N. Funck [RBINS]; **MEXICO, Sonora:** 2 ♂♂, 1 ♀, E of Yecora on Highway 16, near km 296, Rancho Cañada Ancha, IORI # 00066986 {28.4414°N, 108.541°W}, 1460 m, 19 July 2006, S. W. Dunkle [FSCA, RWG]; 1 ♂, same data but near Chihuahua border, Arroyo Los Pilares near Puente El Castillo, IORI # 00066978 {28.3667°N, 108.917°W}, 1310 m, 19 July 2006, S. W. Dunkle [FSCA]; 4 ♂♂, 1 ♀, Maycoba River 13 mi W of Maycoba at San Francisco Bridge {28.3758°N, 108.761°W}, 1229 m, 22 August 1986, R. Baumann & B. Kondratieff [RWG]; 2 ♂♂, 1 ♀, same data but 29 June 1987 [BYU, RWG]; 1 ♂, same data but 21 August 1987 [RWG]; 1 ♀, El Trigo de Colón, S of km 296 on Highway 16, IORI # 00066968 {28.3092°N, 108.793°W}, 1399 m, 20 July 2006, S. W. Dunkle [FSCA]; **Chihuahua:** 1 ♂, 2 ♀♀, Riito, 10 mi E of Yepachic, Highway 16 {28.4369°N, 108.477°W}, 1517 m, 28 June 1987, B. Kondratieff & R. Baumann [BYU, RWG]; **Zacatecas:** 1 ♂, Presa Las Tuzas, Nochistlán {21.3771°N, 102.851°W}, 1887 m, 17 August 1992, B. & C. Villegas [RWG]; **Nayarit:** 1 ♂, Río El Limón, 6.3 km W of Santa María del Oro {21.3403°N, 104.632°W}, 1100 m, 18 September 2001, D. R. Paulson & N. Smith [RWG]; **Jalisco:** 1 ♂, 1 ♀, rocky stream in rocky hills N of Guadalajara on Highway 41 at km 7–8 {20.777°N, 103.399°W}, 1493 m, 4 August 1966, R. W. Cruden [RWG]; **Michoacán:** 4 ♂♂, 2 ♀♀, El Sabino, 20 mi SSE of Uruapán {20.0081°N, 102.3169°W}, 1560 m, 27–28 July 1936, H. D. Thomas [RWG, UMMZ]; 2 ♂♂, Villa Victoria, 18.7561°N, 103.373°W, 770 m,

19 August 2005, R. Novelo & J. A. Gómez [RWG]; 2 ♂♂, 3 ♀♀, La Chichihua, 18.7469°N, 103.223°W, 1127 m, 4 June–10 July 2005, R. Novelo & J. A. Gómez [RWG]; **Veracruz**: 1 ♀, Cascada Texolo, Teocelo, 19.4014°N, 96.9943°W, 1065 m, 3 May 1980, R. Lopez [UMMZ]; 1 ♀, Barranca de Cayoapa, Tejería, Teocelo, 19.3733°N, 96.9267°W, 900 m, 2 May 1980, R. Lopez [UMMZ]; 1 ♂, same data but 9 June 1981 [UMMZ]; **Guerrero**: 1 ♂, Taxco {18.5564°N, 99.605°W}, 1768 m, 30 June 1935, A. Earl Pritchard [RWG]; 1 ♀, Tierra Colorada {17.1621°N, 99.5223°W}, 270 m, 15 August 1938, L. J. Lipovsky [UMMZ]; **Chiapas**: 1 ♀, El Chorreadero {16.7556°N, 92.9725°W}, 720 m, 11 May 1970, R. G. Wind [FSCA]. **GUATEMALA, Zacapa**: 1 ♂, Río Las Cañas near Jones, 71x024 {15.0167°N, 89.3332°W}, 514 m, 22 July 1971, T. W. Donnelly [FSCA]; **Guatemala**: 1 ♂, Agua Caliente {14.7467°N, 90.3242°W}, 900 m, 1 June 1909, E. B. Williamson [UMMZ]; **Chiquimula**: 1 ♂, 1 ♀, 7 km NNW of Olopa, small stream, 62x088 {14.7265°N, 89.3312°W}, 1410 m, 6 July 1962, T. W. Donnelly [FSCA]; 19 ♂♂, 24 ♀♀, El Fiscal {14.7217°N, 90.3917°W}, 1120 m, 3–6 June 1909, E. B. Williamson [CSCA, Haomaio Zhang, RWG, UMMZ]. **EL SALVADOR, Morazán**: 2 ♀♀, Río Negro, Perquín {13.95°N, 88.1668°W}, 1028 m, 10 May 1998, V. Hellebuyck [RWG].

Largest known species of *Argia* (Table 2), with brick-red (N populations, Figs. 62, 63, 808, 810, 917, 918) or obscure chalky brown (S populations, Fig. 61) male, and female (Figs. 808, 809, 919) with posteromesal margin of mesostigmal plate with narrow mesostigmal lobe directed posterolaterally (Fig. 523c).

Diagnosis. Both sexes were fully described in Westfall & May (2006). Both sexes are easily recognized by their large size (♂: Hw 31.3–36.1; TL 50.4–58.9; ♀: Hw 34.1–38.9; TL 51.2–58.3) and thoracic pattern (Figs. 63, 431, 917–919), and can only be confused with the smaller (♂: Hw 27.3–31.5; TL 42.3–49.5; ♀: Hw 29.1–32.5; TL 45.5–48.3) *A. lugens* (Figs. 914, 915) and possibly *A. moesta* (Figs. 910–913). Gloyd (1968a) noted the similarity between *A. funcki*, *A. lugens* and *A. moesta* and provided diagnostic characters to distinguish among them. Males of all three species share a similar genital ligula morphology with the distal segment in the form of a strap-like process (Figs. 614, 623, 626). The lateral lobes of *A. funcki* are quadrate (Fig. 614a), in *A. lugens* digitiform (Fig. 623a), and falcate in *A. moesta* (Figs. 626a, c). The distal segment of the genital ligula in *A. moesta* ends in a narrow strap-like process (Fig. 626b); this structure is broad in *A. funcki* (Fig. 614b) and *A. lugens* (Fig. 623b). Westfall & May (2006) noted that the ventral margin of tergum of S2 in *A. funcki* is distinctly angulate in posterior half but is broadly convex in posterior half in *A. lugens*, but our examination of this structure shows overlap (Figs. 61–63, 84, 85), and we do not consider it to be a good specific diagnostic character.

The posteromesal margin of mesostigmal plate has a narrow mesostigmal lobe directed posterolaterally in females of *A. funcki* and *A. lugens*. In addition to the different sizes of the adults, the posterior lobe of mesostigmal plate is relatively short and broad, about two times as long as wide in *A. funcki* (Fig. 523c) and relatively longer and narrower, about three times as long as wide (Fig. 540c), in *A. lugens*. The mesostigmal lobe in *A. moesta* is small, broadly arcuate and extends posterolaterally (Figs. 543c, d), with a short arcuate ridge overlying its median portion.

Remarks. The type locality of *Hyponeura funcki* is stated by Selys (1865) to be “Cumana en Colombie, par M. Funck. (Collect. Selys.)” González-Soriano & von Ellenrieder (2009) have shown that the type locality for this species, as well as for two other non-South American species (*Amphipteryx agrioides* Selys and *Hetaerina majuscula* Selys), most likely is Veracruz or Puebla in Mexico.

Paulson (2002) noted the brick-red coloration in males of this species from Nayarit: “No other species of *Argia* shows red coloration except for a series of red-eyed, copper-thoraxed species typified by *A. oenea* and *A. cuprea*, so this is a chromatically unique species in this very large genus. *A. funcki* was described as largely black, although Selys (1865) described the pale colors of the type as “marron” (= chestnut). Calvert (1901–08), who examined large series, made no mention of red coloration. A male in my collection from Chiapas is largely black, with all pale areas brown and much less extensive than in the red individuals from Nayarit. However, several colleagues (S. Dunkle, R. Garrison, E. González, R. Novelo, in litt.) reported red as well as black specimens of the species, although the two types apparently have not been collected together. The differently colored individuals seem identical in size and structure, and if they are not different species, then they represent a fascinating case of geographic or ecological variation.”

We have examined specimens that seem to be intermediate in color between the more northerly and southerly populations as shown in Fig. 62. Our illustration of the appendages (Fig. 686) of a Guatemalan male has a set of small teeth bordering the anterior margin of the torifer. These teeth are lacking in males we have examined from Jalisco, Nayarit, Sonora, and Zacatecas, but they may be absent (N=6) or present (N=1), though small, in males from Michoacán. The teeth are present in one male from Guerrero as well as in all males from Guatemala.

Caesar & Wenzel (2009) in their molecular phylogeny reported *A. funcki* and *A. lugens* as the basal clade to all other mainly North American species of *Argia* they sequenced. Torres-Pachón *et al.* (2017) also considered these two sister species based on a combination of morphological and mitochondrial genes of larvae, though this clade was not considered basal to the genus *Argia*. We agree that these two species are likely sister species based on adult morphological characters.

Habitat. *Argia funcki* inhabits shallow, rocky streams, where mature larvae are found close to the edge, in areas with abundant cobble and where the water flow is very slow or absent (Novelo-Gutiérrez & Gómez-Anaya 2006). Mature larvae are apparently present only during a brief period of the dry season (late March to early April), at least in Río Pinolapa (Michoacán); during this time, they are separated from each other in isolated, small pools formed by water evaporation at the stream edges. This isolation probably helps them to avoid predation by fish, which were very abundant at the central, mainstream, water flow. No *A. funcki* larvae were found in the latter microhabitat (Novelo-Gutiérrez & Gómez-Anaya 2006).

According to Paulson (2002), males were present in small numbers at the Río El Limón, mostly perching on twigs and other structures well above (up to 8 m) and often at some distance from the river. On only a few occasions did a male fly down and perch on rocks near the shore, where four other species of *Argia* were seen. The males of this large species had a bouncy flight over the river typical of *Argia*, then would glide down to a perch on set wings raised at about a 45° angle, possibly a display flight. Two females were seen at the Río El Limón, a brown one in tandem with a red male, and one with bright blue thorax that from its size was surely this species; neither could be collected. The blue female foraged by flycatching from twig tips 3–5 m above the ground. At a sandy and rocky stream in Oaxaca (14 mi E of El Camarón) D. R. Paulson (pers. comm.) observed *A. funcki* resting on rocks and sailing over pools and falls at bridge, occasionally flying up apparently after insects before gliding back to the rocks. The stream in the canyon was interspersed with xerophytic trees, elephant ears (*Colocasia esculenta* (L.)) and emergent and submergent aquatic vegetation.

Distribution. *Argia funcki* ranges from Sonora in Mexico south into El Salvador (Fig. 780). We have seen no specimens between Sonora and Nayarit, though this may be due to a lack of collecting. Most records are from the W states of Mexico (Nayarit, Jalisco, Michoacán), and although there are records from Hidalgo and central Veracruz, the species is not known from NE Mexico. *Argia funcki* largely replaces *A. lugens* in central Mexico (Nayarit, Hidalgo and Zacatecas), although both species are known from Sonora and Hidalgo. It ranges in elevation from 270 to 1887 m.

Argia funebris (Hagen, 1861)

Figs. 64–67 (head, thorax, S1–4 ♂); 68 (thorax ♂); 201 (head, thorax, S1–4 ♀); 319–322 (S1–10 ♂); 432 (S7–10 ♀); 491 (pronotum ♀); 524 (mesostigmal plates ♀); 615 (genital ligula); 687–689 (appendages ♂); 758–760 (type labels); 772 (map); 811 (field photo ♂); 887–890 (body scans ♂); 891 (body scan ♀).

[Key locators: ♂ G-1, couplet 10(9'); ♂ M-6, couplet 6(4'); ♀ F-11, couplet 10(9)]

Agrion funebre Hagen 1861: 92 (description ♂);—Garrison & von Ellenrieder 2019: 32 (syntype data).

Argia funebris: Hagen in Selys 1865: 398 [26 reprint] (redescription ♂ “Vera-Cruz, par M. Sallé (Collect. de Selys, Hagen). Mexique, musée de Berlin, par Deppe.”);—Calvert 1902: 97 (key ♂, brief description of MCZ type, pl. IV, figs. 1, 59);—Calvert & Hagen 1902: 109 (pl. I, figs. 4, 4a, type in MCZ);—Calvert 1907: 375 (reference to Calvert & Hagen 1902);—Calvert 1908b: 694 (note on *A. funebris*);—Kennedy 1915: 274 (comparison with *A. emma* n. sp., figs.);—Paulson 1982: 253 (Mexico);—Kiauta 1972: 82 (chromosome number);—Kiauta & Kiauta 1980: 39 (chromosome number);—Paulson 1982: 252 (Mexico);—Westfall 1986: 116 (El Salvador);—González-Soriano 1993: 295 (Mexico);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Förster 2001: 11, 56 (key ♂, fig. C24);—González-Soriano & Novelo-Gutiérrez 2007: 127 (Mexico).

Argia vivida var. *plana* Calvert (Hagen ms.) 1902: 96 (description ♂, ♀, comparison with *A. funebris*, pl. IV, fig. 58);—Kimmins 1970: 190 (holotype type data listed);—von Ellenrieder & Garrison 2007a: 22 (holotype ♂ examined). **New Synonymy.**

Argia (Heliargia) funebris: Kennedy 1920: 85 (in *Heliargia* new subgenus).

Argia (Heliargia) plana: Kennedy 1920: 85 (in *Heliargia* new subgenus).

Argia spegazzinii Navás 1934b: 69 (description ♂);—Garrison 1994: 328 (synonymy with *A. plana*).

Argia plana: Gloyd 1958: 19 (raised to full species, fig.);—Bick & Bick 1968: 197 (demography);—Bick & Bick 1971: 146 (behavior of unpaired males);—Johnson 1972a: 85, 89 (key ♂, ♀, figs.);—Bick & Bick 1978: 6 (wing clapping);—Bick

& Bick 1981: 265 (heterospecific pairing with *A. moesta*);—Paulson 1982: 253 (U. S. A., Mexico);—Mendoza Trejo & González-Soriano 1989: 138 (Mexico, Mexico);—Justus *et al.* 1990: 149 (SEM mesostigmal plates, figs. 4B, 5B);—Westfall 1990: 64 (description of larva, habits, fig. 2);—González-Soriano & Novelo-Gutiérrez 1991: 77, 78, 88 (key ♂, ♀, figs. 14, 40, 43, Durango, Mexico);—Novelo-Gutiérrez & González-Soriano 1991: 112 (key, figs. 23, 32);—Novelo-Gutiérrez & Peña-Olmedo 1991: 130 (Hidalgo, Mexico);—Novelo-Gutiérrez 1992: 65 (description and diagnosis larva, figs. 8, 21, 40, 76, 92);—González-Soriano 1993: 295 (Mexico);—Peña-Olmedo & Novelo-Gutiérrez 1993: 131 (key ♂, ♀, figs. 44, 61);—Garrison 1994: 295, 302, 327 (key ♂, ♀, diagnosis, figs. 32, 33, 62, 79, 110);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Abbott & Stewart 1998: 207 (U. S. A., Mexico);—Förster 2001: 11, 56 (key ♂, fig. C24);—Abbott 2005a: 58, 62, 64, 81 (♂, ♀, key, description, diagnosis, figs. 14, photos 10a, 10b);—Westfall & May 2006: 146, 152, 158, 208 (keys, description ♂, ♀, larva, figs. 71, 74C, 78B, 84A, 86B, 99I, 103E);—Behrstock *et al.* 2007a: 57 (Chihuahua, Mexico);—Behrstock *et al.* 2007b: 30 (Tamaulipas, Mexico);—Campbell & Novelo-Gutiérrez 2007: 87 (Hidalgo, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Upson *et al.* 2007: 32 (Sonora, Mexico);—Behrstock 2009: 3 (Coahuila, Mexico);—Caesar & Wenzel 2009: 106 (phylogeny within genus *Argia*);—2009 Escoto-Moreno *et al.* 2009: 154 (Aguascalientes, Mexico);—Paulson 2009: 164 (♂, ♀, description, diagnosis, fig., photos 98.1, 98.2);—Abbott 2011: 130 (♂, ♀, figs, diagnosis, distribution in Texas);—González-Soriano *et al.* 2011: 184 (San Luis Potosí, Mexico);—Paulson 2011: 159 (♂, ♀, description, diagnosis, fig., photo 84);—Bailowitz *et al.* 2015: 140 (diagnosis, photos);—Escoto-Moreno *et al.* 2015: 153 (Zacatecas, Mexico);—Escoto-Moreno *et al.* 2017: 386 (Hidalgo, Mexico);—Torres-Pachón *et al.* 2017: 414 (molecular phylogeny of larvae within *Argia*);—Escoto-Moreno *et al.* 2020: 237 (Veracruz, Mexico);—Ortega-Salas & González-Soriano 2019: 120 (Coahuila, Mexico).

Argia plana?: 2011 González-Soriano & Paulson 2011: 307 (Chiapas, Mexico).

Primary types. *Agrion funebre*: lectotype ♂ by present designation, MEXICO, Deppe leg. (Fig. 758) [examined, in MCZ; Garrison & von Ellenrieder 2019];—*Argia vivida plana*: holotype ♂, MEXICO, Sierra de las Aguas Escondidas, Guerrero, 7000 ft., July, H. H. Smith leg. (Fig. 759) [examined, in BMNH; Kimmins 1970; Garrison 1994];—*Argia spegazzinii*: holotype ♂, MEXICO, S. Juan Sentuhuacán [probably San Juan Teotihuacán], 14.XI.1931 (Fig. 760) [examined, in MNHN].

Specimens examined. 431 ♂♂, 173 ♀♀: **U. S. A., Nebraska:** 1 ♂, road W of Smith Falls State Park on Niobrara River, 4 mi S of Route 12, 42.895°N, 100.322°W, 19 July 1998, R. W. & J. A. Garrison [RWG]; **Missouri:** 1 ♂, Kay Branch fen, 37.5362°N, 91.2911°W, 365 m, 21 June 2016, B. D. Smith-Patten [ONHI]; 1 ♂, 1 ♀, Markham Spring Run {36.979°N, 90.6037°W}, 127 m, 9 July 1981, S. W. Dunkle [RWG]; **Colorado:** 1 ♂, Trinidad Lake State Park, Reilly Canyon creek, 37.1314°N, 104.608°W, 1898 m, 13 July 2016, B. D. Smith-Patten [ONHI]; **Oklahoma:** 1 ♂, 13 km W of Buffalo, Doby Springs Park, 36.8292°N, 97.7743°W, 330 m, 18 May 2015, B. D. Smith-Patten & M. A. Patten [RWG]; 6 ♂♂, Lake Ponca, 36.7201°N, 97.0265°W, 293 m, 15 October 2014, B. D. Smith-Patten & M. A. Patten [RWG]; 1 ♀, Mooreland {36.432°N, 99.2022°W}, 573 m, 12 June 1960, R. L. Fischer [RWG]; 1 ♂, 3 km SSE of Perry, Perry Lake (in tandem with ♀ of *Argia apicalis*), 36.2694°N, 97.2764°E, 320 m, 2 August 2009, B. D. Smith-Patten & M. A. Patten [ONHI]; 1 ♂, 3 km SSE of Pink, Bullfrog Creek, 35.2328°N, 97.1065°W, 307 m, 31 August 2013, B. D. Smith-Patten & M. A. Patten [RWG]; 1 ♂, Elmore City Lake, 35.2147°N, 96.5628°E, 260 m, 11 September 2011, B. D. Smith-Patten & M. A. Patten [ONHI]; 1 ♂, 15 km N of Hollis; Lake Hall, 34.8326°N, 99.9236°W, 550 m, 19 June 2015, B. D. Smith-Patten & M. A. Patten [RWG]; 1 ♀, Grassy Slough Wildlife Management area, 33.7923°N, 94.7507°W, 108 m, 2 August 2009, M. A. Patten [ONHI]; **Texas:** 7 ♂♂, 4 ♀♀, Fort McKavet State Historic Park, small, shaded stream, 36.826°N, 100.11°W, 652 m, 14 July 2001, N. von Ellenrieder [MHNN, RMNH, RWG]; 1 ♀, Cottonwood Creek at Morton Vail Road, Plano-Parker {33.0505°N, 96.6536°W}, 160 m, 23 April 1994, S. W. Dunkle [RWG]; 4 ♂♂, Limpia Canyon, 9.4 mi NE of Fort Davis on Highway 17, 30.6833°N, 103.7901°W, 1300 m, 31 July 1984, R. W. & J. A. Garrison [RWG]; 6 ♂♂, 3 ♀♀, Davis Mtns. Calamity Creek Ranch, 6.5 mi south of Ft. Davis on Hwy 17, 30.52°N, 103.941°W, 1500 m, 31 July 1984, R. W. & J. A. Garrison [BMNH, RWG]; 2 ♂♂, Ojito Adentro, cottonwood oasis and waterfall on Bofecillos Creek, Big Bend Ranch State Park {29.4916°N, 104.0611°W}, 1267 m, 27 July 1997, S. W. Dunkle [RWG]; 1 ♀, N of Saucedo Headquarters, Big Bend Ranch State Park {29.4728°N, 103.958°W}, 1260 m, 27 July 1997, S. W. Dunkle [RWG]; **New Mexico:** 1 ♂, 1 ♀, dry marsh on frontage road just N of Wagon Mound, 36.0247°N, 104.696°W, 1890 m, 22 July 1998, R. W. & J. A. Garrison [RWG]; 1 ♀, Tunnel Spring, Cibola National Forest, 35.2908°N, 106.439°W, 1958 m, 21 July 2016, B. D. Smith-Patten [ONHI]; 1 ♂, 1 ♀, Otero Canyon, Cedro Nature Trail; Cibola National Forest, 35.0324°N, 106.363°W, 2128 m, 22 July 2016, B. D. Smith-Patten [ONHI]; 4 ♂♂, 3 ♀♀, Tularosa River just E of Aragon on Highway 12, 33.8878°N, 108.518°W, 2069 m, 28 July 1984, R. W. & J. A. Garrison [BMNH, ONHI, RWG]; 2 ♂♂, 2 ♀♀, same data but 4 August 1995, R. W., J. A. & P. A. Garrison [RWG]; 1 ♂, same data but 26 July 1987, R. W. Garrison [RWG]; 1 ♂, Aragon, 33.8881°N, 108.518°W, 2069 m, 20 August 2002, J.A., R.W. Garrison,

N. von Ellenrieder, [CSCA]; 2 ♂♂, 1 ♀, Tula Rosa River, Apache Creek, 33.8297°N, 108.627°W, 1963 m, 20 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, 1 ♀, stream at Highway 380 and Road B27, E of Capitan, 33.5238°N, 105.465°W, 1818 m, 29 July 1984, R. W. & J. A. Garrison [RWG]; 1 ♂, Rio Hondo at Highway 395, E of Hondo, 33.3708°N, 104.399°W, 1050 m, 29 July 1984, R. W. & J. A. Garrison [RWG]; 1 ♂, Sapillo Creek at Highway 15, 25 mi N of Silver City, 33.0408°N, 108.217°W, 1770 m, 7 August 1995, R. W., J. A. & P. A. Garrison [RWG]; 2 ♀♀, Cherry Creek, by Highway 15, 13 mi N of Silver City, 32.8625°N, 108.839°W, 2133 m, 7 August 1995, J. A. Garrison [RWG]; 1 ♂, Mangas Springs at Blacksmith Canyon on Route 180, NW of Silver City, 32.8426°N, 108.512°W, 1445 m, 5 August 1995, R. W. Garrison [RWG]; 3 ♂♂, 1 ♀, Gila River at Red Rock, 32.6901°N, 108.738°W, 1220 m, 6 August 1995, R. W., J. A. & P. A. Garrison [RWG]; 1 ♂, Sitting Bull Falls, Guadalupe Mountains, 32.2431°N, 104.696°W, 1386 m, 22 August 1985, R. Baumann, Nelson, Wells & M. Whiting [RWG]; 11 ♂♂, 2 ♀♀, same data but 24 August 1998, R. W. & J. A. Garrison, [RWG]; **Arizona:** 2 ♂♂, 3 ♀♀, Pine flat Forset Camp, Oak Creek Canyon, Highway 89A, 14 mi S of Flagstaff, 35.0125°N, 111.739°W, 1700 m, 2 August 1975, R. W. Garrison [RWG]; 1 ♂, same data but 18 July 1977 [RWG]; 2 ♂♂, 1 ♀, same data but 8 November 2001, N. von Ellenrieder [CSCA]; 1 ♂, 1 ♀, Bootlegger Campground, by Highway 89A, 8 mi N of Sedona, 34.9697°N, 111.751°W, 1575 m, 19 July 1977, R. W. Garrison [RWG]; 2 ♂♂, 1 ♀, Sedona, Red Rock Crossing, 34.8174°N, 111.815°W, 1200 m, 5 October 1990, R. W. & J. A. Garrison [RWG]; 2 ♂♂, 1 ♀, Page Springs Fish Hatchery ponds and Oak Creek, 34.7648°N, 111.89°W, 1060 m, 6 October 1990, R. W. & J. A. Garrison, [RWG]; 1 ♂, Granite Creek, just above Watson Lake, Prescott, 34.6032°N, 112.416°W, 1540 m, 13–14 May 1984, R. W. & J. A. Garrison [RWG]; 4 ♂♂, 1 ♀, seepage at Skull Valley, 34.5156°N, 112.686°W, 1295 m, 15 May 1984, R. W. & J. A. Garrison [CSCA, RWG]; 1 ♂, same data but 31 July 1987 [RWG]; 1 ♂, same data but 8 October 1990, R. W. Garrison [RWG]; 2 ♂♂, 1 ♀, Webber Creek, Camp Geronimo, Road 440, Tonto National Forest, 34.4089°N, 111.377°W, 1704 m, 3 August 1992, R. W. Garrison [RWG]; 1 ♂, 1 ♀, same data but 5 July 1969 [RWG]; 1 ♂, Kirkland Creek near Kirkland at Highway 96, 34.3962°N, 112.707°W, 1200 m, 31 July 1987, R. W. Garrison [RWG]; 3 ♂♂, 1 ♀, Sycamore Spring, Fossil Creek Road, Road 708, Coconino National Forest, 34.395°N, 111.65°W, 1065 m, 2 August 1992, R. W. Garrison [RWG]; 1 ♂, 1 ♀, Santa María River at Highway 93, 34.3693°N, 113.185°W, 535 m, 8 October 1990, R. W. Garrison [RWG]; 1 ♂, 3 ♀♀, Tonto Natural Bridge State Park, 4 mi S of Pine, 34.3212°N, 111.457°W, 1400 m, 3 August 1992, R. W. Garrison [RWG]; 1 ♀, Bill Williams River just below dam, 34.229°N, 113.604°W, 335 m, 23 September 2005, R. A. Bailowitz [RWG]; 6 ♂♂, 1 ♀, small creek at Shadyway Road, 34.2259°N, 112.745°W, 1440 m, 15 May 1984, R. W. & J. A. Garrison [RWG]; 1 ♂, 1 ♀, Tangle Creek, Tonto National Forest, 34.1333°N, 111.774°W, 819 m, 1 August 1992, R. W. Garrison [RWG]; 1 ♂, Seven Springs Picnic Ground, about 12 mi N of Carefree, Tonto National Forest, 33.9675°N, 111.8647°W, 7 May 1972, Alberta Wilson [RWG]; 1 ♂, same data but 18 March 1974, D. Jagner [RWG]; 2 ♂♂, 2 ♀♀, same data but 10 August 1974, R. W. Garrison [RWG]; 3 ♂♂ same data but 22 July 1984 [RWG]; 1 ♂, same data but 20 June 1987 [RWG]; 1 ♂, same data but 29 July 1987 [RWG]; 1 ♂, 1 ♀, same data but 26 September 1988, R. W. Garrison [RWG]; 1 ♂, 1 ♀, same data but 1 August 1992 [RWG]; 1 ♂, 1 ♀, same data but 11 August 2001, N. von Ellenrieder [CSCA]; 1 ♂, Irrigation ditch by Seven Springs wash, 0.7 mi S of Seven Springs, Tonto National Forest, 33.9628°N, 111.859°W, 1050 m, 1 August 1992, R. W. & J. A. Garrison [RWG]; 1 ♂, 1 ♀, Bonita Creek, tributary to Gila River, 32.9097°N, 109.487°W, 978 m, 18 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [RWG]; 1 ♂, 1 ♀, same data but 29 September 2002, R. W. Garrison & N. von Ellenrieder [RWG]; 1 ♂, 1 ♀, Rackensack Canyon at Camp Creek, on Cave Creek Road, 12 mi NE of Carefree, 33.9041°N, 111.8201°W, 1050 m, 21 May 1977, R. W. Garrison [MHNN]; 1 ♀, Cave Creek at Ocotillo Road, Cave Creek, 33.8394°N, 111.9629°W, 619 m, 10 October 1982, R. W. Garrison [RWG]; 1 ♂, same data but 10 August 1984 [RWG]; 1 ♂, 1 ♀, same data but 11 September 1983, S. W. Dunkle [UMMZ]; 1 ♂, Sycamore Canyon, 3.3 mi. WNW of Highway 87 {33.6932°N, 111.539°W}, 540 m, 23 July 1984, R. W. & J. A. Garrison, [RWG]; 6 ♂♂, Sycamore Creek (Sugarloaf Mtn.), 2 mi W of Highway 87, Road 402, Tonto National Forest, 33.685°N, 111.512°W, 696 m, 3 August 1992, C. Fujita & R. W. Garrison [RWG]; 2 ♂♂, Blue River, Blue Crossing Campground, 33.6289°N, 109.098°W, 1770 m, 4 June 1982, R. Baumann & Clark [RWG]; 14 ♂♂, 8 ♀♀, Apache National Forest, K. P. Cienaga, 33.5317°N, 109.305°W, 2400 m, 19 August 2002, J. A., R. W. Garrison, N. von Ellenrieder, [CSCA, CUMZ, RWG]; 11 ♂♂, 9 ♀, Bonita Creek, tributary to Gila River, 32.9097°N, 109.487°W, 978 m, 18 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, same data but R. W. Garrison & N. von Ellenrieder [CSCA]; 4 ♂♂, 1 ♀, S of Safford, Dankworth Park by Highway 191, ponds, 32.7207°N, 109.707°W, 989 m, 18 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA RWG]; 1 ♂, 1 ♀, Marshall Gulch near Summerhaven {32.4289°N, 110.754°W}, 2287 m, 21 May 2001, S. Upson [RWG]; 5 ♂♂,

3 ♀♀, forested stream by turnout, 4.6 mi N of Molino Basin Forest Camp, Coronado National Forest, Santa Catalina Mountains, 32.3628°N, 110.712°W, 1 August 2000, R. W. & J. A. Garrison [RWG]; 5 ♂♂, 2 ♀♀, Hot Springs Canyon, about 2 mi by foot NW of Hookers Hot Springs, T13S, R21E Sec. 36, 32.3525°N, 110.247°W, 1250 m, 20–21 September 1996, R. W. Garrison [MHNH, RMNH, RWG]; 17 ♂♂, 3 ♀♀, same data but 10 August 1997, R. W., J. A. & P. A. Garrison [RWG]; 11 ♂♂, 2 ♀♀, Muleshoe Ranch, Bass Creek, Hot Springs, 32.3528°N, 110.257°W, 1196 m, 17 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♀, Bass Canyon, 1 mi N Muleshoe Preserve, 25 mi W of Willcox, 32.3522°N, 110.257°W, 1196 m, 22 June 2002, S. Upson [RWG]; 3 ♂♂, Old Prison Camp, N of Molino Basin Forest Camp, Coronado National Forest, Santa Catalina Mountains, 32.3392°N, 110.716°W, 1497 m, 24 July 1984, R. W. & J. A. Garrison [RWG]; 1 ♀, Molino Basin Camp, Santa Catalina Mountains, 32.3372°N, 110.692°W, 1400 m, 22 September 1988, R. W. Garrison [RWG]; 1 ♀, same data but 24 July 1984 [DTU]; 1 ♂, Sabino Canyon, Coronado National Forest, 32.3389°N, 110.786°W, 953 m, 5 August 1992, R. W. Garrison [RWG]; 6 ♂♂, vegetated area behind Motel 6 North, Tucson, 7277 North Camino De Oeste, 32.3391°N, 111.065°W, 668 m, 7 August 1972, R. W. & J. A. Garrison leg [RWG]; 7 ♂♂, same data but 26 August 1998 [RWG]; 3 ♂♂, Hot Springs Canyon, about 0.5 mi by foot NW of Hookers Hot Springs, 32.3375°N, 110.237°W, 1250 m, 11 August 1997, R. W., J. A. & P. A. Garrison [RWG]; 1 ♂, 1 ♀, pond at Saint David by Highway 80, 31.8906°N, 110.213°W, 1120 m, 22 July 1987, R. W. Garrison [RWG]; 2 ♂♂, Herb Martyr Dam, Chiricahua Mountains, Coronado National Forest, 31.8742°N, 109.235°W, 8 August 1995, R. W. Garrison [RWG]; 3 ♂♂, 3 ♀♀, same data but 7 September 1999 [RWG]; 6 ♂♂, Box Canyon at bridge, W side, Road 62, Santa Rita Mountains, Coronado National Forest, 31.7989°N, 110.798°W, 1328 m, 7–28 August 1998, R. W. Garrison [RWG]; 3 ♂♂, Rucker Forest upper campground, 31.7833°N, 109.304°W, 1882 m, 22 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 3 ♂♂, 1 ♀, same data but 1836 m [CSCA, RWG]; 7 ♂♂, Coronado National Forest, Adobe Canyon, Bathtub Tank, stream and tank, 31.6786°N, 110.769°W, 1442 m, 23 August 2002, Jo. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 4 ♂♂, 1 ♀, Mesa Draw, stream and associated habitats in Leslie Canyon by Leslie Canyon Road, 17 mi N of Douglas {31.5901°N, 109.508°W}, 1420 m, 23 September 1988, R. W. Garrison [RWG]; 4 ♂♂, 4 ♀♀, same data but 6 August 1992 [RWG]; 1 ♂, same data but 10 October 1987, L. Shaw [RWG]; 16 ♂♂, 7 ♀♀, Huachuca Canyon, 31.5106°N, 110.393°W, 1638 m, 16 August 2002, Jo. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 3 ♂♂, 4 ♀♀, Patagonia Mts., Harshaw Creek, 31.51°N, 110.682°W, 1359 m, 23 August 2002, J. A., R. W. Garrison & N. von Ellenrieder, [CSCA, RWG]; 5 ♂♂, 1 ♀, Road 799, 0.5 mi S of The Little Outfit Ranch, W of Road 92, ephemeral manmade pond, 31.4806°N, 110.57°W, 1550 m, 16 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 2 ♂♂, 1 ♀, Garden Canyon, Fort Huachuca Military Reservation, 31.4767°N, 110.364°W, 1727 m, 29 August 1998, R. W. Garrison [CUMZ, RWG]; 2 ♂♂, same data but 16 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 3 ♂♂, Scotia Canyon, Coronado National Forest, Huachuca Mts., 31.4492°N, 110.401°W, 1821 m, 24 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, same data but 1670 m, 7 August 1992, R. W. Garrison [RWG]; 2 ♂♂, same data but 28 September 2002, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, Parker Canyon, Coronado National Forest, Huachuca Mountains, 31.445°N, 110.447°W, 1671 m, 24 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [RWG]; 1 ♂, same data but 28 September 2002, R. W. Garrison & N. von Ellenrieder [RWG]; 1 ♂, 2 ♀♀, small springs 0.6 mi W of Carr Canyon Road, near Miller Park, 31.4339°N, 110.285°W, 1989 m, 22 July 1987, R. W. Garrison [RMNH, RWG]; 2 ♂♂, Sycamore Canyon, 31.4269°N, 111.194°W, 1196 m, 27 September 2002, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 2 ♂♂, Miller Canyon, 31.415°N, 110.277°W, 1760 m, 15 July 1989, J. Ryan [RWG]; 1 ♂, Peña Blanca Lake, cattle pond on ruby Road, 31.3894°N, 111.119°W, 1225 m, 27 August 1998, R. W. & J. A. Garrison [RWG]; 6 ♂♂, 1 ♀, Coronado National Forest, Bear Creek at Lown Mountain Creek, 31.3828°N, 110.363°W, 1687 m, 24 August 2002, Jo. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 4 ♂♂, 1 ♀, Parker Canyon at schoolhouse, 31.3725°N, 110.524°W, 1426 m, 16 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, San Bernardino Ranch, Bunting Spring, 31.3447°N, 109.261°W, 1138 m, 21 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [RWG]; 2 ♂♂, San Bernardino Ranch, Twin ponds and Evil Twin, 31.3406°N, 109.265°W, 1143 m, 21 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]. **MEXICO**, 1 ♂ (syntype), Deppe [MCZ]; **Chihuahua**: 1 ♂, 1 ♀, headwater spring of Arroyo Toro {28.9333°N, 104.45°W}, 23 June 1987, B. Kondratieff & R. Baumann [FSCA]; **Coahuila**: 2 ♂♂, higher streams in the Maderas del Carmen down to spillway stream below the reservoir at Campo Uno, 28.99°N, 102.612°W, 2316 m, 18–19 June 2007, R. Wauer [CNIN]; **Sonora**: 1 ♂, same data but 26 September 2007 [RWG]; 1 ♂, small river W of Yecora on Highway 16, 28.3767°N, 108.897°W, 1556 m, 24 August 1986, B. Kondratieff

[FSCA]; 1 ♀, El Trigo de Colón, S of km 296 on Highway 16, 28.3092°N, 108.793°W, 1399 m, 20 July 2006, S. W. Dunkle [FSCA]; 2 ♂♂, Nacapule Cañon, 4 km N of San Carlos, 28.0156°N, 111.051°W, 140 m, 29 October 2004, R. A. Bailowitz [RWG]; **Nuevo León**: 1 ♂, 7.7 mi W of La Cienega in Cañón Huasteca National Park, 25.6667°N, 100.767°W, 1100 m, 29 April 1988, C. Hogue [RWG]; 1 ♂, Rancho Los Pinos, 25.4269°N, 100.152°W, 483 m, 3 July 1987, M. J. Westfall, G. Luna & A. Contreras [FSCA]; 1 ♀, Horsetail falls, 38 km SW of Monterrey, 25.35°N, 100.15°W, 550 m, 6 September 1962, T. W. Donnelly [FSCA]; 1 ♂, same data but 25 June 1965, D. R. & M. L. Paulson [FSCA]; **Sinaloa**: 1 ♂, El Palmito, on Highway 40 E of Mazatlán {23.5622°N, 105.837°W}, 1905 m, 3 September 1963, H. V. Weems, Jr. [FSCA]; 1 ♂, 1 ♀, stream 44.9 mi NE of Concordia {23.5644°N, 105.849°W}, 2029 m, 26 August 1965, D. R. & M. L. Paulson [FSCA]; **Durango**: 1 ♀, Arroyo Temazcal, Reserva de la Biósfera La Michilia, 23.3653°N, 104.231°W, 2389 m, 15 April 1987, E. González & R. Novelo-Gutiérrez [RWG]; 1 ♂, 1 ♀, along Highway 40, mileage 44480, 2550 m, 13 May 1965 [FSCA]; **San Luis Potosí**: 1 ♂, El Salto Falls {22.5857°N, 99.3843°W}, 685 m, 12 June 1963, R. E. Woodruff [FSCA]; **Zacatecas**: 2 ♀♀, Nochistlán de Mejía, 21.35°N, 102.833°W, 1700 m, 23 September 1979, B. Villegas [UCD, RWG]; **Jalisco**: 1 ♂, 1 ♀, Río Encarnación de Díaz, 21.3333°N, 102.133°W, 1851 m, 13 April 1995, E. González-Soriano [RWG]; 1 ♂, Route 110 ca 6 mi E of Atotonilco El Alto, little sandy and rocky streams along road, 66-521, 20.5661°N, 102.431°W, 1920 m, 9 August 1966 [RWG, UMMZ]; 5 ♂♂, 2 ♀♀, Lake Chapala region {20.1167°N, 102.867°W}, 1600 m, 5 December 1923, J. H. Williamson [RWG, UMMZ]; **Guanajuato**: 3 ♂♂, 1 ♀, 4 mi E of Silao {20.956°N, 101.369°W}, 1850 m, 16 August 1932, H. M. Smith & E. H. Taylor [UMMZ]; 1 ♂, 1 ♀, Route 110, 2 mi W of Penjamo, 66-540-541 {20.445°N, 101.75°W}, 1813 m, 9 August 1966 [UMMZ]; **Hidalgo**: 1 ♂, Río Tula at Highway 85, NW of Tasquillo {20.5347°N, 99.315°W}, 1615 m, 28 June 1965, D. R. & M. L. Paulson, [FSCA]; 1 ♀, same data but ditches around Tasquillo, 1706 m [FSCA]; 2 ♂♂, 1 ♀, Humedales, marsh & stream {19.2714°N, 99.0108°W}, 1767 m, 28 June 1965, D. R. Paulson & N. Chernoff [FSCA]; **Puebla**: 2 ♂♂, Río San Marcos, km 1 on Highway 130 between Avila Camacho and Petlacotla {20.3928°N, 97.8914°W}, 236 m, 22 July 1987, R. Novelo-Gutiérrez [RWG]; 3 ♂♂, 5 ♀♀, 3 mi N of Tlatlauquitepec on Highway 125 {19.8893°N, 97.485°W}, 1650 m, 14 July 1963, G. G. Musser [RWG, UMMZ]; 1 ♀, 15 mi E of Puebla {19.0265°N, 97.9759°W}, 1650 m, 26 July 1935, H. R. Roberts [FSCA]; **Michoacán**: 3 ♂♂, near Lake Cuitzeo {19.9685°N, 101.048°W}, 1800 m, 10 October 1932, Hobart M. Smith & E. H. Taylor [UMMZ]; 1 ♂, route 15, S of Morelia, 0.55 mi. N km 290, stream along road, 66-151 {19.6886°N, 101.092°W}, 2030 m, 14 July 1966 [UMMZ]; 2 ♂♂, Tuxpán {19.5639°N, 100.472°W}, 1800 m, 15 July 1955, R. B. & J. M. Selander [RWG]; **Mexico**: 1 ♂ (lectotype of *Argia spagazzinii*), San Juan Teotihuacán {19.6925°N, 98.8438°W}, 14 November 1932 [MNHN]; **Veracruz**: 1 ♂, Veracruz {probably within the vicinity of Córdoba, 18.8889°N, 96.9178°W, 780 m}, A. Sallé [RBINS]; 1 ♂, 8 km N of Huatusco {19.3286°N, 96.4843°W}, 1200 m, 11 September 1965, T. W. Donnelly [FSCA]; 1 ♂, Puente Nacional, 19.3286°N, 96.4843°W, 21 March 1964, R. D. Cuyler [FSCA]; 1 ♂, Marta, Bastonal, Estación Biológica Los Tuxtlas, 18.5869°N, 95.0731°W, 120 m, 17 July 1986, R. Mendoza & F. Alvarez [RWG]; **Morelos**: 1 ♂, 3 mi N of Cuernavaca {18.9914°N, 99.2572°W}, 2000 m, 22 August 1933, E. E. Carothers [RWG]; 1 ♂, Cuernavaca {18.9342°N, 99.2317°W}, 1569 m, 4 January 1899 [RWG]; 1 ♂, same data but C. C. Plummer, [UMMZ]; 2 ♂♂, 3 ♀♀, same data but 2 March 1941, I. J. Cantrall [UMMZ]; 1 ♂, 1 ♀, same data but 3 August 1938, L. J. Lipovsky [RWG, UMMZ]; 1 ♂, 28 July 1938, H. D. Thomas [UMMZ]; 2 ♀♀, same data but 7 October 1890, C. C. Deam [UMMZ]; 2 ♂♂, 2 ♀♀, Las Fuentes, spring and stream {18.877°N, 99.1657°W}, 1340 m, 8 July 1987, M. J. Westfall, Jr. [FSCA]; 5 ♂♂, 3 ♀♀, La Fuente, Municipio of Jiutepec, 10 km W of Cuernavaca, 18.2558°N, 99.2822°W, 1300 m, 17 September–1 October 1983, R. W. Garrison [RWG]; **Guerrero**: 1 ♂ (lectotype of *Argia plana*), Sierra de las Aguas Escondidas, 3 mi S of Omilteme {18.5823°N, 99.6483°W} 2133 m, July 1888, H. H. Smith [BMNH]; **Oaxaca**: 1 ♂, no locality, 6 September 1825, Ferdinand Deppe, [MCZ]; 6 ♂♂, 1 ♀, Ixtlán de Juárez {17.4667°N, 99.6333°W}, 2030 m, 12 June 2 August 1965, R. M. Kirkton [RWG, UMMZ]; 1 ♂, same data but 27 July 1966 [UMMZ]; 1 ♂, 1 ♀, same data but 1 August 1966 [UMMZ]; 1 ♂, 2 ♀♀, stream 10.3 mi NE of Oaxaca, 17.1408°N, 96.6247°W, 2011 m, 6 August 1965, D. R. & M. L. Paulson [FSCA]; **Chiapas**: 1 ♀, forest trail at Palenque ruins {17.4869°N, 92.0181°W}, 64 m, 5 April 1972, E. W. Stiles [RWG]; 2 ♂♂, km 13 on Highway 175 on route to Ixtlán de Juárez, 13 km NE of Oaxaca {17.137°N, 96.6185°W}, 2150 m, 13 August 1966, R. W. Cruden [RWG]; 1 ♂, 1 ♀, 5 km SE of Jitotol, 17.0333°N, 92.85°W, 1676 m, 10 September 1981, D. E. & P. M. Breedlove [CAS, RWG]; 1 ♂, 1 ♀, stream 21.4 mi N of Ocozocoautla {16.8°N, 93.4°W}, 600 m, 21 July 1965 [FSCA]; 3 ♂♂, 5 ♀♀, stream 20.1 mi N of Ocozocoautla, 67-226 {16.7667°N, 93.3667°W}, 610 m, 25 August 1967, D. R. & M. L. Paulson [FSCA, RWG]; 1 ♂, reservoir at San Cristobal de las Casas {16.75°N, 92.6333°W}, 2255 m, 13 July 1965, D. R. & M. L. Paulson [FSCA]; 2 ♂♂, 3 ♀♀, Río Amarillo E of San Cristobal de las Casas,

16.745°N, 92.5836°W, 2194 m, 4 August 1981, D. E., P. M. Breedlove & C. G. Whitefield [CAS, RWG]; 2 ♀♀, San Cristobal de las Casas {16.7378°N, 92.6367°W}, 2134 m, 28 April 1959, H. E. Evans [FSCA, RWG]; 7 ♂♂, 2 ♀♀, same data but 20 August 1963, F. A. Lee & H. V. Weems, Jr. [FSCA]; 1 ♀ same data but 16 June 1969, W. J. Boyes [UMMZ]; 2 ♂♂, 1 ♀, same data but 30 July 1982, J. E. Hafernik, Jr. [RWG]; 2 ♂♂, 1 ♀, stream and marsh 8.1 mi SE of San Cristobal de las Casas {16.655°N, 92.5517°W}, 2320 m, 13 July 1965, D. R. & M. L. Paulson [RWG, UMMZ]; 1 ♀, stream 15.1 mi SE of San Cristobal de las Casas {16.5933°N, 92.5192°W}, 2164 m, 17 July 1965, M. L. Paulson [FSCA]; 3 ♂♂, Rancho El Belén {16.1825°N, 93.4894°W}, 740 m, 2 April–19 March 1969, R. G. Wind [BMNH, RWG, USNM]; 1 ♂, Jaltenango, above Finca Custepec, 15.7167°N, 92.9667°W, 1371 m, 11 August 1981, D. E. & P. M. Breedlove [RWG]; 1 ♂, Angel Albino Corzo, Reserva de la Biosfera El Triunfo, 15.6642°N, 92.8135°W, 1979 m, 20 August 1983, R. Novelo-Gutiérrez [RWG]; 1 ♂, same data but 1700 m, 14 May 1985, E. González-Soriano [RWG]. **GUATEMALA, Huehuetenango:** 1 ♂, La Mesilla, 12.2 mi SE on CA 1, stream, 67–213 {15.5309°N, 91.8494°W}, 1050 m, 23 August 1967, D. R. Paulson [RWG]; **El Quiché:** 2 ♂♂, tributary of Río Sepela, 3 km S of Chichicastenango, near Paxot {14.9195°N, 91.1057°W}, 2000 m, 23 August 1964, T. W. Donnelly [FSCA]; **El Progreso:** 2 ♂♂, Finca La Cajeta near Estación de la Virgen {14.7833°N, 90.7333°W}, 2150 m, 22 August 1965, T. W. Donnelly [FSCA]; **Quetzaltenango:** 1 ♂, Zunil Creek, 6 km N of Fuentes Georgina {14.7730°N, 91.4802°W}, 2195 m, 1 June 2015, J. Heppner & E. Fuller [FSCA]; **Sololá:** 1 ♂, 1 ♀, Río Nahualate, 3 km S of Santa Catarina Ixtahuacán {14.6961°N, 91.1166°W}, 1400–2200 m, 30 June 1962, T. W. Donnelly [FSCA]; 2 ♂♂, 1 ♀, same data but 3.6 km S of Santa Catarina, 2000 m [FSCA]; 1 ♂, near Santa María Visitación, 2000 m, 1 July 1962, T. W. Donnelly [FSCA]; **Chimaltenango:** 1 ♂, 1 ♀, stream 12 mi SE of Tecpán on CA-1 {14.6298°N, 90.9168°W}, 2103 m, 22 August 1967, D. R. Paulson [FSCA]; **Retalhuleu:** 5 ♂♂, San Sebastián {14.559°N, 91.6443°W}, 325 m, from Staudinger [RWG, UMMZ]; 4 ♂♂, same data but 307 m, 21 June 1975 [RWG, UMMZ]. **HONDURAS, Cortés:** 1 ♂, 1 ♀, Cantiles Camp, Río Cantiles, large waterfall, Cusuco National Park, on top of granite rocks, 15.4972°N, 88.2114°W, 1607 m, 27 July 2008, M. Jocque [RWG]; **Comayagua:** 1 ♀, Peña Blanca, San Jacinto Mountains, near Rosario {14.5667°N, 87.9333°W}, 1800 m, 15 July 1930, C. B. Worth [FSCA]; 1 ♂, same data but 1620 m, 26 July 1930, Honduras Expedition 1930.39, [FSCA]. **EL SALVADOR, Chalatenango:** 1 ♂, 1 ♀, Cerro El Pital, RM Caesar—Argia DNA voucher specimen Afun, 19 February 2010, 14.3833°N, 89.1167°W, 2690 m, 6 March 1994, V. Hellebuyck [RWG]; **Santa Ana:** 1 ♂, Hacienda Montecristo, Miramundo, Metapán, cloud forest, {14.3333°N, 89.45°W}, 2200 m, 8 March 1970, S. & L. Steinhäuser [FSCA]; 1 ♀, same data but 12 February 1972 [FSCA]; 1 ♂, same data but 15 September 1972 [FSCA].

A medium size species (Table 2), with vivid violaceous (Figs. 64, 67, 888, 889), rarely dark violaceous (Fig. 811), or blue (Figs. 65, 887, 890) male and tan female (Figs. 201, 891).

Diagnosis. Male was described (as *A. plana*) by Calvert (1902), and both sexes were diagnosed by Garrison (1994) and described by Westfall & May (2006). *Argia funebris* is most similar to the allopatric (or allotopic; see under Distribution and habitat) *A. vivida*. In *A. funebris*, the decumbent portion of cercus in posterior view is short and abruptly narrows into an apical inner tooth (Fig. 688d), and the lateral lobes of genital ligula distal segment are unilobed, directed entally and not visible in ectal view (Fig. 615b). In *A. vivida*, the decumbent portion of cercus in posterior view is longer and gradually narrows into an apical inner tooth (Fig. 752d), and the lateral lobes of genital ligula distal segment are bilobed, directed entolaterally and visible in ectal view (Figs. 658b–660b). Females of *A. funebris* and *A. vivida* approach one another closely, and their separation is limited to the morphology of the middle lobe of the prothorax as follows. In *A. funebris*, the dorsolateral depression on the middle lobe of prothorax is relatively deep and is oblique to the suture between the prothoracic middle and posterior lobes (Fig. 491); in *A. vivida*, the dorsolateral depression on the middle lobe of prothorax is relatively shallow and is almost parallel to suture between prothoracic middle and posterior lobes (Fig. 492). Fortunately, separation is aided by their allopatric distributions (Fig. 772).

Remarks. Hagen (1861) provided a description of *Agrion funebre* based on the male only, based on an unspecified number of specimens from “Mexico” collected by Ferdinand Deppe. This species was transferred to the genus *Argia* by Hagen in Selys (1865) noting “...Patrie: Vera-Cruz, par M. Sallé (Collect. de Selys, Hagen). Mexique, musée de Berlin, par Deppe.” A summary of Deppe’s travels in Mexico gleaned from Papavero (1971) and Papavero & Ibáñez-Bernal (2001) states that Deppe collected specimens in the states of Veracruz, Mexico, Morelos, Puebla, and Oaxaca between 25 December 1824 and January 1827, and the type locality of *Agrion funebris* cannot be precisely determined based on these data. As stated by Garrison & von Ellenrieder (2019), Hagen’s (1861) description of the male of *Agrion funebre* included venation counts (“Fourteen postcubital crossnervules”) which

seemed to imply that he had only one ♂ at the time of his description. However, M. Turiault (pers. comm.) sent us a photo of another male of *Agrion funebre* at MNB with an inked label by Hagen “A. funebre. / Hag.*”, accompanied by a printed red “Typus” label and a recently inked “3397=MEXICO, Deppe” label, both of which were likely provided by a subsequent museum curator. Both MCZ and MNB specimens have 14 postnodal crossveins and it is likely that Hagen had both males at the time of the original description. In order to ensure stability of this name, we here designate the male that we examined at MCZ as lectotype of *Agrion funebre* Hagen, 1861 (Fig. 758).

Argia plana was originally described from a series from Arizona and Mexico as a variety of *A. vivida* by Calvert (1902), and its validity as a separate species from *A. vivida* based on structural morphology of the male caudal appendages and female middle lobe of the prothorax was well documented and illustrated by Gloyd (1958). She noted the presence of a violaceous form primarily from the SW United States W of the Rocky Mountains and a blue form found E of the Rocky Mountains. The latter form matched the blue ground color found in *A. vivida*. As Gloyd stated: “A preliminary study of more than a hundred specimens of *vivida* and of *plana* indicates that *plana* should be given specific rank and that all specimens taken in the region between the Mississippi River and the Rocky Mountains, some of which have been recorded in the literature by various authors as *vivida*, are actually a blue form of *plana*.” More recent observations (Paulson 2009) record blue populations of *A. plana* mostly east of New Mexico and south into NE Mexico, east to Wisconsin, Missouri, and Arkansas, and violet populations mostly west of Texas and south in uplands to Guatemala. Garrison (1994), in his synopsis of the genus from the United States, further documented the differences between *A. plana* and *A. vivida*, provided diagnostic keys and illustrations for their separation and synonymized *A. spengazzinii* with *A. plana*.

The type series of *A. vivida* var. *plana* (Hagen ms) at the MCZ was a mixed series including more than one species, as already noted by Calvert (1902) in his description. Garrison (1994) confirmed that a pair of the paratype specimens from Arizona at the MCZ mentioned by Calvert correspond to *A. nahuana*; the male from Sierra de las Aguas Escondidas, Guerrero, Mexico, depicted in Calvert’s (1902) pl. IV, fig. 58 is considered to represent the holotype (Fig. 759; see Kimmins 1970).

In his key to males, Calvert (1901) differentiated *A. funebris* from *A. vivida plana* and *A. vivida* as follows:

“Black postbasal streaks present on segments 3–6. 31. *vivida* and varieties.”
 “Black postbasal streaks absent from segments 3–6 32. *funebris*.”

Calvert (1902) had doubts about the distinctness of *A. vivida* var. *plana* from *A. funebris* as evidenced by his statement: “It seems likely that a complete transition may hereafter be found between *A. plana* and *A. funebris*.” Gloyd, in her unpublished notes for *A. funebris* applied this name to specimens from Morelos, Oaxaca and Chiapas in Mexico as well as from Honduras and El Salvador. Her penciled notes accompanying her drawing of the MCZ syntype male noted the following: “[Type of *A. funebris*] similar to *plana* but larger. Inf[erior]. To sup[erior]. App[endage]s longer, sup[erior] app[endage]s more rounded laterally (dorsal v[iew]). Postquad[rangular cells] h[ind]. W[ing], 4–4 instead of 3–3” Gloyd’s voluminous locality data for *A. plana* lists it from the Mexican states of Sinaloa, Durango, Chihuahua, Nayarit, Hidalgo, Michoacán, San Luis Potosí, Nuevo León, Colima, Guerrero, Morelos, Jalisco, Puebla, Distrito Federal, and Oaxaca as well as from Guatemala.

Our examination of specimens, including types, attributed to both taxa indicates that *A. plana* cannot confidently be separated from *A. funebris*. The differences in abdominal markings mentioned by Calvert show considerable variation (Figs. 64–67, 887–890). Some males of “*A. plana*” from Oklahoma (Fig. 887) are heavily marked in black on S2–6. The morphology of the genital ligula is the same, and male caudal appendages (Figs. 687–689) show no significant differences. We therefore consider *A. plana* to be a junior synonym of *A. funebris*. The lectotype of *A. spengazzinii* lacks the head and S7–10 (Fig. 68) but its thoracic pattern and morphology of the genital ligula (Fig. 615) is consistent with other examples of *A. funebris* we have examined and supports the synonymy established by Garrison (1994).

Habitat. *Argia funebris*, as treated here, is one of the more common and familiar damselflies from the SW United States. Individuals are numerous and have been the subject, as *A. plana*, of various studies on behavior and population dynamics (Bick & Bick 1968, 1971, 1972, 1978, 1981) and have been featured in several field guides (e. g., Abbott 2005a, 2011; Bailowitz *et al.* 2015; Paulson 2009, 2011). In Guatemala (Chimanténango, 12.0 mi SE of Tecpan on CA-1), D. R. Paulson (pers. comm.) found it to be very common on a short stretch of stream with submergent aquatics, where he observed pairs ovipositing in tandem with male supported free.

Distribution. The most recent distribution gleaned from Odonata Central (odonatacentral.org) records *A.*

funnebris from Arizona, New Mexico, east through Texas and north through the central United States. Isolated records also exist for Utah and Alabama. In their treatment of *A. vivida*, Bailowitz *et al.* (2015) stated that it was sympatric with *A. plana* (= *A. funnebris*) at one locality in Arizona along the Bill Williams River 65 km ENE Parker on the La Paz/Mohave County line. According to R. Bailowitz (in litt.), the species were allotopic, with *A. funnebris* occurring at seeps where water oozed from the below-impoundment soil of the Alamo Lake dam, and *A. vivida* along the creek below the dam, perhaps a few hundred feet below these seeps. We did examine a female from the seeps and confirmed that it represents *A. funnebris*.

This species is widespread in Mexico, although absent from Baja California, and it extends as far south as Honduras (Fig. 772). In this area, it does not occur in sympatry with *A. vivida*, which is restricted to Baja California (Fig. 772). Its elevation in Central America ranges from 64 to 2726 m (Guatemala, small seepage stream 4 mi E of Totonicapán; not seen, in FSCA).

***Argia garrisoni* Daigle, 1991**

Figs. 11 (head ♂); 12 (head ♀); 69 (head, thorax, S1–4 ♂); 202 (head, thorax, S1–4 ♀); 323 (S7–10 ♂); 433 (S7–10 ♀); 525 (mesostigmal plates ♀); 690 (appendages ♂); 796 (map); 812 (field photo ♂); 995 (body scan ♂); 996 (body scan ♀).

[Key locators: ♂ G-5, couplet 7(6'); ♂ M-6, couplet 16'; ♀ F-2, couplet 1']

Argia garrisoni Daigle 1991: 337 (description ♂, ♀, comparison with *A. calida*, figs. 1, 3, 5, 6, 8, 10, 12);—González-Soriano 1993: 295 (Mexico);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Westfall & May 2006: 144, 150, 192 (key, description ♂, ♀, figs. 81D, 92A, 102C);—González-Soriano & Novelo-Gutiérrez 2007: 127 (Mexico);—Caesar & Wenzel 2009: 104 (phylogeny within genus *Argia*);—González-Soriano *et al.* 2011: 184 (San Luis Potosí, Mexico);—Rangel-Sánchez *et al.* 2018: 924 (estimated range in Mexico).

Primary types. *Argia garrisoni*: holotype ♂, MEXICO, San Luis Potosí, Río Huichihuayán headwater, W of town of Huichihuayán, off Highway 85, 23 June 1990, Jerrell J. Daigle leg. [not examined, in FSCA].

Specimens examined. 64 ♂♂, 29 ♀♀: **MEXICO, Nuevo León:** 2 ♂♂, Horsetail Falls, 38 km SW of Monterrey, 62x120 {25.35°N, 100.15°W}, 550 m, 6 September 1962, T. W. Donnelly [FSCA]; 6 ♂♂, Río Ramos, 3 km S of Allende, 25.26°N, 99.9975°W, 432 m, 2–7 September 1963, T. W. Donnelly [FSCA]; **Tamaulipas:** 2 ♂♂, 1 ♀, Río Sabinas, by Highway 85, 23.0314°N, 99.0931°W, 99 m, 26 May 1984, G. Harp [RWG]; 1 ♂, 1 ♀, Gomez Farías, Highway 85, Río Salinas {22.8428°N, 99.026°W}, 70 m, 30 May 1947, G. M. Sutton [FSCA]; 1 ♂, same data but 2 April 1987, Moreno-Valdéz [FSCA]; **San Luis Potosí:** 3 ♂♂, 1 ♀, El Salto Falls {22.5857°N, 99.3843°W}, 470 m, 12 June–15 August 1963, R. E. Woodruff [FSCA; RWG]; 2 ♀♀, same data but 8 July 1966–9 August 1968, R. E. Woodruff & J. W. McReynolds [FSCA, RWG]; 1 ♂, 1 ♀, same data but 24 June 1960, M. W. Sanderson [CSCA]; 2 ♀♀, El Salto near El Naranjo, 22.3617°N, 99.2647°W, 250 m, 8 August 1966, O. S. Flint, Jr. [USNM, RWG]; 1 ♂, 2 ♀♀, same data but 5 June 1966 [USNM]; 12 ♂♂, 4 ♀♀, Cascada de Micos, NW of Ciudad Valles, 22.0992°N, 99.15°W, 140 m, 22 August 1999, R. W. & J. A. Garrison [CSCA, RWG]; 3 ♀♀ (allotype and paratypes), same data but 25 June 1990, J. J. Daigle & K. J. Tennessen [FSCA, RWG]; 1 ♂, Río Huichihuayán headwaters, spring 2.2 mi N of Highway 70, 10 mi W of Tamuín, 21.9653°N, 98.8892°W, 126 m, 25 May 1984, G. Harp [RWG]; 1 ♂, 1 ♀, Río Coy headwaters, 28 km S of Ciudad Valles, 21.7331°N, 98.9781°W, 42 m, 24 June 1990, A. Maya, E. González & K. J. Tennessen [FSCA, RWG]; 4 ♂♂, 3 ♀♀, same data but 21 August 1999, R. W. & J. A. Garrison, [RWG]; 6 ♂♂, 3 ♀♀, Río Ojitipa, NW of Palmira Viejo, 21.6983°N, 99.0081°W, 41 m, 19 August 1999, R. W. & J. A. Garrison [RWG]; 1 ♂, bridge, Río Huichihuayán, W of Huichihuayán, 21.4792°N, 98.9669°W, 104 m, 23 June 1990, K. J. Tennessen [FSCA]; 3 ♂♂, same data but 18 August 1999, R. W. & J. A. Garrison [RWG]; 17 ♂♂, 5 ♀♀, Río Huichihuayán headwaters, W of Huichihuayán, 21.4614°N, 98.9753°W, 104 m, 18 August 1999, R. W. & J. A. Garrison [BMNH; BYU; Reagan J. Villanueva; RMNH; RWG]; 3 ♂♂, Río Huichihuayán, Highway 85, SW Huichihuayán town, 21.4522°N, 98.9383°W, 90 m, 23 June 1990, J. J. Daigle [RWG].

A medium-size species (Table 2); male purple and black (Figs. 812, 995) with a bifid cercus with outer branch spatulate and about twice as broad as inner branch, and with S8 mostly purple (Figs. 690, 812, 995); female similar to male, tan (Fig. 996), with a transverse costate ridge formed by extension of posterior margin of mesostigmal plate to mid-level of underside of mesostigmal lobe in posterior view (as in Fig. 501e).

Diagnosis. *Argia garrisoni* was described in detail by Daigle (1991) and Westfall & May (2006) and is diagnosed under *A. calida*.

Remarks. We have been unable to corroborate the structural differences noted by Daigle (1991) between *A. calida* and *A. garrisoni* and suggest that further studies, especially molecular, might support *A. garrisoni* to represent a geographic color variant of *A. calida*.

Habitat. The first author collected numerous *A. garrisoni* along the shaded banks of the Río Huichihuayán but not along sun-exposed areas (Fig. 812).

Distribution. Although Rangel-Sánchez *et al.* (2018), using ecological niche modeling methods, speculated a possible disjunct occurrence of *A. garrisoni* in the southernmost Veracruz region, our records show the species to occur only in San Luis Potosí, Tamaulipas and Nuevo León (Fig. 796), at elevations between 41 and 550 m.

Argia gaumeri Calvert, 1907

Figs. 70 (head, thorax, S1–4 ♂); 203, 204 (head, thorax ♀); 324, 325 (S7–10 ♂); 434, 435 (S7–10 ♀); 526 (mesostigmal plates ♀); 691 (appendages ♂); 800 (map); 813 (field photo ♂, ♀); 1031 (body scan ♂); 1032, 1033 (body scans ♀).

[Key locators: ♂ G-5, couplet 14'; ♂ M-2, couplet 3(1'); ♀ F-6, couplet 12(11'); F-8 couplet 1]

Argia gaumeri: Calvert 1907: 363 (key, description ♂, ♀, Mexico, Honduras, pl. VIII, figs. 41, 41s; pl. X, figs. 2, 2s, 20);—Calvert 1908a: xxix (clarification of holotype data);—Paulson 1982: 252 (Mexico south through Honduras);—Paulson 1984: 34 (Yucatan, Mexico);—Boomsma 1993: 55 (Belize);—Dunkle 1998: 45 (Honduras);—Novelo-Gutiérrez *et al.* 1988: 19, 41 (Quintana Roo, Mexico, fig. 2);—Novelo-Gutiérrez 1991: 259, 263 (key, Quintana Roo, Mexico, fig. 1);—González-Soriano 1993: 295 (Mexico);—Measey 1994: 46 (Belize);—Boomsma & Dunkle 1996: 25 (Belize);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Förster 2001: 11, 54 (key ♂, fig. C24);—Esquivel 2005: 147 (Mexico, Honduras, photo 47);—González-Soriano & Novelo-Gutiérrez 2007: 127 (Mexico).

Argia (Chalcargia) gaumeri: Kennedy 1920 (new subgenus).

Primary types. *Argia gaumeri*: holotype ♂, MEXICO, Izamal, Yucatan, G. G. Gaumer [photo examined, in FMNH].

Specimens examined. 93 ♂♂, 28 ♀♀: **MEXICO, Yucatán:** 3 ♂♂, Merida {20.9635°N, 89.5319°W}, 12 m, 13 March 1964, R. D. Cuyler [FSCA]; 1 ♂ (holotype), Izamal {20.9438°N, 89.0303°W}, 14 m, G. G. Gaumer [FMNH]; 2 ♂♂, cenote 8.8 mi N of Muna on Highway 180 {20.6097°N, 89.7156°W}, 10 m, 8 July 1965, D. R. Paulson [FSCA]; 1 ♂, ponds and forest edge at Uxmal, 20.3736°N, 89.77°W, 50 m, 7 November 1983, D. R. Paulson [FSCA]; **Campeche:** 4 ♂♂, 1 ♀, Janataya, Río Champotón {19.7833°N, 90.4833°W}, 6 m, 9 July 1932, E. P. Creaser [UMMZ]; 5 ♂♂, 2 ♀♀, Paixán, Río Champotón {19.285°N, 90.6828°W}, 10 m, 11 July 1932, E. P. Creaser & A. S. Pearse [UMMZ]; **Veracruz:** 1 ♂, stream at Puente Plan del Río, near Rinconada, about 34 km SE of Xalapa {19.4019°N, 96.6309°W}, 270 m, 11 July 1987, M. J. Westfall, Jr. [FSCA]; 1 ♂, Puente Nacional, Carretera Jalapa to Veracruz on Road 125 {19.3286°N, 96.4843°W}, 60 m, 11 July 1987, M. J. Westfall, Jr. [FSCA]; 3 ♂♂, Sontecomapán, near Los Tuxtlas Biological Research Station, stream near Laguna Escondida {18.6794°N, 95.1544°W}, 35 m, 14–15 July 1992, K. J. Tennessen & W. F. Mauffray [FSCA]; 3 ♂♂, 1 ♀, Laguna Azul, Emilia, and Arroyo de Laguna Escondida near Los Tuxtlas Biological Station, 18.5781°N, 95.0922°W, 200 m, 27 August 1988, S. W. Dunkle & M. J. Westfall, Jr. [FSCA]; 2 ♂♂, 1 ♀, same data but 7–29 August 1982, R. W. Garrison [RWG]; 3 ♂♂, 2 ♀♀, same data but 27 August 1988, R. W. Garrison [RWG]; 1 ♂, 2 ♀♀, Río La Palma, pond and roadside spring pool, N of Sontecomapán, on road to Los Tuxtlas Biological Station, 18.5619°N, 95.0592°W, 18 m, 17 July 1992, W. F. Mauffray & S. W. Dunkle [FSCA]; 1 ♂, 1 ♀, Arroyo Agua Caliente and hillside seepages, 1 km SE of Sontecomapán {18.4933°N, 95.0119°W}, 4 m, 30 August 1988, S. W. Dunkle & M. J. Westfall, Jr. [FSCA]; 2 ♂♂, 2 ♀♀, Caldera Lake, near Motel Playa Azul, near Laguna Catemaco, Catemaco, 18.4261°N, 95.0947°W, 349 m, 30 June 1965, D. R. Paulson & N. Chernoff [FSCA, RWG]; 13 ♂♂, 3 ♀♀, same data but 18 August 1976, R. W. & J. A. Garrison [BYU, CSCA, RMNH, RWG]; 1 ♀, same data but 30 August 1988, R. W. Garrison [RWG]; 1 ♂, Catemaco, 11 March 1964, R. D. Cuyler [FSCA]; 1 ♂, hydroelectric plant between San Andrés Tuxtla and Catemaco {18.4197°N, 95.1538°W}, 240 m, 16 July 1961, J. A. Harshaw [FSCA]; **Tabasco:** 2 ♂♂, Villa Hermosa {17.9667°N, 92.9168°W}, 8 m, 17 March 1964, R. D. Cuyler [FSCA]; **Chiapas:** 1 ♂, Ruinas Chinkultic, near Comitán {16.1292°N, 91.7833°W}, 1488 m, 23 October 1986, E. M. Fisher [RWG]; 1 ♂, Montebello {16.12°N,

91.73°W}, 1475 m, 15 May 1969, R. G. Wind [RWG]. **BELIZE, Corozal:** 1 ♂, Sarteneja, Shipstern Nature Reserve, Mangrove, 2002-102, 18.2953°N, 88.17°W, 2 m, 29 July 2002, L. Juillerat [LJ]; 1 ♀, same data but Xopol, 2002-101, 18.2669°N, 88.2731°W, 2 m, 28 July 2002 [LJ]; 1 ♂, same data but Cowpen, 2002-103, 18.2214°N, 88.22°W, 2 m, 9 August 2002, M. Pittet [LJ]; **Cayo:** 1 ♂, Roaring Creek at W Highway, small clear river with rapids {17.2669°N, 88.8125°W}, 40 m, 19 March 1986, S. W. Dunkle [FSCA]; 1 ♂, Belmopan, Roaring creek at W Highway, 17.2514°N, 88.767°W, 72 m, 19 March 1986, S. W. Dunkle [FSCA]; 1 ♂, same data but 1 January 1974, L. Jack & P. Kiefer [RWG]; 1 ♂, W of Unitedville at Unitedville School, tributary to Belize River {17.2158°N, 88.9435°W}, 70 m, 30 May 1993, W. F. Mauffray [FSCA]; 1 ♂, 3.9 m S of Georgeville on Chiquibul Road on Maya Ranch, spring fed vegetated pond, {17.1464°N, 88.9619°W}, 105 m, 1 June 1993, W. F. Mauffray [FSCA]; 1 ♂, pond 1 mi W of San Ignacio on W Highway, 140 m, 24 March 1986, S. W. Dunkle [FSCA]; 3 ♂♂, W branch Belize River, San Jose Soccots, 83x043 {17.0877°N, 89.129°W}, 90 m, 10 January 1983, T. W. Donnelly [FSCA]; 1 ♂, same data but 24 March 1986 [FSCA]; 1 ♂, 1 ♀, Little Vaquero Creek on Chiquibul Road, N of Augustine, Mountain Pine Ridge, 83x043 {17.05°N, 88.95°W}, 500 m, 22–25 July 1983, T. W. Donnelly [FSCA]; 4 ♂♂, 3 ♀♀, Río On, creek and pools on Chiquibul Road, N of Augustine, granite bedrock and vegetated pools {16.9886°N, 88.9747°W}, 442 m, 23 March 1986, S. W. Dunkle [FSCA, RWG]; same data but 1 ♂, 10 December 1992, T. Boomsma [RWG]; **Toledo:** 1 ♂, Santa Rosita Village, S Highway at Crique Negra {16.5016°N, 88.5209°W}, 25 m, 8 June 1993, W. F. Mauffray [FSCA]; 5 ♂♂, 3 ♀♀, lily pond 3.6 mi S of Bladen River on S Highway {16.4713°N, 88.6467°W}, 20 m, 8 June 1993, S. W. Dunkle [FSCA, RWG]; 1 ♂, Medina Bank, 3.6 mi S of Bladen River at Big Dry Creek {16.4411°N, 88.7417°W}, 20 m, 8 June 1993, W. F. Mauffray [FSCA]; **Stann Creek:** 1 ♂, small stream 10 mi NW of Mango Creek, 83x002 {16.6276°N, 88.4769°W}, 35 m, 7 January 1983, T. W. Donnelly [FSCA]. **GUATEMALA, El Petén:** 2 ♂♂, Aguada, Tikal, 64x076 {17.225°N, 89.6133°W}, 194 m, 16 September 1964, T. W. Donnelly [FSCA]; 2 ♂♂, Arroyo Negro, 6 km S of Tikal, 83x040 {17.1894°N, 89.6345°W}, 250 m, 19 July 1964, T. W. Donnelly [FSCA]; 1 ♂, 1 ♀, Piedras Negras {17.1792°N, 91.2561°W}, 197 m, 30 June 1933, D. W. Amram [ANSP]; 1 ♂, 1 ♀, Flores, grassy marshy area near lake, 63x071 {16.9289°N, 89.8698°W}, 140 m, 26 July 1963, T. W. Donnelly [FSCA]; 1 ♂, 1 ♀, same data but 83x038, 17–18 July 1980 [FSCA]; 1 ♂, 14 mi S of La Libertad, Santa Teresa on Río Subín {16.6332°N, 90.1833°W}, 130 m, 12 April 1933, L. C. Stuart [FSCA]; 1 ♂, Río Subín, 20 km S of La Libertad, 83x041, 20 July 1983, T. W. Donnelly [FSCA]; 2 ♂♂, Tikal, 64x078 {17.225°N, 89.6133°W}, 194 m, 17 September 1964, T. W. Donnelly [FSCA]; **Izabal:** 1 ♂, 1 ♀, Puerto Matías de Galvez {15.6768°N, 88.6121°W}, 60 m, 22 August 1964–15 June 1965, F. G. Thompson & D. A. Dean [FSCA]; 1 ♂, Río Dulce at Fronteras, 78x005 {15.66°N, 89°W}, 31 May 1978, T. W. Donnelly [FSCA]; 2 ♂♂, 5 km S of San Felipe, 68x021 {15.6298°N, 88.9697°W}, 11 m, 26 August 1968, T. W. Donnelly [FSCA].

A small species (Table 2) with brilliant blue male (Figs. 813, 1031) and blue or tan female (Figs. 1031, 1032).

Diagnosis. As Calvert noted, *A. gaumeri* is essentially a blue *A. frequentula*, differing primarily by color pattern and in having 4 instead of 3 Fw Pq. The male genital ligula of this species and of *A. frequentula* are like those of *A. pulla* (Fig. 640), and we have been unable to find any significant differences in the male caudal appendage morphology between *A. gaumeri* (Fig. 691) and *A. frequentula* (Fig. 682). The differences between the males of these two species are provided in couplets 3(1') and 3' of Key M-2 and in the diagnosis of *A. frequentula*. Female *A. gaumeri* is similar to that of *A. frequentula*, but the mesostigmal plates in *A. frequentula* are separated by a distance shorter than transverse width of each mesostigmal lobe (Figs. 516–520), whereas in *A. gaumeri*, the mesostigmal plates are separated by a distance subequal to or larger than transverse width of each mesostigmal lobe (Fig. 526) and, in this respect, more closely approach the mesostigmal plate morphology of *A. pulla* (Figs. 562, 563) as Calvert noted, “The appendages of the male are like those of *frequentula*, the mesostigmal laminae of the female intermediate between those of *frequentula* and of *pulla*.” In *A. pulla*, there is usually a small concave notch (Fig. 562d) or U-shaped concavity (Fig. 563d) between the lobe and the lateral branch of the dorsal carina that is absent in *A. gaumeri* (Fig. 526d).

Males of *A. gaumeri* share a similar color pattern to *A. sedula* in the field. Besides the obvious differences in the male caudal appendages (trilobed paraproct and short cercus in *A. gaumeri*, Fig. 691 versus bifurcate paraproct with lower branch acuminate and dorsal margin serrulate and cercus about twice as long as wide, Fig. 731), S8–10 in *A. gaumeri* are entirely blue (Figs. 324, 325, 1031) and lack the ventral black stripes (sometimes vestigial on S8) present in *A. sedula* (Figs. 376, 1010). The two species are also allopatric; *A. gaumeri* occurring no farther north than Los Tuxtlas region in S Veracruz (Fig. 800) and *A. sedula* occurring no farther south than the city of Veracruz (Fig. 797).

Remarks. Calvert (1907) had access to 23 males (including the holotype) and five females and provided a fairly thorough description of both sexes. Our color illustrations (Figs. 70, 203, 204, 324, 325, 434, 435, 813, 1031–1033) supplement Calvert's description.

Distribution. Although Förster (2001) lists this species as occurring south through Costa Rica, we have seen no records from that country, nor is it included in Paulson & Haber's (2021) field guide for that country; we have seen no records farther south than N Honduras (Fig. 800). Based on iNaturalist observations (checked by D. R. Paulson, pers. comm.) this species occurs on Isla Utila, Honduras, perhaps representing the only *Argia* that has crossed over to a W Caribbean island.

***Argia gonzalezi* Garrison & von Ellenrieder, n. sp.**

Figs. 71 (head, thorax, S1–4 ♂); 205 (head, thorax ♀); 326 (S7–10 ♂); 436 (S7–10 ♀); 527 (mesostigmal plates ♀); 692 (appendages ♂); 774 (map); 1004 (body scan ♂); 1005 (body scan ♀).

[Key locators: ♂ G-5, couplet 8(4'); ♂ M-6, couplet 8(7); ♀ F-16, couplet 1]

Argia medullaris? (= *variabilis*?): Calvert 1902: 91 (♂, ♀, Guatemala, Zapote, San Gerónimo, pl. IV, figs. 6, 54, 54s).

Argia medullaris: Calvert 1907: 374 (Zapote ♀).

Etymology. Named *gonzalezi* (Latinized name) in honor of our friend and colleague Enrique González-Soriano, in recognition of his valuable contributions to the knowledge of the Mexican Odonata and his generous help in our studies.

Primary types. *Argia gonzalezi*: holotype ♂, MEXICO, Chiapas, 3.5 mi E of Rayón, stream {17.2058°N, 92.9700°W}, 1676 m, 16 July 1965, Dennis R. Paulson leg. [examined, in CNIN].

Specimens examined. 16 ♂♂, 4 ♀♀ (all types): **MEXICO, Hidalgo:** 1 ♂, Molango, Pemuxtilta, Tetziutla (escurridero) {20.8333°N, 98.7608°W}, 1200 m, 21 May 1984, J. Peña [INECOL]; **Chiapas:** 1 ♂, 1 ♀, Rincón Chamula at km 95, Teapa-Chiapa de Corzo Road {17.2083°N, 92.9333°W}, 1844 m, 26 September 1983, R. W. Garrison [RWG]; 1 ♂, near Linda Vista Tropical Biological Station, 21 August 1967, Gittins, Clarke *et al.* [RWG]; 5 ♂♂, 2 ♀♀ (holotype and paratypes), 3.5 mi E of Rayón, stream, 17.2058°N, 92.97°W, 1676 m, 16 July 1965, D. R. Paulson [CNIN, FSCA, RWG]. **GUATEMALA, Suchitepéquez:** 8 ♂♂, 1 ♀, Finca Moca Grande {14.5336°N, 91.2517°W}, 400 m, 6–8 July 1977, M. J. Westfall, Jr. [CSCA, FSCA, RWG].

A medium-size species (Table 2); male brilliant blue (Figs. 71, 326, 1004) with flagellum of genital ligula bifid along its distal 0.20 (as in Fig. 625b), and cercus subrectangular in dorsal view (Fig. 692); female pale blue (Fig. 1005), with mesostigmal lobe not widened distally (Fig. 528).

Description of male holotype. Head (as in Fig. 71): Labrum, ante- and postclypeus, ante- and postfrons, base of mandibles and genae blue; epicranium black but interrupted by large blue postocular spots each broadly confluent with compound eyes, blue occipital bar represented by lateral spot, a small triangular pale spot anterolateral to lateral ocellus; antennae black; rear of head pale starkly marked with black on each side of occipital foramen.

Prothorax black with following areas blue: lateral margins of anterior lobe, dorsolateral spot on middle lobe, propleuron except for anterior margin rimmed in black, and extreme lateral margins of posterior lobe. Pale areas of pterothorax vivid blue, with black middorsal stripe of uniform width, slightly broader than middorsal carina; remainder of mesepisternum blue; anterior 0.80 of mesinfraepisternum black, continuous with broad humeral stripe at base then forked at dorsal sixth along mesopleural suture, the posterior fork broad but not touching antealar crest; upper portion of humeral stripe a hairline expanding again at mesopleural fossa; remainder of thorax blue except for vestige of interpleural stripe and a narrow black stripe on metapleural suture (as in Fig. 71). Wings hyaline with venation black; Pt dark brown, surmounting 1 cell in all wings; px Fw 18/19, Hw 17/16; pq cells Fw 4/4, Hw 3/3; RP2 at Fw 8/8, Hw 7/7. Coxae and trochanters pale blue except for black on dorsum of trochanters; femora black, flexor surface pale; tibiae black with extensor surface pale, tarsi and armature black.

Abdomen (as in Figs. 71, 326) mostly blue; S1 blue, dorsally with a black basal spot and ventrobasal black spot; S2 blue laterally with a broad black stripe terminating at apical fifth, its posterior portion expanded as an inverted triangle dorsally at apical fourth, its tip almost meeting the other dorsally, annulus black; S3 blue, with a complete uniform ventral black stripe beginning at basal tenth with its anteapical dorsal margin extending dorsally as a blunt triangle, remainder of stripe connected to black annulus; S4–6 similar but black lateral stripe extending full length

of each segment; S7–9 blue dorsally and laterally with continuous black stripe; S10 black up to torus; torus pale, its ventral margin rimmed with black; cercus black; paraproct narrowly blue dorsobasally, remainder black.

Genital ligula as in *A. medullaris*, in ectal view with flagellum bifid along its distal 0.20 only (as in Fig. 625b), in lateral view distal segment lacking a raised sclerotized boss, lateral lobe broadly hook-shaped with a distinct U-shaped concavity separating lobe from base of genital ligula (as in Figs. 625a, c).

Torus large, swollen, transversely oval, occupying entire ventral margin of torifer but not overlapping bilobed epiproct (Fig. 692c); epiproct apically with a narrow cleft, pale, black laterally; cerci not approximate, their inner surfaces separated by a distance greater than width of epiproct (Fig. 692c); cercus in dorsal view subrectangular, with inner and outer margins subequal in length, and space between cerci about three times basal width of each cercus (Fig. 692c); cercus in lateral view subequal in length to paraproct (Fig. 692b), mediobasal margin of cercus in dorsomedial view with a distinct semicircular sinus, its medial and apical margin expanding into a broadly based ventrally directed tooth (Fig. 692a) that is usually not visible in lateral view (Fig. 692b).

Dimensions. Hw 24.9, abdomen 31.4, total length 39.7.

Description of female paratype (GUATEMALA: Suchitepéquez, Finca Moca Grande, Figs. 205, 436, 1005). Similar to male but pale colors a lighter blue. Head with more extensive black on epicranium and on postfrons especially on frontal suture; pro- and pterothorax as in male but antehumeral stripe blue-tan; legs largely pale blue with streaks of brown on outer surfaces of femora and inner portion of tibiae; Pt dark brown, surmounting 1.5 cells in right Fw, 1 cell in all other wings; px Fw 16/15, Hw 13/13; pq cells Fw 4/4, Hw 3/3; RP2 at Fw 8/8, Hw 6/6. S1 as in male; S2 with black lateral stripe running full length of segment, its posterior end enlarged at apical fifth and connecting above isolating small dorsal blue spot and with a small blue lateral streak within black lateral stripe; S3–6 similar to S2 but dorsal blue becoming progressively smaller posteriorly; S7 with dorsal blue almost limited to a basal ring; S8 blue dorsolaterally, black laterally; S9 entirely black except for small midlateral blue spot; S10, cerci and ovipositor black.

Mesepisternal tubercles absent, mesostigmal lobe distally roundly quadrate, erect, directed medioposteriorly, in dorsal view its posterior margin almost linear (as in Fig. 527c), its mesal margin slightly overlapping lateral branch of dorsal carina (as in Fig. 527d) and its base meeting at carina (as in Fig. 527a).

Dimensions. Hw 23.6, abdomen 27.4, total length 35.5.

Variation in paratypes. Both sexes vary in the extent of dark markings on thorax and abdomen. The lateral stripes on S3–9 are narrower in one male (Finca Moca Grande), and the posterior fork of the humeral stripe is vestigial in another male (Finca Moca Grande). The dorsolateral blue spot on S8 is reduced to the apical half and S9 is totally black in the Rincón Chamula female. Pt surmounting 1–2 cells in males and females; px: Fw 14–18, Hw 12–17 in males, Fw 15–20, Hw 13–17 in females; pq: Fw 3.5–4, Hw 3 in males, Fw 4, Hw 3 in females; RP2 at Fw 7–9, Hw 6–8 in males, at Fw 8–9, Hw 6–8 in females. Dimensions. ♂: Hw 22.9 ± 1.5 [20.5–24.9], abdomen 29.3 ± 1.9 [26.5–31.5], total length 37.1 ± 2.3 [33.6–40.0]. ♀: Hw 25.9 ± 1.8 [23.6–28.1], abdomen 30.0 ± 1.9 [27.4–31.9], total length 38.0 ± 2.0 [35.5–40.4].

Diagnosis. This species is similar in body markings to the more widespread *A. medullaris* but differs in the morphology of the male appendages and female mesostigmal plates. The genital ligula of both species is the same, and both are unique in having the flagellum of the genital ligula bifid along its distal 0.20 (as in Fig. 625b). The cercus of *A. gonzalezi* in dorsal view is subrectangular, with inner and outer margins subequal in length and space between cerci is about three times basal width of each cercus (Fig. 692c); in lateral view it is subequal in length to the paraproct (Fig. 692b). The cercus of *A. medullaris* in dorsal view is bluntly triangular, with the inner margin much longer than the outer margin and the space between the cerci is shorter than the basal width of each cercus (Fig. 707c); in lateral view it is distinctly shorter in length than paraproct (Fig. 707b). A distinct semicircular sinus is present along the mediobasal margin of cercus of *A. gonzalezi* in dorsomedial view with its medial and apical margin expanding into a broadly based ventrally directed tooth (Fig. 692a) that is usually not visible in lateral view (Fig. 692b). The semicircular sinus in *A. medullaris* is much smaller, and its medial and apical margins are linear, abruptly ending at base to the inner branch (Fig. 707a).

The mesostigmal lobe of the female of *A. gonzalezi* in dorsal view is not widened distally, is directed posteromedially, and its lateral (outer) margin is almost linear with lateroposterior margin of mesostigmal plate (Figs. 527, 528); that for *A. medullaris* is distally wider than basally (Figs. 542), is directed posteriorly, and its lateral (outer) margin is concave (Fig. 542c).

Males of *Argia variabilis* (Fig. 863) and some examples of *A. funebris* (not illustrated, e. g., Mexico: Chiapas,

stream 20.1 mi. N Ocozocoautla) share a similar overall abdominal marking (largely continuous parallel ventral black stripe on S3–10) and may be confused with *A. gonzalezi* (Fig. 1004), but the genital ligula in both *A. variabilis* (Fig. 657) and *A. funebris* (Fig. 615) lacks the long bifurcate terminal segment characteristic of both *A. gonzalezi* and *A. medullaris* (Fig. 625). The female mesostigmal plates of *A. gonzalezi* (Fig. 527) differ from the angulate lobes of *A. funebris* (Fig. 524) and almost approximate lobes of *A. variabilis* (Fig. 588). The female of *A. variabilis* also appears to be unique in possessing a fishhook-like middorsal stripe (Fig. 268) compared to the parallel stripe in *A. funebris* (Figs. 64–68), *A. gonzalezi* (Fig. 71) and *A. medullaris* (Fig. 90).

Remarks. Calvert (1902, 1907) experienced difficulty separating *A. variabilis* from *A. medullaris* and later opined that both may be synonymous, as both have nearly identical body markings. However, the genital ligula of both species is different, as evidenced by Figures 542 (*A. medullaris*) and 588 (*A. variabilis*). In addition, the black humeral stripe is unforked in *A. variabilis* (Figs. 160, 161, 488) but is generally forked in *A. medullaris* (Figs. 90, 223). Our records for *A. variabilis* show it to be confined to Mexico (Fig. 774) although there is one male identified by L. K. Gloyd from Guatemala (stream 28.5 mi SE of La Mesilla on CA 1). Calvert (1902) had one of Selys' syntypes ("Vera Cruz", pl. IV, fig. 53), and this was the only specimen representing that species at his disposal in 1902 and 1907. His specimens from Costa Rica (Caché, Cañas Gordas, Juan Viñas) most likely represented the true *A. medullaris*. The pair from Guatemala (Zapote) probably represent what we are calling *A. gonzalezi*, though an examination of the male will be necessary in order to confirm this. His illustration of the Zapote female mesostigmal lobe (pl. IV, fig. 6) tallies with our illustration of *A. gonzalezi* (Fig. 527a). We have been unable to determine to what species his figure (pl. X, fig. 21) from Juan Viñas represents. In summary, we suggest that Calvert had examples of all three species (*A. gonzalezi*, *A. medullaris* and *A. variabilis*) when treating *A. medullaris* and *A. variabilis*.

A female from Costa Rica (Cartago, Reserva Tapantí, unnamed tributaries ca. 9 km NW of tunnel {9.72°N, 83.78°W}, 1400 m, 8–9 June 1988, C. M. & O. S. Flint, Jr. & R. W. Holzethal, in RWG) appears to be *A. gonzalezi* but is far from the presently known distribution and in the middle of the range of the very similar *A. medullaris*. It differs from the more northerly females of *A. gonzalezi* in possessing a pair of raised microspinose tubercles on the mesepisternum directly posterior to the medial portion of the mesostigmal lobe (Fig. 528) and having S5–7 entirely black except for an incomplete pale dorsal basal ring. This female was collected with *A. underwoodi* but it is definitely not the female of that species, as the lateral margin of the mesostigmal lobe in that species is largely quadrate (Fig. 587) and the body markings in that species are different (Figs. 266, 487). We are uncertain if it is indeed *A. gonzalezi* or if it represents the female of another yet undescribed species, and we are reserving final judgment on its identity until more specimens are available.

Distribution. *Argia gonzalezi*, like its close relative *A. medullaris*, is a montane species occurring from about 400 to 1845 m. It ranges from Hidalgo, Mexico, south to Finca Moca Grande in Guatemala (Fig. 774). At the latter locality, nine males and one female were collected along with a male *A. medullaris*, and this represents the farthest north known locality for *A. medullaris*.

***Argia haberi* Garrison & von Ellenrieder, 2017**

Figs. 72 (head, thorax, S1–4 ♂); 274 (wings ♂); 327 (S7–10 ♂); 616 (genital ligula); 693 (appendages ♂); 782 (map); 880 (body scan ♂).

[Key locators: ♂ G-1, couplet 13(12'); ♂ M-5, couplets 7', 16']

Argia haberi Garrison & von Ellenrieder 2017: 22 (key, description ♂, figs. 26, 75, 124, 140, 160, 171);—Paulson & Haber: 2021: 94 (diagnosis, photo).

Primary types. *Argia haberi*: holotype ♂, COSTA RICA, San José: km 118 on Pan American highway, Bosque del Tolomuco, in seeps and trickles through brushy pasture on forested hillside (9°28'18" N, 83°41'48" W, 1710 m), 27 March 2006, F. C. Sibley [examined, in FSCA].

Specimens examined. See Garrison & von Ellenrieder 2017.

A medium-size species (Table 2); male largely blue (Figs. 72, 327, 880) with slightly amber wings (Fig. 274) and genital ligula with spatulate distal segment lacking flagella and with relatively larger lateral lobes (Fig. 616).

Diagnosis. Male is superficially similar in markings, amber wings and male appendage morphology to *A. rhoadsi* and was described and diagnosed against *A. rhoadsi* by Garrison & von Ellenrieder (2017). Both possess

a quadrate cercus and a unilobate paraproct extending well beyond level of cercus. However, the decumbent tooth representing inner branch is not as prominent and is placed more basally in *A. rhoadsi* (Fig. 726a) compared with *A. haberi* (Fig. 693a). The torus in *A. rhoadsi* is more elongate and partially overlaps the epiproct (Fig. 726c), compared with the shorter non-overlapping torus in *A. haberi* (Fig. 693c). The posterior margin of the paraproct in *A. rhoadsi* is slightly convex (Figs. 726a, b), not linear as in *A. haberi* (Figs. 693a, b). The greatest difference is in the morphology of the genital ligula: the terminal segment is rectangular with two flagella and small poorly developed lateral lobes at flexure in *A. rhoadsi* (Fig. 641) versus a spatulate terminal segment lacking flagella and with relatively large lateral lobes in *A. haberi* (Fig. 616). Although males of both species possess amber wings, the pale coloration in *A. rhoadsi* (Fig. 122) is an aquamarine blue, compared to a more intense violaceous blue in *A. haberi* (Fig. 72). The female is unknown.

Habitat. The four males known were found along seeps and trickles through brushy pasture on a forested hillside.

Distribution. *Argia haberi* is so far known only from its type locality in San José, Costa Rica (Fig. 782).

Argia harknessi Calvert, 1899

Figs. 73 (head, thorax, S1–4 ♂); 206, 207 (♀ head, thorax, S1–4 ♀); 328 (S7–10 ♂); 437, 438 (S7–10 ♀); 529 (mesostigmal plates); 694 (appendages ♂); 792 (map); 814 (field photo ♂), 815 (field photo ♀); 968 (body scan ♂); 969, 970 (body scans ♀).

[Key locators: ♂ G-4, couplet 7(1'); ♂ M-2, couplet 2', M-5, couplet 8(6'); ♀ F-16, couplet 5(4'); ♀ shortcut 7]

Argia harknessi Calvert 1899: 378 (description ♂, ♀, pl. XXV, fig. 6);—Calvert 1902: 87 (♂, ♀, redescription, plate IV, figs. 21, 45, 45i);—Calvert & Hagen 1902: 109 (“Type in Calif. Acad. Sci.”);—Calvert 1907: 372 (♀ note);—Calvert 1947: 607 (lectotype ♂ designated, in CAS);—Paulson 1982: 252 (Mexico);—Novelo-Gutiérrez 1992: 47 (description of larva, figs. 3, 18, 37, 58, 73, 96);—González-Soriano 1993: 295 (Mexico);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Paulson 2002b: 362 (Nayarit, Mexico);—Bailowitz & Danforth 2007: 24 (Arizona, new record for the U. S. A.);—González-Soriano & Novelo-Gutiérrez 2007: 127 (Mexico);—Upson *et al.* 2007: 30 (Sonora, Mexico);—González-Soriano *et al.* 2008: 310 (Morelos, Mexico);—Bailowitz *et al.* 2009: 16 (Nayarit, Mexico);—Caesar & Wenzel 2009: 104 (phylogeny within genus *Argia*);—Paulson 2009: 160 (♂, ♀, description, diagnosis, figs., photo 93);—Bailowitz *et al.* 2015: 114 (diagnosis, photos);—Escoto-Moreno *et al.* 2015: 153 (Zacatecas, Mexico);—González-Soriano *et al.* 2016: 156 (Colima, Mexico);—Torres-Pachón *et al.* 2017: 413 (molecular phylogeny of larvae within *Argia*).

Argia (Chalcargia) harknessi: Kennedy 1920: 85 (in subgenus *Chalcargia*).

Primary types. *Argia harknessi*: lectotype ♂, MEXICO, Tepic, October 1894, Gustav Eisen & Frank H. Vaslit leg. [not examined, in CAS; Calvert 1947].

Specimens examined. 29 ♂♂, 5 ♀♀: **MEXICO, Sonora:** 1 ♂, 1 ♀, Hwy #12, at spillway below Cajón de Onapa reservoir, 2:00 PM, 28.7083°N, 109.131°W, 604 m, 23 July 2004, S. Upson [RWG]; 1 ♂, same data but 6 June 2003 [RWG]; **Nayarit:** 1 ♂, small rocky and muddy river 20.1 mi S of Acaponeta {22.2422°N, 105.268°W}, 53 m, 27 August 1965, D. R. Paulson & N. Smith [FSCA]; 1 ♂, Jumatán, Selva Baja, 21.6442°N, 105.036°W, 360 m, 25 September 1979, R. Lopez [UMMZ]; 5 ♂♂, 1 ♀, Tepic, 21.5°N, 104.9°W, 900 m, 5–6 November 1923, J. H. Williamson [FSCA, RWG]; **Colima:** 1 ♂, Río El Salto at El Salto Recreation Area, 5 km S of Minatitlán, 300 m off Highway 98, 3:00 p.m. {19.3692°N, 104.0849°W}, 681 m, 28 July 1996, G. Harp [RWG]; **Morelos:** 2 ♂♂, Pueblo Cocoyotla, Highway 421 about 30 km S of Cuernavaca, 11:00 AM {18.7678°N, 99.4572°W}, 1070 m, 23 July 1992, J. J. Daigle [RWG]; 1 ♂, river on 421, 0.3 km N of Pueblo Cocoyotla {18.7581°N, 99.4564°W}, 1045 m, 23 July 1992, S. W. Dunkle [FSCA]; 1 ♂, Puente de Ixtla Ojos de Agua {18.5908°N, 99.3147°W}, 890 m, 26 August 1984, V. García [RWG]; 4 ♂♂, 1 ♀, San Rafael Vicente Aranda, 18.5622°N, 99.2369°W, 852 m, 13 April 1985, R. Novelo-Gutiérrez & V. García [CSCA, RWG]; 2 ♂♂, same data but 2–5 February 1985 [RWG]; 1 ♂, 1 ♀, Río Amacuzac at Tehuixtla and stream at Balneario Las Palmas, female collected at top of high dry ridge, 18.5475°N, 99.2703°W, 866 m, 20 July 1992, S. W. Dunkle [RWG]; **Guerrero:** 1 ♂, 32 mi N of Acapulco {17.1321°N, 99.5583°W}, 160 m, 15 August 1936, H. R. Roberts [FSCA]; **Oaxaca:** 1 ♂, Tehuantepec {16.3203°N, 95.2411°W}, 41 m [RWG].

A relatively large species (Table 2); male mostly blue (Figs. 73, 328, 814, 968) with ventral lobe of paraproct vestigial (Fig. 649b); female similar to male, blue or tan (Figs. 969, 970), with mesostigmal lobe occupying about 0.33

of plate and with posterolateral margin of mesostigmal lobe in dorsal view distinctly concave, clearly differentiated from remainder of mesostigmal plate (Fig. 529).

Diagnosis. Both sexes of *A. harknessi* were described in detail by Calvert (1899) and redescribed and keyed by Calvert (1902). This species is diagnosed against its most similar congeners, *A. barretti*, *A. pipila*, and *A. insipida*, under *A. barretti*. We have been unable to find reliable characters with which to separate females of *A. harknessi* from *A. pipila*; they will need to be identified based on their allopatric distributions: SE Arizona in the United States south to Oaxaca along W Mexico for *A. harknessi* and S Veracruz in Mexico south through Nicaragua for *A. pipila* (Fig. 792).

Remarks. No type of *A. harknessi* was designated in the original description. The male originally figured in Calvert (1899) was later refigured by Calvert in 1902 (pl. IV, fig. 45) and was lodged in the CAS but was destroyed during the San Francisco earthquake and fire in 1906. Calvert (1947) rectified the loss by designating a lectotype from the type locality.

Habitat. This species was common at a fair-sized river, open with some wooded areas and sand to mud to gravel bottom, with some shore vegetation, scattered small pools and mostly good current, in Sonora (Cajón de Onapa, Río Sahuaripa; D. R. Paulson pers. comm.), perching mostly on rocks but also on shore vegetation, and ovipositing, mostly in rootlets at swift current.

Distribution. *Argia harknessi* is the W component of a closely related group of species, including *A. barretti* from S Texas and NE Mexico south to about 20°N, followed farther south by *A. pipila* at about 19.3°N and extending south into Nicaragua and then extending just north of the Sierra Madre of Oaxaca in the Isthmus of Tehuantepec (about 17.0°N, 95.0°W). *Argia harknessi* also extends south into the Isthmus (Fig. 792) but only along the S coast of Oaxaca south of the Sierra Madre del Sur (about 16.3°N, 95.25°W) and ranges in elevation from about 20 m to about 1300 m.

Argia herberti Calvert, 1902

Figs. 74–76 (head, thorax, S1–4 ♂); 208 (♀ head, thorax, S1–4 ♀); 329–331 (S7–10 ♂); 439 (S7–10 ♀); 530 (mesostigmal plates); 617 (genital ligula); 695 (appendages ♂); 796 (map); 816 (field photo ♂); 817 (field photo ♀); 989–991 (body scans ♂); 992 (body scan ♀).

[Key locators: ♂ G-5, couplet 6(5'); ♂ M-5, couplet 13(12); ♀ Key to groups; couplet 24(23')]

Argia herberti Calvert 1902: 82 (♂ description, pl. IV, figs. 37, 37s);—Calvert & Hagen 1902: 109 (“Type in Coll. Godman.”);—Kimmins 1970: 186 (holotype data);—Paulson 1982: 252 (Mexico, Guatemala);—González-Soriano 1993: 295 (Mexico);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Förster 2001: 11, 54 (key ♂, fig. C24);—González-Soriano & Novelo-Gutiérrez 2007: 127 (Mexico);—von Ellenrieder & Garrison 2007a: 16 (holotype examined).

Argia sp. nov. Behrstock *et al.* 2007b: 34 (notes, Sonora, Mexico).

Argia new species: Caesar & Wenzel 2009: 104 (phylogeny within genus *Argia*).

Argia cf. *herberti* Bailowitz *et al.* 2015: 116 (fig., photos).

Primary types. *Argia herberti*: holotype ♂, MEXICO, Guerrero, Amula, 6000 ft. [examined, in BMNH; von Ellenrieder & Garrison 2007a].

Specimens examined. 29 ♂♂, 4 ♀♀. **MEXICO, Sonora:** 3 ♂♂, E of Yécora on Highway 16, near km 296, Rancho Cañada Ancha {28.4414°N, 108.541°W}, 1460 m, 19 July 2006, S. W. Dunkle [FSCA, RWG]; 1 ♂, 2 ♀♀, small tributary to Río Los Pilares at Puente El Castillo on Highway 16, km 301, noon, 28.4011°N, 108.796°W, 1260 m, 19 July 2006, S. Upson [RWG]; 5 ♂♂, 1 ♀, same data but 16 August 2003 [CSCA, RWG]; 1 ♂, same data but 14 September 2004 [RWG]; 1 ♂, same data but 26 June 2004 [RWG]; 1 ♂, same data but 27 June 2005, R. Bailowitz [RWG]; 1 ♂, El Trigo de Colón, S of km 296 on Highway 16 {28.3092°N, 108.793°W}, 1399 m, 20 July 2006, S. W. Dunkle [FSCA]; **Morelos:** 1 ♂, 1 ♀, Tepoztlán {18.985°N, 99.1°W}, 1715 m, 14 August 1985, V. García & E. González-Soriano [RWG]; 1 ♂, same data but 8 November 1985, V. García [RWG]; 1 ♂, Las Estacas {18.73°N, 99.1133°W}, 980 m, 30 April 1986, E. González-Soriano & V. García [RWG]; 2 ♂♂, same data but July 1987, M. J. Westfall, Jr. [FSCA, RWG]; 1 ♂, La Fuente, Municipio of Jiutepec, 10 km W of Cuernavaca {18.2558°N, 99.2822°W}, 1300 m, 8 July 1987, M. J. Westfall, Jr. [FSCA]; **Guerrero:** 1 ♂ (holotype), Amula {about 9.5 km NW of Chilapa, 17.6332°N, 99.25°W, 1830 m}, September 1888, H. H. Smith [BMNH]; **Oaxaca:** 1 ♂, 7.1 mi E

of El Camarón, stream {16.5483°N, 95.9228°W}, 1250 m, 26 August 1967, D. R. & M. L. Paulson [RWG]; 1 ♂, 14 mi E of El Camarón, stream, 67-229 {16.4983°N, 95.7967°W}, 850 m, 26 August 1967, D. R. Paulson [FSCA]. **GUATEMALA, Huehuetenango:** 1 ♂, La Mesilla, 9.3 mi SE on CA 1, stream; 67-212 {15.6117°N, 91.8683°W}, 980 m, 23 August 1967, D. R. Paulson [FSCA].

A medium size species (Table 2); male violaceous (Figs. 74–76, 329–331, 816, 989–991) with a forked humeral stripe and cercus subquadrate, its distal margin almost linear (Fig. 695c); female similar to male (Figs. 208, 439, 817, 992), with mesostigmal lobe directed posteriorly to slightly posterolaterally, forming an almost right angle with posterior margin of mesostigmal plate (Figs. 530c, d).

Redescription. *Argia herberti* is a poorly known species. Calvert (1902) had at his disposal only the holotype male. We provide a redescription of both sexes here.

Male (MEXICO, 7.1 mi E of El Camarón, Figs. 76, 331, 990): Head: Labrum, ante- and postclypeus, ante- and postfrons, base of mandibles and genae violaceous; antefrons violet with a narrow transverse black stripe bordering postclypeus; epicranium entirely black except for large violet postocular spots not bordering eye and small linear pale spots anterolaterally to lateral ocellus; antennae black; rear of head black, pale along eye margin. Prothorax black with following areas violet: anterior lobe, dorsolateral spot on middle lobe, its posteroventral margin confluent with propleuron; extreme lateral margins of posterior lobe. Pale areas of pterothorax violet, with black middorsal stripe slightly widening dorsally, about as twice as wide as violaceous antehumeral stripe, ventrally expanding laterally covering mesostigmal plates except for extreme lateral tip of plate, anterior 0.80 of mesinfraepisternum black, continuous with broad humeral stripe at base, the latter about as wide as pale antehumeral stripe; black humeral stripe forked dorsally, the posterior fork thicker and connecting above with black antealar carina at interpleural suture, narrow anterior fork almost a mere line, slightly expanding again at mesopleural fossa; remainder of thorax violet except for a narrow black stripe on metapleural suture. Wings hyaline with venation black; Pt dark brown, surmounting 1.5 cells in both Fw, and Hw; px Fw 18/19, Hw 15/16; pq cells Fw 4/4, Hw 4/4; RP2 at Fw 8/9, Hw 7/7. Coxae and trochanters pale violet except for black on dorsum of trochanters; femora, tibiae, tarsi and armature black. Abdomen mostly black; S1 violet with a narrow black basal ring; S2 black with a dorsal violet spot, its posterior constricted by broad dorsolateral black stripe before expanding at apical fourth, annulus black, lateral black stripe partially interrupted posterolaterally by violet; S3 violet dorsally but narrowing posteriorly to apical fifth, remainder of S3 black except for narrow isolated violet stripe laterally that is not connected anteriorly to dorsal violet, annulus black; S4–7 but with pale violet stripe gradually decreasing apically until it is a basal ring on S6–7; S8–10 violet dorsally, black ventrally; S8 laterally with a small black parallel stripe narrowly connected with ventral black as in Fig. 331.

Distal segment of genital ligula with a coiled bifid flagellum attached to ental surface of broad membranous hood, with a pair of basal lateral lobes (as in Fig. 617).

Torus swollen, transversely parallel, occupying entire ventral margin of torifer but not overlapping bilobed epiproct (as in Figs. 695a, c); epiproct apically raised with a narrow cleft, black, pale posteriorly; cerci not approximate, their inner surfaces separated by a distance greater than width of epiproct (as in Fig. 695c); cercus subquadrate in dorsal view, its posterior margin slightly concave; in mediodorsal view a decumbent blunt black tooth along medial margin (not visible in dorsal view) followed medially by a narrow u-shaped concavity (Fig. 695a); paraproct with posterior margin slightly concave, ventral branch, in both lateral and inner mediodorsal views, narrow, smaller than broad dorsal branch, forming a broadly based triangle (as in Figs. 695a, b).

Dimensions. Hw 24, abdomen 31.5, total length 40.5.

Female (MEXICO: tributary of Los Pilares River, Figs. 208, 439, 992). Similar to male but pale colors tan. Head with more extensive black, base of labrum with a small medial black spot, postclypeus black, anterior black on epicranium with narrow medial offshoot connecting with black postclypeus; pro- and pterothorax as in male; wings hyaline with venation black; Pt dark brown, surmounting 1 cell in all wings; px Fw 15/17, Hw 15/16; pq cells Fw 3/4, Hw 3/3; RP2 at Fw 8/9, Hw 8/8; legs largely black with pale streaks on outer surfaces of femora and inner portion of tibiae; S1–7 black dorsally except for narrow pale basal ring connected laterally (S3) with lateral longitudinal stripe, the latter ending at distal fifth then followed ventrally by a black stripe extending full length of segment; S4–6 similar but pale basal ring not connecting with pale lateral stripe; S7 entirely black except for pale basal ring; S8–9 black, posterior half of 8–9 pale dorsolaterally; S10 pale dorsally, black laterally; sternite 8, cerci and ovipositor except for tip black.

Mesostigmal lobes quadrate, occupying medial fourth of mesostigmal plate, lobe directed posteriorly to slightly

posterolaterally, forming an almost right angle with posterior margin of mesostigmal plate (Figs. 530c, d); with a pronounced mesepisternal tubercle laterally to mesostigmal lobe.

Dimensions. Hw 24.7, abdomen 28.4, total length 36.7.

Diagnosis. Male of *A. herberti* differs from its congeners by the unique morphology of the short subquadrate cercus (Fig. 695c); in mediodorsal view (Fig. 695a), the decumbent tooth is visible and is immediately followed medially by a small U-shaped concavity thus separating the inner branch (lobe) from the medial tooth. Its dark violaceous coloration coupled with the largely dark abdomen (Figs. 74–76, 329–331, 816, 989–991) is similar to that of *A. underwoodi* (Figs. 159, 393, 931) and violaceous populations of *A. oculata* (Figs. 98, 99, 350) and *A. ulmeca* (Figs. 155, 390, 391, 1002). However, the cercus in these three species is longer than wide and differs considerably in overall morphology (Figs. 712, 745c–750c); the posterior margin of the cercus is forked to some degree, with the inner branch longer than the outer in *A. ulmeca* (Figs. 745–749), subequal in *A. underwoodi* (Fig. 750c) and preapical in *A. oculata* (Fig. 712). The genital ligulae of these four species differ as well. In *A. underwoodi* (Fig. 656) there is a long flagellum-like process, whereas there is a bifid flagellum in *A. herberti* (Fig. 617), *A. oculata* (Fig. 631) and *A. ulmeca* (Fig. 655). The membranous dorsal hood is small in *A. oculata* (Fig. 631b) and the ventral pouch-like process (Fig. 631a) is lacking in *A. herberti* (Fig. 617a) and *A. ulmeca* (Fig. 655a). The genital ligulae of both *A. herberti* (Fig. 617b) and *A. ulmeca* (Fig. 655b) share a large membranous hood, but the long, acuminate lateral lobes present in *A. ulmeca* (Fig. 655a) differ from the smaller falcate lobes in *A. herberti* (Fig. 617a).

The female mesostigmal plates of *A. herberti* (Fig. 530) are small, largely parallel-sided and occupy the medial fourth of the mesostigmal plate and differ from the more transversely expansive obtuse lobes in *A. oculata* (Figs. 549–551), *A. ulmeca* (Figs. 583–586) and *A. underwoodi* (Fig. 587).

Remarks. The only description of this species so far had been that of the holotype male (Calvert 1902). It was characterized by having no apical, dorsal, black spot on S8 (Calvert 1901) and S8–9 pale brown, each side with an inferior black stripe as long as the segments, and which on S8 reaches farther up on to the dorsum at apex than at base (Calvert 1902). Calvert's description of the holotype approximates our illustrations of the more southerly (Morelos and Oaxaca) examples (Figs. 989, 990). Behrstock *et al.* (2007b) collected a series of a dark *Argia* in Sonora that they were unable to identify. This was the same species labeled as “*Argia* new species” from Sonora reported by Caesar & Wenzel (2009) in their phylogenetic analysis based on molecular and morphological characters. The former authors kindly sent examples, and examination of the male appendages, genital ligula and female mesostigmal plates were found to match those of *A. herberti*. The Sonoran males differ in having a metallic sheen on the black humeral stripe (Fig. 74) and in having S8 entirely black (Figs. 329, 991); no color or pattern differences were observed among females available to us. Because of these differences, Bailowitz *et al.* (2015) in their field guide to the Odonata of Arizona and Sonora named the species *Argia* cf. *herberti* noting that the population from their region showed some affinities with *A. herberti*, a species known from southern Mexico, but differed markedly in pattern and coloration. However, the morphology of the entire series available to us is consistent with *A. herberti* (including a male from Las Estacas that we compared with the holotype); the coloration differences most likely due to geographic variation noted above are not unique to *A. herberti* and can be found to a lesser or greater extent in males of other species including *A. adamsi* (Garrison & von Ellenrieder 2018), *A. cupraurea* (Figs. 301–303), *A. funcki* (Figs. 61–63), *A. funebris* (Figs. 64, 65, 887, 887–890), *A. oculata* (Figs. 97–100, 980, 981), *A. oenea* (Figs. 101, 102, 961, 962), *A. rogersi* (Figs. 123, 124, 371, 372, 983, 984; Garrison 2019), and *A. ulmeca* (Figs. 390–392, 1001, 1002).

Distribution. *Argia herberti* ranges in elevation from about 85 m (La Cascada, Guerrero, Portal de Datos Abiertos CNIN) to about 1830 m and occurs primarily along the W flank of Mexico south to N Guatemala (Fig. 796).

Argia hinei Kennedy, 1918

Figs. 77 (head, thorax, S1–4 ♂); 209 (♀ head, thorax, S1–4 ♀); 332 (S7–10 ♂); 440 (S7–10 ♀); 531 (mesostigmal plates); 696 (appendages ♂); 788 (map); 935 (body scan ♂); 936 (body scan ♀).

[Key locators: ♂ G-2, couplet 10'; ♂ M-4, couplet 1; ♀ Key to groups, couplet 31(29'); F-4; couplet 1]

Argia hinei Kennedy 1918: 258 (description ♂, ♀, pl. V, figs. 11–22);—Gloyd 1958: 16 (Texas, diagnosis against *A. violacea*);—Johnson 1972a: 85, 90 (♂, ♀, key, figs. 9M, 11E);—Paulson 1982: 252 (U. S. A., Mexico);—González-Soriano 1993: 295 (Mexico);—Garrison 1994: 312 (key, diagnosis, figs. 10, 48, 95, 86);—Abbott & Stewart 1998: 207 (U. S. A., Coahuila,

Mexico);—Garrison *et al.* 2003: 31 (holotype data);—Johnson 2004: 25 (new for Utah);—Abbott 2005a: 71 (♂, ♀, key, figs. 13, 15, photo 7f, distribution in New Mexico, Texas);—Bailowitz & Stevens 2006: 21 (AZ, UT);—Westfall & May 2006: 194 (key, description ♂, ♀, larva, figs. 82E, 92B, 98J, 102D);—Behrstock *et al.* 2007a: 56 (Chihuahua, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Upson *et al.* 2007: 30 (Sonora, Mexico);—Behrstock 2009: 3 (Coahuila, Mexico);—Caesar & Wenzel 2009: 104 (phylogeny within genus *Argia*);—Paulson 2009: 152 (♂, ♀, description, diagnosis, figs., photo 86);—Abbott 2011: 140 (♂, ♀, figs., diagnosis, distribution in Texas);—Bailowitz *et al.* 2013: 15 (AZ);—Bailowitz *et al.* 2015: 118 (diagnosis, figs., photos, AZ, Mexico);—Torres-Pachón *et al.* 2017: 415 (molecular phylogeny of larvae within *Argia*).

Primary types. *Argia hinei*: holotype ♂, U. S. A., California, Fillmore, Sespe River, 7 August 1915, C. H. Kennedy leg. [examined, in UMMZ; Garrison *et al.* 2003].

Specimens examined. 223 ♂♂, 71 ♀♀. **U. S. A., Nevada:** 1 ♂, Red Rock Canyon Scenic Loop Drive, White Rock {36.1712°N, 115.473°W}, 1440 m, 13 June 1990, G. L. Harp [RWG]; **California:** 3 ♂♂, Warm Springs Creek, by Lake Hughes Road, 34.6739°N, 118.443°W, 985 m, 8–15 June 1985, R. W. Garrison [RWG]; 2 ♂♂, just below Matilija Hot Springs, 34.4831°N, 119.304°W, 430 m, 2 September 1984, R. W. & J. A. Garrison [RWG]; 1 ♂, Sespe Creek, 4 mi N of Fillmore, 34.4585°N, 118.928°W, 212 m, 5 September 1982, R. W. & J. A. Garrison [RWG]; 1 ♂ (holotype), Fillmore, Sespe River {34.3992°N, 118.9182°W}, 7 August 1915, C. H. Kennedy [UMMZ]; 1 ♂, Upper Big Tujunga Creek at Wildcat Gulch, Angeles National Forest, 34.308°N, 118.081°W, 1028 m, 12 September 1986, M. L. Pearson [RWG]; 2 ♂♂, San Gabriel Mountains, Big Dalton Canyon, debris basin {34.1704°N, 117.809°W}, 510 m, 29–31 August 1988, D. Swinney [RWG]; **Arizona:** 1 ♂, 1 ♀, Santa María River at Highway 96, 34.4809°N, 113.06°W, 690 m, 8 October 1990, R. W. Garrison [RWG]; 1 ♂, Kirkland Creek near Kirkland at Highway 96, 34.3962°N, 112.707°W, 1200 m, 8 October 1990, R. W. Garrison [RWG]; 7 ♂♂, 2 ♀♀, Sycamore Spring, Fossil Creek Road, Coconino National Forest, 34.395°N, 111.65°W, 1065 m, 2 August 1992, R. W. Garrison [RWG]; 1 ♂, Tonto Natural Bridge State Park, 4 mi S of Pine, 34.3212°N, 111.457°W, 1400 m, 3 August 1992, R. W. Garrison [RWG]; 1 ♂, Agua Fria River at Horseshoe Ranch, 5.2 mi E of I-17, Road 269, 34.2575°N, 112.064°W, 980 m, 14 July 1998, R. W., J. A., P. A., A. V. Garrison [RWG]; 1 ♂, same data but at Bumble Bee exit, 950 m, 1 September 1994, R. W. Garrison [RWG]; 4 ♂♂, Tangle Creek, Tonto National Forest, 34.1333°N, 111.774°W, 819 m, 1 August 1992, R. W. Garrison [BMNH; RWG]; 2 ♂♂, Seven Springs Picnic Ground, about 12 mi. N of Carefree, Tonto National Forest, 33.9675°N, 111.864736°W, 8–14 April 1974, C. T. Goldstein & B. Rentzel [RWG]; 2 ♀♀, same data but 10 August 1974, R. W. Garrison [BMNH, RWG]; 7 ♂♂, same data but 17 August 1974 [RWG]; 12 ♂♂, 2 ♀♀, same data but 22 July 1984, M. S. Miller, R. W. & J. A. Garrison [CSCA, RWG]; 4 ♂♂, same data but 20 June 1987, R. W. Garrison [RWG]; 1 ♂, same data but 29 July 1987 [RWG]; 1 ♂, same data but 26 September 1988 [RWG]; 5 ♂♂, 4 ♀♀, same data but 1 August 1992 [RWG]; 2 ♂♂, 1 ♀, same data but 12 August 1995 [CUMZ, RWG]; 1 ♂, same data but 12 August 1995 [RWG]; 15 ♂♂, 8 ♀♀, same data but 11 August 2001, N. von Ellenrieder [CSCA]; 5 ♂♂, 3 ♀♀, irrigation ditch by Seven Springs wash, 0.7 mi S of Seven Springs, Tonto National Forest, 33.9628°N, 111.859°W, 1050 m, 1 August 1992, R. W. & J. A. Garrison [RWG]; 3 ♂♂, Rackensack Canyon at Camp Creek, on Cave Creek Road, 12 mi NE of Carefree, 33.9041°N, 111.8201°W, 1050 m, 4 August 1975, R. W. Garrison [RWG]; 1 ♂, same data but 21 May 1977 [RWG]; 1 ♂, 1 ♀, same data but 8 August 1992 [RWG]; 1 ♂, Cave Creek at end of Ocotillo Road, Cave Creek, 33.8436°N, 111.963°W, 630 m, 12 May 1984, R. W. Garrison [RWG]; 1 ♂, same data but 4 August 1992 [RWG]; 2 ♀♀, same data but 13 August 1995 [RWG]; 1 ♂, Sycamore Canyon, 3.3 mi. WNW of Highway 87 {33.6932°N, 111.539°W}, 540 m, 23 July 1984, R. W. & J. A. Garrison [RWG]; 1 ♂, 1 ♀, irrigation ditch by US Hwy 60-70, Superior {33.287°N, 111.107°W}, 859 m, 23 July 1984, R. W. Garrison [RWG]; 10 ♂♂, 4 ♀♀, Bonita Creek, 32.9289°N, 109.495°W, 1011 m, 18 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, ONHI, RWG]; 2 ♂♂, same data but 29 September 2002, R. W. Garrison & N. von Ellenrieder [CSCA RWG]; 1 ♂, 1 ♀ (in tandem), Aravaipa Creek, 32.8596°N, 110.373°W, 1011 m, 23 May 2013, K. J. Tennessen [RWG]; 1 ♂, forested stream by turnout, 4.6 mi N of Molino Basin Forest Camp, Coronado National Forest, Santa Catalina Mountains, 32.3628°N, 110.712°W, 1 August 2000, R. W. & J. A. Garrison, [MHNN]; 6 ♂♂, 2 ♀♀, Muleshoe Ranch, Bass Creek, Hot Springs, 32.3528°N, 110.257°W, 1196 m, 17 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 5 ♂♂, 1 ♀, Hot Springs Canyon, about 2 mi by foot NW of Hookers Hot Springs, 32.3528°N, 110.244°W, 1250 m, 20–21 September 1996, R. W. Garrison [RWG]; 12 ♂♂, 9 ♀♀, same data but 10–11 August 1997, R. W., J. A. & P. A. Garrison [RWG]; 3 ♂♂, Upper Sabino Canyon, about 3 mi N of visitor center, N of Tucson, 32.3433°N, 110.783°W, 974 m, 20 July 1987, R. W. Garrison [RWG]; 4 ♂♂, 1 ♀, same data but 22 September 1988, R. W. & J. A. Garrison [RWG]; 4 ♂♂, Sabino

Canyon, Coronado National Forest, 32.3389°N, 110.786°W, 953 m, 5 August 1992, R. W. Garrison [RWG]; 9 ♂♂, 2 ♀♀, Molino Basin Forest Camp, Coronado National Forest, Santa Catalina Mountains, 32.3371°N, 110.69°W, 1221 m, 26 August 1998, R. W. & J. A. Garrison [BYU, RWG]; 3 ♂♂, 1 ♀, same data but 24 July 1984, [RWG]; 1 ♂, same data but 1 August 2000, R. W. Garrison [RWG]; 7 ♂♂, Tanque Verde Falls and road, at Tanque Verde Wash, 32.2552°N, 110.655°W, 1362 m, 25 August 1989, R. W. & J. A. Garrison [RWG]; 1 ♂, Box Canyon at west side of bridge, Road 62, Santa Rita Mountains, Coronado National Forest, 31.7989°N, 110.798°W, 1328 m, 7 August 1992, R. W. Garrison [RWG]; 4 ♂♂, same data but 28 August 1998 [RWG]; 1 ♂, Sycamore Canyon {31.7736°N, 109.342°W}, 1800 m, 3 August 1994, Van Dam family [RWG]; 1 ♂, Madera Canyon {31.7258°N, 110.644°W}, 1480 m, 22 July 1963, N. L. H. Krauss [RWG]; 19 ♂♂, 7 ♀♀, Coronado National Forest, Adobe Canyon, Bathtube Tank, stream and tank, 31.6786°N, 110.769°W, 1442 m, 23 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, MHNN, ONHI, RMNH, RWG]; 6 ♂♂, Coronado National Forest, Bear Creek at Lown Mountain Creek, 31.3828°N, 110.363°W, 1687 m, 24 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 4 ♂♂, 2 ♀♀, Mesa Draw, stream and associated habitats in Leslie Canyon by Leslie Canyon Road, 17 mi N of Douglas {31.5901°N, 109.508°W}, 1420 m, 6 August 1992, P. & R. W. Garrison [RWG]; 6 ♂♂, 4 ♀♀, Patagonia Mountains, Harshaw Creek, 31.51°N, 110.682°W, 1359 m, 23 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, Bog Hole, near Cattle pond, 31.4728°N, 110.652°W, 1516 m, 23 August 2002, J. A., R. W. Garrison & N. von Ellenrieder leg [RWG]; 4 ♂♂, 2 ♀♀, Ramsey Canyon, 31.4625°N, 110.289°W, 21 July 1987, R. W. Garrison [RWG]; 3 ♂♂, 3 ♀♀, Sycamore Canyon, 31.4269°N, 111.194°W, 1196 m, 8 August 1972, R. W. & J. A. Garrison [RWG]; 2 ♂♂, same data but 27 September 2002, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 11 ♂♂, 1 ♀, Peña Blanca Lake, cattle pond on ruby Road, 31.3894°N, 111.119°W, 1225 m, 27 August 1998, R. W. & J. A. Garrison [RWG]; 1 ♀, Parker Canyon at schoolhouse, 31.3725°N, 110.524°W, 1426 m, 16 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA]; **Texas:** 1 ♀, Cherry Canyon, Davis Mtns. {30.9217°N, 104.003°W}, 1280 m, 8 July 1916, F. M. Gaige [UMMZ]. **MEXICO, Sonora:** 1 ♂, Aconchi Hot Springs, 29.8267°N, 110.246°W, 600 m, 7 January 2002, S. Upson [RWG]; **Sinaloa:** 1 ♂, 1 ♀, stream 27.9 mi NE of Concordia {23.5392°N, 105.754°W}, 1220 m, 30 August 1965, D. R. & M. L. Paulson [FSCA].

A relatively small species (Table 2); male predominantly violaceous (Fig. 935) with cercus with a black convex ridge between inner and outer branches in posterior view (Fig. 696d), and dorsal branch of paraproct with a small anteapical tooth (Figs. 696a, b); female tan (Fig. 936), with mesostigmal lobe narrow, longer than wide (Figs. 531b, c, d), lacking a low mesepisternal tubercle laterally to mesostigmal lobe (Fig. 531c).

Diagnosis. Both sexes of *A. hinei* were diagnosed against *A. nahuana*, *A. fumipennis violacea*, and *A. leonorae* by Garrison (1994), and both sexes were fully described in Westfall & May (2006). Male of *A. hinei* is one of six species, including also *A. agrioides*, *A. fumipennis violacea*, *A. leonorae*, *A. nahuana* and *A. pallens*, in which the inner branch of the cercus forms a decumbent lobe. The apical margin of cercus of *A. hinei* in posterior view has a black convex ridge (Fig. 696d) instead of the decumbent tooth present in *A. agrioides* (Fig. 662d), *A. fumipennis violacea* (Figs. 684d, 685), *A. leonorae* (Fig. 704d), *A. nahuana* (Fig. 710d), and *A. pallens* (Fig. 714d).

Female of *A. hinei* may be confused with the other five species mentioned above, but it can be separated from them by the following characters: the anterior margin of mesepisternum directly underneath mesostigmal lobe in *A. hinei* lacks a tubercle (Fig. 531e), this area forming a concave juncture with base of mesostigmal lobe (a tubercle is present in *A. fumipennis violacea*, Fig. 522e, *A. leonorae*, Fig. 539e, and *A. pallens*, Fig. 554e). The mesostigmal lobe in *A. hinei* is narrow, almost digit-like, not broad as in *A. agrioides* (Fig. 495c) and *A. nahuana* (Figs. 546c, 547c).

Distribution. In Mexico, *A. hinei* is thus far known only from the N states of Sonora, Sinaloa, Chihuahua, and Coahuila (Fig. 788). In the U. S. A. the species is relatively common in Arizona and SW California, and it has also been reported from S Nevada and Utah (Johnson 2004; Bailowitz & Stevens 2006). Our records indicate a range of elevation from about 140 m to about 2300 m. Garrison (1994) listed a female from Coahuila, 5.6 mi W of Cuatro Ciénegas, Cuatro Ciénegas Basin, as *A. hinei*. Subsequent examination of that female shows it to be a female of *A. leonorae*.

***Argia immunda* (Hagen, 1861)**

Figs. 78 (head, thorax, S1–4 ♂); 210 (head, thorax, S1–4 ♀); 211 (thorax ♀); 333 (S7–10 ♂); 441 (S7–10 ♀); 532, 533 (mesostigmal plates ♀); 618 (genital ligula); 697 (appendages ♂); 781 (map); 922 (body scan ♂); 923 (body scan ♀).

[Key locators: ♂ G-2, couplet 2(1); ♂ M-6, couplet 27(26); ♀ F-6, couplet 13', F-8, couplet 3']

Agrion immundum Hagen 1861: 93 (description ♂, ♀);—Garrison & von Ellenrieder 2019: 34 (lectotype data).

Argia immunda: Hagen in Selys 1865: 401 (29 reprint);—Calvert 1902: 97 (key, description ♂, ♀, pl. IV. figs. 60, 60s);—Calvert & Hagen 1902: 110 (pl. II, figs. 12, 12a, “Types in M. C. Z.”);—Calvert 1907: 375 (reference to Calvert & Hagen 1902);—Johnson 1972a: 83, 88 (♂, ♀, key, figs. 8J, 10I, J);—Bick & Bick 1978: 6 (wing clapping);—Kiauta & Kiauta 1980: 39 (cytotaxonomy, figs. 21, 22);—Paulson 1982: 253 (U. S. A., Mexico, Belize);—Justus *et al.* 1990: 148 (SEM of mesostigmal plates, figs. 4A, 5A);—Novelo-Gutiérrez & Peña-Olmedo 1991: 130 (Hidalgo, Mexico);—González-Soriano 1993: 295 (Mexico);—Peña-Olmedo & Novelo-Gutiérrez 1993: 131 (key, Hidalgo, Mexico, figs. 39, 56);—Garrison 1994: 314 (key, diagnosis, lectotype designation, figs. 21, 53, 76, 83);—Daigle 1995: 469 (♂, ♀, diagnosis from *A. carlcooki*, key, figs. 1a–e);—Boomsma & Dunkle 1996: 25 (Belize);—Abbott & Stewart 1998: 207 (U. S. A., Mexico);—Förster 2001: 11, 56, 59 (key, fig. C24);—Alonso-Eguía *et al.* 2002: 352 (Querétaro, Mexico);—Abbott 2005a: 72 (♂, ♀, key, figs. 13, 15, photo 8c, distribution in New Mexico, Texas, Oklahoma, Arkansas);—Westfall & May 2006: 195 (key, description, larva, figs. 74B, 81E, 82B, 85A, 92C, 98K, 102E);—Behrstock *et al.* 2007a: 56 (Chihuahua, Mexico);—Behrstock *et al.* 2007b: 30 (Querétaro, Mexico);—Cuevas-Yañez 2007: 86 (Puebla, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Upton *et al.* 2007: 49 (Sonora, Mexico);—Behrstock 2009: 3 (Coahuila, Mexico);—Caesar & Wenzel 2009: 102 (phylogeny within genus *Argia*);—Escoto-Moreno *et al.* 2009: 154 (Aguascalientes, Mexico);—Paulson 2009: 159 (♂, ♀, description, diagnosis, figs., photo 92);—Abbott 2011: 142 (♂, ♀, figs., diagnosis, distribution in Texas);—González-Soriano & Paulson 2011: 307 (Chiapas, Mexico);—González-Soriano *et al.* 2011: 184 (San Luis Potosí, Mexico);—Paulson 2011: 158 (♂, ♀, description, diagnosis, figs., photo 83);—Escoto-Moreno *et al.* 2014: 1051 (Hidalgo, Mexico);—Bailowitz *et al.* 2015: 120 (diagnosis, photos);—Torres-Pachón *et al.* 2017: 415 (molecular phylogeny of larvae within *Argia*);—Ortega-Salas & González-Soriano 2019: 120 (Coahuila, Mexico).

Argia (Heliargia) immunda: Kennedy 1920: 85 (in subgenus *Heliargia*).

Primary types. *Agrion immundum*: lectotype ♂, MEXICO, Tampico, Terres chaudes [examined, in MCZ; Garrison & von Ellenrieder 2019].

Specimens examined. 91 ♂♂, 55 ♀♀: **U. S. A., Nevada:** 1 ♂, Red Rock Canyon Rec. Lands Scenic Loop Drive—White Rock, {36.1712°N, 115.473°W}, 1440 m, 13 June 1990, G. L. Harp, [RWG]; **California:** 3 ♂♂, Warm Springs Creek, by Lake Hughes Road, 34.6739°N, 118.443°W, 985 m, 8–15 June 1985, R. W. Garrison [RWG]; 1 ♂, Sespe Creek, 4 mi N of Fillmore, 34.4585°N, 118.928°W, 212 m, 5 September 1982, R. W. & J. A. Garrison [RWG]; 1 ♂, Upper Big Tujunga Creek at Wildcat Gulch, Angeles National Forest, 34.308°N, 118.081°W, 1028 m, 12 September 1986, M. L. Pearson [RWG]; 2 ♂♂, just below Matilija Hot Springs, 34.4831°N, 119.304°W, 430 m, 2 September 1984, R. W. & J. A. Garrison [RWG]; 2 ♂♂, San Gabriel Mountains, Glendora, Big Dalton Canyon, debris basin {34.1704°N, 117.809°W}, 510 m, 29–31 August 1988, D. Swinney [RWG]; **Arizona:** 1 ♂, 1 ♀, Santa Maria River at Highway 96, 34.4809°N, 113.06°W, 690 m, 8 October 1990, R. W. Garrison [RWG]; 1 ♂, Kirkland Creek near Kirkland at Highway 96, 34.3962°N, 112.707°W, 1200 m, 8 October 1990, R. W. Garrison [RWG]; 2 ♂♂, Fossil Creek, Road 502 S of Fossil Creek Road 708, Coconino National Forest, 34.395°N, 111.65°W, 1065 m, 2 August 1992, R. W. Garrison [RWG]; 4 ♂♂, 2 ♀♀, same data but Sycamore Spring [RWG]; 1 ♂, same data but two cattle tanks near Cimarron Hills [RWG]; 1 ♂, Tonto Natural Bridge State Park, 4 mi S of Pine, 34.3212°N, 111.457°W, 1400 m, 3 August 1992, R. W. Garrison [RWG]; 1 ♂, Agua Fria River at Horseshoe Ranch, 5.2 mi E of I-17, 34.2575°N, 112.064°W, 980 m, 14 July 1998, R. W., J. A., P. A. & A. V. Garrison [RWG]; 1 ♂, Agua Fria River just E of I-17 at Bumble Bee exit, 34.2331°N, 112.098°W, 950 m, 1 September 1994, R. W. Garrison [RWG]; 4 ♂♂, Tangle Creek, Tonto National Forest, 34.1333°N, 111.774°W, 819 m, 1 August 1992, R. W. Garrison [BMNH, RWG]; 1 ♂, Seven Springs Picnic Ground, about 12 mi N of Carefree, Tonto National Forest, 33.9675°N, 111.864736°W, 1012 m, 8 April 1974, C. T. Goldstein [RWG]; 1 ♂, same data but 14 April 1974, B. Rentzel [RWG]; 7 ♂♂, same data but 17 August 1974, R. W. Garrison [RWG]; 2 ♀♀, same data but 10 August 1974 [BMNH, RWG]; 12 ♂♂, 2 ♀♀, same data but 22 July 1984, M. S. Miller, R. W. & J. A. Garrison [CSCA, RWG]; 5 ♂♂, same data but 20 June–29 July 1987, R. W. Garrison [RWG]; 1 ♂, same data but 26 September 1988 [RWG]; 5 ♂♂, 4 ♀♀, same data but 1 August 1992 [RWG]; 1 ♂, 1 ♀, same data but 12 August 1995 [CUMZ, RWG]; 15 ♂♂, 8 ♀♀, Seven Springs Picnic Ground, about 12 mi N of Carefree, Tonto National Forest, 33.9675°N, 111.864736°W, 11

August 2001, N. von Ellenrieder [CSCA]; 5 ♂♂, 3 ♀♀, irrigation ditch by Seven Springs wash, 0.7 mi S of Seven Springs, Tonto National Forest, 33.9628°N, 111.859°W, 1050 m, 1 August 1992, R. W. & J. A. Garrison [RWG]; 3 ♂♂, Rackensack Canyon at Camp Creek, on Cave Creek Road, 12 mi NE of Carefree, 33.9041°N, 111.8201°W, 1050 m, 4 August 1975, R. W. Garrison [RWG]; 1 ♂, same data but 21 May 1977 [RWG]; 1 ♂, 1 ♀, same data but 8 August 1992 [RWG]; 1 ♂, Cave Creek at end of Ocotillo Road, Cave Creek, 33.8436°N, 111.963°W, 630 m, 12 May 1984, R. W. Garrison [RWG]; 1 ♂, same data but 4 August 1992 [RWG]; 2 ♀♀, same data but 13 August 1995 [RWG]; 1 ♂, Sycamore Canyon, 3.3 mi. WNW of Highway 87 {33.6932°N, 111.539°W}, 540 m, 23 July 1984, R. W. & J. A. Garrison [RWG]; 1 ♂, 1 ♀, irrigation ditch by Highway 60–70, Superior {33.287°N, 111.107°W}, 859 m, 23 July 1984, R. W. Garrison [RWG]; 7 ♂♂, 1 ♀, Bonita Creek, tributary to Gila River, 32.9097°N, 109.487°W, 978 m, 18 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, ONHI, RWG]; 4 ♂♂, 3 ♀♀, same data but 29 September 2002, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, 1 ♀ (in tandem), Aravaipa Creek, 32.8596°N, 110.373°W, 1011 m, 23 May 2013, K. J. Tennessen [RWG]; 1 ♂, forested stream by turnout, 4.6 mi N of Molino Basin Forest Camp, Coronado National Forest, Santa Catalina Mountains, 32.3628°N, 110.712°W, 1 August 2000, R. W. & J. A. Garrison [MHNN]; 3 ♂♂, 2 ♀♀, Hot Springs Canyon, about 2 mi by foot NW of Hookers Hot Springs; 12:00–4:30 PM, 32.3528°N, 110.244°W, 1250 m, 20–21 September 1996, R. W. Garrison [RWG]; 2 ♂♂, 2 ♀♀, same data but 10 August 1997, R. W., J. A. & P. A. Garrison [RWG]; 6 ♂♂, 2 ♀♀, Muleshoe Ranch, Bass Creek, Hot Springs, 32.3528°N, 110.257°W, 1196 m, 17 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 3 ♂♂, Upper Sabino Canyon, about 3 mi. N of visitor center, N of Tucson, 32.3433°N, 110.783°W, 974 m, 20 July 1987, R. W. Garrison [RWG]; 4 ♂♂, 1 ♀, same data but 22 September 1988, R. W. & J. A. Garrison [RWG]; 4 ♂♂, Sabino Canyon, Coronado National Forest, 32.3389°N, 110.786°W, 953 m, 5 August 1992, R. W. Garrison [RWG]; 10 ♂♂, 7 ♀♀, Hot Springs Canyon, about 0.5 mi by foot NE of Hookers Hot Springs, 32.3375°N, 110.237°W, 1250 m, 11 August 1997, R. W., J. A. & P. A. Garrison [RWG]; 3 ♂♂, 1 ♀, Molino Basin Forest Camp, Coronado National Forest, Santa Catalina Mountains, 32.3367°N, 110.69°W, 1340 m, 24 July 1984, R. W. & J. A. Garrison [RWG]; 9 ♂♂, 2 ♀♀, same data but 26 August 1998 [BYU, RWG]; 1 ♂, same data but 1 August 2000, R. W. Garrison [RWG]; 7 ♂♂, Tanque Verde Falls near Tanque Verde Road at Tanque Verde Wash, 32.2552°N, 110.655°W, 1362 m, 25 August 1989, R. W. & J. A. Garrison [RWG]; 4 ♂♂, Box Canyon at bridge, W side, Road 62, Santa Rita Mountains, Coronado National Forest, 31.7989°N, 110.798°W, 1328 m, 28 August 1998, R. W. Garrison [RWG]; 1 ♂, same data but 7 August 1992 [RWG]; 1 ♂, Sycamore Canyon {31.7736°N, 109.342°W}, 1800 m, 3 August 1994, Van Dam family [RWG]; 1 ♂, Madera Canyon {31.7258°N, 110.644°W}, 1480 m, 22 July 1963, N. L. H. Krauss [RWG]; 19 ♂♂, 7 ♀♀, Coronado National Forest, Adobe Canyon, Bathtub Tank, stream & tank, 31.6786°N, 110.769°W, 1442 m, 23 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, MHNN, ONHI, RMNH, RWG]; 4 ♂♂, 2 ♀♀, Mesa Draw, stream and associated habitats in Leslie Canyon by Leslie Canyon Road, 17 mi N of Douglas, {31.5901°N, 109.508°W}, 1420 m, 6 August 1992, R. W. & P. A. Garrison [RWG]; 6 ♂♂, 4 ♀♀, Patagonia Mountains, Harshaw Creek, 31.51°N, 110.682°W, 1359 m, 23 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, Bog Hole, near cattle pond, 31.4728°N, 110.652°W, 1516 m, 23 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [RWG]; 4 ♂♂, 2 ♀♀, Ramsey Canyon, 31.4625°N, 110.289°W, 21 July 1987, R. W. Garrison [RWG]; 3 ♂♂, 3 ♀♀, Sycamore Canyon, 31.4269°N, 111.194°W, 1196 m, 8 August 1972, R. W. & J. A. Garrison [RWG]; 2 ♂♂, same data but 27 September 2002, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 11 ♂♂, 1 ♀, Peña Blanca Lake, cattle pond on ruby Road, 31.3894°N, 111.119°W, 1225 m, 27 August 1998, R. W. & J. A. Garrison [RWG]; 6 ♂♂, Coronado National Forest, Bear Creek at Lown Mtn. Creek, 31.3828°N, 110.363°W, 1687 m, 24 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♀, Parker Canyon at schoolhouse, 31.3725°N, 110.524°W, 1426 m, 16 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA]; **Texas:** 1 ♀, Cherry Canyon, Davis Mtns. {30.9217°N, 104.003°W}, 1280 m, 8 July 1916, F. M. Gaige [UMMZ]. **MEXICO, Sonora:** 1 ♂, Aconchi Hot Springs, 29.8267°N, 110.246°W, 600 m, 7 January 2002, S. Upson [RWG]; **Sinaloa:** 1 ♂, 1 ♀, stream 27.9 mi NE of Concordia {23.5392°N, 105.754°W}, 1220 m, 30 August 1965, D. R. & M. L. Paulson [FSCA]; **Tamaulipas:** 4 ♂♂, 1 ♀ (lectotype and paralectotypes), Tampico {22.2167°N, 97.85°W, 8 m} [MCZ].

A small species (Table 2) with violet male (Figs. 78, 922) and tan female (Fig. 923).

Diagnosis. Both sexes of *A. immunda* were diagnosed against *A. carlcooki* by Daigle (1995) and from those *Argia* species occurring in the U. S. A. by Garrison (1994) and, additionally, described by Westfall & May (2006). Both sexes of *A. immunda* most closely approach *A. carlcooki* by morphology of the appendages and mesostigmal plates and are diagnosed under the latter species.

Remarks. Caesar & Wenzel (2009) considered *A. immunda* as sister to the clade containing *A. tibialis*, *A. apicalis*, *A. tarascana* and *A. tezpi* [(*A. immunda* (*A. tibialis* (*A. apicalis* ((*A. tarascana*, *A. tezpi*)))))]. Based only on the North American taxa they treated, their hypothesis appears to be partially correct, as our examination of the genital ligula of *A. immunda* (Fig. 618) shows it to be unique (not counting *A. carlcooki*); that of *A. apicalis* (Fig. 597) is the same as *A. tibialis* (not illustrated) and, in addition, the male caudal appendages for both *A. apicalis* (Fig. 667a) and *A. tibialis* (fig. 5a in Garrison 1994) are similar in that the inner branch of the cercus in mediodorsal view is represented by a long, ventrally pointed (*A. apicalis*, Fig. 667a) or blunt (*A. tibialis*, fig. 5a in Garrison 1994) tooth, followed distally by a smaller blunt tooth (no such tooth in *A. tibialis*). However, we question the inclusion of *A. tarascana* within this clade, as it is the only one of the five taxa lacking a strap-like coiled flagellum or strap-like process (Fig. 649); we consider this species to be more closely related to *A. sabino* (Fig. 645) based on morphology of the male genital ligula, caudal appendages and mesostigmal plates. See under *A. carlcooki* for our reasons for questioning the phylogenetic relationship of *A. immunda* relative to other species as documented by Torres-Pachón *et al.* (2017).

Distribution. *Argia immunda* is a widespread species occurring as far north as Montana (Phillips County, The Plunge Spring Pond and Warm Springs Creek, 4 mi S of Landusky, 47.8433°N, 108.59948°W, OC#323514) and south to Honduras (Fig. 781). We have seen no records from the central plateau south of Chihuahua, Mexico, though this may be due to a lack of collecting. Our records show it to co-occur with *A. carlcooki* in SW Mexico, and both occur in sympatry in Nayarit (Mecatán). Elevation ranges from near sea level (ca. 4 m, Agua Caliente, 1 km SE of Sontecomapan) to 1800 m (Sycamore Canyon, Arizona).

Argia indicatrix Calvert, 1902

Figs. 79 (head, thorax, S1–4 ♂); 212 (head, thorax, S1–4 ♀); 334, 335 (S7–10 ♂); 442, 443 (S7–10 ♀); 534 (mesostigmal plates ♀); 619 (genital ligula); 698, 699 (appendages ♂); 798 (map); 1012 (body scan ♂); 1013, 1014 (body scans ♀).

[Key locators: ♂ G-5, couplet 12'; ♂ main key to groups, couplet 10(9'); ♀ F-6, couplet 6(5)]

Argia indicatrix Calvert, 1902: 82–83, pl. IV, figs. 23, 39, 39s (description);— Calvert in Calvert & Hagen 1902: 110 (catalog);— Calvert 1907: 368–369 (comments on color variability);— Ris 1918: 104–105 (Tabasco, Mexico; Bugabita, Panama; Muzo, Colombia);— Kimmins 1970: 186 (holotype data);—Westfall 1986: 116 (El Salvador);— Dunkle 1988: 45 (Honduras);—Maes *et al.* 1988: 34 (Nicaragua);— Brooks 1989: 50 (Costa Rica);— Maes 1989: 6 (Nicaragua);— De Marmels 1990: 337 (Venezuela);—Dunkle 1991: 132 (Honduras);—Donnelly 1992: 83 (Canal Zone, Panama);—González 1993: 295 (Mexico);—Butt 1995: 96 (Tambopata Reserved Zone, Peru);—Boomsma & Dunkle 1996: 25 (Belize);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Louton *et al.* 1996: 438 (Pakitz, Peru);—González-Soriano 1997: 254 (lotic habitat Los Tuxlas, Veracruz, Mexico);—Förster 2001: 11, 54, 58 (key ♂, ♀, fig. C24);—Lencioni 2006: 93 (Brazil, fig. 41a);—von Ellenrieder & Garrison 2007a: 18, 21 (fig. 6g of holotype);—González-Soriano & Novelo-Gutiérrez 2007: 113, 128 (Mexico);—Pérez *et al.* 2007: 189 (as stenotopic species in Colombia);—Hoffmann 2009: 65 (Peru);—Pérez-Gutiérrez & Palacino-Rodríguez 2011: 212 (Colombia);—Garrison & von Ellenrieder 2013: 15 (Costa Rica);—Garrison & von Ellenrieder 2015: 36 (♂, ♀, key, description, diagnosis, distribution, figs. 1g, 3n–p, 4v–z, 5n–o, 6l–m, 7e2–q2, 9g, h, 10p3–d4, 11d, 15g, h);—Bota-Sierra *et al.* 2019: 40 (Colombia, photo 23);—Maufray & Tennesen 2019: 41 (Ecuador);—Koroiva *et al.* 2020: 7 (Amazonas, Brazil);—Palacino-Rodríguez *et al.* 2020: 1566 (Colombia, fig. 3D);—Sanchez Herrera *et al.* 2020: 140 (Colombia, fig. 2D);—Paulson & Haber: 2021: 103 (diagnosis, photos).

Argia dagnina Förster, 1914: 62–63 (description of two males from Río Dagna [sic! Dagua], Colombia);—Garrison *et al.* 2003: 28–29 (notes on syntypes, synonymy with *A. indicatrix*).

Argia (Chalcargia) indicatrix: Kennedy, 1920: 85 (new subgenus based on bifid apex of genital ligula).

Argia stigmatica Navás, 1934a: 141–142, figs. 115a, b (description ♂ Villavicencio, Colombia [= *A. gerhardi* Calvert, 1909], ♂, ♀, Muzo, Colombia [apparently mixed series]);—Garrison & von Ellenrieder 2015: 35 (synonymy with *A. indicatrix*).

Argia umbriaca Fraser, 1946: 451, figs. 2i, j (description ♂, ♀, Umbría, Colombia);—Kimmins 1966: 217 (lectotype ♂ & allotype ♀ designation);—von Ellenrieder & Garrison 2007a: 21, figs. 6e, f of holotype (synonymized with *A. indicatrix*).

Primary types. *Argia indicatrix*: holotype ♂, MEXICO, Tabasco, February 1888, H. H. Smith leg. [examined, in BMNH];—*Argia dagnina*: lectotype ♂, COLOMBIA, Valle del Cauca, San José, Río Dagua, March 1909 [examined, in UMMZ];—*Argia stigmatica*: lectotype ♂, COLOMBIA, Boyacá, Muzo, July 1918 [examined, in MNHP];—*Argia umbriaca*: lectotype ♂, COLOMBIA, Putumayo, Umbría, 28 November 1930 [examined, in BMNH].

Specimens examined. 333 ♂♂, 104 ♀♀ (see Garrison & von Ellenrieder 2015 for additional material examined not listed here): **MEXICO, Veracruz:** 1 ♂, Fortín de las Flores {18.9019°N, 96.9897°W}, 1008 m, 20 March 1964, R. D. Cuyler [FSCA]; 1 ♀, seep near inlet to Laguna Escondida {18.6794°N, 95.1544°W}, 35 m, 14 July 1992, K. J. Tennessen [FSCA]; 1 ♀, Tezonapa {18.6052°N, 96.6845°W}, 8 August 1941, H. S. Dybas [FSCA]; 1 ♀, stream 6.7 mi NE of Los Mangos {18.3264°N, 95.0958°W}, 490 m, 2 July 1965, D. R. & M. L. Paulson [FSCA]. **BELIZE, Toledo:** 7 ♂♂, 1 ♀, Río Temash {15.9764°N, 88.9419°W}, 11 m, October 1934, J. J. White [RWG, UMMZ]. **COSTA RICA, San José:** 1 ♂, 1 ♀, river in Monterrey de San Cristobal, L03-1144 {9.9381°N, 84.0414°W}, 9 April 1989, B. Gonzáles & C. Esquivel-Herrera [UNH]. **PANAMA, Panamá:** 1 ♀, Cerro Campana {8.7167°N, 79.9°W}, 200 m, 14 November 1970, E. S. Morton [FSCA]; **Veraguas:** 1 ♂, Torio, Cabañas Totio, pond, 7.5486°N, 80.9447°W, 25 m, 24 May W. F. Mauffray [FSCA]. **COLOMBIA, Chocó:** 1 ♀, Quibido, urban perimeter W of bridge on Río Cabi {5.6641°N, 76.6395°W}, 240 m, 6 December 2005, M. García [FSCA]; **Meta:** 2 ♂♂, stream, Bosque Bavaria, near Villavicencio, 4.175°N, 73.6418°W, 475 m, 13 October 2014, K. J. Tennessen [FSCA]. **ECUADOR, Sucumbios:** 1 ♂, stream about 3 km W of Shushufindi, 2+ km N off Highway 26 at km marker 17, 2009-0254, 0.1664°S, 76.6917°W, 290 m, 13 October 2009, J. Johnson [JJ]; **Santo Domingo de los Tsáchilas:** 1 ♂, Tinalandia, 12 km E Santo Domingo de los Colorados, {0.2839°S, 79.05°W}, 760 m, 11–17 May 1986, G. B. Edwards [RWG]; 2 ♂♂, pond/ small stream, Highway 30, near marker 72, near La Unión del Toachi, 0.3133°N, 78.9472°W, 900 m, 25 February 2010, J. Johnson [JJ]; **Los Ríos:** 1 ♀, 8 miles S of Quevedo, 1.1238°S, 79.4367°W, 70 m, 3 February 1955, E. I. Schlinger & E. S. Ross [CAS]; **El Oro:** 3 ♂♂, 1 ♀, wetland about 12 km E of Arenillas, Highway 25, stream and associated pond, 2008-0032/ 0153-155, photographed, 3.5244°S, 79.983°W, 30 m, 29 March–9 April 2008, J. Johnson [JJ]. **BRAZIL, Para:** 1 ♂, Apehu {1.3°S, 47.983°W}, 13 m, 30 October 1892 [FSCA]; 2 ♂♂, 1 ♀, Camargo, Rio Tapajoz [Tapajos], August 1962, R. von Diringshofen [MZSP]; 3 ♂♂, 1 ♀, Agropalma, ACR-04481, 496, 4497, 2.2664°S, 48.6268°W, 32 m, 3–4 November 2016, D. Silva Vilela & A. Cordero-Rivera [RWG]; **Ceará:** 1 ♂, Igarape Gurupi-Uma, Aldeia Aracu, MA, 50 km E of Caninde, May 1963, B. Malkin [MZSP]; **Paraíba:** 1 ♀, locality erroneous, more likely from the Guiana Shield, July 1985 [FSCA]; **Rondônia:** 1 ♀, 23 April 1991, H. Ebert [FSCA]. **BOLIVIA, Beni:** 1 ♂, Guayaramerín {10.8049°S, 65.3636°W}, 128 m, 18 May 1954, W. Föster [RWG].

A small to medium size species (Table 2); male largely grayish blue (Figs. 79, 1012) with cercus in the form of a fist with an index finger pointing outward (Figs. 698, 699), and pale blue and black or tan female (Figs. 1013, 1014), with mesostigmal lobe enlarged, broadly foliate with a narrow laminate digit-like lobe directed medially (Fig. 534).

Diagnosis. Both sexes of *A. indicatrix* were redescribed, diagnosed and illustrated by Garrison & von Ellenrieder (2015). The finger-like outer branch of the male cercus (Figs. 698, 699) and enlarged mesostigmal lobe with the narrow laminate medially directed digit-like lobe (Fig. 534), coupled in both sexes with four Fw pq will separate this species from others within its range.

Remarks. Garrison & von Ellenrieder (2015) discussed the morphological and color variation of populations within South America, but these variations do not seem to be present in material from Mexico and Central America as far as we can see; all examples are as illustrated in Figs. 534, 698, 699, 1012–1014.

Distribution. *Argia indicatrix* is widespread in N South America and all of Central America but extends northward only to southernmost Chiapas, Tabasco and Veracruz in SE Mexico and does not extend north of the Trans-Mexican Volcanic Belt (Fig. 798). The species occurs from near sea level to about 1350 m (Costa Rica, Wisconsin pond, 3 km by road NW of Laguna Zoacho; not seen, at FSCA).

Argia insipida Hagen in Selys 1865

Figs. 13 (head ♀); 80 (head, thorax, S1–4 ♂); 214, 215 (head, thorax, S1–4 ♀); 336 (S7–10 ♂); 444, 445 (S7–10 ♀); 535 (mesostigmal plates ♀); 620 (genital ligula); 700, 701 (appendages ♂); 792 (map); 971 (body scan ♂); 972 (body scan ♀).

[Key locators: ♂ G-4, couplet 8'; ♂ M-6, couplet 21(19'); ♀ key to groups, couplet 24']

Agrion (Agrion) insipidum Hagen, 1861: 312 (*nomen nudum*).

Argia insipida Hagen in Selys, 1865: 389 (17 reprint) (description ♂, ♀);—Calvert & Hagen 1902: 110, (pl. I, figs. 3, 3a; “Type in M. C. Z.”);—Geijskes 1943: 172 (description of larva, Surinam, plate III);—Gloyd in Calvert 1948: 58 (British Guiana,

comparison with *A. pipila* Calvert);—Geijskes 1971: 660 (French Guiana);—Michalski 1988: 40 (key ♂, ♀, Trinidad);—De Marmels 1992: 62 (Venezuela, habits);—Belle 2002: 2 (Surinam);—Lencioni 2006: 96 (Pará, Amazonas, Brazil, figs. 44a–c);—Machet 2006: 36 (French Guiana as “*Argia* sp. 5 [from Machet 2004]”);—Heckman 2008: 358 (key to species, males);—Pérez-Gutiérrez & Palacino-Rodríguez 2011: 206 (erroneously delisted from Colombia);—von Ellenrieder 2011: 58, 73, 76 (Surinam);—Garrison & von Ellenrieder 2013: 15 (Costa Rica);—Garrison & von Ellenrieder 2015: 43 (♂, ♀, key, description, diagnosis, figs. 1d; 2e; 3s; 4b2; 5q, r; 6o; 7t2, u2; 9i–k; 10i4–k4; 15i);—Michalski 2015: 94, 96 (key ♂, ♀, Trinidad, Tobago, figs. 69b, 70a, 71a, photos);—Garrison & von Ellenrieder 2019: 35 (syntype data);—Paulson & Haber 2021: 95 (diagnosis, photos, Costa Rica).

Argia (Chalcargia) insipida: Kennedy, 1920: 85 (new subgenus based on bifid apex of genital ligula).

Argia ierea Geijskes, 1932: 244 (description ♂, ♀);—Geijskes 1943: 172 (synonymized with *A. insipida* teste Gloyd);—Gloyd in Calvert 1948: 58 (synonymized with *A. insipida*).

Argia sp. 5 Machet 2004: 146 (French Guiana).

Primary types. *Argia insipida*: syntypes ♂, ♀, GUYANA, Schomburgh [one ♂ syntype examined, in MCZ; Garrison & von Ellenrieder 2019];—*Argia ierea*: syntypes ♂, ♀ [not examined, in RMNH].

Specimens examined. 231 ♂♂, 89 ♀♀ (see Garrison & von Ellenrieder 2015 for additional material examined not listed here): **NICARAGUA, Río San Juan**: 1 ♂, Río San Juan, Refugio Bartola {10.97°N, 84.34°W}, 30 m, 4 May 2001, G. Grether [RWG]; 1 ♂, same data but 28 April 2001, D. Chen [RWG]. **COSTA RICA, Guanacaste**: 2 ♂♂, 1 ♀, Río Colorado, where it intersects Interamerican Highway ca. 5 km N of Liberia, L-03-1246/ 47 {10.6687°N, 85.4811°W}, 130 m, 12 July 2001, C. Esquivel-Herrera [UNH]; 2 ♂♂, S inlet at N end of Lago Arenal, 14.3 km NW of Tilarán, a rocky stream {10.5259°N, 84.9716°W}, 594 m, 28 February 1987, S. W. Dunkle [FSCA]; 1 ♂, 2 ♀♀, Río Corobicil at Palmira {10.5°N, 85.5667°W}, 20 m, 6 May 1995, B. O. Huntsman & R. W. Baumann [BYU]; 1 ♂, Río Santa Rosa, 3.5 km N of Cañas, 67-184 {10.461°N, 85.0739°W}, 120 m, 28 July 1967, D. R. Paulson [FSCA]; **Alajuela**: 1 ♂, 1 km SE of El Bosque at road crossing, rocky stream with fairly heavy pollution in large pasture, perched in shrub at stream’s edge over fast flowing pool, Haber #7264, 10.4639°N, 84.6525°W, 280 m, 30 June 2010, W. W. A. Haber, E. Cruz & L. Ramirez [CSCA]; 1 ♂, Río Sarapiquí {10.3061°N, 84.1671°W}, 505 m, 27 May 1990, C. Esquivel-Herrera [UNH]; **Heredia**: 1 ♂, La Selva Biological Station, OET, Río Peje, L-03-888 {10.4332°N, 84.0167°W}, 60 m, 19 March 2000, D. Brenes [INBIO]; 1 ♂, small river 9.7 km SE of Puerto Viejo, clear water with a small flood plain pool {10.3828°N, 83.9242°W}, 66 m, 2 March 1987, S. W. Dunkle [FSCA]; **Cartago**: 1 ♂, A. C. Amistad, Sendero Soki, 70 m, 10–30 April 1995, G. Gallardo, [INBIO]; **Limón**: 1 ♂, 1 ♀, Río Parismina near Iroquois, medium large clear rocky river, {10.1944°N, 83.6461°W}, 78 m, 5 March 1987, S. W. Dunkle, , [FSCA]; 1 ♂, Finca de Olman Sanchez, 4 km N of crossing with road to Guápiles on road to Puerto Viejo Sarapiquí, medium river with fast water and prominent boulders, L03-1045 {10.107°N, 83.532°W}, 63 m, 15 July 2001, C. Esquivel-Herrera [UNH]; **Puntarenas**: 1 ♂, Los Negritos, intermittent stream pots {10.0833°N, 84.7167°W}, 60 m, 8 September 1990, C. Esquivel-Herrera & T. B. Herman [UNH]. **PANAMA, Bocas del Toro**: 2 ♂♂, Ojo de Agua, SW of Bocas Ridge Hotel, Río Changuniola and adjacent seepages, 9.2568°N, 82.4814°W, 85 m, 8 April 2017, W. F. Mauffray [FSCA, RWG]; **Panamá**: 1 ♂, Corregimiento Las Margaritas, Cocobolo E Access Road, Río Gaspar Sabanas near junction with Río Mamoni, 9.2392°N, 79.1134°W, 122 m, 28 May 2019, W. F. Mauffray [FSCA]; 3 ♂♂, 2 ♀♀, La Chorrera Falls, {8.876°N, 79.7767°W}, 78 m, 13 April 1912, A. Busck [FSCA, RWG]; **Darién**: 1 ♂, Parque Nacional Darién, between El Real and confluence of Río Tuira and Río Pucuro, 3 mi upstream from confluence of Río Tuira and Río Pucuro along Río Pucuro, L85-3 {8.1164°N, 77.7266°W}, 12 m, 16 February 1985, J. J. Louton [RWG]. **COLOMBIA, Valle del Cauca**: 1 ♂, 1 ♀, Laguna El Darien (Calima) {3.9289°N, 76.4978°W}, 1620 m, 15 March–15 April 1969, G. Wolffhugel [RWG]. **TRINIDAD, Diego Martin**: 3 ♀♀, Diego Martin River {10.7311°N, 61.5603°W}, 36 m, 29 February 1912, E. B. Williamson [CSCA, RWG, UMMZ]. **VENEZUELA, Falcón**: 29 ♂♂, 7 ♀♀, Palma Sola, {10.6039°N, 68.5455°W}, 37 m, 10 March 1920, J. H. Williamson, E. B. Williamson & W. H. Ditzler [RWG, UMMZ]. **GUYANA, Potaro-Sipurini**: 1 ♂, Iwokrama {4.6561°N, 58.6789°W}, 22 January 2015, B. Willink & E. Svensson [MZLU].

A relatively large species (Table 2); male mostly blue (Figs. 80, 214, 215, 336) with outer branch of cercus reduced and with a small circular patch clearly differentiated from remainder of cercus in dorsal view (Fig. 700c); female similar to male, blue or tan (Figs. 214, 215), with prominent mesepisternal tubercles lateral to mesostigmal lobes (Fig. 535).

Diagnosis. Both sexes of *A. insipida* were redescribed and illustrated by Garrison & von Ellenrieder (2015). This species is most similar in coloration and morphology to three closely related more northerly species occurring in Texas S through N Nicaragua: *A. barretti*, *A. harknessi* and *A. pipila*, and both sexes of *A. insipida* are diagnosed against them under *A. barretti*.

Remarks. Calvert (1902, 1907) did not record this species from Costa Rica, and L. K. Gloyd in her unpublished notes did not record specimens from Central America. Although Garrison & von Ellenrieder (2015) mentioned that no records were known from Panama, this species has recently been collected there (Fig. 792). We have seen only one specimen from Colombia and the species would seem to be rare in that country. Garrison & von Ellenrieder (2015) further stated that a “... comparison of Central American specimens and material from the Guyanas shows no appreciable differences in morphology or coloration.” Further examination of Central American versus South American males allowed us to detect a difference in the development of the outer branch of the cercus when seen in dorsal view. In Central America, the outer branch is small and forms a rounded right-angle lobe in comparison to the longer inner branch, and there is a conspicuous small circular patch clearly differentiated from remainder of cercus in dorsal view (Fig. 700c); the same lobe in South American populations tends to have a more pronounced outer branch, that more or less forms a slight concavity between it and the inner branch, and there is no conspicuous small circular patch present on the dorsal surface of the outer branch (Fig. 701c). We have been unable to find any significant differences in the male genital ligula and female mesostigmal plate between specimens from Central America and South America and consider the small differences observed in male cercus to reflect intraspecific geographic differences.

Distribution. *Argia insipida* is the most southerly representative of a largely allopatric set of closely related species that includes *A. barretti* occurring in Texas and NE Mexico, *A. pipila* replacing it in Veracruz south into Honduras, and *A. harknessi* occurring from Sonora south to Oaxaca along the W coast of Mexico (Fig. 792). As stated by Garrison & von Ellenrieder (2015), records of *A. insipida* from several localities in St. Vincent reported by Kirby (1894: 268), repeated by Calvert (1902b), and questioned by Gloyd in Calvert (1948), are in error and refer to *A. telesfordi* Meurgey, 2009 (Meurgey 2009). *Argia insipida* is common in Trinidad but its reported occurrence in Tobago by Lencioni (2006) is almost certainly in error. Although Pérez-Gutiérrez & Palacino-Rodríguez (2011: 206) state that records of *A. insipida* from Colombia as reported by Heckman (2008) are in error, the species does occur in that country, but is apparently rare. According to our records, it extends from S Nicaragua south through Trinidad, Venezuela, the Guyanas, Colombia and Amazonas State in Brazil (Fig. 792). Within Central America, *A. insipida* occurs from about 10 to 600 m.

Argia johannella Calvert 1907

Figs. 81 (head, thorax, S1–4 ♂); 216 (head, thorax, S1–4 ♀); 337 (S7–10 ♂); 446 (S7–10 ♀); 536 (mesostigmal plates ♀); 621 (genital ligula); 702 (appendages ♂); 797 (map); 818 (field photo ♂); 819 (field photo ♀); 1008 (body scan ♂); 1009 (body scan ♀).

[Key locators: ♂ G-5, couplet 12(10'); ♂ main key to males, couplet 3(2'); ♀ F-15, couplet 3(1'); shortcut 10]

Argia johannella Calvert 1907: 370 (description ♂, ♀, pl. X, figs. 12, 12s, 19);—Paulson 1982: 253 (Costa Rica);—Flint 1991: 55 (holotype in USNM);—Donnelly 2000a: 18 (new for Honduras);—Ramírez *et al.* 2000: 249 (Costa Rica);—Esquivel 2005: 286 (Honduras, Nicaragua, Costa Rica);—Garrison & von Ellenrieder 2013: 15 (Costa Rica);—Paulson 2013a: 10 (new for Panama);—Paulson & Haber 2021: 108 (diagnosis, photos).

Argia johannella [sic!]: Brooks 1989: 50 (Costa Rica);—Donnelly 2000a: 18 (new for Honduras);—Förster 2001: 11, 54, 58 (key ♂, ♀, fig. C24).

Primary types. *Argia johannella*: holotype ♂, COSTA RICA, Juan Viñas, 15–23 March 1902, L. Bruner & M. Cary leg. [not examined, in USNM; Flint 1991].

Specimens examined. 54 ♂♂, 33 ♀♀ (see Garrison & von Ellenrieder 2015 for additional material examined not listed here): **HONDURAS, Atlántida:** 1 ♀, Dakota, humid forest {15.6167°N, 87.35°W}, 93 m, 27 May 1923, T. H. Hubbell [RWG]; **Gracias a Dios:** 2 ♂♂, Las Marías, near Río Platanos, 99x060 {15.6767°N, 84.84°W}, 27 October 1999, T. W. Donnelly [FSCA]. **NICARAGUA, Atlántico Sur:** 1 ♂, Siquia River {12.1553°N, 84.2217°W}, August 1935, M. J. Allen [FSCA]; **Río San Juan:** 2 ♂♂, San Juan River, Refugio Bartola {10.97°N, 84.34°W}, 30 m, 7 August 2002, J. J. Daigle [FSCA]. **COSTA RICA, Alajuela:** 1 ♂, 2 ♀♀, Los Chiles, 66–269 {10.4167°N, 84.3332°W}, 60 m, 30 July 1966, D. R. Paulson [FSCA, RWG]; 1 ♂, 1 ♀, same data but 13 October 1966 [FSCA]; 3 ♂♂, 2 ♀♀, marshy tributary of small stream 6.6 km W of Venecia, with a small pond {10.3839°N, 84.3111°W}, 300 m, 1 March 1987, S. W. Dunkle [CSCA, FSCA, RWG]; 1 ♂, Bioforesta, L-03-1223, 11 March 2001, C.

Esquivel-Herrera [UNH]; **Guanacaste**: 1 ♀, 8 km S of Santa Cecilia, Estación Biológica Pitilla, shaded stream riffle {10.9891°N, 85.4258°W}, 680 m, July 1988, S. J. Brooks [BMNH]; 1 ♀, Área de Conservación Guanacaste Sector Cacao, Estación San Ramón, 1.5 km N of headquarters, Nueva Zelandia, permit 308-96-OSRA-ACCVC, 10.9578°N, 85.4969°W, 600 m, 16 April 1996, F. A. Quesada [RWG]; 3 ♀♀, Finca Jirón, Dos Ríos, L-06-49/ 59, 30 March 1988, C. Esquivel-Herrera [UNH]; 1 ♂, 1 ♀, S side of Laguna Arenal {10.55°N, 84.9°W}, 594 m, 16 July 1966, D. R. Paulson [FSCA]; **Limón**: 1 ♀, Tortuguero National Park, Tortuguero River, 3.5 km S of Tortuguero, 10.509°N, 83.504°W, 5 m, 26 March–4 April 1992, R. W. Holzenthal & R. Blahnik [FSCA]; 2 ♀♀, Penitencia, Palmitas, Cariari de Guápiles, L03-1009 {10.3692°N, 83.7306°W}, 63 m, 29 April 1990 [UNH]; 1 ♂, 6 km WSW of Pandora {9.7333°N, 82.9667°W}, 85 m, 5 July 1964, F. G. Thompson [FSCA]; **Heredia**: 1 ♂, La Rambla, muddy ditch, L-03-574, 8 April 2000, C. Esquivel-Herrera [UNH]; 3 ♂♂, **Finca La Selva**, 10.4667°N, 84.0167°W, 60 m, 3 September 1996, L. LaPierre [BMNH, RWG]; 2 ♀♀, same data but 66-248 {10.4667°N, 84.0167°W}, 60 m, 21–23 September 1966, D. R. & M. L. Paulson [FSCA]; 1 ♂, 1 ♀, same data but 9 April 1967, D. R. Paulson [FSCA]; 1 ♂, same data but site A, L-03-228 {10.4319°N, 84.0106°W}, September 1980, C. Esquivel-Herrera [UNH]; 1 ♂, same data but Puerto Viejo, L-01-017 {10.4667°N, 84.0167°W}, 60 m, 24 February 1988, C. Esquivel-Herrera [UNH]; 1 ♂, same data but L-01-275 {10.4667°N, 84.0167°W}, 60 m, 26 June 1988, C. Esquivel-Herrera [UNH]; 1 ♀, Finca La Selva Verde, IORI 00067401, 37 m, 24 September 1986 [FSCA]; 2 ♂♂, Magsaysay, Finca Magsaysay near Peje River, in swampy area in pasture along Peje River, 10.4°N, 84.05°W, 170 m, 26 February 2004, D. Wagner, R. Vargas & E. Lopez [RWG]; 1 ♂, La Virgen, Finca La Tirimbina {10.398°N, 84.117°W}, 190 m, 4–8 August 1978, A. M. Young, [USNM]; 1 ♂, near Puerto Viejo, Chilamate, vicinity of Selva Verde Lodge, 15 August 1986, J. L. Nation, [FSCA]; 2 ♂♂, 1 ♀, Chilamate, vicinity of Selva Verde Lodge, 2 January 1990, T. C. Emmel, L. Groce & D. Freberg [FSCA]; 1 ♂, 7 km W of Puerto Viejo, Bejuco Biological Station, 10.4497°N, 84.0669°W, 92 m, January 1998, D. Wagner [RWG]; 1 ♂, 1 ♀, small river 9.7 km SE of Puerto Viejo {10.3828°N, 83.9242°W}, 66 m, 2 March 1987, S. W. Dunkle [RWG]; 1 ♂, 1 ♀, Bioforesta, Horquetas, swamp in grassland, L03-691 {10.3333°N, 83.95°W}, 70 m, 9 April 2000, C. Esquivel-Herrera [UNH]; **Cartago**: 1 ♂, Cachi, banks of Reventazón River {9.8333°N, 83.8°W}, 1181 m, 5 March 1910, P. P. Calvert [FSCA]; 1 ♀, 2 km E of Sitio de Mata {9.9258°N, 83.7239°W}, 1200 m, 2 August 1963, F. G. Thompson [FSCA]; 1 ♂, Turrialba, along railroad E of station {9.9°N, 83.6833°W}, 609 m, 27 July 1909 [FSCA]; 3 ♂♂, Juan Viñas (formerly Infiernillo), pond {9.9°N, 83.75°W}, 1000 m, 5 October 1909, P. P. Calvert [FSCA]; 1 ♂, same data but Reventazón Valley below Juan Viñas, 762 m, 25 June 1909 [FSCA]; 7 ♂♂, 1 ♀, same data but Turrialba, IICA, Bajo Reventazón, high forest edge, 20 July 1968 [RWG, UMMZ]; 4 ♂♂, Reventazón River, SE of Turrialba, by Highway 10, 9.8821°N, 83.6469°W, 561 m, 10 August 1979, R. W. & J. A. Garrison [RWG]. **PANAMA, Bocas del Toro**: 1 ♀, Ojo de Agua, SW of Bocas Ridge Hotel, Changuinola River and adjacent seepages, 9.2568°N, 82.4814°W, 85 m, 20 May 2019, W. F. Mauffray [FSCA]; **Coclé**: 1 ♂, Santa Rita Arriba (by signal towers), 9.1272°N, 79.7146°W, 245 m, 1 February 2014, L. G. Bezark [RWG]; 1 ♂, 1 ♀, Altos de María, above El Valle de Antón, marshy stream entering lake {8.6333°N, 80.1333°W}, 800 m, 2 September 2012, D. R. Paulson [FSCA]; **Panamá Oeste**: 1 ♂, Arraiján {8.9417°N, 79.6425°W}, 150 m, March 1911, A. Busck [FSCA]; **Panamá**: 1 ♂, 3 ♀♀, 5 mi from Colón {9.3667°N, 79.9°W}, 28 December 1950, R. B. Cumming [FSCA]; 1 ♀, Barro Colorado Island {9.15°N, 79.85°W}, 62 m, 31 August 1978, R. B. & L. S. Kimsey [RWG]; 1 ♂, 1 ♀, Canal Zone {9.0667°N, 79.65°W}, 75 m, 10 February 1939, C. H. Richardson [FSCA, RWG]; 1 ♂, small stream near La Polvareda, S of Pan American Highway, just SW of Canal Zone, 8.9411°N, 79.6433°W, 138 m, 31 July 1979, R. W. & J. A. Garrison [RWG]; 1 ♂, 1 ♀, Trinidad River {8.1333°N, 81.2333°W}, 217 m, 15–30 March 1912, A. Busck [FSCA].

A medium size species (Table 2); male violaceous (Figs. 81, 337, 818, 1008) with an elongate spatulate paraproct, with apical half abruptly curved mediodorsally (Figs. 702a, b); female similar to male (Figs. 216, 446, 819, 1009), with mesal margin of mesostigmal lobe recurved ventrally forming a tubercle and with basal area of mesostigmal lobe depressed forming a shallow concavity (Figs. 536c, d).

Redescription. We supplement Calvert's description of this little-known species as follows. **Male** (Costa Rica, Cartago, Río Reventazón, Figs. 81, 337, 1008): Head: Labium, ante- and postclypeus, genae and ante- and postfrons entirely violaceous, except for narrow black margin at base of anteclypeus, epicranium black with small pale spot anterolateral to lateral ocellus, black appearing as a broad cross-band delimited posteriorly by large violaceous postocular spots separated from pale occipital bar by a thin black line, dorsal surface of postocular lobe black; antennae black, rear of head black externally with lateral margin bordering eye pale. Prothorax black with following areas violaceous: anterior lobe, large mediolateral spot on middle lobe, small medial spot and lateral 0.20 of hind

lobe and propleuron. Pale areas of pterothorax violet, with broad black middorsal stripe about two thirds as wide as each pale parallel antehumeral stripe; black humeral stripe extending from base of mesinfraepisternum and forked above at dorsal 0.20, its anterior fork narrow, about half as wide as base and connecting with black antealar carina, posterior fork of same width as anterior fork but ending before antealar carina; remainder of thorax pale violet with narrow metapleural stripe. Wings hyaline, with venation black; Pt brown, surmounting 1 cell in all wings; px Fw 13/15, Hw 13/12; pq cells Fw 3/3, Hw 3/3; RP2 at Fw 7/7, Hw 6/6.5. Coxae pale; trochanters pale anteriorly, brown posteriorly; femora black externally, pale internally; tibiae pale externally black laterally and internally; tarsi and armature black. Abdomen violaceous and black; S1 pale with small black spot dorsally on basal 0.50; S2 dorsally with pale spot narrowing preapically before expanding at black annulus, ventral margin of S2 pale, with a lateral longitudinal black stripe broadening but not meeting dorsally at posterior 0.20 of segment and connected apically by black annular ring; S3 with basal ring of violet and dorsally prolonged posteriorly and ending at apical fifth, laterally with a longitudinal black stripe narrowing at medially and then enlarging forming a black apical ring at apical 0.20, ventral margin pale; S4–6 as in S3 but pale basal ring lacking dorsal prolonged pale area, lateral black stripe gradually extending closer to ventral margin of segment but with medial portion of segment pale thus giving the appearance laterally of a pale, dark, pale, dark area; S7 similar to S4–6 but black more extensive; S8 violet except for vestige narrow edge of black on posterolateral margin; S9–10 violet, black ventrally, S10 with posterior margin rimmed with black, posterolateral margin of S10 prominent, pointed; cercus and paraproct brown.

Genital ligula (as in Fig. 621) with distal segment ending in two filaments which at their base are covered by a narrow, long digit-like membranous hood slightly spatulate distally, lateral lobes absent.

Torus large, transversely triangular, swollen ventrally, occupying entire ventral margin of torifer and partially overlapping bilobed epiproct (as in Fig. 702c), base of epiproct and surrounding area black; cercus small, slightly wider than long, posterior margin slightly convex, posteromedial margin with a small decumbent tooth; paraproct elongate, spatulate with apical half abruptly curved mediadorsally (Figs. 702a, b).

Dimensions. Hw 17.3, abdomen 24.5, total length 31.1.

Female (Costa Rica, Heredia, 9.7 km SE of Puerto Viejo [in tandem with ♂], Fig. 1009): Head, pro- and pterothorax and S1–2 as in male but pale colors largely blue; post- and anteclypeus dark brown and with posterior fork of humeral stripe connecting above with dark interpleural suture; Wings hyaline with venation black; Pt dark brown, surmounting 1 cell in all wings; px Fw 15/16, Hw 14/14; pq cells Fw 3/3, Hw 3/3; RP2 at Fw 8/8, Hw 7/7. S3–7 as in male but black areas more extensive, S8–9 blue, except for diffuse lateral black curving dorsally at posterior margin; S10 entirely blue; ovipositor pale. Mesostigmal lobe small, occupying basal fifth of mesostigmal plate, its posterolateral margin confluent with remainder of plate, mesal border of mesostigmal lobe recurved ventrally forming a tubercle appressed against anterior margin of mesepisternum and extending anterolaterally beyond medial margin of lobe in posterior view, basal area of mesostigmal lobe depressed, forming a shallow concavity (as in Figs. 536c, d).

Dimensions. Hw 18.1, abdomen 24.4, total length 30.9.

Diagnosis. Male easily identified by the unusually long, upturned paraproct which is unique to members of this genus. Within its range, the ventrally recurved mesostigmal lobe of the female separates this species from all others. The morphology of the lobe is similar to South American *A. huanacina* Förster (figs. 7q–s) and *A. infrequentula* Fraser (figs. 7t, u) as illustrated in Garrison & von Ellenrieder (2015) but those species are allopatric to *A. johannella*. Paulson & Haber (2021) noted differences in eye color in live individuals: purple or dark blue to purple above in *A. pulla*, black above in *A. frequentula* and *A. johannella*. All three species normally have 3 Fw pq and have large postocular spots separated mesally from prominent pale postoccipital bar by a narrow black line. Although Calvert (1907) was unable to separate females of *A. johannella* from *A. frequentula*, the differences in the morphology of the mesostigmal plates (mesostigmal lobe with a recurved lobe present in *A. johannella*, Fig. 536e; with no recurved lobe in *A. frequentula*, Fig. 517e) easily distinguishes them, as does the pattern of black on S8–9 (with ventrolateral black curving dorsally at posterior margin in *A. johannella*, Fig. 446; not curving dorsally in *A. frequentula*, Fig. 427).

Remarks. One of the males from Venecia has the following annotation by S. W. Dunkle: “Eyes brown above/gray green; male compared with cotype at USNM in March 1991 by Dunkle and thought to be the same species; holotype male has little black on S8.” This species-epithet is spelled *johannella* or incorrectly *johanella* (with one n) in the literature as the synonymy above shows.

Habitat. Paulson & Haber (2021) stated that in Costa Rica this species occurs at small streams and marshy

seeps in open or forested areas, sometimes heavily vegetated ponds, often together with *A. frequentula* and *A. indicatrix*, less often with *A. pulla*, and can be locally abundant.

Distribution. Our records show this species to be restricted to Central America, ranging from the N coast of Honduras south through W half of Panama (Fig. 797). The species is found from near sea level to about 1200 m in Costa Rica.

Argia lacrimans (Hagen, 1861)

Figs. 82 (head, thorax, S1–4 ♂); 217–219 (head, thorax, S1–4 ♀); 338 (S7–10 ♂); 447 (S7–10 ♀); 537, 538 (mesostigmal plates ♀); 703 (appendages ♂); 761 (type label); 778 (map); 820 (field photo ♂); 821 (field photo ♀); 903 (body scan ♂); 904, 905 (body scans ♀).

[Key locators: ♂ G-3, couplet 4'; ♂ M-5, couplet 15', M-6, couplet 29'; ♀ F-11, couplet 8(7')]

Agrion lacrimans Hagen 1861: 95 (description ♀ “Cordova, Mexico (Saussure)”)—Garrison 1994: 325 (lectotype designation, figs. 24, 64, 115a, 115b, 116);—Garrison & von Ellenrieder 2019: 38 (type data).

Argia lacrymans: Hagen in Selys 1865: 386 [14 reprint] (redescription ♀, incomplete ♂ with doubt from Brazil);—Calvert 1902: 88 (♂, ♀, description, pl. IV, figs. 16, 49, 49s);—Calvert & Hagen 1902: 111 (“Types ♀ in M. C. Z.”);—Calvert 1908b: 695 (sexual dimorphism).

Argia lacrimans: Paulson 1982: 253 (Mexico);—Novelo-Gutiérrez & Peña-Olmedo 1991: 130 (Hidalgo, Mexico);—Novelo-Gutiérrez 1992: 48 (description larva, figs. 4, 24, 39, 52, 61, 74, 97);—González-Soriano 1993: 295 (Mexico);—Peña-Olmedo & Novelo-Gutiérrez 1993: 119, 139 (Hidalgo, Mexico, figs. 40, 62);—Garrison 1994: 325 (key, comparison with *A. pima* n. sp., figs. 24, 64, 115a, 115b, 116);—Boomsma & Dunkle 1996: 25 (Belize);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Cole 1998: 10 (second record for Arizona, U. S. A.);—Upton 2000: 19 (habits, Arizona, U. S. A.);—Förster 2001: 11, 56, (key ♂, fig. C24);—Westfall & May 2006: 196 (♂, ♀, key, description, figs. 92D, 98L, 102F);—Behrstock *et al.* 2007a: 56 (Chihuahua, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Upton *et al.* 2007: 30 (Sonora, Mexico);—Caesar & Wenzel 2009: 106 (phylogeny within genus *Argia*);—Paulson 2009: 162 (♂, ♀, description, diagnosis, photos);—Bailowitz *et al.* 2013: 14 (Arizona, U. S. A., photo ♂);—Escoto-Moreno *et al.* 2014: 1051 (Hidalgo, Mexico);—Bailowitz *et al.* 2015: 122 (diagnosis, photos);—Torres-Pachón *et al.* 2017: 416 (molecular phylogeny of larvae within *Argia*);—Escoto-Moreno *et al.* 2021: 33 (new record for Aguascalientes, Mexico).

Argia (*Cyanargia*) *lacrymans*: Kennedy 1920: 85 (in subgenus *Cyanargia*).

Primary types. *Agrion lacrimans*: lectotype ♂, MEXICO, Cordova, Mexique, t. chaudes; (Fig. 761) [examined, in MCZ; Garrison 1994; von Ellenrieder & Garrison 2019]. NOTE: Garrison & von Ellenrieder (2019) erroneously stated that two syntype ♂♂ are in the MCZ, however, a lectotype ♂ was previously designated by Garrison (1994).

Specimens examined. 62 ♂♂, 32 ♀♀: **U. S. A., Arizona:** 1 ♂, Bonita Spring, Chiricahua National Monument, 32.0111°N, 109.354°W, 1635 m, 9 August 1995, C. M. & O. S. Flint, Jr. [USNM]; 3 ♂♂, same data but 10 August 1995 [RWG, USNM]; 2 ♂♂, Shake Spring, Chiricahua National Monument, 32.0217°N, 109.34°W, 1730 m, 8 August 1995, C. M. & O. S. Flint, Jr. [RWG, USNM]; 1 ♂, Leslie Canyon, 15 mi N of Douglas {31.7214°N, 109.4717°W}, 1420 m, 7 September 2000, S. Upton [RWG]; 1 ♀, same data but 25 July 2000 [RWG]; 1 ♂, 3 ♀♀, same data but 18–19 July 2001 [RWG]; 1 ♀, same data but 6 August 2001 [RWG]; 3 ♂♂, 1 ♀, Upper Garden Canyon, 7 mi S of Fort Huachuca, 31.6667°N, 110.367°W, 1829 m, 29 July 1997, J. Cole [CUMZ, RWG]; 1 ♂, Mesa Draw, stream and associated habitats at dam in Leslie Canyon by Leslie Canyon Road, 17 mi N of Douglas {31.5901°N, 109.508°W}, 1419 m, 7 September 2000, S. Upton [MHNN]; 6 ♂♂, 1 ♀, same data but 22 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [BMNH, CSCA, MHNN]; 1 ♂, 1 ♀, Garden Canyon, Fort Huachuca, 31.4733°N, 110.352°W, 1638 m, 29 August 1998, R. W. Garrison [RWG]; 2 ♂♂, 2 ♀♀, same data but 5 August 2001, S. W. Dunkle [RWG]; 1 ♂, 1 ♀, same data but 16 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 2 ♂♂, Scotia Canyon, Coronado National Forest, Huachuca Mts., 31.4492°N, 110.401°W, 1821 m, 24 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]. **MEXICO, Chihuahua:** 1 ♂, Highway 16, ca. 1.6 km E of Sonora-Chihuahua border, 28.4333°N, 108.498°W, 1587 m, 5 September 2005, D. R. Paulson & N. Smith [FSCA]; 1 ♂, Creel-Divisadero Road, km 18, 27.6653°N, 107.749°W, 2100 m, 10 July 2006, D. G. Furth [USNM]; **Sonora:** 2 ♂♂, 1 ♀, small stream W of Yecora on Route 16, 28.3767°N, 108.897°W, 1556 m, 24 August 1986, B. Kondratieff [FSCA, RWG]; **Sinaloa:** 1 ♂, Potrerillos, 25.4356°N, 107.569°W, 245 m, 22 August 1964, E. I. Schlinger [RWG]; 3 ♂♂, 1 ♀, El Palmito, on Route 40, mountain stream {23.5622°N, 105.837°W}, 1922 m, 3

September 1963, H. V. Weems, Jr. [FSCA]; 1 ♂, same data but 20 July 1975, S. W. Dunkle [FSCA]; 2 ♀♀, stream 27.9 mi NE of Concordia {23.5392°N, 105.754°W}, 1220 m, 30 August 1965, D. R. & M. L. Paulson [FSCA, RWG]; **Durango**: 2 ♂♂, 2 ♀♀, 2 mi N of Pueblo Nuevo {23.3832°N, 105.383°W}, 1990 m, 23 July 1960, R. A. Scheibner [RWG]; **Jalisco**: 1 ♂, Route 110 ca 6 mi E of Atotonilco El Alto, little sandy and rocky streams along road, 20.5661°N, 102.431°W, 1920 m, 9 August 1966 [UMMZ]; **Michoacán**: 1 ♂, stream 20.6 mi SE of Zamora {19.8494°N, 102.057°W}, 1876 m, 19 August 1965, D. R. Paulson [FSCA]; 2 ♂♂, Route 15, S of Morelia, 0.55 mi N of km 290, stream along road {19.6886°N, 101.092°W}, 2030 m, 14 July 1966 [CSCA, UMMZ]; 1 ♂, 5–10 mi S of Uruapán, 19.3103°N, 102.071°W, 1288 m, 17 August 1940, H. R. Roberts [FSCA]; **Veracruz**: 1 ♂, Cascada Texolo, near Xico, 19.4114°N, 96.9926°W, 1256 m, 12 July 1987, M. J. Westfall, Jr. [FSCA]; 1 ♀, near Río Jamapa, 4 mi N of Coscomatepec {19.0667°N, 97.0333°W}, 1463 m, 23 July 1966, O. S. Flint, Jr & M. A. Ortiz B. [USNM]; 1 ♂, 1 ♀ (lectotype and paralectotype), Córdoba {18.8839°N, 96.9238°W} [MCZ]; 1 ♂, river near Concordia, S of Jalapa on Route 7, 18.8028°N, 96.7225°W, 360 m, 12 July 1992, S. W. Dunkle [FSCA]; 5 ♂♂, 1 ♀, La Taza de Agua at Ojo Zarco, 18.7753°N, 97.2039°W, 1370 m, 26 August 1994, Baumann & B. Kondratieff [BYU, FSCA]; **Morelos**: 9 ♂♂, 11 ♀♀, La Fuente, Municipio of Jiutepec, 10 km W of Cuernavaca, 18.2558°N, 99.2822°W, 1300 m, 17 September–1 October 1983, R. W. Garrison [RMNH, RV, RWG]; 1 ♂, 1 ♀, same data but 6 October 1983, E. González-Soriano [CNIN]; **Oaxaca**: 1 ♂, Ixtlán {17.3273°N, 96.4812°W}, 2030 m, 27 July 1966 [UMMZ]; 3 ♂♂, 2 mi E of Tlaxiaco, stream, 17.2681°N, 97.6503°W, 1770 m, 21 August 1954, L. B. Short [FSCA, RWG, USNM].

A large robust species (Table 2); male bright blue and black (Figs. 82, 338, 820, 903) with cercus in dorsal view with inner branch (tooth) obscured, strongly decumbent and not easily visible, so that cercus appears unequally branched (Fig. 703c); female blue (Figs. 217, 904) or tan (Figs. 218, 219, 821, 905), with a prominent mesepisternal tubercle (Fig. 537e) under base of mesostigmal lobe in posterior view (which may be low and small in some specimens from Mexico, Fig. 538e).

Diagnosis. Both sexes were distinguished from its closest congener, *A. pima*, by Garrison (1994), and were also keyed and described by Westfall & May (2006). The genital ligula of *A. lacrimans* is the same as in *A. pima* (Fig. 637) and is similar to that of *A. chelata* (Fig. 604) and *A. tonto* (Fig. 653). Both sexes of *A. lacrimans* approach *A. pima* in color pattern, but the latter is slightly smaller (TL 37.7–43.6) than *A. lacrimans* (TL 39.1–46.8). The humeral stripe of *A. lacrimans* is usually not forked (Figs. 217–219), or, if forked (as in Figs. 136–137), then the posterior branch of fork is weaker than the anterior branch and may form an isolated spot separated from the anterior branch; in *A. pima*, the humeral stripe is forked, the robust posterior branch is thicker than the anterior branch, and the posterior branch is rarely separated from the anterior branch (Figs. 112, 237). The inner branch (tooth) of the cercus in male *A. lacrimans* is strongly decumbent, bent posteroventrally (Fig. 703a) and usually not visible in dorsal view (Fig. 703c), with inner branch appearing as a slight convexity. The inner branch (tooth) of the cercus in *A. pima* is directed more posteriorly so that the inner branch in dorsal view appears as a prominent tooth subequal in size to the outer branch (Fig. 719).

Pale color in male of *A. tonto* is violaceous (Fig. 899), the middorsal thoracic stripe narrowly expands over the middorsal carina and the humeral stripe is never forked (Figs. 146–149). Overall pale coloration in male of *A. lacrimans* (Figs. 82, 820, 903) and *A. pima* (Figs. 112, 901) is blue, and the black middorsal stripe is wider and expands onto the mesepisternum. The cercus in *A. tonto* is deeply forked posteriorly, with the inner branch (tooth) prominent and with the area between inner and outer branches deeply concave (Fig. 742c).

Female of *A. lacrimans* (Figs. 217–219, 821, 904, 905) is also most similar to *A. pima* (Figs. 237, 902) but differs in thoracic stripe shape as noted for the male. They also differ in the development of mesepisternal tubercles under the base of the mesostigmal lobe in posterior view; in *A. lacrimans* there is a prominent tubercle in that position (Fig. 537e), which may be low and small in some specimens from Mexico (Fig. 538e) and which in *A. pima* is always low and transverse (Fig. 557e).

Female of *A. lacrimans* might also be confused with *A. tonto*, especially since mesostigmal plates show variability (Figs. 579, 580); the body markings of both (Figs. 217–219, 260, 447, 484, 900, 904, 905) hardly differ. The mesostigmal lobes of *A. tonto* are separated from each other by a distance equal (Figs. 580a, c) to about two to three times (Figs. 579a, c) the width of each lobe in dorsal view, and the mesepisternum usually lacks a tubercle under base of mesostigmal lobe in posterior view (Fig. 579e), although some Mexican specimens may have a low tubercle (Fig. 580e). The mesostigmal lobes in *A. lacrimans* (Fig. 537a) are separated from each other by a distance equal to or shorter than one and a half times the width of each lobe (Figs. 537a, c, 557a, c) and, as stated above, there usually is a tubercle on mesepisternum under base of each mesostigmal lobe in posterior view (Figs. 537e, 538e,

557e). Differentiation between females of *A. lacrimans* and *A. tonto* within the U. S. A. seems straightforward, given their differences in mesostigmal plate morphology as given in Figs. 537, 538 (*A. lacrimans*) and 579 (*A. tonto*). However, we acknowledge that isolated females of *A. tonto* (Fig. 580) collected in sympatry with *A. lacrimans* (Figs. 537, 538) in Mexico may be difficult to distinguish, and reference to females in tandem or copulation may be the only reliable means for distinguishing them.

Remarks. The specific epithet was originally spelled with an “i [*lacrimans*]” and was changed to *lacrymans* by Hagen in Selys (1865), which was followed by Calvert (1902, 1908a). We asked Heinrich Fliedner’s opinion for the change, and he suggested (pers. comm. 31 January 2022) that Selys may have preferred this spelling, as these changes were traditional in French-speaking areas at the time when the pronunciation of y and i no longer differed. Paulson (1982) was the first author to revert to Hagen’s original spelling, and this has been followed ever since.

Distribution. Dunkle & Boomsma (1996) recorded both *A. chelata* and *A. lacrimans* from Cayo in Belize. We have seen a pair of *A. chelata* from that district (Hidden Valley Inn), and this species does occur farther south into Panama, but we have been unable to verify any record of *A. lacrimans* south of the Isthmus of Tehuantepec (Fig. 778). We doubt its occurrence in Belize and suggest it be deleted from that country’s listing pending bona fide records of that species. Our records show *A. lacrimans*, like *A. chelata*, to be a species of mountainous areas, occurring between 245 and 2315 m.

Argia leonorae Garrison, 1994

Figs. 83 (head, thorax, S1–4 ♂); 220 (head, thorax, S1–4 ♀); 275 (wings ♂); 339 (S7–10 ♂); 448 (S7–10 ♀); 539 (mesostigmal plates ♀); 622 (genital ligula); 704 (appendages ♂); 788 (map); 822 (field photo ♂); 823 (field photo ♀); 937 (body scan ♂); 938 (body scan ♀).

[Key locators: ♂ G-2, couplet 10’; ♂ M-4, couplet 3(2’); ♀ F-15, couplet 3’]

Argia leonorae Garrison 1994: 315 (♂, ♀, key, description, diagnosis, figs. 11, 50, 111, 112);—Abbott & Stewart 1998: 207 (Texas);—Abbott 2001: 197 (Texas);—Abbott 2005a: 73 (♂, ♀, key, figs. 14, 15 photo 8d, distribution in Texas);—Abbott 2005b: 170 (Texas, New Mexico);—Westfall & May 2006: 197 (♂, ♀, key, description, figs. 93A, 99A, 102G);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Caesar & Wenzel 2009: 106 (phylogeny within genus *Argia*);—Paulson 2009: 149 (♂, ♀, description, diagnosis, photos);—Abbott 2011: 134 (♂, ♀, figs., diagnosis, distribution in Texas);—Ortega-Salas & González-Soriano 2019: 120 (Coahuila, Mexico).

Primary types. *Agrion leonorae*: holotype ♂, MEXICO, Nuevo León, García, Parque Turístico Nacatáz, 4 July 1987, M. J. Westfall, Jr. & A. Contreras leg. [examined, in FSCA; Garrison 1994].

Specimens examined. 33 ♂♂, 10 ♀♀: **U. S. A., Texas:** 1 ♀, 25 July 1928, L. D. Beamer [UMMZ]; 1 ♂, stream pools 0.9 mi W of junction 2185 on 652, 31.8275°N, 104.126°W, 1000 m, 16 June 1994, S. W. Dunkle [RWG]; 2 ♂♂, Balmorhea State Park, at canal {30.9881°N, 103.744°W}, 970 m, 14 September 1954, T. W. Donnelly [FSCA]; 3 ♂♂, 1 ♀, Mustang Creek, by Carlos G. Parker Blvd. (Loop 427), Taylor, 30.5769°N, 97.455°W, 170 m, 15–17 August 1975, R. W. Garrison [CSCA, RWG]; 1 ♂, 1 ♀, same data but 25 August 1976, J. E. Hafernik, Jr. [RWG]; 2 ♂♂, Taylor, 30.5667°N, 97.4°W, 170 m, 26 May 1978, C. E. Williams & L. K. Gloyd [RWG; UMMZ]; 3 ♀♀, Oasis Ranch/ Independence Creek, Sheffield, 15.1 mi. S. R. Hill & Field Entomology Class, #1052, 30.4669°N, 101.801°W, 600 m, 21–24 May 2003, J. C. Abbott [RWG]; 1 ♂, Guadalupe River at S fork Marsh, Highway 39, 6.6 mi SW of intersection with FM 1340, JCA2092, 30.0006°N, 99.4104°W, 562 m, 23 October 2004, J. C. Abbott [RWG]; 1 ♂, Devils River at Dolan Falls, 13.3 mi W of Loma Alta, JCA10, 29.885°N, 100.994°W, 400 m, 18–21 May 2003, J. C. Abbott [RWG]; 1 ♂, Pinto Creek at US 90, 29.3369°N, 100.532°W, 320 m, 15 September 1983, S. W. Dunkle [RWG]; 7 ♂♂, 1 ♀, McCoy Creek at Route 183, 29.2608°N, 97.2944°W, 70 m, 25 June 1975, K. W. Knopf [FSCA, RWG]. **MEXICO, Coahuila:** 1 ♀, 5.6 mi W of Cuatro Ciénegas, Cuatro Ciénegas Basin, {26.9894°N, 101.9717°W}, 700 m, 11 August 1968, W. L. Minckley [RWG]; **Nuevo León:** 9 ♂♂, 2 ♀♀ (holotype, allotype, and paratypes), Parque Turístico Nacatáz, 25.8014°N, 100.649°W, 767 m, 4 July 1987, M. J. Westfall, Jr. & A. Contreras [FSCA, RWG]; 1 ♂, Arroyo Elizondo, 25.6122°N, 100.315°W, 843 m, 2 July 1987, M. J. Westfall, Jr. & H. Quiroz [FSCA].

A small species (Table 2) with 3 Fw pq (Fig. 275); male blue and black (Figs. 83, 339, 822, 937); female (Figs. 823, 938) with mesal margin of mesostigmal lobe recurved ventrally forming a tubercle (Figs. 539c, d).

Diagnosis. Both sexes were keyed, described and diagnosed against its nearest relatives (*A. agrioides*, *A. fumipennis violacea*, *A. hinei*, *A. nahuana* and *A. pallens*) by Garrison (1994), and keyed and redescribed by Westfall & May (2006). Their differences, abstracted from Garrison (1994), are as follows:

The cercus of *A. agrioides* in dorsomedial and dorsal view is posterodistally elongate (Figs. 662a, c), whereas in *A. leonorae* the whole cercus appears quadrate (Figs. 704a, c). The inner branch (lobe) of *A. agrioides* is easily visible and lies ventromesally (Fig. 662d), and the tooth between inner and outer branches is easily visible, as prominent as inner branch (lobe) in posterior view (Fig. 704d), while in *A. leonorae*, the mesal lobe is small and tends to recurve ventrally beneath the cercus (Fig. 704d), and the decumbent tooth is as not as prominent as the inner branch (lobe) in posterior view. Male of *A. leonorae* is blue (Figs. 83, 339) and is smaller (HW 15.7–17.3 mm), not violaceous (Figs. 57–60, 314, 315) as in *A. fumipennis violacea* (HW 17.6–20.7 mm), and Fw pq = 3 in *A. leonorae* (Fw pq = 4 in *A. f. violacea*). Both are further diagnosed under *A. f. violacea*. The male of *A. hinei* is predominantly violaceous (Fig. 77), and the apical margin of cercus in posterior view has a black convex ridge (Fig. 696d), instead of the decumbent tooth present in *A. leonorae* (Fig. 704d). The dorsal branch of paraproct in *A. hinei* has a small anteapical tooth (Figs. 696a, b), that is lacking in *A. leonorae* (704c). The inner branch (lobe) of the cercus in *A. nahuana* is directed mesoventrally and clearly visible in dorsal view, so that cercus appears distinctly wider at apex than at base (Fig. 710c); in *A. leonorae*, the inner branch (lobe) of the cercus is directed ventrally or ventrolaterally, and is not clearly visible in dorsal view, so that cercus appears about as wide at apex as at base (Fig. 704c). Overall pale coloration is pinkish violet (Figs. 103–105) and the Fw pq = 4 in *A. pallens*; overall pale coloration is blue (Fig. 83) and the Fw pq = 3 in *A. leonorae*. Caudal appendage morphology of *A. leonorae* (Fig. 704) is closest to *A. pallens* (Fig. 714), but the overall coloration and differences in Fw pq as noted above will easily distinguish them.

The combination of 3 Fw pq cells in female *A. leonorae* will separate this sex from those of *A. agrioides*, *A. f. violacea*, *A. hinei*, *A. nahuana* and *A. pallens*, all of which have 4 Fw pq. The mesal margin of mesostigmal lobe is recurved ventrally, forming a tubercle in *A. f. violacea*, *A. leonorae* and *A. pallens*. In *A. leonorae*, that tubercle ends at the medial margin of lobe in posterior view (Figs. 536e, 539e), and the black humeral stripe is about as wide as the pale antehumeral stripe (Fig. 220). In *A. f. violacea* and *A. pallens*, that tubercle extends anterolaterally beyond medial margin of lobe in posterior view (Figs. 522e, 554e), and the black humeral stripe is less than a third as wide as the pale antehumeral stripe (Figs. 199, 234).

Habitat. *Argia leonorae* was found at swift-flowing streams bordered by sedges and tall grasses in Texas (Dolan Creek at Devils River, Dolan Falls Ranch) by D. R. Paulson (pers. comm.), where males were scattered in small numbers throughout areas where a very slender, long-stemmed sedge (*Rhynchospora colorata* (L.) H. Pfeiffer) grew at stream edge, but most individuals were seen at seeps where springs flowed out over flat rocky areas, and also at a stream below sewage-treatment pond (Jim Hogg Co., just E Hebbronville) in weeds along fence downwind from stream, from about 10 to 50 m away from stream. All of them were observed slowly opening and closing their wings at regular intervals, elevating the abdomen slightly at the same time.

Distribution. This species was originally described based on specimens from Texas and Nuevo León, Mexico. It has subsequently been reported from Oklahoma (Smith & Patten 2021) and New Mexico (Abbott 2005b) in the U. S. A., and Coahuila in Mexico (Ortega-Salas & González-Soriano 2019) (Fig. 788). Elevation ranges from about 70 to 1000 m.

Argia lugens (Hagen, 1861)

Figs. 84, 85 (head, thorax, S1–4 ♂); 86–88 (thorax ♂); 221 (head, thorax, S1–4 ♀); 340, 341 (S7–10 ♂); 449 (S7–10 ♀); 540 (mesostigmal plates ♀); 623 (genital ligula); 705 (appendages ♂); 762 (type label); 780 (map); 824 (field photo ♂); 825, 826 (field photos ♀); 914, 915 (body scans ♂); 916 (body scan ♀).

[Key locators: ♂ G-2, couplet 10(9'); ♂ M-5, couplet 10(9'); ♀ F1, couplet 1'; ♀ shortcut 5]

Agrion lugens Hagen 1861: 95 (description of ♀).

Hyponeura lugens: Hagen in Selys 1865: 382 (10 reprint) (redescription of ♀, comparison with *H. funcki*);—Calvert 1901: 66 (description ♂, ♀, comparison with *H. funcki*);—Calvert & Hagen 1902: 105 (“Type in M. C. Z.”, pl. II, fig. 22);—Needham & Cockerell 1902: 135 (description of larva);—Needham 1904: 715 (redescription of larva, pl. XLII, fig. 5);—Calvert 1907: 66 (description ♂, ♀, comparison with *H. funcki*).

Argia lugens: Gloyd 1968a: 272 (synonymy of *Hyponeura* Selys, diagnosis of *A. lugens* from *A. funcki* and *A. moesta*);—

Johnson 1972a: 83, 89 (key ♂, ♀, figs. 8G, H, 10M, N);—Paulson 1982: 252 (U. S. A., Mexico);—González-Soriano & Novelo-Gutiérrez 1991: 87 (key, Durango, Mexico, figs. 11, 35);—Novelo-Gutiérrez & González-Soriano 1991: 127 (key, description larva, figs. 20, 30);—Novelo-Gutiérrez 1992: 518 (description larva, figs. 5, 28, 33, 50, 65, 79, 84);—González-Soriano 1993: 295 (Mexico);—Garrison 1994: 318 (key, diagnosis, figs. 9, 34, 36, 37, 69);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Abbott & Stewart 1998: 207 (Texas, Mexico);—Abbott 2005a: 75 (♂, ♀, key, distribution in New Mexico, Texas, Oklahoma, figs. 14, 15, photos 8a, 8f);—Novelo-Gutiérrez & Gómez-Anaya 2006: 261 (comparison of larva with *A. funcki*);—Westfall & May 2006: 198 (♂, ♀, key, description larva, figs. 73, 85K, 93B, 99B, 102H);—Behrstock *et al.* 2007a: 57 (Chihuahua, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Upson *et al.* 2007: 31 (Sonora, Mexico);—Behrstock 2009: 3 (Coahuila, Mexico);—Caesar & Wenzel 2009: 101 (phylogeny within genus *Argia*);—Escoto-Moreno *et al.* 2009: 154 (Aguascalientes, Mexico);—Paulson 2009: 172 (description, diagnosis, ♂, ♀, photos);—Abbott 2011: 116 (♂, ♀, figs., diagnosis, distribution in Texas);—Escoto-Moreno *et al.* 2014: 1051 (Hidalgo, Mexico);—Bailowitz *et al.* 2015: 124 (diagnosis, photos);—Escoto-Moreno *et al.* 2015: 153 (Zacatecas, Mexico);—Escoto-Moreno *et al.* 2017: 386 (Hidalgo, Mexico);—Torres-Pachón *et al.* 2017: 413 (molecular phylogeny of larvae within *Argia*).

Primary types. *Agrion lugens*: holotype ♀, “Mexique” (Fig. 762) [examined, in MNB; Garrison 1994].

Specimens examined. 115 ♂♂, 52 ♀♀: **U. S. A., South Dakota:** 1 ♂, Hot Brook, Chataqua Park, Hot Springs, section 14, T7S, R5E, {43.4427°N, 103.481°W}, 1060 m, 8 July 1980, S. Hummel [RWG]; **California:** 1 ♂, Bidwell City Park, by Big Chico Creek, Chico, 39.7438°N, 121.817°W, 60 m, 14–15 June 1975, R. W. Garrison [RWG]; 3 ♂♂, same data but 5 July 1976 [RWG]; 1 ♂, same data but 20 June 2003, R. W. & J. A. Garrison, N. von Ellenrieder [CSCA, RWG]; 1 ♂, Bear creek at Highway 16, 3.7 mi S junction CA 20, 38.9724°N, 122.333°W, 371 m, 20 June 2003, R. W. & J. A. Garrison, N. von Ellenrieder [CSCA]; 1 ♀, Lake Clementine trail, just below Lake Clementine Road, 38.9313°N, 121.029°W, 285 m, 18 July 2021, R. W. Garrison [RWG]; 2 ♀♀, Cache Creek at W. W. H. Bill Davis Memorial Picnic Area, by Highway 16, 6 mi N of Rumsey, 38.9158°N, 122.309°W, 339 m, 3 July 1978, R. W. & J. A. Garrison [RMNH, RWG]; 1 ♀, Davis, 38.9158°N, 122.309°W, 339 m, 13 July 1963, S. Seminoff [CSCA]; 3 ♂♂, 3 ♀♀, Butts creek, 38.6997°N, 122.452°W, 234 m, 21 June 2003, R. W. & J. A. Garrison, N. von Ellenrieder [CSCA, RWG]; 3 ♂♂, 1 ♀, Pope Creek at entrance to Walter Springs, W of Lake Berryessa, 38.6475°N, 122.357°W, 180 m, 10 June 1978, R. W. & J. A. Garrison [RWG]; 1 ♂, same data but at entrance to Samuel Springs {38.6459°N, 122.356°W}, 160 m, 27 May 1978 [RWG]; 1 ♂, same data but just S of Pope Canyon Road and 3.8 mi W of junction of Berryessa-Knoxville Road, 38.6385°N, 122.348°W, 160 m, 13 May 1972, J. A. Garrison [RWG]; 1 ♀, same data but about 2 mi W of Lake Berryessa {38.6213°N, 122.323°W}, 150 m, 27 May 1978, R. W. & J. A. Garrison [RWG]; 1 ♀, spring just S of Pope Creek, about 0.6 mi NW of Samuel Springs, W of Lake Berryessa, 38.6039°N, 122.312°W, 140 m, 27 May 1979, R. W. & J. A. Garrison [RWG]; 3 ♂♂, Del Puerto Canyon at N Fork of Del Puerto Creek, about 24 km W of Patterson on Del Puerto Canyon Road, 37.4384°N, 121.337°W, 270 m, 4 June 1977, R. W. & J. A. Garrison [RWG]; 1 ♂, 1 ♀, same data but 25 June 1978, R. W. & J. A. Garrison [RWG]; 3 ♂♂, 5 ♀♀, same data but 19 June 2003, R. W. & J. A. Garrison, N. von Ellenrieder [CSCA, RWG]; 1 ♂, Kaweah River, by Highway 198 {36.4124°N, 118.937°W}, 200 m, 27 July 1972, R. W. Garrison [RWG]; 1 ♂, Warm Springs Creek, by Lake Hughes Road, 34.6739°N, 118.443°W, 985 m, 8 June 1985, R. W. Garrison [RWG]; 1 ♂, 1 ♀, Castaic Power plant, Templin Highway near I-5, W of Lake Castaic, 34.5911°N, 118.662°W, 714 m, 4 September 1999, R. W. Garrison [RWG]; 1 ♀, Sespe Creek, 4 mi N of Fillmore, 34.4585°N, 118.928°W, 212 m, 5 September 1982, R. W. & J. A. Garrison [RV, RWG]; 1 ♂, just below Matilija Hot Springs, 34.4831°N, 119.304°W, 430 m, 2 September 1984, R. W. & J. A. Garrison [RMNH]; 1 ♂, Santa Paula, 34.3694°N, 119.066°W, 175 m, 15 June 1957, W. E. Simonds [CSCA]; 2 ♂♂, Upper Big Tujunga Creek at Wildcat Gulch, Angeles National Forest, 34.308°N, 118.081°W, 1028 m, 12 June 1986, M. L. Pearson [RWG]; 1 ♂, 2 ♀♀, Julius M. Klein Conservation Camp, E Fork of San Gabriel River, Angeles National Forest {34.2389°N, 117.821°W}, 460 m, 7 August 1986, M. L. Pearson [RWG]; 1 ♀, Azusa Canyon {34.1714°N, 117.886°W}, 280 m, 20 July 1985, R. W. Garrison [RWG]; **Utah:** 1 ♂, Beaver Dam Wash, Lytle Ranch, malaise trap {37.1445°N, 114.024°W}, 845 m, 3 October 1985, G. Baird [RWG]; **Arizona:** 3 ♂♂, 1 ♀, Oak Creek Canyon, Highway 89A, 14 mi S of Flagstaff, 35.0025°N, 111.77°W, 8 November 2001, N. von Ellenrieder [CSCA]; 1 ♂, Bootlegger Campground, by Highway 89A, 8 mi N of Sedona, 34.9697°N, 111.751°W, 1575 m, 19 July 1977, R. W. Garrison [RWG]; 2 ♂♂, 1 ♀, Webber Creek, Camp Geronimo, Road 440, Tonto National Forest, 34.4089°N, 111.377°W, 1704 m, 5 July 1969, R. W. Garrison [RWG]; 1 ♂, 1 ♀, same data but 3 August 1992, R. W. Garrison [RWG]; 2 ♂♂, 1 ♀, Sycamore Spring, Fossil Creek Road 708, Coconino National Forest, 34.395°N, 111.65°W, 1065 m, 2 August 1992, R. W. Garrison [RWG]; 1 ♂, Tonto Natural Bridge State Park, 4 mi S of Pine, 34.3212°N, 111.457°W, 1400 m, 3 August 1992, R. W. Garrison [CUMZ];

1 ♂, 1 ♀, Agua Fria River at Horseshoe Ranch, 5.2 mi E of I-17, Road 269, 34.2575°N, 112.064°W, 980 m, 14 July 1998, R. W., J. A., P. A. & A. V. Garrison [RWG]; 1 ♂, same data but Agua Fria River at Bloody Basin Road, 990 m, 1 August 1992, R. W. Garrison [RWG]; 1 ♂, Agua Fria River just E of I-17 at Bumble Bee exit, 34.2331°N, 112.098°W, 950 m, 1 September 1994, R. W. Garrison [RWG]; 2 ♂♂, Tangle Creek, Tonto National Forest, 34.1333°N, 111.774°W, 819 m, 1 August 1992, R. W. Garrison [RWG]; 4 ♂♂, Seven Springs Picnic Ground, about 12 mi N of Carefree, Tonto National Forest, 33.9675°N, 111.8647°W, 1012 m, 17 August 1974, R. W. Garrison [CSCA, RWG]; 1 ♂, same data but 29 July 1987, R. W. Garrison [RMNH]; 2 ♂♂, 2 ♀♀, same data but 1 August 1992, R. W. & J. A. Garrison [MHNN, RWG]; 1 ♂, 1 ♀, same data but 1 August 1992, R. W. Garrison [RWG]; 1 ♂, 1 ♀, same data but 12 August 1995, R. W. Garrison [RWG]; 13 ♂♂, 3 ♀♀, same data but 11 August 2001, N. von Ellenrieder [CSCA]; 1 ♂, Rackensack Canyon at Camp Creek, on Cave Creek Road, 12 mi NE of Carefree, 33.9041°N, 111.8201°W, 1050 m, 4 August 1975, R. W. Garrison [RWG]; 1 ♀, same data but 8 August 1992, C. Fujita [RWG]; 1 ♂, Sycamore Canyon, 3.3 mi WNW of Highway 87 {33.6932°N, 111.539°W}, 540 m, 23 July 1984, R. W. & J. A. Garrison [RWG]; 1 ♂, 1 ♀, Ranch, Blue River, FR 475C end, Apache National Forest, 33.3225°N, 109.19°W, 1320 m, 5 September 1995, Van Dam family [RWG]; 1 ♂, Coal Creek, 33.1047°N, 109.064°W, 1730 m, 20 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA]; 1 ♂, Bonita Creek, 32.9289°N, 109.495°W, 1011 m, 18 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA]; 2 ♂♂, 3 ♀♀, same data but 29 September 2002, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 4 ♂♂, 1 ♀, same data but 32.9097°N, 109.487°W, 978 m, 18 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, Hot Springs Canyon, about 2 mi by foot NW of Hookers Hot Springs, T13S, R21E 36, 32.3528°N, 110.244°W, 1250 m, 20 September 1996, R. W. Garrison [RWG]; 2 ♂♂, same data but 10 August 1997, R. W., J. A. & P. A. Garrison [RWG]; 7 ♂♂, 1 ♀, Muleshoe Ranch, Bass Creek, Hot Springs, 32.3528°N, 110.257°W, 1196 m, 17 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, Upper Sabino Canyon, about 3 mi N of visitor center, N of Tucson, 32.3433°N, 110.783°W, 974 m, 20 July 1987, R. W. Garrison [RWG]; 1 ♂, Sabino Canyon, Coronado National Forest, 32.3389°N, 110.786°W, 953 m, 5 August 1992, R. W. Garrison [RWG]; 1 ♂, Tanque Verde Falls near Tanque Verde Road, at Tanque Verde Wash, 32.2552°N, 110.655°W, 1362 m, 25 August 1989, R. W. & J. A. Garrison [RWG]; 1 ♂, Stewart Campground, Chiricahua Mountains, 31.8909°N, 109.167°W, 1536 m, 26 July 1984, R. W. & J. A. Garrison [RWG]; 1 ♀, Proctor Ranch Road {31.7398°N, 110.885°W}, 1360 m, 5 July 1986, R. Rogers [RWG]; 1 ♂, Sycamore Canyon, 31.4269°N, 111.194°W, 1196 m, 8 August 1972, R. W. & J. A. Garrison [RWG]; **New Mexico**: 1 ♀, Tularosa River just E of Aragon on Highway 12, 33.8881°N, 108.518°W, 2069 m, 28 July 1984, R. W. & J. A. Garrison [RWG]; 1 ♂, same data but 4 August 1995, R. W., J. A. & P. A. Garrison [RWG]; 2 ♂♂, W of Fork Gila River at Gila Cliff Dwellings National Monument {33.2296°N, 108.26°W}, 1730 m, 30 July 1983, J. E. Hafernik, Jr. [RWG]; 2 ♂♂, 1 ♀, Sapiño Creek at Highway 15, 25 mi N of Silver City, 33.0408°N, 108.217°W, 1776 m, 27 July 1984, R. W. & J. A. Garrison [RWG]; 3 ♂♂, 1 ♀, same data but 7 August 1995, R. W., J. A. & P. A. Garrison [RWG]; 1 ♂, Gila River S of Gila, 32.9408°N, 108.609°W, 1830 m, 5 August 1995, R. W. & J. A. Garrison [RWG]; 1 ♂, Sitting Bull Falls, Guadalupe Mountains, 32.2431°N, 104.696°W, 1386 m, 24 August 1998, R. W. & J. A. Garrison [RWG]; **Texas**: 2 ♂♂, Limpia Canyon, 9.4 mi NE of Fort Davis on Highway 17, 30.6833°N, 103.7901°W, 1300 m, 31 July 1984, R. W. & J. A. Garrison [RWG]; 1 ♂, Davis Mountains, Limpia Creek, 3 mi NE of Fort Davis by Highway 17, 30.6245°N, 103.865°W, 1450 m, 31 July 1984, R. W. Garrison [RWG]. **MEXICO**, 1 ♀ (holotype) [MNB]; **Baja California**: 1 ♂, Cañón de Guadalupe, Sierra Juarez Mountains, {32.1544°N, 115.789°W}, 356 m, 17 May 1986, J. Wiseman [RWG]; **Chihuahua**: 1 ♂, Arroyo Fresca, 3 mi N of junction of Río Piedras Verdes {30.3209°N, 108.223°W}, 1690 m, 22 June 1987, B. Kondratieff & R. Baumann [BYU]; 1 ♂, Río Piedras Verdes near Pacheco {30.0853°N, 108.393°W}, 2250 m, 22 June 1987, B. Kondratieff & R. Baumann [RWG]; 1 ♂, Río Tomochic, Highway 16 at Tomochic {28.3528°N, 107.854°W}, 1918 m, 28 June 1987, B. Kondratieff & R. Baumann [BYU]; 1 ♂, 1 ♀, Creel-Divisadero Road, km 18, 27.6653°N, 107.749°W, 2100 m, 10 July 2006, D. G. Furth [USNM]; **Hidalgo**: 2 ♂♂, 5 ♀♀, Tecozautla, Arroyo San José del Desierto, 20.5317°N, 99.6292°W, 1730 m, 16 September 1992, R. Novelo-Gutiérrez [RWG].

Second largest species of *Argia* (Table 2); male brown (Figs. 85–88, 915), becoming pruinose black with age (Figs. 84, 824, 914); female blue or brown (Figs. 825, 826, 916) with posteromesal margin of mesostigmal plate with narrow mesostigmal lobe directed posterolaterally (Fig. 540c).

Diagnosis. Both sexes were keyed, described and diagnosed against *A. moesta* by Garrison (1994), and keyed and redescribed by Westfall & May (2006). As noted under *A. funcki*, males of this species and *A. lugens* and *A. moesta* share a similar genital ligula morphology with the distal segment in the form of a strap-like process (Figs. 614, 623, 626). All three species are diagnosed under *A. funcki*.

Remarks. The holotype female was stated by Hagen (1861) to have come from Mexico via “Mühlenpford.” Philipp. August Friedrich Mühlenpfordt (30 January 1803–1891) was a botanist known for his investigations of cacti. We have been unable to determine whether Mühlenpfordt collected in Mexico or whether the holotype of *A. lugens* came into his possession and was later given to Hagen, nor where in Mexico the holotype was collected.

Distribution. *Argia lugens* ranges from SW Oregon south through Arizona, SE New Mexico, W Texas south primarily along the W flank of Mexico through Hidalgo, Mexico (Fig. 780). It has not been collected south of the E portion of the Trans-Mexican Volcanic Belt (ca. 96.8°N), where it extends nearly to the Gulf of Mexico. There is an isolated record from SE South Dakota. Its elevation range in Mexico extends from 356 to 2286 m (Behrstock 2009).

Argia mayi González-Soriano, 2012

Figs. 89 (head, thorax, S1–4 ♂); 222 (head, thorax, S1–4 ♀); 342 (S7–10 ♂); 450 (S7–10 ♀); 541 (mesostigmal plates ♀); 624 (genital ligula); 706 (appendages ♂); 798 (map); 827, 828 (field photos ♂); 1022 (body scan ♂); 1023 (body scan ♀).

[Key locators: ♂ G-5, couplet 12'; ♂ M-5, couplet 5(4'); ♀ F6, couplet 6']

Argia mayi González-Soriano, 2012: 261 (description ♂, ♀, diagnosed against *A. pocomana*);—Ortega-Salas & González-Soriano 2019: 120 (Coahuila, Mexico);—Smith 2022: 36 (photographic records from Oaxaca and Sinaloa, Mexico).

Primary types. *Argia mayi*: holotype ♂, MEXICO, Oaxaca, La Palma, 5.3 km NE of crossroad between Salina Cruz and Santa Cruz Huatulco routes, 15.8164°N, 96.1758°W, 3 October 2005, E. González-Soriano [not examined, in CNIN].

Specimens examined. 10 ♂♂, 4 ♀♀: **MEXICO, Nayarit:** 2 ♂♂, 1 ♀, 7 mi N of Tepic {21.6016°N, 105.005°W}, 900 m, 3 July 1957, R. R. Dreisbach [PSU, RWG]; 1 ♂, Tepic {21.5°N, 104.9°W}, 900 m, 14 September 1957, R. R. Dreisbach [PSU]; 1 ♂, vicinity of Compostela, 21.2491°N, 104.884°W, 900 m, 1934 [RWG]; 1 ♂, same data but 18 May 1937, E. Rosenbauer [RWG]; **Michoacán:** 1 ♂, 12 km W of Apatzingán, side of stream, {19.0942°N, 102.44°W}, 253 m, 12 August 1941, H. Hoogstraal [UMMZ]; **Morelos:** 1 ♂, 1 ♀, Balneario on River S of Temixco on Highway 95, 18.8303°N, 99.2272°W, 1220 m, 21 July 1992, S. W. Dunkle [RWG]; 2 ♂♂, waterpark Apotla on Highway 1, S of Cuernavaca, 18.6994°N, 99.2439°W, 1013 m, 24 July 1985, E. González-Soriano, R. Novelo-Gutiérrez & García [RWG]; **Guerrero:** 1 ♂, 22 mi N of Acapulco {17.1167°N, 99.8332°W}, 800 m, 14 August 1936, H. R. Roberts [FSCA]; **Oaxaca:** 2 ♂♂, 2 ♀♀, Candelaria Loxicha {15.9264°N, 96.4928°W}, 500 m, 21–25 November 1967, E. C. Welling M. [CSCA, RWG]; 1 ♂, 1 ♀ (paratypes), La Palma, 5.3 km NE of crossroad between Salina Cruz and Santa Cruz Huatulco routes, 15.8164°N, 96.1758°W, 165 m, 3 June 2005, J. A. Escoto-Moreno. [RWG].

A medium-size species (Table 2); male violaceous (Figs. 827, 828, 1022) with almost equally branched cerci (Fig. 706) and distal segment of genital ligula ending in two filaments which at their base are covered by a narrow, long digit-like membranous hood (Fig. 624); female (Fig. 1023) with mesostigmal plate with raised portion of mesostigmal lobe entire and lacking an inner narrow foliate free lobe extending medially (Fig. 541).

Redescription. Both sexes of this species were described by González-Soriano (2012). We have modified his description as pertains to the male and female figured here as follows: **Male** (Mexico, Oaxaca, La Palma, 5.3 km NE of crossroad between Salina Cruz and Santa Cruz Huatulco routes, paratype, Figs. 89, 32, 706, 1022): labrum, clypeus, frons violaceous; epicranium with a cross band of black anteriorly with narrow inverted T-spot occupying frontal suture, postocular spots violaceous, their inner margins narrowing toward but separated by pale occipital bar by a narrow black line; rear of head pale with small black spot on each side of occipital foramen. Prothorax violaceous, black dorsally with following areas pale: anterior lobe, dorsolateral spot on middle lobe, lateral margin of posterior lobe, propleuron. Pterothorax violaceous with black middorsal stripe occupying 0.45 of mesepisternum; black humeral stripe wide extending from base of mesinfraepisternum, forked above at dorsal fourth with posterior fork not meeting black vestigial interpleural stripe, black metapleural stripe a mere line, metepimeron violet blue. Wings slightly amber, venation black, Pt dark brown surmounting 1 cell in all wings: Fw pq: 4/4, Hw 3/3, RP2 originating at Fw 6.8/6.8, in Hw 5.8/5. Legs: coxae and trochanters pale; femora black dorsally, pale ventrally; tibiae pale dorsally, black ventrally; armature black. Abdomen largely black laterally, violaceous dorsally, S1

violaceous with small black spot dorsally on basal 0.50; S2 dorsally with violaceous spot narrowing preapically before expanding at black annulus, ventral margin of S2 pale, with a lateral longitudinal black stripe broadening but not meeting dorsally at posterior 0.20 of segment and connected apically by black annular ring; S3 with basal ring of violet and dorsally prolonged posteriorly, parallel and ending at apical fifth, laterally with a longitudinal black parallel stripe enlarging forming a black apical ring at apical 0.20, ventral margin pale; S4–5 as in S3; S6 similar but pale dorsal stripe narrowing posteriorly and ending at apical fifth; S7 black with a violaceous basal ring and laterally with an obscure incomplete pale lateral stripe; S9–10 violet, black ventrally, S10 black each side with a small dorsolateral violaceous spot; cercus and paraproct brown.

Genital ligula (as in Fig. 624) with distal segment ending in two filaments which at their base are covered by a narrow, long digit-like membranous hood, small falcate lateral lobes present.

Torus large, transversely triangular, swollen ventrally, occupying entire ventral margin of torifer and not overlapping bilobed epiproct (Fig. 706c); area around epiproct and base of same black; cercus (Figs. 706a, c) long, about subequal to paraproct, sides more or less parallel but medial margin convex, planate dorsomedially, bifid apically with smaller slightly decumbent inner branch separated from longer outer branch by a U-shaped cleft; inner branch forming a glabrous tooth visible in lateral view (Fig. 706b); paraproct bilobed, its ventral branch much smaller than long slightly anteriorly directed dorsal branch, in lateral view, tip of dorsal branch with small acuminate tooth, emarginate anteriorly followed by a slightly raised lobe; paraproct slightly higher than long, in lateral view apicoventral margin rounded, dorsally with two small tubercles (Fig. 706b).

Dimensions. Hw 19.3, abdomen 25.5, total length 32.3.

Female (Mexico, Oaxaca, La Palma, 5.3 km NE of crossroad between Salina Cruz and Santa Cruz Huatulco routes, paratype, Figs. 222, 450, 541, 1023). As in male but middle lobe of prothorax dorsally with a small pale geminate spot with pale line extending posteriorly over posterior lobe; black humeral stripe narrow, posterior for vestigial. Wings slightly amber, venation black, Pt dark brown surmounting 1 cell in all wings: Fw pq: 3/3, Hw 3/3, RP2 originating at Fw 6/6, in Hw 5/5. Abdomen as in male but dorsolateral black stripe extensive and separated dorsally by a narrow pale middorsal line; S7–10 black dorsally, pale laterally and each segment with a narrow black ventral stripe; ovipositor and cerci brown. Raised portion of mesostigmal lobe in anterior view extending for almost entire width of plate; mesostigmal lobe wider than long and lacking an inner narrow foliate free lobe extending medially (Fig. 541).

Dimensions. Hw 19.3, abdomen 23.5, total length 30.4.

Diagnosis. In the original description, González-Soriano (2012) compared the male of *A. mayi* (Fig. 706) with *A. pocomana* (Figs. 721, 722) based on the similarity of their male caudal appendages: both possess an elongate cercus with an inner and outer branch, and the ventral branch of the paraproct is small. The inner branch (tooth) of the cercus in *A. mayi* is not as long as the outer branch (Figs. 706a, c); in *A. pocomana*, the inner branch (tooth) of the cercus is as long as the outer branch and is more robust (Figs. 721a, c, 722a, c). Males of both species also differ in color pattern: the black metapleural stripe in *A. mayi* (Fig. 89) is a mere line and is not subequal in width to the humeral stripe as in *A. pocomana* (Fig. 115). The black lateral stripe on S3–5 is continuous (Fig. 89) in *A. mayi* and is not interrupted midlaterally by a narrow pale stripe as in *A. pocomana* (Fig. 115); there is usually some violet middorsally on S10 in *A. mayi* (Fig. 342), whereas S10 is entirely black in *A. pocomana* (Fig. 363). The distal segment of the genital ligula of *A. mayi* (Fig. 624) ends in a bifid flagellum that is covered at its base by a narrow, long digit-like membranous hood, and the falcate lateral lobes are small; the genital ligula in *A. pocomana* is like that of *A. talamanca* (Fig. 648): the distal segment ends in a long flagellum-like or strap-like process with large sacoid lateral lobes and with an entally directed flared process on each side distal to them (as in Fig. 648). The mesostigmal laminae of both species differ significantly. The mesostigmal lobe of *A. mayi* is entire (Fig. 541a) and is rounded apically (Fig. 541c); the mesostigmal lobe in *A. pocomana* (Fig. 559c) is small, slightly wider than long and occupies only the basal fourth or fifth of mesostigmal plate.

Male of *A. mayi* is similar to the allopatric NE South American *A. deceptor* Garrison & von Ellenrieder, 2015 in appendage morphology, but the basomesal margin of the cercus in *A. deceptor* is broadly convex (figs. 10a2, c2 in Garrison & von Ellenrieder 2015); the distomesal portion of the cercus in *A. mayi* is slightly concave, with the convexity limited only to the basomesal half of the cercus (Fig. 706a, c). The ventral branch of the paraproct in *A. deceptor* is well-developed (figs. 10a2, b2 in Garrison & von Ellenrieder 2015), not vestigial as in *A. mayi* (Figs. 706a, b). The mesostigmal plate in female of *A. deceptor* has a thumb-like posteroventrally directed lobe (fig. 7l, m in Garrison & von Ellenrieder 2015) that is lacking in *A. mayi* (Fig. 541).

Remarks. The morphology of the male caudal appendages, genital ligula and female mesostigmal plates of *A. mayi* place this species within the complex comprising *A. indicatrix*, *A. deceptor* and *A. gemella* Garrison & von Ellenrieder, 2015 (the latter two exclusively South American).

Distribution. *Argia mayi* represents the NW counterpart to the more southerly *A. indicatrix*, ranging as far north as Coahuila on the Central Plateau (Ortega-Salas & González-Soriano 2019) and S Sinaloa (on the W edge of the town of Copala; Smith 2022) south along the W escarpment of Mexico into Oaxaca (Fig. 798). It is allopatric with *A. indicatrix*, which extends into SE Mexico only into Tabasco and central Veracruz (Fig. 798). Our records show this species to occur from about 90 m (Guerrero, tributary river to Río Tecpán, Colonia Palma de Callaco, 4.8 km E of Tecpán, 17.2287°N, 100.5860°W, via photo shared by Hector Ortega Salas) to 1220 m.

Argia medullaris Selys, 1865

Figs. 90 (head, thorax, S1–4 ♂); 223 (head, thorax, S1–4 ♀); 343 (S7–10 ♂); 451 (S7–10 ♀); 542 (mesostigmal plates ♀); 625 (genital ligula); 707 (appendages ♂); 763 (type label); 774 (map); 1006 (body scan ♂); 1007 (body scan ♀).

[Key locators: ♂ G-5, couplet 8(4'); ♂ M-6, couplet 8'; ♀ F11, couplet 11']

Argia medullaris Selys 1865: 412 (40 reprint) (description of ♂, “Bogota, Nouvelle-Grenade, par Lindig. (Collect. Hagen, de Selys)”)”;—Calvert in Calvert & Hagen 1902: 111 (catalog, pl. I, figs. 2, 2a);—Calvert 1907: 374 (Guatemala, Costa Rica);—Förster 1914: 64 (comparison of *A. fraudatrix* sp. nov. to *A. medullaris*);—Ris 1918: 116 (*A. variabilis* compared to *A. medullaris*);—Garrison 1982: 6 (Costa Rica);—De Marmels 1990: 337 (Venezuela);—Tennessen 1996: 16 (Ecuador);—Daigle 1996: 10 (Ecuador);—Ramírez *et al.* 2000: 249 (Costa Rica);—Förster 2001: 11 (list);—Abbott *et al.* 2002: 126 (Nicaragua);—Esquivel 2005: 286 (Mexico [in error], Guatemala, Costa Rica, Colombia, Ecuador, Venezuela);—von Ellenrieder & Garrison 2007a: 19 (mention of syntypes and identity);—Heckman 2008: 350, 351, 384 (key, figs. based on Calvert & Hagen 1902);—Garrison *et al.* 2010: 213 (listed);—Pérez-Gutiérrez & Montes-Fontalvo 2011: 218 (description larva, figs. 1a–l);—Pérez-Gutiérrez & Palacino-Rodríguez 2011: 212 (Colombia);—Garrison & von Ellenrieder 2013: 16, 18, 22 (Costa Rica, field photo);—Pérez-Gutiérrez *et al.* 2013: 100 (Colombia, field photo);—Garrison & von Ellenrieder 2018: 20 (extensive remarks concerning names associated with *A. medullaris* with new synonymy, figs. 18, 63, 64, 80, 98, 115–117, 129, 130, 132, 133, 135, 138, photo 147);—Bota-Sierra *et al.* 2019: 43 (brief diagnosis, Colombia, photo 27);—Garrison & von Ellenrieder 2019: 39 (paralectotype data);—Mauffray & Tennessen 2019: 43 (additional records for Ecuador);—von Ellenrieder *et al.* 2020: 11 (Ecuador);—Hämäläinen 2021: 69 (Ecuador);—Paulson & Haber 2021: 90 (diagnosis, photos).

Argia ?medullaris: Calvert 1902: 91–92 (in part, specimens from Guatemala, Costa Rica, Colombia, determined as possible *A. medullaris*).

Argia rectangula Navás 1920: 1–2 (Colombia);—Garrison & von Ellenrieder 2018: 20 (synonymy with *A. medullaris*).

Argia columbiana Navás 1924: 327–328 [16–17 separate] (Colombia);—Garrison & von Ellenrieder 2018: 20 (synonymy with *A. medullaris*).

Argia augustana Navás 1934a: 180 (28 reprint) (Colombia);—Garrison *et al.* 2003: 27 (catalog, synonymy with *A. medullaris*).

Argia variabilis: Ris 1918: 116 (misidentification, *A. variabilis* compared to *A. medullaris*, Costa Rica, Panama);—Brooks 1989: 50 (misidentification, Costa Rica);—Ramírez *et al.* 2000: 249 (misidentification, Costa Rica);—Förster 2001: 11, 56 (misidentification, key ♂, ♀, fig. C25).

Primary types. *Argia medullaris*: lectotype ♂, COLOMBIA, St. Fe de Bogota, Lindig 1863 (Fig. 763) [examined, in RBINS];—*Argia augustana*: holotype ♀, COLOMBIA, S. Antonio de Tena, Agosto 1926 [examined, in UMMZ];—*Argia columbiana*: syntypes ♂, ♀, COLOMBIA La Mesa, VII-15 [examined, in MNHN];—*Argia rectangula*: holotype ♀, COLOMBIA, Viotá, VII-15” [examined, in MNHN].

Specimens examined. 750 ♂♂, 285 ♀♀ (see Garrison & von Ellenrieder 2018 for additional material examined not listed here): **GUATEMALA, Suchitepéquez**: 1 ♂, Finca Moca Grande {14.5336°N, 91.2517°W}, 400 m, 6–8 July 1977, M. J. Westfall, Jr. [RWG]. **HONDURAS, Cortés**: 1 ♂, El Danto camp, Cusuco National Park at river [Da0908], 15.5328°N, 88.2769°W, 1515 m, 4 July 2009, M. Jocque, [RWG]; 2 ♂♂, Cantiles, small river close to camp, Cusuco National Park [Ca0911], 15.4972°N, 88.2114°W, 1320 m, 10–11 July 2009, M. Jocque [RWG]; 2 ♂♂, same data but NAPACU, 1607 m, 26 July 2008, M. Jocque, [RWG]. **EL SALVADOR, Santa Ana**: 2 ♂♂, La Borda, Cerro Montecristo, Metapán {14.4166°N, 89.35°W}, 477 m, 26 August 1987, V. Hellebuyck [RWG]. **NICARAGUA, Jinotega**: 1 ♂, Cerro Kilambe, small forest stream at camp, 01x065, 13.5866°N, 85.71°W,

1250 m, 30 July 2001, T. W. Donnelly [FSCA]; **Matagalpa**: 9 ♂♂, Hotel Selva Negra, FCS03-0932, 12.9994°N, 85.9089°W, 1270 m, 30 August–1 September 2003, F. C. Sibley [FSCA; RWG]. **COSTA RICA, Cartago**: 1 ♂, 1 ♀, Orosi, Volcán Irazu {9.95°N, 83.8332°W}, 1500 m, May 1912, O. Garlepp. [UMMZ]; 1 ♀, Turrialba {9.9°N, 83.6833°W}, 638 m, 22 May 1951, O. L. Cartwright [USNM]; 3 ♀♀, same data but IICA, forest clearing, 19 June 1969, Schaaf [RWG; UMMZ]; 3 ♀♀, same data but forest trail, 19–21 June 1969 [UMMZ]; **San José**: 1 ♂, Ciudad Colón, 7 km W, El Rodeo Forest Reserve, IORI # 00085390 {9.9°N, 84.4301°W}, 637 m, 7 February 1994 [FSCA]. **PANAMA, Chiriquí**: 1 ♀, Cerro Punta {8.8522°N, 82.5742°W}, 1953 m, 2 July 1965, H. Real [RWG]; 1 ♂, Finca Hartmann, creek behind house, 8.8431°N, 82.7623°W, 1540 m, 17–22 February 2012, L. G. Bezark [RWG]; 1 ♀, Alto Lino, near Boquete {8.8°N, 82.4333°W}, 1160 m, 17 July 1967, O. S. Flint, Jr. & M. A. Ortiz B. [USNM]. **COLOMBIA, Antioquia**: 1 ♂, 1 ♀, Santa Margarita, West Cordillera, 7.6667°N, 74.75°W, 2300 m, July 1909, A. H. Fassl [UMMZ]; 1 ♂, 12 km NW Medellín, road to San Pedro, 6.41°N, 75.611°W, 2554 m, 13 February 1984, C. M. & O. S. Flint, Jr. [RMNH]; 1 ♀, Cisneros, Río Santa Getrudis {6.5298°N, 75.0917°W}, 1122 m, 10 February 1917, J. H. & E. B. Williamson [UMMZ]; 3 ♂♂, 1 ♀, mountainside near Medellín, 6.23°N, 75.5381°W, 1770 m, 23–26 July 1938, N. A. Weber [RWG; UMMZ]; 1 ♂, 3 ♀♀, La Estrella {6.1666°N, 75.6668°W}, 2220 m, February 1959, H. Gloger [RWG; UMMZ]; **Caldas**: 1 ♂, 1 ♀, Ciudad Manizales, Reserva Rio Blanco, 5.0606°N, 75.4792°W, 2200 m, 15 May 2012, E. A. Ussa Cristiano [RWG]; **Cundinamarca**: 1 ♂, La Mesa {4.6321°N, 74.463°W}, 1270 m, July 1915, A. María [MNHN]; 1 ♀, San Antonio de Tena 4.6172°N, 74.3548°W, 1380 m, August 1926, P. Uribe [UMMZ]; 1 ♂, Medina {4.5083°N, 73.3498°W}, 530 m, January 1918, A. María [UMMZ]; 1 ♀, Viotá {4.4387°N, 74.5223°W}, 560 m, July 1915, A. María [MNHN]; **Capital District**: 2 ♂♂, Santa Fe {4.6138°N, 74.0786°W}, 2500 m, 1863, A. Lindig [MCZ; RBINS]; **Bogotá**: 1 ♀, Pensilvania {4.6117°N, 74.0968°W}, 2500 m, 1913, A. María [NHMP]; **Valle del Cauca**: 3 ♂♂, 2 ♀♀, Rio Ponce at El Topacio (CL 2423), 4.2°N, 75.8332°W, 1500 m, 27 July 1989, D. A. & J. T. Polhemus [RWG; USNM]; **Boyacá**: 4 ♂♂, 2 ♀♀, Río Negro, 3.6425°N, 74.8092°W, 1143 m, 10 April 1917, M. A. Carriker [RWG; UMMZ]; **Tolima**: 5 ♂♂, 5 ♀♀, San Antonio, West Cordillera, between Cali and Buenaventura, 3.2139°N, 75.6073°W, 2000 m, January–June 1909, A. H. Fassl [RWG; UMMZ]. **VENEZUELA, Táchira**: 1 ♂, El Chimborazo, 7.7667°N, 72.2°W, 100 m, 31 March 1988, F. Rey [MIZA]; **Zulia**: 1 ♂, Mesa Turik, Euskal-pica, Cabeceras del Río Palmar, Sierra de Perija, cloud forest in swampy bamboo area, 1800–1900 m, 20 March 1991, A. L. Vilorio [RWG]. **ECUADOR, Tungurahua**: 2 ♂♂, Río Blanco, Río Pastaza watershed {1.3976°S, 78.3489°W}, 2000 m, April 1936, W. Clarke-Macintyre [RWG]; **Napo**: 2 ♂♂, rocky stream on dirt road to Reserva Antisana, 0.6091°S, 77.8453°W, 2090 m, 15 January 2020, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 7 ♂♂, 8 ♀♀, small rocky stream S of Bermejo, 0.5276°S, 77.8828°W, 1870 m, 15 January 2020, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 5 ♂♂, second small rocky stream 5 km S of Baeza, 0.4761°S, 77.872°W, 1856 m, 15 January 2020, R. W. Garrison & N. von Ellenrieder [CSCA, RWG, USFQ]; 3 ♂♂, small rocky stream 5 km S of Baeza, 0.4744°S, 77.8706°W, 1836 m, 15 January 2020, R. W. Garrison & N. von Ellenrieder [CSCA, RWG, USFQ]; **Pichincha**: 12 ♂♂, 4 ♀♀, ditch 9.6 km W of Manuel Cornejo Astorga (Tapandi), 77-26 {0.4469°S, 78.7461°W}, 1520 m, 16 July 1977, D. R. Paulson [RWG].

A medium-size species (Table 2); male brilliant blue (Figs. 90, 343, 1006) with bluntly triangular cercus in dorsal view (Fig. 707c) and flagellum of genital ligula bifid along its distal 0.20 (Fig. 625b); female (Fig. 1007) with mesostigmal lobe wider distally than basally (Fig. 542).

Diagnosis. The description given under *A. gonzalezi* applies equally well to *A. medullaris* except for details of the male caudal appendages and female mesostigmal plates. These two species are diagnosed under *A. gonzalezi*.

Habitat. This species is found at rocky streams and rivers, even adjacent to waterfalls and at small seeps, as well as along forest trails, often perched on leaves exposed to sunshine.

Distribution. *Argia medullaris* occurs from Guatemala (Fig. 774) south to Ecuador. Brooks (1989) identified *A. variabilis* from Costa Rica, but that species is known only as far south as Guatemala; his identification undoubtedly refers to *A. medullaris*. This is primarily a montane species, with a few records near sea level but with most occurring from 400–5000 m. Within its range, *A. medullaris* is one of the most common species at higher elevations where the characteristic almost entirely blue male coloration makes it noticeable.

Argia moesta (Hagen, 1861)

Figs. 91, 92 (head, thorax, S1–4 ♂); 224, 225 (head, thorax, S1–4 ♀); 276 (wings ♀); 344, 345 (S7–10 ♂); 452, 453 (S7–10 ♀); 543 (mesostigmal plates ♀); 626 (genital ligula), 708 (appendages ♂); 780 (map); 829 (field photo ♂); 830 (field photo ♀); 910, 911 (body scans ♂); 912, 913 (body scans ♀).

[Key locators: ♂ G-3, couplet 2(1'); ♂ M-5, couplet 9(8'); ♀ Key to groups, couplet 9(8')]

Agrion moestum Hagen 1861: 94 (description ♂, ♀);—Garrison & von Ellenrieder 2019: 39 (lectotype data).

Argia moesta Hagen in Selys 1865: 384 (12 reprint) (redescription ♂, ♀);—Calvert 1902: 76 (key, description ♂, ♀, conditional synonymy of *A. putrida*);—Calvert & Hagen 1902: 112 (“Types in M. C. Z.”);—Calvert 1907: 361 (key, additional notes);—Williamson 1912: 200 (geographic variation);—Seemann 1927: 12 (figs.);—Gloyd 1958: 17 (Texas);—Gloyd 1968b: 1 (comparison with *A. funcki* and *A. lugens*, synonymy of *A. putrida*, *A. intruda* with *A. moesta*);—Johnson & Westfall 1970: 64, 67 (key, diagnosis, figs. 8D, 11A–C);—Bick & Bick 1972: 6 (reproduction);—Johnson 1972a: 83, 87 (key ♂, ♀, diagnosis, figs. 4C, 8E, F, 10E, F);—Johnson 1973: 69 (ovarian development, ontogenetic changes);—Bick & Bick 1978: 6 (wing clapping behavior);—Kiauta 1978: 8 (autosomal fusion);—Kiauta & Kiauta 1980: 40 (cytotaxonomy and evolutionary history, figs. 23–28);—Paulson 1982: 253 (U. S. A., Mexico);—Pritchard 1982: 231 (distribution in U. S. A., Mexico, fig. 10);—Legrís & Pilon 1987: 61 (larval morphology);—Justus *et al.* 1990: 148 (SEM mesostigmal plates, figs. 2C, 3C);—González-Soriano 1993: 295 (Mexico);—Garrison 1994: 319 (key ♂, ♀, diagnosis, figs. 8, 40);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Abbott & Stewart 1998: 207 (U. S. A., Mexico);—Abbott 2001: 198 (distribution in Texas);—Abbott 2005a: 77 (♂, ♀, key, figs. 14, 15, photos 9a, 9b, 9c distribution in New Mexico, Texas, Oklahoma);—Westfall & May 2006: 200 (key, description, figs. 69, 79A, 93C, 99C, 102I);—Behrstock *et al.* 2007a: 57 (Chihuahua, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Upton *et al.* 2007: 31 (Sonora, Mexico);—Behrstock 2009: 3 (Coahuila, Mexico);—Caesar & Wenzel 2009: 102 (phylogeny within genus *Argia*);—Paulson 2009: 145 (♂, ♀, description, diagnosis, photos);—Abbott 2011: 114 (♂, ♀, figs., diagnosis, distribution in Texas);—Paulson 2011: 151 (♂, ♀, description, diagnosis, photos);—Bailowitz *et al.* 2015: 126 (diagnosis, photos);—Torres-Pachón *et al.* 2017: 415 (molecular phylogeny of larvae within *Argia*);—Ortega-Salas & González-Soriano 2019: 120 (Coahuila, Mexico).

Agrion putridum Hagen 1861: 96 (description ♂, ♀);—Hagen in Selys 1865: 385 (13 reprint) (description ♂, ♀);—Kennedy 1902: 166 (key, plate II, figs. 9, 10, mesostigmal plates);—Williamson 1912: 200 (synonymy with *A. moesta*);—Garrison & von Ellenrieder 2019: 43 (syntype data).

Argia intruda Williamson 1912: 200 (description ♂, ♀);—Gloyd 1968b: 1 (synonymy of *A. intruda* with *A. moesta*);—Garrison *et al.* 2003: 33 (lectotype data).

Primary types. *Agrion moestum*: lectotype ♂, U. S. A., Texas, Pecos River, July 16 [examined, in MCZ];—*Agrion putridum*: 3 ♂♂, 3 ♀♀ syntypes, U. S. A.: 1 ♂, 1 ♀, Maryland, 1858, Uhler leg.; 1 ♂, 1 ♀, [West] Virginia, Berkeley Springs, Osten Sacken leg.; 1 ♂, 1 ♀, Upper Wisconsin River, 1860, Uhler leg. [examined, in MCZ];—*Argia intruda*: lectotype ♂, U. S. A., Oklahoma, Wister, 2 August 1907, Frank Collins leg. [examined, in UMMZ].

Specimens examined. 95 ♂♂, 77 ♀♀: **U. S. A., Michigan:** 1 ♂, Gull Creek {42.304°N, 85.3982°W}, 250 m, 18 July 1961, R. E. Groos [RWG]; **Wisconsin:** 1 ♂, 1 ♀ (syntypes of *Agrion putrida*), Upper Wisconsin River, 1860, P. R. Uhler [MCZ]; **Pennsylvania:** 1 ♂, 1 ♀, Sayre, 41.9789°N, 76.5153°W, 235 m, 27 July 2001, T. Keller [RWG]; **Maryland:** 1 ♂, 1 ♀ (syntypes of *Agrion putrida*), 1858, P. R. Uhler [MCZ]; 1 ♀, Williamsport, along canal bordering Potomac River near Route 11 overpass, 39.5998°N, 77.8265°W, 105 m, 11 August 2018, N. von Ellenrieder [RWG]; **Virginia:** 5 ♂♂, 3 ♀♀, Goose Creek, Leesburg, 39.0561°N, 77.5258°W, 20–25 August 2001 [CSCA]; 3 ♂♂, 6 ♀♀, James River Park, wetlands, 37.5332°N, 77.5°W, 21 August 2001, R. W. Garrison [RWG]; 2 ♂♂, 2 ♀♀, Reedy Creek Trail, James River, 37.5242°N, 77.4682°W, 21 m, 18 August 2018, R. W. Garrison & P. Evans [RWG]; **Missouri:** 1 ♂, 1 ♀, Missouri River at Rocheport {38.9741°N, 92.5631°W}, 180 m, 14 August 1976, E. J. Rogers, Jr. [RWG]; **West Virginia:** 1 ♂, 1 ♀ (syntypes of *Agrion putrida*), Berkeley Springs {39.6270°N, 78.2272°W}, O. Sacken [MCZ]; 2 ♂♂, 1 ♀, CR 38 at Highway 219, Tygart Valley River, 2 mi S of Beverly, 38.8089°N, 79.8817°W, 596 m, 26 June 2002, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, CR 38 at Highway 219, Tygart Valley River, 2 mi S of Beverly, 38.8089°N, 79.8817°W, 596 m, 26 June 2002, R. W. Garrison & N. von Ellenrieder [MHNN]; 1 ♂, Alvon {37.9167°N, 80.2214°W}, 680 m, 17 June 1957, R. L. Fischer [RWG]; 3 ♂♂, 1 ♀, Greenbrier River at Alderson, 37.7253°N, 80.6436°W, 471 m, 22 June 2002, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, Pence Springs, 37.6828°N, 80.7278°W, 465 m, 21 June 2002, R. W. Garrison & N. von Ellenrieder [RWG]; 4 ♂♂, 1 ♀, Greenbrier River by State Rt. 3, 37.6439°N, 80.8025°W, 751 m, 21 June 2002, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; **Alabama:** 1 ♂, Butler Creek, Highway 61, 34.9858°N, 87.6156°W, 165 m, 15 June 1984, R. W. Garrison [RWG]; **Oklahoma:** 1 ♂ (lectotype of *Argia intruda*), Wister

{34.9674°N, 94.7256°W, 140 m}, 2 August 1907, F. Collins [UMMZ]; **Arkansas**: 1 ♂, 1 ♀, Walnut Creek at 270 {34.5149°N, 93.383°W}, 202 m, 27 May 1981, S. W. Dunkle [RWG]; **Arizona**: 1 ♂, W side of London Bridge, Lake Havasu City, 34.4711°N, 114.348°W, 140 m, 2 August 1972, R. W. Garrison [RWG]; 1 ♂, Fossil Creek, Forest Road 502 S of Fossil Creek Road, Coconino National Forest, 34.395°N, 111.65°W, 1065 m, 2 August 1992, R. W. Garrison [RWG]; 1 ♀, Cave Creek, Rancho Mañana, golf course pond, by Ocotillo Road, 33.8389°N, 111.959°W, 28 July 1998, R. W. Garrison [RWG]; 4 ♂♂, 1 ♀, along E bank of the Colorado River, by tamarisk trees under Highway 10 bridge, Ehrenberg, 33.6043°N, 114.53°W, 80 m, 31 July 1972, R. W. Garrison [RWG]; 1 ♂, 1 ♀, Colorado River, near RV resort off Highway 10, 33.6°N, 114.546°W, 100 m, 27 July 1997, J. Cole [RWG]; 2 ♂♂, Gila River at Highway 70, 33.1667°N, 110.136°W, 1797 m, 29 September 2002, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 16 ♂♂, 10 ♀♀, Gila River at Highway 95, NW of Yuma, 32.7617°N, 114.411°W, 62 m, 25 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, Adair Park, McPhaul Bridge, by Gila River, ca. 15 mi ENE of Yuma, 32.7595°N, 114.421°W, 46 m, 2–8 August 1973, R. W. & J. A. Garrison [RWG]; 3 ♀♀, Colorado River at Yuma Territorial Prison, 32.7261°N, 114.613°W, 68 m, 25 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, Herb Martyr Dam, Chiricahua Mountains, Coronado National Forest, 31.8742°N, 109.235°W, 7 September 1999 [RWG]; 1 ♂, pond at Slaughter Ranch, 26 km E of Douglas, 31.3364°N, 109.279°W, 1160 m, 2 August 1974, R. W. & J. A. Garrison [RWG]; **California**: 2 ♂♂, 3 ♀♀, irrigation ditch at junction of Highway 195 and 66th Avenue, Mecca, 33.5693°N, 116.078°W, -60 m, 27 May 1984, R. W. & J. A. Garrison [RWG]; 2 ♀♀, Dos Palmas Preserve, 4.8 mi E of N shore of Salton Sea, 33.4972°N, 115.832°W, -46 m, 4–5 May 1991, R. W. Garrison [MHNN, RWG]; 1 ♀, same data but ca. 2 mi E Salton Sea Recreation Area, 0 m, 12–13 May 2001, R. W. Garrison [RWG]; 3 ♀♀, Algodones Dunes, by cemetery {32.7128°N, 114.751°W}, 41 m, 2 September 1999 [RWG]; **New Mexico**: 2 ♂♂, Pecos River at Carlsbad, 32.4465°N, 104.258°W, 940 m, 30 July 1984, R. W. & J. A. Garrison [RWG]; **Texas**: 1 ♂, 2 ♀♀, Camp Sol Mayer, 2.8 mi E of Ft. Mc Kavel, Boy Scout Camp at San Saba River, 30.8386°N, 100.06°W, 619 m, 14 July 2001, R. W. Garrison [CSCA, RWG]; 5 ♂♂, 2 ♀♀, San Saba River, 0.7 mi E of Fort Mc Kavel by Highway 130, 30.8347°N, 100.0939°W, 637 m, 14 July 2001, N. von Ellenrieder [CSCA]; 3 ♂♂, 5 ♀♀ (lectotype and paralectotypes), Pecos River, July 1916 [MCZ]; 1 ♂, 1 ♀, Pecos River at Highway 290, 30.7205°N, 101.807°W, 630 m, 21 July 1977, R. W. Garrison [RWG]; 3 ♂♂, Mustang Creek, by Carlos G. Parker Boulevard (= Loop 427), Taylor, 30.5769°N, 97.455°W, 15–17 August 1975, R. W. Garrison [CSCA, RWG]; 1 ♀, same data but 25 August 1976, J. E. Hafernik, Jr. [RWG]; 1 ♂, 1 ♀, rest area by Highway 150, near Shepherd, Sam Houston National Forest, 30.55°N, 95.0832°W, 60 m, 28 July 1977, R. W. Garrison [RWG]; 5 ♂♂, N Llano River at Junction off Road 1674, 30.5161°N, 99.8053°W, 506 m, 15 July 2001, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 2 ♂♂, 3 ♀♀, S Llano River, 1.1 mi N Telegraph on U.S. 377, 30.3444°N, 99.9019°W, 563 m, 13 July 2001, N. von Ellenrieder [CSCA]; 2 ♂♂, 1 ♀, Nueces River at Barksdale on Route 55, 29.7211°N, 100.034°W, 449 m, 13 July 2001, R. W. Garrison [RMNH, RWG]; 1 ♀, Plum Creek, 3 mi E of Luling, at Highway 90, 29.6719°N, 97.6067°W, 26 August 1976, J. E. Hafernik, Jr. [RWG]; 1 ♀, Palmetto State Park, 6 mi S of Luling, near Highway 183, 29.5894°N, 97.5822°W, 27 August 1976, J. E. Hafernik, Jr. [RWG]; 1 ♂, 1 ♀, Guadalupe River, 4 mi S of Gonzales, 29.4477°N, 97.4105°W, 74 m, 21 August 1975, R. W. Garrison [RWG]; same data but 28 August 1976, J. E. Hafernik, Jr. [RWG]; 1 ♀, Pinto Creek, 15 mi SE of Del Rio {29.1892°N, 100.703°W}, 260 m, 1 September 1992, B. & C. Villegas [RWG]; 1 ♀, 6 mi N of Carrizo Spring, Malaise trap, 28 April 1977, T. Eichlin & M. Wausbauer [CSCA]; **Florida**: 3 ♂♂, 4 ♀♀, Santa Fe River 3 mi W of 225, 29.9981°N, 82.2743°W, 45 m, 5 October 1980, S. W. Dunkle [RWG]; 1 ♂, 1 ♀, Withlacoochee River at Route 200 {28.9888°N, 82.3496°W}, 9 m, 27 September 1987, S. W. Dunkle [RWG]. **MEXICO**, **Sonora**: 1 ♂, Río Yaqui, Highway 16 near Tonichi {28.5901°N, 109.557°W}, 185 m, 19 August 1986, R. W. Baumann & Sargent [BYU]; **Jalisco**: 3 ♀♀, Ajijic, Lake Chapala {20.3054°N, 103.266°W}, 1620 m, 28 August 1966, M. E. Smith [RWG, USNM]; 2 ♂♂, 1 ♀, Lago de Chapala (near Mex. Hwy 15), 75 mi. SE of Guadalajara {20.1167°N, 102.8333°W}, 1600 m, 7 August 1968, R. W. Garrison [RWG]; **Michoacán**: 1 ♀, Hardy Central American Expedition 1968, June 1968, A. Hardy, L. Espinosa & J. Abrayaya [RWG].

A relatively large species (Table 2); male subject to great color pattern variation (Figs. 91, 92, 344, 345, 829, 910, 911), with a small circular torus (Fig. 708c), Hw usually with four or five pq, usually one row of cells posterior to CuA (as in Fig. 276) and, if mesepisterna dark, then covered by gray pruinosity (Figs. 92, 829, 910); female (Figs. 912–913) with dorsal surface of mesostigmal lobe with a short arcuate ridge overlying its median portion, and mesostigmal lobe small, broadly arcuate and extending posterolaterally (Figs. 543c, d).

Diagnosis. Both sexes were keyed, described and diagnosed against *A. lugens* by Garrison (1994) and also

keyed against *A. funcki* and *A. lugens* and redescribed by Westfall & May (2006). As noted under *A. funcki*, males of this species and *A. lugens* and *A. moesta* share a similar genital ligula morphology with the distal segment in the form of a strap-like process (Figs. 614, 623, 626). All three species are diagnosed under *A. funcki*.

Distribution. *Argia moesta* ranges from SE Canada south to Florida and California in the United States and to Michoacán in Mexico (Fig. 780). In Mexico its altitudinal range goes from 114 (Nuevo León, Río Las Lajas 2 mi northeast of China; not seen, FSCA) to 1620 m (Behrstock 2009).

Argia munda Calvert, 1902

Figs. 93 (head, thorax, S1–4 ♂); 226, 227 (head, thorax, S1–4 ♀); 346 (S7–10 ♂); 454, 455 (S7–10 ♀); 544, 545 (mesostigmal plates ♀); 627 (genital ligula); 709 (appendages ♂); 770 (map); 831 (field photo ♂); 855 (body scan ♂); 856 (body scan ♀).

[Key locators: ♂ G-1, couplet 1; ♂ M-6, couplet 5'; ♀ Key to groups, couplet 4(3')]

Argia vivida var. *munda* Calvert 1902: 96 (brief description ♂, ♀);—Calvert & Hagen 1902: 117 (“Types in M. C. Z.”);—Calvert 1907: 359, 361 (key);—Garrison 1994: 320 (lectotype designated);—Garrison & von Ellenrieder 2019: 47 (lectotype data).

Argia munda: Gloyd 1958: 17 (diagnosis from *A. vivida*, Texas);—Johnson 1972a: 83, 87 (key ♂, ♀, diagnosis, figs. 9J, K, 10O, P);—Paulson 1982: 253 (U. S. A., Mexico);—Westfall 1990: 61 (description of larva, fig. 1);—González-Soriano & Novelo-Gutiérrez 1991: 87 (key ♂, ♀, diagnosis, Durango, Mexico, figs. 8, 37, 44);—Novelo-Gutiérrez & González-Soriano 1991: 129 (key larva, diagnosis, Durango, Mexico, figs. 21, 31);—Novelo-Gutiérrez 1992: 63 (redescription of larva, figs. 6, 15, 29, 55, 60, 78, 86);—González-Soriano 1993: 295 (Mexico);—Garrison 1994: 320 (key ♂, ♀, diagnosis, lectotype designated, figs. 30, 39);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Abbott & Stewart 1998: 207 (U. S. A., Mexico);—Abbott 2001: 198 (distribution in Texas);—Abbott 2005a: 77 (♂, ♀, key, figs. 14, 15, photos 9d distribution in New Mexico, Texas);—Westfall & May 2006: 201 (key, description, figs. 85F, 93D, 99D, 102J);—Behrstock *et al.* 2007a: 57 (Chihuahua, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Upton *et al.* 2007: 31 (Sonora, Mexico);—Behrstock 2009: 3 (Coahuila, Mexico);—Caesar & Wenzel 2009: 102 (phylogeny within genus *Argia*);—Escoto-Moreno *et al.* 2009: 154 (Aguascalientes, Mexico);—Paulson 2009: 168 (description, diagnosis, ♂, ♀, photos);—Abbott 2011: 128 (♂, ♀, figs., diagnosis, distribution in Texas);—Escoto-Moreno *et al.* 2014: 1046 (Hidalgo, Mexico);—Bailowitz *et al.* 2015: 128 (diagnosis, photos);—Escoto-Moreno *et al.* 2017: 386 (Hidalgo, Mexico);—Torres-Pachón *et al.* 2017: 415 (molecular phylogeny of larvae within *Argia*);—Rangel-Sánchez *et al.* 2018: 924 (estimated range in U. S. A. & Mexico);—Escoto-Moreno *et al.* 2020: 237 (Veracruz, Mexico).

Argia rita Kennedy 1919b: 17 (description ♀, figs. 3–5);—Gloyd 1958: 17 (synonymy of *A. rita* with *A. munda*);—Garrison *et al.* 2003: 33 (lectotype data).

Primary types. *Argia vivida* var. *munda*: lectotype ♂, U. S. A., Arizona, CU. Lot 35 [examined, in MCZ]. According to Calvert (1902: 104), the type locality for specimens from “CU. Lot 35” is probably near the Graham Mountains in Arizona;—*Argia rita*: holotype ♀ [not examined, SEMC].

Specimens examined. 61 ♂♂, 31 ♀♀: **U. S. A., Arizona:** 2 ♂♂ 1 ♀ (lectotype and paralectotypes) [MCZ]; 1 ♀, Painted Rocks (N of Piedra) {32.9838°N, 112.97°W}, 200 m, 28–29 May 1980, M. F. O'Brien [UMMZ]; 1 ♂, 1 ♀, Rose Canyon Forest Camp, 34 mi NE of Tucson, Coronado National Forest, Santa Catalina Mountains, 32.3892°N, 110.709°W, 2122 m, 6 June 1965, J. Matthews [RWG]; 1 ♂, 3 ♀♀, mile 11, Coronado National Forest, Santa Catalina Mountains {32.3723°N, 110.696°W}, 1780 m, 14 May 1955, G. D. Butler [UMMZ]; 1 ♂, 1 ♀, mile 10, Coronado National Forest, Santa Catalina Mountains {32.3647°N, 110.71°W}, 1700 m, 14 May 1955, G. D. Butler [UMMZ]; 2 ♂♂, 1 ♀, Upper Sabino Canyon, about 3 mi N of visitor center, N of Tucson, 32.3433°N, 110.783°W, 974 m, 9 September 1983, S. W. Dunkle [RWG]; 2 ♂♂, 1 ♀, same data but 20 July 1987, R. W. Garrison [RWG]; 7 ♂♂, 4 ♀♀, Old Prison Camp, N of Molino Basin Forest Camp, Coronado National Forest, Santa Catalina Mountains, 32.3392°N, 110.716°W, 1497 m, 24 August 1984, R. W. & J. A. Garrison [RWG, RMNH]; 1 ♂, 1 ♀, same data but 1 August 2000 [MHNH, RWG]; 15 ♂♂, 5 ♀♀, Molino Basin Forest Camp, Coronado National Forest, Santa Catalina Mountains, 32.3371°N, 110.69°W, 1221 m, 26 August 1998, R. W. & J. A. Garrison [RWG]; 1 ♂, 1 ♀, Molino Basin Forest Camp, Coronado National Forest, Santa Catalina Mountains, 32.3367°N, 110.69°W, 1340 m, 7 September 1983, S. W. Dunkle [ONHI]; 6 ♂♂, 4 ♀♀, same data but 24 July 1984, R. W. & J. A. Garrison & B. Johnson [CSCA, RWG]; 2 ♂♂, 1 ♀, same data but 1 August 2000, R. W. Garrison [RWG]; 3 ♂♂, Turkey Creek, 15 mi W of Portal {31.9422°N, 109.213°W}, 1630 m, 6 June 1966, C. Johnson & H. J. Bentley [RWG, UMMZ]; 2

♂♂, Southwestern Research Station, W Cave Creek Road, 5 mi W of Portal {31.8828°N, 109.206°W}, 1640 m, 16 June 1956, M. J. Westfall, Jr. [UMMZ]; 1 ♂, 1 ♀, Madera Creek, Madera Canyon {31.7097°N, 110.875°W}, 1706 m, 10 June 1994, S. W. Dunkle [RWG]; **Texas**: 1 ♂, Limpia Creek, near Old Fort Davis {30.6043°N, 103.896°W}, 1480 m, 3 August 1953, G. W. Byers [UMMZ]. **MEXICO, Chihuahua**: 1 ♂, 1 ♀, Arroyo Fresa, 3 mi N of junction of Río Piedras Verdes {30.3209°N, 108.223°W}, 1690 m, 22 June 1987, B. Kondratieff [FSCA]; 2 ♀♀, Water Canyon, 2.5 mi W of Pacheco {30.0853°N, 108.393°W}, 2250 m, 22 June 1987, B. Kondratieff [FSCA]; 1 ♂, Río Piedras Verdes near Pacheco, 2250 m, 22 June 1987, B. Kondratieff & R. W. Baumann [FSCA]; 2 ♂♂, tributary of Río Gavilán, 22 June 1987, B. Kondratieff & R. W. Baumann [BYU, FSCA]; 1 ♀, 23 mi S of Creel {27.5647°N, 107.82°W}, 2421 m, 18 July 1960, S. L. Wood & J. B. Karren [BYU]; **Sonora**: 1 ♂, Barranca Canyon, 12 mi W of Yecora on Route 16 {28.3739°N, 109.054°W}, 1615 m, 20 July 2006, S. W. Dunkle [FSCA]; **Durango**: 2 ♂♂, Arroyo Temazcal, Reserva de la Biósfera La Michilia, 23.3653°N, 104.231°W, 2389 m, 15 April 1987, E. González-Soriano & R. Novelo-Gutiérrez [INECOL, RWG]; **San Luis Potosí**: 4 ♂♂ (paralectotypes), Río Verde {23.3653°N, 99.9833°W}, E. Palmer [MCZ].

A medium-size species (Table 2); male blue to slightly lavender (Figs. 93, 346, 831, 855) with uniquely dome-shaped cercus, exposing its inner surface in lateral view (Fig. 709b), and trowel-shaped genital ligula lacking lateral lobes and flagellum (Fig. 627); female tan (Fig. 856) to blue, distinct from all congeners in Mexico and Middle America by having a costate circular pit directly posterior to each mesostigmal plate (Figs. 544c, 545c).

Diagnosis. Gloyd (1958) was the first to recognize the distinctness of *A. munda*. Both sexes were keyed and diagnosed by Garrison (1994) and keyed and redescribed by Westfall & May (2006). Although both sexes of *A. munda* are superficially similar in body markings to *A. funebris* (Figs. 887–891) and *A. vivida* (Figs. 874–877), they differ by the morphological characters noted above and by their narrower middorsal stripe (Figs. 855, 856).

Remarks. Two pinned males and one female from the Robert McLachlan collection currently housed in the BMNH were collected at “El Frijol” (no date) which may be El Frijol in Jalisco. The two males are typical *A. munda* by appendage and genital ligula morphology, but the mesostigmal lobe in the female is almost bilobate, with a posterolateral extension as shown in Fig. 545, and differs from the more common unilobate lobe found in females from the U. S. A. (Fig. 544) and elsewhere in Mexico. The presence of the costate circular pit in the El Frijol female, however, leaves no doubt that it represents *A. munda*.

Caesar & Wenzel (2009, fig. 4), in their phylogenetic analysis based on molecular and morphological data, placed *A. munda* as sister to *A. pima*, *A. lacrimans*, *A. tonto* and several other species. Torres-Pachón *et al.* (2017, fig. 3) in their molecular and morphological analysis of larvae included *A. munda* within their “tarascana” clade including *A. pallens* and *A. tarascana*, a conclusion with which we do not agree due to differences in genital ligula morphology (trowel-shaped ligula lacking lateral lobes in *A. munda*, Fig. 627; narrow uniflagellate terminal segment in *A. pallens* with lateral lobes, Fig. 633; distal segment anterior to lateral lobes in *A. tarascana* narrow, subrectangular, about twice as long as wide or longer and roughly parallel-sided in ectal view and with lateral lobes, Fig. 649). As noted above, the unique morphology of the male genital ligula is most similar to that of the group comprising *A. chelata* (Fig. 604), *A. lacrimans* (as in Fig. 637), *A. pima* (Fig. 637) and *A. tonto* (Fig. 653) but differs in lacking the long flexible flagellum typical of those three species. The strongly developed mesepisternal pit of the female is also unique (though slightly similar to that of *A. rhoadsi* but see below) and would seem to isolate *A. munda* from all others. Its phylogenetic position can be questioned, but we suggest that this species, at least based on the morphology of the genital ligula alone, may be a sister to the three species noted above. One other species, *A. emma* from the U. S. A., also has a semicircular mesepisternal pit posterior to the abbreviated mesostigmal lobe. The lateral margin of the mesepisternal pit is bordered by a pronounced almost digit-like mesepisternal tubercle (fig. 38 in Garrison 1994) that is absent in *A. munda*. The male cercus of *A. emma* in dorsal view curves laterally (fig. 3c in Garrison 1994), and a well-defined pale oval area occupies the laterobasal margin. The morphology of the caudal appendages, as in *A. munda*, is unique within this genus. The genital ligula of *A. emma*, however, is similar to that of *A. paludicola* (Fig. 634), but the flexible flagellum is shorter and a long narrow digit-like hyaline basal hood extends nearly the full length of the flagellum. The genital ligula of *A. munda* was diagrammatically illustrated and described by Kennedy (1917, figs. 50, 51), but his illustrations omit details that we have seen in specimens we have examined.

Habitat. *Argia munda* is primarily a species of seepages and desert streams.

Distribution. Calvert (1902) recorded four males from Río Verde collected by E. Palmer. In his gazetteer of localities (1908a), Calvert lists Río Verde with doubt from “(? San Luis Potosí)” at an elevation of 996 m with no

further comments. We have been unable to further verify whether Palmer collected *A. munda* in San Luis Potosí, but, according to Escoto-Moreno *et al.* (2014), it has been collected in nearby Hidalgo (Camino Carpinteros–La Selva, San Agustín Metzquititlán).

This species extends from central Arizona, S New Mexico and W Texas south as far as Jalisco, with an isolated record from extreme W Veracruz (Escoto-Moreno *et al.* 2020), where it was reported within a pine-oak forest. Our records show a range from 200 to 2550 m (Durango, Ciénega de Los Caballos (arroyo), Reserva de la Biósfera La Michilia; Novelo-Gutiérrez 1992).

***Argia nahuana* Calvert, 1902**

Figs. 94, 95 (head, thorax, S1–4 ♂); 228 (head, thorax, S1–4 ♀); 347, 348 (S7–10 ♂); 456 (S7–10 ♀); 546, 547 (mesostigmal plates ♀); 628 (genital ligula); 710 (appendages ♂); 786 (map); 939, 940 (body scan ♂); 941 (body scan ♀).

[Key locators: ♂ G-2, couplet 10'; ♂ M-4, couplet 2(1'); ♀ F-16, couplet 3(2')]

Argia vivida var. *nahuana* Calvert 1902: 99 (description ♂, ♀, pl. IV, fig. 62ss);—Calvert & Hagen 1902: 106 (“Types in Colls. Calvert, Adams, McLachlan, etc.”);—Calvert 1907: 359, 361 (key);—Calvert 1908a: xxix (clarification of holotype data);—Calvert 1947: 609 (listed in CAS).

Argia nahuana: Gloyd 1958: 18 (diagnosis from *A. vivida*, Texas, pl. III, fig. 20);—Kimmins 1970: 188 (paratypes in BMNH);—Johnson 1972a: 85, 88 (key ♂, ♀, diagnosis, figs. 9H, I, 10K, L);—Provonsha & McCafferty 1973: 452 (description of larva, diagnosis, note that specimens in Seemann 1927 were actually *A. nahuana*, figs. 4, 5);—Paulson 1982: 253 (U. S. A., Mexico);—Mendoza Trejo & González-Soriano 1989: 138 (Valle de México);—Novelo-Gutiérrez & Peña-Olmedo 1991: 130 (Hidalgo, Mexico);—Novelo-Gutiérrez 1992: 45 (comparison of larva with *A. fumipennis violacea*);—González-Soriano 1993: 295 (Mexico);—Peña-Olmedo & Novelo-Gutiérrez 1993: 131 (key ♂, ♀, Hidalgo, Mexico, fig. 42);—Garrison 1994: 320 (key ♂, ♀, diagnosis, figs. 14, 54);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Abbott & Stewart 1998: 207 (U. S. A., Mexico);—Abbott 2001: 198 (distribution in Texas);—Abbott 2005a: 77 (♂, ♀, key, figs. 14, 15, photo 9e distribution in New Mexico, Texas, Oklahoma);—Westfall & May 2006: 202 (key, description, figs. 87B, 88A, 94A, 99E, 103A);—Behrstock *et al.* 2007a: 57 (Chihuahua, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Upson *et al.* 2007: 31 (Sonora, Mexico);—Behrstock 2009: 3 (Coahuila, Mexico);—Caesar & Wenzel 2009: 102 (phylogeny within genus *Argia*);—Escoto-Moreno *et al.* 2009: 154 (Aguascalientes, Mexico);—Kerst 2009: 8 (color change in tandem pairs);—Paulson 2009: 155 (♂, ♀, description, diagnosis, fig., photos);—Abbott 2011: 136 (♂, ♀, figs., diagnosis, distribution in Texas);—Paulson 2011: 157 (♂, ♀, description, diagnosis, fig., photos);—Escoto-Moreno *et al.* 2014: 1051 (Hidalgo, Mexico);—Bailowitz *et al.* 2015: 130 (diagnosis, photos);—Torres-Pachón *et al.* 2017: 415 (molecular phylogeny of larvae within *Argia*);—Ortega-Salas & González-Soriano 2019: 120 (Coahuila, Mexico);—García-Miranda & Carrillo-Muñoz 2021: (Puebla, Mexico).

Argia agrioides: Seemann 1927: 11, 12, (key ♂, ♀, figs. 1a–f.).

Argia saalasi Valle 1942: 164 (description ♂, ♀, figs. 3–5);—Hämäläinen 1982: 163 (synonymy of *A. nahuana*, lectotype designated).

Primary types. *Argia nahuana*: holotype ♂, MEXICO, Mexico City [not examined, in ANSP];—*Argia saalasi*: lectotype ♂, U. S. A., Riverside, California [not examined, in LUOMUS].

Specimens examined. 298 ♂♂, 81 ♀♀: **U. S. A., Oregon:** 1 ♂, Illinois River State Park near Cave Junction, 7 August 1992, R. Orr [RWG]; **California:** 2 ♂♂, Bidwell City Park, by Big Chico Creek, Chico, 39.7438°N, 121.817°W, 60 m, 14 June 1975, R. W. Garrison [RWG]; 8 ♂♂, 2 ♀♀, Del Puerto Canyon at N Fork of Del Puerto Creek, about 24 km W of Patterson on Del Puerto Canyon Road, 37.4384°N, 121.337°W, 270 m, 8 June 1975–3 July 1977, R. W. & J. A. Garrison [MHNN; RWG]; 1 ♂, slough near gravel quarry, end of Five Bridges Road, 3 mi N of Bishop, 37.4253°N, 118.403°W, 1259 m, 29 May 1976, R. W. & J. A. Garrison [RWG]; 3 ♂♂, 4 ♀♀, same data but 2 September 1983 [RWG]; 3 ♂♂, 2 ♀♀, Cartago, Owen’s Lake by Lake Streat, 36.3222°N, 118.021°W, 1094 m, 25 June 2003, R. W. & J. A. Garrison, N. von Ellenrieder [CSCA, RWG]; 2 ♂♂, canal just S of the Kern-Ventura County line, just S of Lake of the Woods, 34.8121°N, 119.01°W, 1580 m, 22 June 1985, R. W. & J. A. Garrison [RWG]; 8 ♂♂, Sespe Creek, 4 mi N of Fillmore, 34.4585°N, 118.928°W, 212 m, 5 September–16 October 1982, R. W. & J. A. Garrison leg [RWG]; 1 ♂, Santa Paula Creek about 3 mi N of Santa Paula on California Highway 150, 34.3956°N, 119.075°W, 180 m, 21 April 1984, R. W. & J. A. Garrison [RWG]; 6 ♂♂, 2 ♀♀, Santa Rosa Plateau Preserve, 2–5 mi SW of Murrietta, 33.5117°N, 117.27°W, 615 m, 25–26 May 1991, R. W. & P. A. Garrison [RWG]; 3 ♂♂, 1 ♀, Dos Palmas Nature Preserve, NE corner of Salton Sea, ca 2 mi E Salton Sea Recreation Area, 33.4972°N,

115.832°W, 0 m, 30 May 1999, R. W., J. A. & P. A. Garrison [RMNH, RWG]; 2 ♂♂, 2 ♀♀, Santa Rosa Plateau Preserve, 2–5 mi SW of Murrietta, 33.5117°N, 117.27°W, 615 m, 25–26 May 1991, R. W. & P. A. Garrison [RWG]; **Arizona:** 1 ♂, 1 ♀, Little Jamaica, Highway 15 near Littlefield {36.8954°N, 113.923°W}, 540 m, 8 October 1983, R. W. Baumann [RWG]; 3 ♂♂, 2 ♀♀, Sedona, Red Rock Crossing, 34.8174°N, 111.815°W, 1200 m, 5 October 1990, R. W. & J. A. Garrison [RWG]; 1 ♂, 1 ♀, Page Springs Fish Hatchery ponds and Oak Creek, 34.7648°N, 111.89°W, 1060 m, 6 October 1990, R. W. & J. A. Garrison leg [RWG]; 3 ♂♂, 1 ♀, Page Springs Fish Hatchery ponds and Oak Creek, 34.7648°N, 111.89°W, 1160 m, 6 October 1990, R. W. & J. A. Garrison [RWG]; 1 ♂, Granite Creek, just above Watson Lake, Prescott {34.6032°N, 112.416°W}, 1540 m, 13–14 May 1984, R. W. & J. A. Garrison [RWG]; 1 ♂, seepage at Bagdad, 34.57°N, 113.175°W, 1137 m, 31 July 1987, R. W. Garrison [RWG]; 7 ♂♂, 1 ♀, seepage at Skull Valley, 34.5156°N, 112.686°W, 1295 m, 15 May 1984, R. W. & J. A. Garrison [CSCA; RWG]; 3 ♂♂, 1 ♀, same data but 31 July 1987, R. W. Garrison [RWG]; 1 ♂, 1 ♀, Santa Maria River at Highway 96, 34.481°N, 113.061°W, 690 m, 8 October 1990, R. W. Garrison [RWG]; 3 ♂♂, Concho Lake, 34.4436°N, 109.628°W, 1900 m, 28 August 2016, P. Deviche [RWG]; 4 ♂♂, 2 ♀♀, Kirkland Creek near Kirkland at Highway 96, 34.3962°N, 112.707°W, 1200 m, 8 October 1990, R. W. Garrison [RWG]; 1 ♂, Santa Maria River at Highway 93, 34.3693°N, 113.185°W, 535 m, 31 July 1987, R. W. Garrison [RWG]; 1 ♂, same data but 8 October 1990 [RWG]; 1 ♂, Tonto Natural Bridge State Park, 4 mi S of Pine, 34.3212°N, 111.457°W, 1400 m, 3 August 1992, R. W. Garrison [RWG]; 2 ♂♂, Agua Fria River at Horseshoe Ranch, Bloody Basin Road, 5.2 mi E of Highway 17, Forest Road 269, 34.2575°N, 112.064°W, 990 m, 1 August 1992, R. W. Garrison [RWG]; 5 ♂♂, same data but 14 July 1998, Rosser W., J. A., P. A. & A. V. Garrison [RWG]; 1 ♂, Agua Fria River just E of Highway 17 at Bumble Bee exit, 34.2331°N, 112.098°W, 950 m, 1 September 1994, R. W. Garrison [RWG]; 1 ♂, Thompson Spring, 0.25 mi W of Road 182, 1.6 mi N of Highway 260 (Pinetop), 34.1297°N, 109.901°W, 2180 m, 17 June 1990, G. L. Harp [RWG]; 1 ♂, marsh at McNary, Fort Apache Indian Reservation, 34.0706°N, 109.854°W, 2200 m, 5 July 2016, P. Deviche [RWG]; 2 ♂♂, Agua Fria River at Black Canyon City, DNA Sample RG-49/ 50, 34.0617°N, 112.158°W, 590 m, 4 September 2016, P. Deviche [RWG]; 3 ♂♂, 3 ♀♀, Seven Springs Picnic Ground, about 12 mi N of Carefree, Tonto National Forest, 33.9675°N, 111.8647°W, 26 September 1988, R. W. Garrison [RWG]; 2 ♂♂, Irrigation ditch by Seven Springs wash, 0.7 mi S of Seven Springs, Tonto National Forest, 33.9628°N, 111.859°W, 1050 m, 1 August 1992, R. W. & J. A. Garrison [RWG]; 4 ♂♂, 1 ♀, Cave Creek at Ocotillo Road, Cave Creek, 33.8394°N, 111.9629°W, 619 m, 10 August 1975, R. W. Garrison [RWG]; 2 ♂♂, same data but 13 July 1998 [RWG]; 3 ♂♂, Morgan City Wash; DNA Sample RG-51/ 52, 33.8386°N, 112.281°W, 440 m, 5 September 2016, P. Deviche [RWG]; 1 ♂, Cherry Creek at farm road 203, S crossing, 33.804°N, 110.836°W, 920 m, 1 June 2006, R. A. Bailowitz [RWG]; 1 ♂, Sycamore Canyon, 3.3 mi. WNW of Highway 87 {33.6932°N, 111.539°W}, 540 m, 23 July 1984, R. W. & J. A. Garrison [RWG]; 4 ♂♂, Sycamore Creek (Sugarloaf Mountain), 2 mi W of Highway 87, Forest Road 402, Tonto National Forest, 33.685°N, 111.512°W, 696 m, 3 August 1992, R. W. Garrison [RWG]; 3 ♂♂, Queen Valley; DNA Sample RG-53/ 54, 33.3011°N, 111.292°W, 620 m, 27 August 2016, P. Deviche [RWG]; 1 ♂, Gila River at Highway 70, 33.1667°N, 110.136°W, 1797 m, 29 September 2002, R. W. Garrison & N. von Ellenrieder [RWG]; 1 ♂, Bonita Creek, 32.9289°N, 109.495°W, 1011 m, 18 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [RWG]; 3 ♂♂, 1 ♀, same data but 29 September 2002, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 13 ♂♂, 3 ♀♀, Bonita Creek, tributary to Gila River, 32.9097°N, 109.487°W, 978 m, 18 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 5 ♂♂, S of Safford, Dankworth Park by Highway 191, ponds, 32.7207°N, 109.707°W, 989 m, 18 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, 1 ♀, Muleshoe Ranch, Bass Creek, Hot Springs, 32.3528°N, 110.257°W, 1196 m, 17 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA]; 1 ♂, small pools at lower Sabino Canyon, N of Tucson, Coronado National Forest, 32.3151°N, 110.81°W, 830 m, 25 July 1984, R. W. & J. A. Garrison [RWG]; 4 ♂♂, Sonoita Creek, 3 mi S of Sonoita {31.6582°N, 110.698°W}, 1420 m, 13 June 1978, J. E. Hafernik, Jr. [RWG]; 1 ♀, marsh just NE of junction with Price Canyon Road near marker 400 on Highway 80, 53 km NE of Douglas, 31.6356°N, 109.189°W, 1400 m, 8 August 1995, R. W. & J. A. Garrison [RWG]; 2 ♂♂, 1 ♀, Mesa Draw, stream and associated habitats in Leslie Canyon by Leslie Canyon Road, 17 mi N of Douglas {31.5901°N, 109.508°W}, 1420 m, 23 September 1988, R. W. Garrison [RWG]; 4 ♂♂, 1 ♀, same data but 6 August 1992, R. W. Garrison leg [RWG]; 1 ♂, 1 ♀, Sonoita Creek at Patagonia {31.5339°N, 110.764°W}, 1230 m, 25 July 1984, R. W. Garrison [BYU]; 3 ♂♂, Huachuca Canyon, 31.5106°N, 110.393°W, 1638 m, 16 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 17 ♂♂, 1 ♀, Patagonia Mountains, Harshaw Creek, 31.51°N, 110.682°W, 1359 m, 23 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 2 ♂♂, 1 ♀, Scotia Canyon, Coronado National Forest, Huachuca

Mountains, 31.4492°N, 110.401°W, 1821 m, 24 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [RWG]; 3 ♂♂, same data but 28 September 2002, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 2 ♂♂, 1 ♀, Parker Canyon, Coronado National Forest, Huachuca Mountains, 31.445°N, 110.447°W, 1671 m, 24 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♀, San Pedro River at Hereford Road, 31.4383°N, 110.108°W, 1267 m, 23 July 1987, R. W. Garrison [RWG]; 2 ♂♂, Sycamore Canyon, 31.4269°N, 111.194°W, 1196 m, 27 September 2002, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, Coronado National Forest, Bear Creek at Lown Mountain Creek, 31.3828°N, 110.363°W, 1687 m, 24 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [RWG]; 8 ♂♂, 2 ♀♀, San Bernardino Ranch, Twin ponds and Evil Twin, 31.3406°N, 109.265°W, 1143 m, 21 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, pond N of San Bernardino Ranch, 16 mi E of Douglas, 31.3377°N, 109.279°W, 1160 m, 2 August 1974, R. W. & J. A. Garrison [RWG]; 7 ♂♂, San Bernardino Ranch, Bathtube spring, 31.3369°N, 109.272°W, 1135 m, 21 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, pond at Slaughter Ranch, 26 km E of Douglas, 31.3364°N, 109.279°W, 1160 m, 2 August 1974, R. W. Garrison [RWG]; 1 ♂, 1 ♀, same data but 24 July 1987 [RWG]; 2 ♂♂, same data but 24 September 1988 [RWG]; 6 ♂♂, 3 ♀♀, same data but 9 August 1995 [RMNH, RWG]; 2 ♀♀, springs just E of San Bernardino Ranch, 16 mi E of Douglas, 31.3352°N, 109.276°W, 1140 m, 24 July 1987, R. W. & J. A. Garrison [RWG]; 1 ♂, San Bernardino Ranch, Black Drough, 31.3342°N, 109.261°W, 1129 m, 21 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [RWG]; **New Mexico:** 6 ♂♂, 1 ♀, Tularosa River just E of Aragon on Highway 12, 33.8881°N, 108.518°W, 2069 m, 28 July 1984, R. W. & J. A. Garrison [RWG]; 2 ♂♂, 1 ♀, same data but 26 July 1987, R. W. Garrison [RWG]; 7 ♂♂, 3 ♀♀, same data but 4 August 1995, R. W., J. A. & P. A. Garrison leg [CUMZ, RMNH, RWG]; 1 ♂, 1 ♀ (in tandem), same data but 20 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [RV]; 6 ♂♂, 2 ♀♀, Tularosa River, Apache Creek, 33.8297°N, 108.627°W, 1963 m, 20 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 2 ♂♂, 1 ♀, San Francisco River, near Highway 12, 33.6792°N, 108.778°W, 1735 m, 20 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, ONHI, RWG]; 6 ♂♂, Spring River at AT & SF Railroad Tressel, Roswell {33.405°N, 104.519°W}, 1080 m, 18–29 May 2002, R. Larsen [RWG]; 1 ♂, Rio Hondo at Highway 395, E of Hondo, 33.3708°N, 104.399°W, 1050 m, 29 July 1984, R. W. & J. A. Garrison [RWG]; 1 ♂, Grapevine Campground, E Fork of Gila River at Highway 15, 33.1783°N, 108.203°W, 1706 m, 27 July 1984, R. W. Garrison [RWG]; 1 ♂, 1 ♀, Gila River S of Gila, 32.9408°N, 108.609°W, 1830 m, 5 August 1995, R. W. & J. A. Garrison [RWG]; 1 ♂, Mangas Springs at Blacksmith Canyon on Route 180, NW of Silver City, 32.8425°N, 108.511°W, 1450 m, 5 August 1995, R. W. Garrison [RWG]; 12 ♂♂, 5 ♀♀, shallow marsh at wildlife area, 2 mi N, 1 mi E of Red Rock {32.6983°N, 108.733°W}, 1220 m, 6 August 1995, R. W., J. A. & P. A. Garrison [BMNH, ONHI, RWG]; 7 ♂♂, 2 ♀♀, Gila River at Red Rock {32.6861°N, 108.738°W}, 1220 m, 6 August 1995, R. W., J. A. & P. A. Garrison [RWG]; 3 ♂♂, Pecos River at Carlsbad, 32.4465°N, 104.258°W, 940 m, 30 July 1984, R. W. & J. A. Garrison [BYU, RWG]; **Texas:** 3 ♂♂, 1 ♀, San Saba River, at Highway 864, 0.7 mi E of Fort Mc Kavett, 30.8347°N, 100.0939°W, 14 July 2001, R. W. Garrison [RWG]; 2 ♂♂, 2 ♀♀, Davis Mountains, Limpia Creek, 3 mi NE of Fort Davis by Highway 17, 30.6245°N, 103.865°W, 1450 m, 31 July 1984, R. W. Garrison [RWG]; 1 ♂, Mustang Creek, by Carlos G. Parker Boulevard (Loop 427), Taylor, 30.5769°N, 97.455°W, 15 August 1975, R. W. Garrison [RWG]; 1 ♂, same data but 25 August 1976, J. E. Hafernik, Jr. [RWG]; 2 ♂♂, 2 ♀♀, Davis Mountains Calamity Creek Ranch, 6.5 mi S of Fort Davis on Highway 17, 30.52°N, 103.941°W, 1500 m, 31 July 1984, R. W. & J. A. Garrison [RWG]; 2 ♂♂, 12 miles SE of Fort Davis, 30.4981°N, 103.753°W, 1349 m, 6 July 1980, J. E. Hafernik, Jr. [RWG]; 1 ♂, 1 ♀ (in copula), Block Creek, 5 mi E of Comfort, Highway 473, 29.9981°N, 98.8364°W, 419 m, 27–29 July 1992, T. W. Donnelly [FSCA]; 4 ♂♂, Nueces River at Barksdale on Route 55, 29.7211°N, 100.0341°W, 449 m, 22–23 July 1977, R. W. Garrison [RWG]; 1 ♂, 1 ♀, Frio River at Texas Highway 1120, near Leakey, 29.6944°N, 99.7542°W, 460 m, 23 July 1977, R. W. Garrison [RWG]; 1 ♂, Palmetto State Park, 6 mi S of Luling, near Highway 183, 29.5894°N, 97.5822°W, 95 m, 18 August 1975, R. W. Garrison [RWG]; 2 ♂♂, Guadalupe River, 4 mi S of Gonzales, 29.4477°N, 97.4105°W, 74 m, 25–26 July 1977, R. W. Garrison [RWG]. **MEXICO, Chihuahua:** 1 ♀, 5 mi N of Delicias, near canal {28.252°N, 105.466°W}, 1140 m, 21 July 1952, R. B. & J. M. Selander [UMMZ]; **Coahuila:** 1 ♀, 5.6 mi W of Cuatro Ciénegas, Cuatro Ciénegas Basin, 26.9894°N, 101.972°W, 700 m, 11 August 1968, W. L. Minckley [RWG]; **Aguascalientes:** 1 ♂, Aguas Calientes {21.8832°N, 102.3°W}, 1900 m, 12 July 1898, C. C. Deam [UMMZ]; **Nayarit:** 1 ♂, Tepic {21.4667°N, 104.883°W}, 966 m, 5 November 1923, J. H. Williamson [UMMZ]; **Jalisco:** 1 ♂, Río Encarnación de Díaz, near embankment, 21.3333°N, 102.133°W, 1851 m, 13 April 1995, E. González-Soriano [RWG]; **Michoacán:** 3 ♂♂, 1 ♀, Lago de Cuitzeo, near hot springs {19.9745°N, 101.275°W}, 1838 m, 7 July 1947, T. H. Hubbell [RWG, UMMZ]; 1 ♂, near

Lago de Cuitzeo {19.9695°N, 101.236°W}, 1838 m, 10 August 1932, Hobart M. Smith & E. H. Taylor [UMMZ]; 8 ♂♂, 1 ♀, Lago de Camécuaro, 13 km E of Zamora {19.9039°N, 102.2099°W}, 1702 m, 17 July 1947, T. H. Hubbell [RWG, UMMZ]; 2 ♂♂, 1 ♀, Lago Patzcuaro, E end, ca. 2.5 mi N of Patzcuaro {19.6256°N, 101.617°W}, 2090 m, 27 July 1947, T. H. Hubbell [RWG, UMMZ]; 1 ♂, Tuxpán {19.5639°N, 100.472°W}, 1800 m, 15 July 1955, R. B. & J. M. Selander [UMMZ]; **Distrito Federal:** 2 ♂♂, 3 ♀♀, Mexico City {19.4°N, 99.15°W}, 2220 m, 17 July 1897, Otis W. Barrett [RWG, UMMZ].

A relatively small species (Table 2); male predominantly bright blue (Figs. 939, 940), with inner branch (lobe) of cercus directed mesoventrally and clearly visible in dorsal view, so that cercus appears distinctly wider at apex than at base, and each torus wider than interval separating tori (Fig. 710c); female (Fig. 941) with anterior area of mesepisternum smooth, lacking a mesepisternal tubercle lateral to mesostigmal lobe and a concavity underneath it (Fig. 547e), and with middorsal thoracic carina branching slightly posterior to distal margin of mesostigmal lobes (Figs. 546c, 547c).

Diagnosis. Both sexes of *A. nahuana* were diagnosed against *A. agrioides*, *A. fumipennis violacea*, *A. leonorae* and *A. pallens* by Garrison (1994) and were fully redescribed in Westfall & May (2006). *Argia nahuana* shares male cercus with inner branch in the form of a decumbent lobe with those five species, and the genital ligula in all is similar, consisting of a single flexible flagellum and a pair of falcate lateral lobes basally; however, the full length of distal segment lateral margins and the lateral lobes in *A. nahuana* are usually darkened and strongly sclerotized (Fig. 628), whereas only the lateral lobes themselves are darkened in *A. agrioides*, *A. f. violacea* (Fig. 613), *A. hinei*, *A. leonorae* (Fig. 622) and *A. pallens* (Fig. 633). *Argia nahuana* is farther diagnosed against its most similar relative, *A. agrioides*, under the latter species.

Remarks. Bailowitz *et al.* (2015) noted that S2 of *A. nahuana* almost always has a lateral black spot (Fig. 94), which is generally true for males occurring within the United States. However, males from farther south in Mexico (Lago de Camécuaro, Fig. 95) are heavily marked, most of S2 laterally is black, and there is a black ventral stripe extending the entire length of S3–6 (Fig. 939). The humeral stripe varies from unforked (Fig. 94) to forked (Fig. 95). Provonsha & McCafferty (1973) were the first to recognize that specimens determined by Seemann (1927) from S California as *A. agrioides* were really *A. nahuana*.

In their phylogenetic tree combining morphological and molecular data, Caesar & Wenzel (2009, fig. 4) place *A. nahuana* as basal to *A. agrioides*, *A. hinei*, *A. pallens*, *A. fumipennis*, *A. sedula*, *A. pulla* and *A. rhoadsi* along with *A. alberta* and *A. leonorae*. As stated above, the morphology of the male genital ligula and appendages suggests that *A. nahuana* may be related to *A. agrioides*, *A. f. violacea*, *A. hinei*, *A. leonorae* and *A. pallens*. The genital ligulae of *A. alberta* and *A. paludicola* (Fig. 643) share similar morphology, and they may be closely related to the latter six species. However, *A. pulla* (Fig. 640) and *A. rhoadsi* (Fig. 641) have a biflagellate genital ligula, and we question their placement within the strict consensus tree. According to Torres-Pachón *et al.* (2017, fig. 3), *A. nahuana* forms part of a “carlcooki” clade based on molecular data (no morphological characters for larvae of *A. nahuana* were available to these authors) as follows: [(*A. nahuana*, *A. carlcooki*, (*A. plana*, (*A. vivida*, *A. extranea*, (*A. immunda* + *A. bipunctulata*)))). Their results differ considerably from those of Caesar & Wenzel (2009). We agree with Torres-Pachón *et al.*’s (2017) suggestion that future phylogenetic studies should include a greater number of species of *Argia* in the adult stage, including those distributed in South America, and supplementary molecular markers such as nuclear gene sequences within the total evidence data sets.

Kerst (2009) recognized a color change in male thoracic color pattern of *A. nahuana* when males were seen in tandem with females. We have not observed this phenomenon, but we have noted that the bright blue and violaceous colors of several species of *Argia* turn dark when they are exposed to cold or are kept in the dark.

Distribution. In Mexico, *A. agrioides* is thus far known only from Baja California (Fig. 787), but *A. nahuana* occupies a much larger range, occurring in N Baja California east to San Luis Potosí and south bordering the N flank of the Trans-Mexican Volcanic Belt (ca. 96.8°N) as shown in Fig. 786. This species ranges from below sea level (Dos Palmas Nature Reserve) to 2500 m in Mexico (Tlaxcala, San Tadeo Huiloapán; Portal de Datos Abiertos CNIN).

***Argia noveloi* Garrison & von Ellenrieder, n. sp.**

Figs. 96 (head, thorax, S1–4 ♂); 229 (head, thorax, S1–4 ♀); 349 (S7–10 ♂); 457 (S7–10 ♀); 548 (mesostigmal plates ♀); 629 (genital ligula); 711 (appendages ♂); 773 (map); 832 (field photo ♂); 892 (body scan ♂); 893 (body scan ♀).

[Key locators: ♂ G-1, couplet 10''; ♂ M-3, couplet 3(2'); ♀ F-11, couplet 12(9')]

Argia extranea: Calvert 1902: 93 (♂ in part, Texolo, pl. IV, fig. 57ss).

Argia vivida: Calvert 1902: 95 (♂, ♀, in part, Texolo, Jalapa, pl. IV, figs. 2, 56ii).

Etymology. Named *noveloi* (Latinized name) in honor of our friend and colleague Rodolfo Novelo-Gutiérrez, in recognition of his outstanding work on odonates, in particular the immature stages of Mexican Odonata, and his generous help in our studies.

Types. *Argia noveloi*: holotype ♂, MEXICO, Veracruz, Puente Texolo, near Teocelo, 19.4028°N, 96.9867°W, 1065 m, 26 August 1988, Rosser W. Garrison leg. [examined, in INECOL].

Specimens examined. 65 ♂♂, 27 ♀♀ (all types): **MEXICO, Puebla:** 1 ♀, 3 mi N of Tlatlauquitepec on Highway 125 {19.8893°N, 97.485°W}, 1650 m, 14 July 1963, G. G. Musser [BYU]; **Veracruz:** 8 ♂♂, 7 ♀♀, Banderillas, Reserva La Martinica, on partially shaded trail, 19.5831°N, 96.9464°W, 1544 m, 17 June 2009, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 4 ♂♂, Parque Javier Clavijero, Jalapa, 19.5142°N, 96.9456°W, 1800 m, 17 August 1982, R. W. & J. A. Garrison [RWG, UNH]; 1 ♀, 5 km on Highway 7 N of Consolapán, along river adjacent to highway near small dam {19.5085°N, 96.9327°W}, 1334 m, 12 July 1992, W. F. Mauffray [FSCA]; 8 ♂♂, 4 ♀♀, Puente Texolo, Río Texolo near Texolo, 19.4028°N, 96.9867°W, 1065 m, 16–17 August 1982, R. W. & J. A. Garrison [RWG]; 6 ♂♂, same data but 26 July 1983, J. C. Michalski [FSCA, RWG]; 1 ♂, same data but 10 July 1987, M. J. Westfall, Jr. [FSCA]; 7 ♂♂, 3 ♀♀, (holotype and paratypes), same data but 26 August 1988, R. W. Garrison, S. W. Dunkle & M. J. Westfall, Jr. [FSCA, INECOL, RWG]; 1 ♂, 6 ♀♀, same data but 12 July 1992, W. F. Mauffray, K. J. Tennessen & S. W. Dunkle [FSCA]; 6 ♂♂, same data but 20 July 1992, 92x023, T. W. Donnelly [FSCA, RWG]; 1 ♂, same data but 17 June 2009, R. W. Garrison & N. von Ellenrieder [CSCA]; 1 ♂, 2 ♀♀, Cascada de Texolo, Xico {19.4014°N, 96.9943°W}, 1060 m, 12 July 1987, M. J. Westfall, Jr. [FSCA]; 1 ♂, 4.5 mi N of Huatusco {19.25°N, 96.9833°W}, 1280 m, 11 August 1965, M. L. Paulson [FSCA]; 3 ♂♂, streams 2.4 and 2.6 mi NE of Coscomatepec {19.0997°N, 97.0342°W}, 1463 m, 11 August 1965, D. R. Paulson [FSCA]; 5 ♂♂, 3 ♀♀, Orizaba, Ojo de Agua {19.0167°N, 97.2667°W}, 1158 m, 29 June–10 August 1965, D. R. & M. L. Paulson [FSCA]; 1 ♂, stream 4.2 mi N of Fortín {18.9619°N, 97.0103°W}, 1249 m, 11 August 1965, D. R. & M. L. Paulson [FSCA]; 2 ♂♂, 6.5 mi NE of Orizaba on Río Chicola {18.9063°N, 97.0129°W}, 1160 m, 26 October 1967, W. H. Cross [FSCA].

A medium-size species (Table 2); male violaceous (Figs. 96, 349, 832, 892) with ventral branch of paraproct longer than dorsal branch (Figs. 711a, b); female (Fig. 893) with mesostigmal lobe in dorsal view with posterior margin broadly convex, posterolateral margin of mesostigmal lobe forming a deep U-shaped concavity with posterior margin of mesostigmal plate, and lobe separated from opposite by a space subequal to or narrower than the width of each lobe (Figs. 548c, d).

Description of male holotype. Head (as in Figs. 71, 892): Labrum, ante- and postclypeus, ante- and postfrons, base of mandibles and genae violaceous; epicranium black but interrupted by large violaceous postocular spots each broadly confluent with compound eyes, violaceous occipital bar separated from postocular spots by narrow black line, a small triangular pale spot anterolateral to lateral ocellus; antennae black; postoccipital lobes narrowly black, rear of head pale with black spot on each side of occipital foramen. Prothorax black with following areas violaceous: anterior lobe, dorsolateral spot on middle lobe, propleuron except for anterior margin rimmed in black, and extreme lateral margins of posterior lobe. Pale areas of pterothorax violet, with black middorsal stripe of uniform width, slightly narrower than violet antehumeral stripe; anterior 0.80 of mesinfraepisternum black, humeral stripe not forked, enlarged at base with upper half a hairline expanding again at mesopleural fossa; remainder of thorax violet except for vestige of interpleural stripe and a narrow black stripe on metapleural suture (as in Fig. 96). Wings hyaline with venation black; Pt dark brown, surmounting 1 cell in right Fw, 1.5 in left Fw; 1.5 in left Hw, 1 in right Hw; px Fw 16/17, Hw 14/14; pq cells Fw 4/4, Hw 3/3; RP2 at Fw 8/8, Hw 7/7. Coxae and trochanters pale except for black on dorsum of trochanters; femora black; tibiae black with extensor surface pale, tarsi and armature black.

Abdomen (as in Figs. 96, 349, 892) mostly violet; S1 violet, dorsally with a black basal spot; S2 violet laterally

with a broad black sinuate stripe terminating at apical fifth, its posterior portion expanded as an inverted triangle dorsally at apical fourth, its tip almost meeting the other dorsally, annulus black; S3 violet, with a complete ventral black stripe beginning at basal tenth with basal fourth slightly expanded, narrowing medially with its apical portion expanded dorsally forming a black ring confluent with black annulus; S4–6 similar but black lateral stripe slightly more extensive; S7 black except for narrow basal violet ring dorsally prolonged to apical fifth; S8–10 violet dorsally and laterally with continuous black stripe; torus pale, its ventral margin rimmed with black; cercus brown; paraproct narrowly pale dorsobasally, remainder brown.

Genital ligula distal segment in lateral view with apex greatly enlarged, roundly capitate, and basal boss bluntly quadrate (as in Fig. 629b), lateral lobes broadly triangular, decumbent; in dorsal view distal segment slightly enlarged at apical half, slightly enlarged with remainder of apical portion parallel.

Torus large, swollen, transversely oval, occupying most of torifer and slightly overlapping bilobed epiproct (Fig. 711c); epiproct apically with a narrow cleft, pale, black laterally; cerci not approximate, their inner surfaces separated by a distance greater than width of epiproct (Fig. 692c); cercus in lateral view half as long as paraproct (Fig. 711b), in dorsal view roundly trapezoidal with distal side longer than medial side, distance between cerci slightly longer than width of each cercus (Fig. 711c), mediodistal margin of cercus in dorsomedial view with a distinct decumbent tooth (Fig. 711a) visible in lateral view (Fig. 711b); paraproct with dorsal branch forming a broadly based triangle, the ventral branch long, narrower, extending well beyond level of cercus.

Dimensions. Hw 23.5, abdomen 29.4, total length 38.0.

Description of female paratype (same data as holotype, Figs. 229, 457, 893). Similar to male but pale colors a lighter violet. Head with black on epicranium less extensive, and with a narrow black cross stripe at base of postclypeus; prothorax as in male, but pale areas more extensive; antehumeral stripe pale violet; legs largely pale with streaks of brown on outer surfaces of femora and inner portion of tibiae. Wings hyaline with venation black; Pt dark brown, surmounting 1 cell in both Fw, 1.5 in left Fw; 1.5 in both Hw; px Fw 16/16, Hw 14/14; pq cells Fw 4/4, Hw 3/3; RP2 at Fw 7/8, Hw 6/6. S1 entirely pale; S2 with black dorsolateral stripe narrowing medially, its posterior end enlarged at apical fifth and barely connecting above but not connecting with black annulus; S3–6 similar to S3 but black dorsolateral stripe longer and connecting above at apical fifth; S7 with dorsolateral black stripe wider and only slightly narrowed medially so that pale middorsal stripe is a mere line, S8 violet with a narrow ventral black stripe; S9 pale with a pair of black wedge-shaped dorsolateral spots confined to basal half; S10 pale; ovipositor pale but ventral margin black. Mesepisternal tubercles absent, mesostigmal lobe prominent, narrower basally and occupying half of mesostigmal lamina, posterolateral margin of mesostigmal lobe forming a deep U-shaped concavity with posterior margin of mesostigmal plate (Figs. 548c, d).

Dimensions. Hw 24.5, abdomen 29.3, total length 38.1.

Variation in paratypes. Both sexes vary in extent of dark markings. In the male, the large violet postocular stripes may be narrowly rimmed by black, indicating a reduction of black on the epicranium, and the black lateral stripe on S7 may be reduced so that the prolongation of the dorsal violet stripe is as wide as on preceding segments; in others, the black thoracic stripes are narrower than in the holotype. Sometimes there is an isolated narrow pale stripe within the lateral black stripe on S7. A female (Reserva La Martinica) has the least amount of black, as follows: black on epicranium is limited to an area between the lateral ocelli and a short incomplete diagonal stripe directly behind the antenna and a corresponding narrow incomplete transverse black stripe along postocular margin, thus allowing postocular spots to be confluent with rest of pale area of head; dorsolateral stripes on S2–5 are separated into an inverted triangular postbasal spot and a larger apical spot. Pt surmounting 1–2 cells in males and females; px: Fw 15–18, Hw 13–16 in males, Fw 14–18, Hw 12–16 in females; pq: Fw 4, Hw 3 in males, Fw 4–5, Hw 3–4 in females; RP2 at Fw 8–9, Hw 6–7 in males, at Fw 7–8, Hw 6–7 in females. Dimensions. ♂: Hw 23.9 ± 0.7 [23.2–25.3], abdomen 30.3 ± 0.8 [29.3–31.6], total length 38.8 ± 0.8 [37.7–40.3]. ♀: Hw 25.7 ± 0.8 [24.5–27.1], abdomen 29.0 ± 0.6 [27.8–29.6], total length 37.5 ± 0.7 [36.5–38.6].

Diagnosis. Both sexes are most similar to the more widespread violaceous examples of *A. funebris*; both have almost identical body markings but can be separated by morphology of the male genital ligula, caudal appendages and female mesostigmal plates. The apex of the genital ligula distal segment of *A. noveloi* in lateral view is greatly enlarged, roundly capitate, and the basal boss is bluntly quadrate, Fig. 629a; in *A. funebris*, the apex of the distal segment in lateral view is slightly enlarged, bluntly triangular in lateral view and the basal boss semicircular, Fig. 615a. The cercus of *A. noveloi* in dorsal view is roundly trapezoidal, with distal side longer than medial side, distance between cerci slightly greater than, to about equal to, the width of each cercus (Fig. 711c), and ventral branch of

paraproct is longer than dorsal branch in lateral view (Fig. 711b); the cercus of *A. funebris* in dorsal view is roundly quadrate with distal side shorter than medial side, distance between cerci greater than width of each cercus (Figs. 687c, 689c), and ventral branch of paraproct shorter than dorsal branch in lateral view (Figs. 687b, 689b). Male of the violaceous *A. noveloi* may also be confused with the blue *A. vivida*, but the two are not sympatric. They also differ as follows: The lateral lobes of the distal segment of the genital ligula of *A. noveloi* in ectal view are not bilobed and are not visible (Fig. 629b); the lateral lobes of the distal segment of genital ligula of *A. vivida* from Baja California in ectal view are broadly explanate and bilobed (Fig. 660b). The longer ventral branch of the paraproct in *A. noveloi* (Figs. 711a, b) will easily separate this species from *A. vivida* (Figs. 752a, b). The mesostigmal plates of females of *A. funebris*, *A. noveloi* and *A. vivida* share a similar morphology, but in *A. noveloi* the posterolateral margin of mesostigmal lobe forms a deep U-shaped concavity with posterior margin of mesostigmal plate (Figs. 548c, d); in the other two species the posterolateral margin of the mesostigmal lobe forms a shallow concavity with posterior margin of mesostigmal plate (Figs. 524c, d, 589c, d).

Remarks. *Argia noveloi* has been known for several years and was first recognized as a separate species by L. K. Gloyd, but she never published this. For many years, she had attached the manuscript name “*gesticula*” to specimens here named *A. noveloi*.

In his treatment of *A. extranea*, Calvert (1902) was aware that he may have included a mixed series, and based on his comments and illustrations, we believe that he did include two additional species that were subsequently described: *A. elongata* and *A. noveloi*, and possibly a third one, *A. annae* (see below). *Argia. elongata* and *A. extranea* were recognized as separate species by Garrison & von Ellenrieder (2017) and are diagnosed under *A. elongata*. Calvert’s (1902) inclusion of *A. noveloi* is evidenced by the following statements: “In a general way, it seems that the relative and absolute length of the lower branch of the inferior appendage increases in specimens from north to south, *i. e.* in those from Mexico [= *A. extranea*] to Costa Rica [= *A. elongata*]; *nevertheless, at least one male from Texolo in Vera Cruz* [= *A. noveloi*] *has this branch quite as long as in individuals from Central America* [italics ours].” His additional statement: “*A. extranea* and *A. vivida* are undoubtedly near relatives and, judging from the males alone, exist side by side at Texolo and Cuernavaca” suggests that the Texolo specimens likely correspond to what we are calling *A. noveloi*.

To clarify the association of Calvert’s figures on his plate IV with the taxa as recognized here, we offer the following corrections:

Female mesostigmal plates:

- fig. 1 = *A. funebris*
- fig. 2 = *A. noveloi*
- fig. 3 = probably *A. annae*
- fig. 4 = *A. extranea*

Male caudal appendages:

- fig. 56 = *A. extranea*
- fig. 56i = *A. elongata*
- fig. 56ii = *A. noveloi*
- fig. 57 & 57s = *A. funebris*
- fig. 57ss = *A. noveloi*
- fig. 58 = *A. funebris* (holotype of *A. vivida* var. *plana*)
- fig. 59 = *A. funebris* (paratype)

Distribution. Our records show *A. noveloi* to occur only along the SE facing slopes of the E portion of the Trans-Mexican Volcanic Belt, where it extends nearly to the Gulf of Mexico in central Veracruz and E Puebla (Fig. 773). Elevation ranges from 830 to about 1,800 m. Other species of *Argia* collected within its range include *A. anceps*, *A. annae*, *A. extranea*, *A. oculata*, *A. percellulata*, *A. rudolphi*, *A. ulmeca*, *A. variabilis* and *A. westfalli*.

Argia oculata Hagen in Selys, 1865

Figs. 14–17 (head ♀); 97, 98, 100 (head, thorax, S1–4 ♂); 99 (thorax ♂); 230, 231 (head, thorax, S1–4 ♀); 350–352 (S7–10 ♂); 458, 459 (S7–10 ♀); 549–551 (mesostigmal plates ♀); 630, 631 (genital ligula), 712 (appendages ♂); 794 (map); 980, 981 (body scan ♂); 982 (body scan ♀).

[Key locators: ♂ G-5, couplet 3(2'); ♂ M-6, couplet 34'; ♀ Key to groups, couplet 28(27); F-12, couplet 2'; F-14, couplet 2(1')]

Agrion (Agrion) oculatum Hagen, 1861: 312 (nomen nudum).

Argia oculata Hagen in Selys, 1865: 409–410 (37–38 reprint);—Calvert 1902: 73 (key, 81, pl. IV, fig. 11, ♂ mesostigmal lamina, 36, 36s, 36i, 36ii, ♂ appendages, description of both sexes);—Hagen in Calvert 1902: 112 (pl. I, figs. 12, 12a, type data, freehand illustrations of type ♂ by Hagen);—Calvert 1907: 367–368 (notes, comparison with *Argia difficilis* sensu Calvert 1902);—Calvert 1909: 133–135 (Colombia south to Chapada, Brazil, discussion);—Förster 1914: 66 (comparison with *A. difficilis* sensu Calvert);—Ris 1918: 105–106 (key, comparison with *Argia difficilis* sensu Calvert 1902);—Calvert 1919: 163–163 (Guatemala, comparison with *A. difficilis* sensu Calvert);—Geijskes 1932: 241 (comparison with *A. difficilis* sensu Calvert);—Schmidt 1943: 233, Madre de Dios, Peru);—Rácenis 1959: 476, Peru);—May 1979: 16 (Panama);—Paulson 1982: 253 (Mexico south through South America);—Limongi “1983” [1985]: 100 (larval description, Venezuela);—Dunkle 1988: 45 (Honduras);—Maes *et al.* 1988: 34 (Nicaragua);—Michalski 1988: 5 (Trinidad, suggests synonymy with *A. difficilis* Selys [= *A. difficilis* sensu Calvert]);—Brooks 1989: 50 (Costa Rica);—Convey 1989: 56 (Paria Peninsula, Venezuela);—Maes 1989: 6 (Nicaragua);—Dunkle 1991: 132 (Honduras);—Donnelly 1992: 83 (Canal Zone, Panama);—Novelo-Gutiérrez 1992: 55 (comparison of larva with *A. oenea*);—González-Soriano 1993: 295 (Mexico);—Boomsma & Dunkle 1996: 25 (Belize);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Ramírez *et al.* 2000: 249 (Costa Rica);—Belle 2002: 2 (Surinam);—Förster 2001: 11, 54, 58 (key ♂, ♀, fig. C24);—Alonso-Eguía *et al.* 2002: 352 (Río Moctezuma, Mexico, as *Argia oculata* [sic]);—Paulson 2002b: 362 (Nayarit, Mexico);—Behrstock *et al.* 2004: 11 (Sonora, Mexico);—Lencioni 2006: 100 (fig. 48, figs. of holotype from Garrison, Amazonas and Mato Grosso, Brazil);—Westfall & May 2006: 144–145, 150, 204, (figs. 80B, 91A, 101I, key, description);—Esquivel 2005: 150–151 (description, Costa Rica);—Behrstock *et al.* 2007a (records from Chihuahua, Mexico listed in error);—Garrison & von Ellenrieder 2007 (nomenclatorial history, name as applied to *A. difficilis* sensu Calvert 1902);—Upson *et al.* 2007: 31 (Sonora, Mexico);—Hoffman 2009: 65 (Peru);—Pérez-Gutiérrez & Palacino-Rodríguez 2011: 212 (Colombia);—von Ellenrieder 2011: 58 (Surinam);—Amaya-Perilla & Palacino-Rodríguez 2012: 34 (Meta, Colombia);—Garrison & von Ellenrieder 2013: 16, 22 (Costa Rica);—Pérez-Gutiérrez *et al.* 2013: 101 (Colombia, photos 219–222);—Escoto-Moreno *et al.* 2014: 1051 (Hidalgo, Mexico);—Bailowitz *et al.* 2015: 132 (Sonora, Mexico, diagnosis, photos);—Garrison & von Ellenrieder 2015: 55 (key, nomenclatorial history, extensive diagnosis, lectotype designation, figs. 1h, 2i–o, 3x–c2, 4i2–m2, 5w–y, 6t–v, 7d3–g3, 9o–t, 10y4–f5, 13a–c, 14k–n, 15m–o);—Michalski 2015: 94 (key ♂, ♀, Trinidad, figs. 69a, 70c, photos);—González-Soriano *et al.* 2016: 156 (Colima, Mexico, fig. 1);—Escoto-Moreno *et al.* 2017: 386 (Hidalgo, Mexico);—Sanmartín-Villar *et al.* 2017: 203 (Ecuador, female polymorphism);—Torres-Pachón *et al.* 2017: 415 (molecular phylogeny of larvae within *Argia*);—Bota-Sierra *et al.* 2019: 47 (Colombia, photo 31, 32);—Garrison & von Ellenrieder 2019: 40 (lectotype data);—Mauffray & Tennessen 2019: 43 (Ecuador);—Koroiva *et al.* 2020: 8 (Amazonas, Brazil);—Ortega-Salas & González-Soriano 2019: 124 (Coahuila, Mexico);—Paulson & Haber 2021: 91 (Costa Rica, diagnosis, photos).

Argia eliptica Selys, 1865: 393–394 (21–22 reprint);—Calvert 1902: 108 (pl. 1, figs. 15, 15a, type data, freehand illustrations of type ♂ by Hagen);—Westfall 1986: 116 (El Salvador);—Brooks 1989: 50 (Costa Rica);—Dunkle 1988: 45 (Honduras as = *A. oculata* in part);—Ramírez *et al.* 2000: 249 (Costa Rica);—Lencioni 2006: 89 (fig. 37, figs. from Garrison of specimen from Coyame, Veracruz, Mexico, dorsal view of head of holotype from von Ellenrieder, Rondônia, Brazil);—Esquivel 2005: 150–151 (brief comment on relationship to *A. oculata*);—von Ellenrieder & Garrison 2007a: 15 (illustrations of male cerci of holotype, figs. 6c–d);—Garrison & von Ellenrieder 2013: 16, 22 (Costa Rica);—Pérez-Gutiérrez *et al.* 2013: 101 (Colombia, photo adult);—Garrison & von Ellenrieder 2015: 55 (mention in synonymic list, lectotype designation).

Argia difficilis: Calvert, 1902: 73, 84 (pl. IV, fig. 15, misidentification);—Calvert 1907: 368–369 (pl. VIII, figs. 42, 42s, pl. X, figs. 4, 4s, comparison with *A. oculata*, description ♂, apparent heterospecific tandems explained);—Calvert 1909: 137–139 (Colombia, comparison with *Argia hasemani* sp. nov.);—Förster 1914: 66 (association of *A. difficilis* sensu Calvert with *A. oculata* Hagen in Selys);—Ris 1918: 105 (key);—Calvert 1919: 163–163 (Guatemala, comment on Förster 1914, association of *A. difficilis* sensu Calvert with *Argia oculata* Hagen in Selys);—Geijskes 1932: 241 (Trinidad, comparison with *Argia oculata* Hagen in Selys);—Geijskes 1946: 220, 228 (Tobago, description of larva);—May 1979: 16 (Panama);—Paulson 1982: 252 (Guatemala south through South America);—Shelly 1982: 335–342 (perching-foraging behavior);—Limongi “1983” [1985]: 101 (larval characters from Geijskes 1946 as *A. oculata*);—Dunkle 1988: 45 (Honduras);—Michalski 1988: 5 (Trinidad, suggests synonymy with *A. oculata*);—Dunkle 1991: 132 (Honduras);—Donnelly 1992: 83 (mention of name);—Novelo-Gutiérrez 1992: 55 (comparison of larva with *A. oenea*);—Boomsma & Dunkle 1996: 25 (Belize);—Ramírez *et al.* 2000: 249 (Costa Rica);—Förster 2001: 54, 58 (key, fig. C24);—Garrison & von Ellenrieder 2007: 189–190, 199 (nomenclatorial history, name as applied to *A. difficilis* sensu Calvert 1902);—Pérez-Gutiérrez & Palacino-Rodríguez 2011: 212 (Colombia);—Amaya-Perilla & Palacino-Rodríguez 2012: 33 (Colombia);—Garrison & von Ellenrieder 2015: 55, 62 (synonymic list; brief nomenclatorial history).

Argia icterica Navás, 1934a: 138–139 (6–7 reprint) (fig. 113, description ♂ Muzo, Colombia);—Lencioni 2006: 100 (mention as possible synonym of *A. oculata* after Garrison pers. comm.);—Garrison & von Ellenrieder 2015: 55 (new synonymy). *Argia ocellata* Navás, 1935: 34 (apparent misspelling, name attributed to R. Martin, Muzo, Colombia);—Garrison & von Ellenrieder 2015: 55 (mention in synonymic list). *Argia* sp. A Gloyd in Calvert, 1948: 58 (mention from Guyana);—Garrison & von Ellenrieder 2015: 55 (mention in synonymic list).

Primary types. *Argia oculata*: lectotype ♂, VENEZUELA, Vargas, La Guaira [examined, in MCZ];—*Argia eliptica*: lectotype ♂, BRAZIL [examined, in RBINS];—*Argia icterica*: holotype ♂, COLOMBIA, Boyacá Dept., Muzo, July 1918 [examined, in MHNN].

Specimens examined. 1316 ♂♂, 414 ♀♀ (see Garrison & von Ellenrieder 2015 for additional material examined not listed here): **MEXICO, Nuevo León:** 3 ♂♂, Rancho Los Pinos {25.4269°N, 100.152°W}, 483 m, 3 July 1987, M. J. Westfall, G. Luna & A. Contreras [FSCA]; 2 ♂♂, 2.5 km NW of Rancho Los Atascos {25.3806°N, 100.161°W}, 650 m, 2 July 1987, M. J. Westfall, H. Quiroz & A. Contreras [FSCA]; 1 ♀, Cascada Cola de Caballo, 38 km SW of Monterrey, 62x120 {25.366°N, 100.1621°W}, 550 m, 6 September 1962, T. W. Donnelly [RWG]; 9 ♂♂, 1 ♀, same data but 25 June 1965, D. R. & M. L. Paulson [FSCA]; **Tabasco:** 2 ♂♂, Centro Recreativo Los Trocones, Reseva Ecológica Cañón de la Libertad, W side of Victoria, 23.7844°N, 99.196°W, 326 m, 21 October 2002, R. A. Behrstock [RWG]; 53 ♂♂, 12 ♀♀, Tepescuintle {17.4435°N, 91.4006°W}, 25 m, 12 August – 1 October 1962, E. C. Welling M. [CSCA, RWG, UMMZ]; **Sinaloa:** 2 ♂♂, stream 15.7 mi NE of Concordia, 23.4028°N, 105.937°W, 580 m, 28 August 1965, D. R. Paulson [FSCA]; **San Luis Potosí:** 1 ♀, El Salto Falls near El Mico, about 12 km N of El Naranjo, 22.5855°N, 99.3796°W, 398 m, 5 June 1966, R. A. Behrstock [RWG]; 1 ♀, Huichihuayán {21.4817°N, 98.9675°W}, 100 m, 18 June 1941, H. S. Dybas [USNM]; 7 ♂♂, 3 ♀♀, about 9 mi N of Matlapa on Highway 85 {21.4361°N, 98.9151°W}, 90 m, 11 April 1963, R. L. Pyke [FSCA]; 1 ♂, 1 ♀, 4 mi W of Tamazunchale {21.3°N, 98.8°W}, 182 m, 26 June 1965, D. R. & M. L. Paulson [FSCA]; 1 ♂, Arroyo en Palictla, about 9 km NW of Tamazunchale {21.2916°N, 98.7889°W}, 244 m, 28 June 1990, A. Maya & E. Gonzalez-Soriano [CNIN]; 1 ♂, Plan de Río (teneral), 19.4028°N, 96.6531°W, 300 m, 4 May 1980, M. Galicia [CNIN]; 1 ♂, stream 20.5 mi. NW of Tamazunchale, 90 m, 26 June 1965, D. R. & M. L. Paulson [FSCA]; 3 ♂♂, 1 ♀, stream 7.5 mi WNW of Tamazunchale {17.5167°N, 91.9667°W}, 210 m, 27 June 1965, D. R. & M. L. Paulson [FSCA]; **Nayarit:** 2 ♂♂, Singayta, riparian vegetation of Palm forest-median forest {21.5736°N, 105.228°W}, 50 m, 27 September 1979, R. Lopez [UMMZ]; 2 ♂♂, Punta Camarón, on Pacific Ocean, 4 mi S of Santa Cruz {21.5178°N, 105.267°W}, 850 m, 30 August 1963, H. V. Weems, Jr. [FSCA]; 1 ♂, Palapita {21.44°N, 105.07°W}, 670 m, 13 October 1981, A. L. Martinez [UMMZ]; **Querétaro:** 1 ♂, arroyo near Aquacatlán de Guadalupe {21.2116°N, 99.5436°W}, 1130 m, 29 June 1990, K. J. Tennessen [FSCA]; **Puebla:** 1 ♂, Zongozolta {19.9866°N, 97.7266°W}, 1121 m, 24 March 2016, J. D. Amith [FSCA]; **Veracruz:** 1 ♀, Cuesta de Misantla, 3.5 mi SE of Martinez de la Torre, deep woods {19.9322°N, 96.8509°W}, 190 m, 28 October 1967, W. H. Cross [FSCA]; 1 ♂, Parque Javier Clavijero {19.5142°N, 96.9456°W}, 1320 m, 11 July 1980, R. Lopez [UMMZ]; 1 ♂, 1 ♀, Puente Teocelo {19.4028°N, 96.9867°W}, 1065 m, 17 June 1982, R. Lopez [UMMZ]; 1 ♀, Cascada de Texolo, Xico {19.4014°N, 96.9943°W}, 1060 m, 12 July 1987, M. J. Westfall, Jr. [FSCA]; 1 ♂, 5 mi N of Huatusco {19.25°N, 96.9833°W}, 1219–1524 m, 13 August 1963, H. V. Weems, Jr. [FSCA]; 3 ♂♂, stream 1.4 mi N of Monte Blanco {18.965°N, 97.016°W}, 1249 m, 11 August 1965, D. R. & M. L. Paulson [FSCA]; 1 ♂, stream above Río Metlac, 1.9 mi SW and 0.5 mi N of Fortín del las Flores {18.9075°N, 97.0125°W}, 1000 m, 10 August 1965, D. R. Paulson [FSCA]; 2 ♂♂, Fortín de las Flores, 0.25 mi W on Highway 150 {18.9019°N, 96.9897°W}, 1008 m, 18 September 1985, T. W. Taylor [FSCA]; 1 ♂, 5 mi SW of Fortín {18.9°N, 97°W}, 975 m, 10 August 1965, D. R. & M. L. Paulson [FSCA]; 6 ♂♂, stream 4.3 mi E of Córdoba {18.8997°N, 96.8479°W}, 701 m, 29 June–15 August 1965, D. R. & M. L. Paulson [FSCA]; 1 ♀, Córdoba, 18.8832°N, 96.9333°W, 1000 m, 1–10 September 1964 [RWG]; 1 ♀, Arroyo Laguna Escondida, Los Tuxtlas Biological Station {18.6794°N, 95.1544°W}, 35 m, 17 November 1993, R. W. Baumann [BYU]; 4 ♂♂, 3 km W of Laguna Escondida, vicinity of Biological Station Universidad Nacional de México, near Montepío {18.5869°N, 95.0731°W}, 124 m, 14–19 July 1992, T. W. Donnelly [FSCA]; 2 ♂♂, 2 ♀♀, Laguna Azul, Emilia, and Arroyo de Laguna Escondida near Los Tuxtlas Biological Station {18.5781°N, 95.0922°W}, 200 m, 27 August 1988, S. W. Dunkle [FSCA]; 1 ♂, 1 ♀, Arroyo on road to Jicacal Beach and pond near Rancho La Esperanza {18.5627°N, 95.0571°W}, 28 August 1988, S. W. Dunkle [FSCA]; 3 ♂♂, N of Sontecomapán, near Los Tuxtlas Biological Station along path leading W {18.5619°N, 95.0592°W}, 18 m, 14 July 1992, W. F. Mauffray [FSCA]; 1 ♂, Arroyo Agua Caliente near Sontecomapán and hillside seepages {18.4933°N, 95.0119°W}, 4 m, 30 August 1988, S. W.

Dunkle [FSCA]; 2 ♂♂, 1 ♀, stream at Coyame {18.4381°N, 95.0241°W}, 400 m, 1 July 1965, D. R. & M. L. Paulson [FSCA]; 1 ♂, Lake Catemaco, 8 mi E of San Andres Tuxtla {18.42°N, 95.12°W}, 330 m, 4 July 1963, D. Byrne [FSCA]; **Jalisco**: 1 ♂, stream 37.1 mi E of Colima {19.3073°N, 103.392°W}, 762 m, 23 August 1965, D. R. Paulson [FSCA]; 2 ♂♂, 2 ♀♀, La Toma, spring 1.9 mi NW and 1.2 mi NE of Tequila, 1130 m, 25 August 1965, D. R. Paulson [FSCA]; **Morelos**: 1 ♂, stream on Hwy 421 at Pueblo Cocoyotla {18.7678°N, 99.4572°W}, 1070 m, 23 July 1992, K. J. Tennessen [FSCA]; 1 ♂, small arroyo W of Amacuzac, Highway 55 {18.6118°N, 99.4436°W}, 950 m, 20 July 1992, K. J. Tennessen [FSCA]; **Guerrero**: 1 ♂, small arroyo W of Amacuzac {18.6164°N, 99.4667°W}, 1050 m, 4 September 1983, K. J. Tennessen [RWG]; 1 ♂, Acapulco {16.85°N, 99.9168°W}, 37 m, 13 August 1935, H. R. Roberts [FSCA]; 4 ♂♂, Yoloxochitl {16.8159°N, 98.687°W}, 600 m, 18 May–11 June 2011, J. D. Amith [FSCA]; **Oaxaca**: 1 ♂, Route 185, km 168–169, sandy bottomed stream in jungle {17.0044°N, 95.014°W}, 85 m, 22 August 1966, R. W. Cruden [UMMZ]; 1 ♂, stream 37.1 mi E of Totolapán {16.6244°N, 96.0264°W}, 1040 m, 3 August 1965, D. R. Paulson [FSCA]; 2 ♂♂, ca. 54 km W of Tequisistlán, Route 190, km 691, little shallow stream in oak woodland {16.4477°N, 96.0093°W}, 944 m, 28 July 1966, R. W. Cruden [UMMZ]; 4 ♂♂, 2 ♀♀, 43 mi W of Tehuantepec, at pool of mountain stream {16.4442°N, 95.8503°W}, 762–914 m, 22 August 1963, H. V. Weems, Jr. [FSCA]; 4 ♂♂, stream 11.6 mi E of Tapanatepec {16.4425°N, 94.0962°W}, 640 m, 2 August 1965, D. R. & M. L. Paulson [FSCA]; **Chiapas**: 1 ♂, stream 32.5 mi of NW Huixtla, 31 July 1965, D. R. Paulson [FSCA]; 1 ♂, stream 4.4 mi W Pichucalco {17.5103°N, 93.1708°W}, 90 m, 4 July 1965, D. R. & M. L. Paulson [FSCA]; 2 ♂♂, stream 22 mi N of Ocozocoautla {16.8°N, 93.4°W}, 609 m, 20 July 1965, D. R. Paulson [FSCA]; 5 ♂♂, stream 21.4 mi N of Ocozocoautla, 21 July 1965, D. R. & M. L. Paulson [FSCA]; 3 ♂♂, stream 5.8 mi N of Escopetazo {16.7771°N, 16.7771°E}, 1158 m, 11 July 1965, D. R. Paulson [FSCA]; 2 ♂♂, 8.2 mi NE of Arriaga {16.2°N, 93.9°W}, 365 m, 25 July 1965, D. R. & M. L. Paulson [FSCA]. **BELIZE**, **Cayo**: 2 ♂♂, 2 ♀♀, stream 6 mi W of Belmopan on W Highway at Ontario Village, 17.2272°N, 88.8617°W, 45 m, 11 June 1986, S. W. Dunkle [FSCA]; 5 ♂♂, small stream 3 mi W of Ontario Village on W Highway, narrow shady riffles and wider pools {17.2239°N, 88.9258°W}, 54 m, 20 March 1986, S. W. Dunkle [FSCA]; 1 ♂, W of Unitedville at Unitedville School, tributary to Belize River {17.2158°N, 88.9435°W}, 70 m, 30 May 1993, W. F. Mauffray [FSCA]; 1 ♂, Rio Frio at Augustine, a small forest stream partly in a cleared area, riffle and quiet stretches {16.9665°N, 88.9833°W}, 500 m, 23 March 1986, S. W. Dunkle [FSCA]; 4 ♂♂, Smokey Branch, Maya Mountains, {16.55°N, 89.03°W}, 850 m, 23–28 March 1994, S. J. Brooks [BMNH]; 1 ♂, stream and small torrent tributary 24.2 mi SE of Belmopan on Hummingbird Highway, rocky, 28 March 1986, S. W. Dunkle [FSCA]; 2 ♂♂, 1 ♀, small forest stream 22.1 mi SE of Belmopan on Hummingbird Highway, rocky, also seepages, 27 March 1986, S. W. Dunkle [FSCA]; **Toledo**: 2 ♂♂, Medina Bank at Deep River {16.4419°N, 88.7448°W}, 20 m, 7 June 1993, W. F. Mauffray [FSCA]; 1 ♂, 1 ♀, Rio Blanco, E of Rio Blanco Village {16.2297°N, 89.1086°W}, 252 m, 6 June 1993, S. W. Dunkle [FSCA]. **GUATEMALA**, **El Peten**: 8 ♂♂, Betrel {16.8°N, 90.8167°W}, 115 m, 2–3 November 2001, P. Johnson [RWG]; **Chiquimula**: 1 ♂, 2 ♀♀, Chiquimula {14.8°N, 89.55°W}, 419 m, November 1930, J. J. White [FSCA]; **Escuintla**: 4 ♂♂, 1 ♀, Escuintla, Finca El Salto {14.305°N, 90.785°W}, 355 m, 26–27 June 1977, M. J. Westfall, Jr. [FSCA]. **HONDURAS**, 1 ♂, 110 miles up Río Patuca, 4 May 1947, C. W. Cook [FSCA]; **Atlántida**: 2 ♂♂, 1 ♀, about 25 km W of Tela, small streams in forest {15.6167°N, 87.6167°W}, 700 m, 9 March 1990, S. W. Dunkle [FSCA]; **Comayagua**: 3 ♂♂, Río Yure, SE of San Isidro, clear, rocky, tropical forest {14.5261°N, 87.8186°W}, 13 December 1987, S. W. Dunkle [FSCA]. **EL SALVADOR**, La Libertad Department: 1 ♂, Tamanique {13.5983°N, 89.4203°W}, 1000 m, 31 October 1970, S. & L. Steinhauser [FSCA]. **NICARAGUA**, **Matagalpa**: 1 ♂, 10.8 mi NE of Matagalpa {12.9994°N, 85.8165°W}, 883 m, 23 August 1964, F. G. Thompson [FSCA]; **Rivas**: 3 ♂♂, San Juan del Sur, road just S of town, 11.2278°N, 85.8241°W, 80 m, 16 December 2005, R. M. Caesar & A. Gillogly [RWG]; **COSTARICA**, **Guanacaste**: 1 ♂, El Hacha, Quebrada Alcomoque, Guanacaste National Park, 11.009°N, 85.577°W, 600 m, 26 July 1987, Hozenthal, Morse, Clausen [FSCA]; 1 ♂, Parque Nacional Guanacaste, primera quebrada, L-03-896 {10.9578°N, 85.4969°W}, 600 m, 8 May 1989, M. Barrelier [UNH]; 1 ♂, Parque Nacional Santa Rosa, L03-1209 {10.8546°N, 85.6099°W}, 295 m, 11 July 1989 [UNH]; 2 ♂♂, Parque Nacional Santa Rosa, Ojo de Agua La Penca, L09-223/225 18 August 1990, D. Acevedo & E. Rojas [UNH]; 4 ♀♀, small stream on Route 145 just E of Tilarán {10.4636°N, 84.9722°W}, 531 m, 27 February 1987, S. W. Dunkle [FSCA]; 1 ♂, 2 ♀♀, Río Diria, W of Santa Cruz {10.2569°N, 85.5859°W}, 61 m, 20–23 January 1910, P. P. Calvert [FSCA]; 1 ♀, same data but 14 March 1911, A. Alfaro [FSCA]; 1 ♂, Parque Nacional Guanacaste, Estación Murciélago {10.0667°N, 85.7°W}, 100 m, 10–30 February 1980 [BMNH]; 1 ♂, 1.2 mi E of Caimital {10.0615°N, 85.4605°W}, 304 m, 23 January 1910, F. G. Thompson [FSCA]; **Alajuela**: 1 ♂, 8 km S of Santa Cecilia, Estación Biológica Pitilla {10.9891°N, 85.4258°W}, 680 m, July

1988, S. J. Brooks [BMNH]; 1 ♂, Atenas Station, Quebrada de Salas {9.9817°N, 84.3803°W}, 700 m, 21 December 1909, P. P. Calvert [FSCA]; 3 ♂♂, same data but 8 April 1910 [FSCA]; 1 ♀, same data but 7 May 1916 [FSCA]; 3 ♂♂, along Río Brazil, 940 m, 9 December 1909, P. P. Calvert [FSCA]; 1 ♂, 1 ♀, Río Siquiaries and railroad W of Turrúcares {9.9667°N, 84.3167°W}, 640 m, 14–16 August 1909, P. P. Calvert [FSCA]; 3 ♂♂, Río Tizate S of Turrúcares, 610 m, 23–26 December 1909, P. P. Calvert [FSCA]; 1 ♂, Turrúcares, L-03-49 {9.9642°N, 84.3325°W}, 610 m, 16 April 1988, C. Esquivel-Herrera [UNH]; 11 ♂♂, 3 ♀♀, Bonnefil Farm, Río Surubres {9.9332°N, 84.5167°W}, 147 m, 16–18 October 1909, P. P. Calvert [FSCA]; 1 ♂, 1 ♀, 2 mi SW of Ojo de Agua, streams and forest, 850 m, 21 October 1966, D. R. Paulson [FSCA]; **Puntarenas Province**: 4 ♂♂, 1 ♀, near Sardinal along road to finca del Coco; dry lowland forest with secondary and remnant primary trees along ravine and stream, {10.35°N, 85.65°W}, 757 m, 3 March 1984, A. M. Young, J. Jass, S. Sullivan Borkin [USNM]; 2 ♀♀, unmarked road 3 km W of Miramar, {10.0878°N, 84.7533°W}, 295 m, 13 May 1995, B.O. Huntsman & R. W. Baumann [BYU]; 4 ♂♂, 1 ♀, bosque Los Negritos about 2 km N of the entrance to Miramar, Carretera Interamericana, L-03-1159/ 1228/1230/ 1389 {10.0833°N, 84.7167°W}, 60 m, 16 March–8 June 1990, C. Esquivel-Herrera & T. B. Herman [UNH]; 2 ♂♂, 8.1 mi WNW Esparta, stream {9.9833°N, 84.6668°W}, 60 m, 26 August 1966, D. R. Paulson [FSCA]; 2 ♂♂, same data but 28 September–24 October 1966, D. R. & M. L. Paulson & R. P. Seifert [FSCA]; 1 ♂, about 15 km N of Puntarenas, Barranca site, semi-dry tropical forest along Pan American Highway {9.9667°N, 84.8333°W}, 757 m, 2 March 1984, A. M. Young, J. Jass, S. Sullivan & Borkin [USNM]; 1 ♂, Reserva Biológica Carara, Quebrada Bonita, L-09-061, 9.775°N, 84.604°W, 35 m, 19 November 1988, C. Esquivel-Herrera [UNH]; 1 ♀, same data but 18–20 May 1990, R. Hozenthal & R. J. Blahnik [RWG]; 2 ♂♂, same data but L-03-889, July 1991, C. Esquivel-Herrera [UNH]; 3 ♂♂, 3 ♀♀, same data but L-03-694/ 861/ 884, 21–27 December 1991 [UNH]; 6 ♂♂, 1 ♀, a few km inland of Ojochal on main road of town, 9.0875°N, 83.6472°W, 40 m, 6 January 2007, F. C. Sibley [FSCA]; 4 ♂♂, same data but 8 March 2009 [FSCA]; 1 ♂, same data but 28 March 2011 [FSCA]; 1 ♂, just S of Palmar Sur {8.9443°N, 83.4688°W}, 18 m, 30 March 1961, W. H. Cross [FSCA]; 1 ♂, 2 mi SE of Palmar del Sur {8.9328°N, 83.4483°W}, 11 m, 28 March 1961, W. H. Cross [FSCA]; 1 ♂, Coto Brus Canton, San Vito {8.8333°N, 82.9667°W}, 996 m, 30 September 1986 [FSCA]; 2 ♀♀, Parque Nacional Isla del Caño, L-09-23 {8.7079°N, 83.882°W}, 1400 m, 14 March 1984, C. Esquivel-Herrera [UNH]; 1 ♂, La Gamba, Pacific slope, stream gallery forest strip in open landscape, L-03-1335, {8.703°N, 83.1875°W}, 80 m, February 2007, S. Schneeweih & F. Hofhansl [UNH]; 1 ♂, Rincón, Peninsula de Osa {8.7°N, 83.4833°W}, 13 m, 25 July 1964, F. G. Thompson [FSCA]; 1 ♂, same data but 13 November 1966, D. R. & M. L. Paulson [FSCA]; 1 ♂, same data but waterfall stream, 10 March 1969, D. R. Paulson [FSCA]; 1 ♀, Parque Nacional Corcovado, L09-227 {8.5708°N, 83.5056°W}, 5 April 1982, C. Esquivel-Herrera [UNH]; 1 ♀, same data but 29 December 1988 [UNH]; **Limón**: 1 ♂, approx. 20 km SE of Siquirres, Las Brisas de Pacuarito; L-09-138, {10.1°N, 83.5°W}, 59 m, 2 February 1990, C. Esquivel-Herrera & T. B. Herman [UNH]; **San José**: 2 ♂♂, river in Monterrey de San Cristobal, L03-1142 {9.9381°N, 84.0414°W}, 9 April 1989, B. Gonzales & C. Esquivel-Herrera [UNH]; 2 ♂♂, Campus Universidad para la Paz, 7 km W of Ciudad Colón, L-07-092 {9.9187°N, 84.2768°W}, 852 m, 8 July 1988, C. Esquivel-Herrera [UNH]; 4 ♂♂, 1 ♀, Hacienda El Rodeo, 7 km W of Villa Colón, L07-048/ 1126 {9.9136°N, 84.2694°W}, 859 m, 22 April 1988, C. Esquivel-Herrera [UNH]; 2 ♂♂, 2 ♀♀, same data but L03-1122/ 1113/ 1148, 22 April–25 May 1990, T. B. Herman [UNH]; 1 ♂, 1 ♀, same data but IORI # 00085389, 20 February 1994 [FSCA]; 2 ♂♂, same data but L03-883, 16 March 2000 [UNH]; 1 ♂, 1 ♀, same data but L03-1149, August 2001, C. Esquivel-Herrera [UNH]; **Cartago**: 3 ♂♂, Reventazón Valley below Juan Viñas (formerly Infiernillo) {9.9°N, 83.75°W}, 762 m, 25–28 June 1909, P. P. Calvert [FSCA]; 1 ♂, Palo Verde, Ojo de Agua, L03-235 {9.7833°N, 83.95°W}, January 1981 [UNH]. **PANAMA, Chiriquí**: 1 ♀, Potrerillos, 8.65°N, 82.4833°W, 664 m, 8 February 1935, J. W. MacSwain [UMMZ]; **Ngäbe Buglé**: 2 ♂♂ #, Jirondai District, Büri Corregimiento, S of Willie Mazu pond, Highway 10, 8.8133°N, 82.1808°W, 430 m, 5 April 2017, J. J. Daigle [JJD]; **Veraguas**: 1 ♀, 10 km S of Santa Fe, 8.4403°N, 81.0578°W, 350 m, 22 January 1987, E. S. Ross [CAS]; 1 ♂, Corozal {8.0822°N, 81.4365°W}, 175 m, 17 April 1937, R. Bliss [FSCA]; **Colón**: 1 ♂, Río Rita Arriba, Sierra Llorona Lodge, Ojo de Agua Trail, 12x090, 9.3463°N, 79.7736°W, 210 m, 22 August 2012, J. C. Michalski [FSCA]; 1 ♂, same data but 12x092, 9.341°N, 79.7753°W, 220 m, 23 August 2012, T. W. Donnelly [FSCA]; 1 ♂, same data but stream on Nances Trail, 12x101, 9.3428°N, 79.7744°W, 180 m, 25 August 2012, J. C. Michalski [FSCA]; 1 ♂, Anchiote Toad (S11) {9.2036°N, 79.9887°W}, 35 m, 15 June 1974, M. L. May [FSCA]; **Panamá**: 1 ♂, Barro Colorado Island {9.15°N, 79.85°W}, 62 m, 8 January 1946, D. W. Jenkins [FSCA]; 1 ♀, same data but 24 August 1978, R. B. & Lynn S. Kimsey [RWG]; 1 ♂, same data but 17 January 1981, O. Fincke [FSCA]; 1 ♂, same data but 19–20 June 2006, M. E. Epstein [RWG]; 1 ♀, Cabima Pan (Pacific slope) {9.1308°N, 79.5271°W}, 144 m, 16–31

May 1911, A. Busck [FSCA]; 1 ♀, Gamboa {9.1°N, 79.7°W}, 29 December 2002, K. Kemp [BYU]; 2 ♂♂, 1 ♀, Forest preserve near Summit {9.0667°N, 79.6668°W}, 75 m, 15 April 1961, W. H. Cross [FSCA]; **Panamá Oeste:** 1 ♂, El Valle, Mata Ahogado, stream, 8.6211°N, 80.0973°E, 700 m, 6 June 2010, A. J. & T. W. Donnelly [FSCA]; **Kuna Yala:** 1 ♀, Quebrada Pingadi, 9 km N of Nusagandi [sic Navagandi], small spring-run, {9.0167°N, 77.8°W}, 12 m, 1 March 1985, O. S. Flint, Jr. & J. J. Louton [RWG]; **Darién:** 1 ♀, Cerro Chucantí, base camp, 8.7919°N, 78.4515°W, 875 m, 13–16 February 2012, L. G. Bezark [RWG]. **COLOMBIA, Cundinamarca:** 1 ♀, El Colegio, Vereda El Triunfo W of Viota, {4.5499°N, 74.4833°W}, 1160 m, 23 February 1997, M. García [FSCA]; **Meta:** 1 ♂, Villavicencio, ca. 1.2 km N on Carrera 30, Bosque Bavaria, upstream along unnamed stream, tributaries, seeps and waterfalls, 4.175°N, 73.6417°W, 470 m, 13 October 2014, K. Tennessen & W. F. Mauffray [FSCA]; **Valle del Cauca:** 1 ♂, Río Anchicaya, Carretera al Mar {3.65°N, 76.9333°W}, 320 m, 2 May–19 June 1969, G. Wolffhugel [RWG]; 1 ♂, Bajo Anchicayá, Embalse del Bajo Anchicayá, 3.6192°N, 76.9111°W, 212 m, 23 February 1986, M. Suarez-Toledo [FSCA]; 1 ♂, near El Queremal, 3.5245°N, 76.7071°W, 1500 m, 25 January 1986, M. Suarez-Toledo [FSCA]. **VENEZUELA, Carabobo:** 1 ♀, San Esteban {10.4167°N, 64.0667°W}, 231 m, 18 March 1971, F. Fernandez Y. & J. Salcedo [FSCA]; **Mérida:** 1 ♀, Finca El Alto, area Manzana Blanca {8.6175°N, 71.1057°W}, 1600 m, 6 July 1991 [FSCA]. **TRINIDAD, St. George:** 1 ♀, forest and small stream along trail called Indian Walk Ride off main road, 1.9 mi N of Cumuto, 10.5833°N, 61.2°W, 57 m, 11 January 1981, R. W. Garrison [RWG]. **GUYANA:** 3 ♀♀, S. H. Williams [FSCA]. **FRENCH GUIANA, Guyane Department:** 1 ♂, Mount Mahury {4.8732°N, 52.2618°W}, 130 m, 16 August 1970, W. W. Benson [RWG]; 1 ♂, Route de Kaw, PK 33.5 {4.7167°N, 52.2°W}, 4 m, 31 January 1987, P. J. Claussen & C. Kondor [RWG]; 1 ♂, Amazon Nature Lodge, 30 km SE on Kaw Road, 4.5595°N, 52.2072°W, 300 m, 5–19 February 2010, J. E. Eger [RWG]; 1 ♂, Cacao, 4.5833°N, 52.4667°W, 22 m, 30 August 2001, P. Johnson [RWG]. **ECUADOR, Esmeraldas:** 2 ♂♂, Seepages along RR track, 1 km NW of Lita, 0.8825°N, 78.4599°W, 514 m, 5 February 1997, J. J. Daigle [RWG]; **Pichincha:** 2 ♂♂, 1 ♀, San Miguel de Los Bancos; Recinto Milpe, Milpe Bird Sanctuary, Mirador Uno Trail, 0.0333°N, 78.8661°W, 1101 m, 4 September 2018, W. F. Mauffray [FSCA]; **Santo Domingo de los Tsáchilas:** 1 ♂, steep trickle about 4 km E of La Unión del Toachi, Highway 30 {0.3336°S, 78.87°W}, 1210 m, 27 February 2010, K. J. Tennessen [FSCA]; 3 ♂♂, stream, Tinalandia, E of Santo Domingo, Highway 30 {0.3°S, 79.0667°W}, 800 m, 31 January 1997, K. J. Tennessen & W. F. Mauffray [FSCA]; 4 ♂♂, forest stream at Hotel Tinalandia, 7.3 km W of Alluriquín, 0.275°S, 79.0832°W, 670 m, 20 July 1977, D. R. Paulson [RWG]; **El Oro:** 1 ♂, 12 km E of Arenillas, Highway 25; stream, 3.5244°S, 79.983°W, 30 m, 9 April 2008, K. J. Tennessen [FSCA]. **BRAZIL:** 1 ♂, J. Smith [FSCA]; **Paraíba** [locality erroneous, more likely from French Guiana]: 5 ♂♂, 2 ♀♀ July 1962 [FSCA]; **Para:** 1 ♂, Santaremsinho [Santarenzinho], Rio Tapajoz [Tapajos] {2.4282°S, 54.7502°W}, 15 m, July 1961, R. von Diringshofen [MZSP]; 5 ♂♂, same data but July–August 1962 [MZSP]; 3 ♂♂, same data but July–October 1963 [MZSP]; **Rondônia:** 3 ♂♂, 3 ♀♀, Fazenda Rancho Grande, 62 km SW of Ariquemes, 10.53°S, 62.8°W, 165 m, 19–25 April 1991 [FSCA]; 3 ♂♂, 1 ♀, 60 km S of Ariquemes, Fazenda Rancho Grande, farm of Harald Schmitz and environs within about 15 km radius; L-03-1333, 10.5167°S, 62.8°W, 165 m, 16–24 March 1989, S. W. Dunkle [UNH]; **Mato Grosso:** 1 ♀, May 1978, H. Ebert [FSCA].

A medium-size species (Table 2); male blue (Figs. 97, 100, 351, 352, 980, 981) or violaceous and black (Figs. 98, 99, 350) with a characteristic appendage morphology comprising cercus with an anteapical decumbent inner branch (tooth) and dorsal surface of dorsal branch of paraproct usually slightly convex in mediodorsal and lateral views (Figs. 712a, b), as well as unique genital ligula morphology with ental surface of distal segment distal to flexure enlarged in the form of a semicircular or keel-like medio-longitudinal membranous process (Figs. 630, 631); female paler than male (Fig. 982), with gently raised convex mesostigmal lobe occupying medial half to fourth of mesostigmal plate (Figs. 549–551).

Diagnosis. Both sexes of *A. oculata* were discussed in full by Garrison & von Ellenrieder (2015) and also redescribed in Westfall & May (2006). This is a species highly variable in color and maculation which, as the synonymy shows, was associated incorrectly with the South American *A. difficilis* Selys. Garrison & von Ellenrieder (2007, 2015) explained the confusion and misapplication of both names to various taxa. Within its range in Mexico and Central America, male of *A. oculata* can almost always be separated from all congeners by the shape of the caudal appendages (Fig. 712) and genital ligula (Figs. 630, 631). The combination of a divided cercus with the decumbent inner anteapical branch (tooth) and the broadly triangular dorsal branch of the paraproct with the gently convex dorsal margin whose tip is acute is unique to this species. The genital ligula in *A. oculata* has a semicircular microspinulate ental pouch (Figs. 630a, c, 631a) that is also present in *A. rogersi* (Fig. 642a) and, to a lesser extent,

in *A. translata* (Figs. 654a, c). Both sexes of *A. oculata* always have a pair of pale postocular spots (Figs. 97, 98, 100, 230, 231, 980–982); these spots are absent in *A. rogersi* (Figs. 123, 124, 246, 247, 983–986). The round undivided cercus of *A. rogersi* (Fig. 727) and *A. translata* (Fig. 744) easily distinguish these two species from *A. oculata*.

Female *A. oculata* may be more difficult to distinguish, given the variability in morphology of the mesostigmal plates as shown in Figs. 549–551, which accounts for its inclusion in three places in the female key. The mesostigmal lobe is usually evenly convex and occupies the medial half (Fig. 549) to fourth (Fig. 550) of the mesostigmal plate. However, some specimens approach the shape depicted in Figure 551c, where the mesal margin of mesostigmal lobe forms a shallow concavity with the lateral branch of middorsal carina in dorsal view. Female *A. oculata* with an entirely or largely black labrum may be confused with *A. adamsi*, but in *A. oculata* the mesostigmal lobe in anterior view is wider than long (Figs. 549a–551a), and the ovipositor (excluding styli) does not extend beyond distal tip of cerci (Figs. 458, 459); in *A. adamsi*, mesostigmal lobe in anterior view is longer than wide or as long as wide (Figs. 493a, b) and the ovipositor (excluding styli) extends beyond distal tip of cerci (Figs. 400–402). Females of *A. oculata* with a pale labrum may be confused with *A. sabino* and *A. tarascana*. The mesostigmal lobe in *A. oculata* is gently convex (Figs. 549, 550), the rear of head and ovipositor are largely black, and black markings accompany S8–9 (Figs. 458, 459). In *A. sabino* and *A. tarascana*, the mesostigmal lobe is subquadrate (Figs. 567, 575), the rear of head and ovipositor are largely pale, and S8–9 are entirely pale (Figs. 474, 479).

Remarks. Within Central America, males of *A. oculata* occur in both blue (Figs. 97, 100, 980, 981) and violaceous (Fig. 98) forms. As noted by Paulson & Haber (2021) for Costa Rica, the blue form is generally found on the Caribbean slope and the violaceous form occurs on the Pacific slope and Central Valley, but there are exceptions. The occurrence of both forms within Mexico and elsewhere in Central America has yet to be adequately documented, though all the males we have seen from Mexico correspond to the blue form.

Middle American males with a greater amount of overall blue markings coupled with bilobed black antefrons and longer pale middorsal stripes on middle abdominal segments (e. g., Figs. 97, 980) versus transverse black antefrons and restricted pale markings on the middle abdominal segments (e. g., Figs. 98, 100, 981) were labeled by the late L. K. Gloyd as “maximum-blue” and “minimum-blue,” respectively, as compared to the “true” (Venezuela) *A. oculata* (Westfall & May 2006). Gloyd later (unpublished) associated the “maximum blue” form of *A. oculata* which was known from Trinidad and elsewhere as *A. eliptica* Selys based on examination of Selys’ syntype male in August 1977. Garrison & von Ellenrieder (2015) demonstrated that the antefrons ranged from entirely blue to blue with bilobed black margin to entirely black with black extending ventrally from the postfrons to the frontoclypeal suture, suggesting that all these phenotypes represent intraspecific variation.

Habitat. Upton *et al.* (2007) noted that in Sonora, larger, bluer individuals, some showing small dorsolateral spots on S8–9, occurred in the flat stretches of rivers traversing Montezuma bald-cypress forests in the Alamos Municipality, and smaller, and/or more purplish individuals without the dorsolateral spots were found in steep, palm canyons in the Guaymas and Onavas Municipalities. The species has also been seen along small, heavily canopied, mountain streams in pine-oak woodland in Yécora Municipality. A female from Hidalgo, Mexico, was collected by J. J. Daigle while ovipositing in tandem with a male of *A. ulmeca*.

Distribution. This common species is widely distributed, occurring from S Arizona (photographic record), Sonora and Nuevo León in Mexico south into Central America (Fig. 794) and almost all of N South America with numerous records from the Guyanas and Venezuela. We have seen no specimens from the central plateau of Mexico. In Central America it is found between 4 and 1980 m.

***Argia oenea* Hagen in Selys, 1865**

Figs. 18 (head, ♂, 19 (head ♀); 26 (labrum ♀); 101, 102 (head, thorax, S1–4 ♂); 232 (head, thorax, S1–4 ♀); 232, 233 (thorax ♀); 353, 354 (S7–10 ♂); 460 (S7–10 ♀); 552, 553 (mesostigmal plates ♀); 632 (genital ligula); 713 (appendages ♂); 790 (map); 961, 962 (body scan ♂); 963 (body scan ♀).

[Key locators: ♂ G-4, couplet 4(2’); ♂ M-1, couplet 3(1’); ♀ F-13, couplet 2(1’); ♀ shortcut 6]

Argia oenea Hagen in Selys 1865: 407 [35 reprint] (redescription, Mexico);—Calvert 1895: 481 (description ♂, Baja California, Mexico, figs. 21, 22);—Calvert 1901: 71 (key ♂);—Calvert 1902: 85 (key, description ♂, ♀, pl. IV, figs. 10, 43, 44, 44s);—Calvert & Hagen 1902: 112 (“Type ♂ in M. C. Z.”);—Calvert 1907: 372 (further notes on ♀);—Gloyd 1932: 189 (first U. S. A. record, Arizona);—Calvert 1947: 604 (material in CAS);—Paulson 1982: 253 (U. S. A., south to Panama);—

Paulson 1984: 51 (El Salvador);—Dunkle 1988: 45 (Honduras);—Maes *et al.* 1988: 34 (Nicaragua);—Maes *et al.* 1989: 6 (Nicaragua);—Donnelly 1992: 83 (Panama);—Novelo-Gutiérrez 1992: 53 (description larva, figs. 7, 17, 35, 43, 57, 81, 91);—González-Soriano 1993: 295 (Mexico);—Peña-Olmedo & Novelo-Gutiérrez 1993: 129, 139 (key ♂, ♀, Hidalgo, Mexico, figs. 43, 59);—Garrison 1994: 321 (key, diagnosis, figs. 2, 59, 81);—Boomsma & Dunkle 1996: 25 (Belize);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Förster 2001: 11, 54, 58 (key ♂, ♀, fig. C24);—Abbott *et al.* 2002: 126 (Nicaragua);—Alonso-Eguía *et al.* 2002: 352 (Moctezuma basin, east-central Mexico);—Paulson 2002b: 368 (Nayarit, Mexico);—Abbott 2005a: 309 (new record for Texas);—Abbott 2005b: 171 (Texas);—Esquivel 2005: 145 (comparison with *A. cupraurea*);—Westfall & May 2006: 144, 149, 162, 204 (keys ♂, ♀, larva, description, figs. 85I, 94B, 99F, 103B);—Behrstock *et al.* 2007a: 57 (Chihuahua, Mexico);—Cuevas-Yañez 2007: 86 (Puebla, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Upson *et al.* 2007: 31 (Sonora, Mexico);—González-Soriano *et al.* 2008: 310 (Morelos, Mexico);—Bailowitz *et al.* 2009: 16 (Nayarit, Mexico)—Caesar & Wenzel 2009: 106 (phylogeny within genus *Argia*);—Paulson 2009: 178 (♂, ♀, description, diagnosis, photos);—Gómez-Anaya & Novelo-Gutiérrez 2010: 292 (Michoacán, Mexico);—Abbott 2011: 148 (♂, ♀, figs., diagnosis, distribution in Texas);—González-Soriano & Paulson 2011: 307 (Chiapas, Mexico);—González-Soriano *et al.* 2011: 184 (San Luis Potosí, Mexico);—Bailowitz *et al.* 2012: 9 (El Salvador);—Bailowitz *et al.* 2013: 15 (SE Arizona);—Garrison & von Ellenrieder 2013: 16 (Costa Rica);—Escoto-Moreno *et al.* 2014: 1051 (Hidalgo, Mexico);—Bailowitz *et al.* 2015: 134 (diagnosis, photos, Sonora);—González-Soriano *et al.* 2016: 156 (Colima, Mexico);—Garrison & von Ellenrieder 2017: 8 (diagnosis, comparison with other metallic red species, key ♂, ♀ for Middle American metallic red species, figs. 3, 4, 8, 15, 16, 37, 38, 61, 62, 86, 88, 109, 110, 131, 150, 166, photo 175);—Nava-Bolaños *et al.* 2017: 808 (reproductive isolation, fig. 1C);—Torres-Pachón *et al.* 2017: 413 (molecular phylogeny of larvae within *Argia*);—Novelo-Gutiérrez & Gómez-Anaya 2021: 442 (diagnosis against larva of *A. cuprea*, figs. 7c–d, 8b);—Paulson & Haber: 2021: 83 (diagnosis, photos).

Argia aenea: Kirby 1890: 138 (catalog);—Ris 1918: 111, 112, 114 (key, Mexico, Guatemala, Panama).

Argia (Chalcargia) oenea: Kennedy 1920: 85 (type of subgenus *Chalcargia*).

Types. *Argia oenea*: Apparently lost according to Garrison 1994: “This species was described from one male from “Cordova (Mexique), Terres-Chaudes, par de Saussure.—Tampico, and is stated to be in the Hagen collection (“Coll. Hagen.”). There is a specimen in the MCZ which does not carry an MCZ type label. Its data are “Tampico./ (T[erres] Chaudes.”, “A. calidum. N.A.N. [Neuroptera of North America] p. 93/ Nota [illegible]! on *A. oenea* -/ at [?] *cuprea*. jun.” A penciled note by L.K. Gloyd reads: “probably / *A. oenea* L.K.G.” This was the specimen tentatively identified as *Agrion calidum* by Hagen (1861: 93) and was probably one of the syntypes used in the original description of that species: “I saw a male taken at the same place (Tampico [Mexico]), allied to this species [*A. calida*], but the epistoma was brassy-green, the sides of the thorax had no middle black line; the appendages destroyed. Is it a distinct species?” I examined this specimen at the MCZ in 1991. It lacked the last four abdominal segments. The original description appearing four years after Hagen had written about this one, describes the type with abdominal segments “8–10 pale blue”. Thus, this specimen cannot be the type of *A. oenea*. I have been unable to locate the type.”

Specimens examined. 550 ♂♂, 210 ♀♀ (see Garrison & von Ellenrieder 2017 for additional material examined not listed here): **U. S. A., Arizona:** 1 ♀, Hot Springs Canyon, about 2 mi by foot NW of Hookers Hot Springs, 32.3525°N, 110.247°W, 1250 m, 21 September 1996, R. W. Garrison [RWG]. **MEXICO, Nayarit:** 1 ♀, Jumatán {21.6442°N, 105.036°W}, 360 m, 12 July 1981, P. Escalante [CSCA]; **Jalisco:** 2 ♂♂, 2 ♀♀, ca 4 km SW of La Huerta, Route 80 at km 1104–1105, shallow clear running water, 19.4558°N, 104.651°W, 500 m, 30 August 1966, R. W. Cruden [CSCA, UMMZ]; **Guerrero:** 2 ♂♂, 2 ♀♀, Yoloxochitl {16.8159°N, 98.687°W}, 600 m, 28 June 2011, J. D. Amith [FSCA]; **Chiapas:** 1 ♀, 10 mi W of Tuxtla Gutiérrez {16.7687°N, 93.2864°W}, 1300 m, 21 June 1955, R. B. & J. M. Selander [UMMZ]. **GUATEMALA, Zacapa:** 1 ♂, 1 ♀, Gualán {15.104095°N, 89.360678°W}, 138 m, 12 June 1909, E. B. Williamson [UMMZ]. **NICARAGUA, Granada:** 1 ♀, Domatila-Pital River, spring area of Río Dorado, FCS03-0752, 11.7019°N, 85.9517°W, 40 m, 24 August 2003, F. C. Sibley [FSCA]; 1 ♂, 1 ♀, same data but E of Hotel, FCS03-0823, 11.7117°N, 85.95°W, 40 m, 26 August 2003 [FSCA]. **COSTA RICA, Alajuela:** 1 ♂, San Miguel, Bijagua, 10.7239°N, 85.0664°W, 453 m, 23 May 2007, L. B. Chistensen & J. Johnson [BYU]; **Guanacaste:** 1 ♀, Santa Rosa River, 3.5 mi N of Cañas, 67-179 {10.4582°N, 85.1021°W}, 430 m, 26–28 July 1967, D. R. & M. L. Paulson [FSCA]; **Puntarenas:** 1 ♀, 3 km W of San Andrés {8.9896°N, 83.2417°W}, 304 m, 7 August 1963, F. G. Thompson [FSCA]. **PANAMA, Panamá:** 1 ♀, Albrook Field, open stream with high grass {8.9736°N, 79.5578°W}, 5 m, 11 January 1937, R. Bliss [FSCA]; **Chiriquí:** 1 ♂, 1 ♀, David, San Pablo, Quebrada Sira, bridge to Cola {8.4811°N, 82.4168°W}, 17 September 2011, G. Caballero S. [UNH].

A medium-size species (Table 2); male with red eyes, a brilliant cupreous thoracic dorsum, dorsum of S1–6 largely blue, S7 black (Fig. 46), and labrum largely pale (Fig. 18); female (Fig. 963) with labrum lacking metallic coloration (Fig. 19) or with only a medial basal spot (Figs. 26, 232a), S3–5 with relatively broad spindle-shaped pale

mark dorsally (Fig. 232b), mesostigmal lobe arcuate (Figs. 552b, 553b) with its upper portion not thickened (Fig. 511e), and mesepisternal tubercles rarely present (Figs. 553c, e) but more commonly lacking (Fig. 552c).

Diagnosis. This species was diagnosed and keyed with other metallic red species for Middle America by Garrison & von Ellenrieder (2017), and both sexes were redescribed by Westfall & May (2006). Male of *A. oenea* is one of four metallic red species occurring in Mexico and Central America and is diagnosed under *A. calverti*, *A. cupraurea* and *A. cuprea*. Both sexes of *A. oenea* can generally be distinguished from the three species mentioned above by the largely pale labrum, Figs. 18, 26 (labrum in other three species with metallic coloration at basal half, e. g., Fig. 24, or more, Figs. 23–25).

Remarks. Calvert (1901) separated males of *A. oenea* and *A. orichalcea* by the following couplet: “Segments 3–6 blue or violet on dorsum, apical fifth black; 7 black, 8–10 blue on dorsum....*oenea*; Segments 3–8 black on dorsum, basal half of 3–6 blue; 9–10 blue....*orichalcea*.” His characterization of *A. orichalcea* in the above couplet would seem to apply more to *A. jocosa* Hagen in Selys (Garrison & von Ellenrieder 2018, fig. 51) than to *A. orichalcea*, as all males of the latter species have only a narrow pale (violaceous) basal ring on S3–7 (Garrison & von Ellenrieder 2018, figs. 19, 54).

Calvert (1902) included *A. orichalcea* as occurring in the Central American fauna (La Chorrera, Panama) based on Kirby (1899), but Kirby’s description of the abdomen (“...Tergum of abdomen blue, with an annular black fascia at the apex of each tergite”) makes it clear that his record pertains to *A. oenea*. His statement “Tergite 8 almost entirely black” presumably applies to S7, not S8, as S8 in both *A. oenea* and *A. orichalcea* is pale.

Westfall & May (2006) separated females of *A. cuprea* (mesepisternal tubercles clearly present) from *A. oenea* (mesepisternal tubercles absent). Females of *A. oenea* from two localities within Veracruz (Parque Clavijero, Río Maquinas) have prominent mesepisternal tubercles (Fig. 553c, e), although we have not observed this condition in any other females of this species.

González-Soriano & Novelo-Gutiérrez (2007) noted that individuals of populations of *A. oenea* inhabiting humid regions in Mexico differ in coloration with respect to populations inhabiting drier zones, the former being blue and the latter violet.

Two errors in Garrison & von Ellenrieder (2017) are noted as follows: fig. 131 of the genital ligula labeled as “ECUADOR, W of Villa Colón” should be “COSTA RICA, W of Villa Colón” and fig. 174 labeled as *A. oenea* is really *A. cupraurea*.

Argia oenea, along with *A. cuprea* (see under the latter species), was treated in the molecular phylogenetic analyses of adults by Caesar & Wenzel (2009) and of larvae by Torres-Pachón *et al.* (2017). Novelo-Gutiérrez & Gómez-Anaya (2021), based on morphological analyses of larvae, agreed with Caesar & Wenzel (2009) in a closer relationship among *A. cuprea*, *A. oenea*, and *A. orichalcea*, and we agree with Caesar & Wenzel (2009) and Novelo-Gutiérrez & Gómez-Anaya (2021) in considering *A. oenea* to be closely related to the South American *A. orichalcea*. We have been so far unable to find any significant morphological differences in the male genital ligula and appendages as well as in the female mesostigmal plates between these two allopatric species. *Argia orichalcea* seems to be essentially a violaceous *cuprea*-like morph of *A. oenea*, as color pattern seems to be the only means by which these two can confidently be separated. We are treating it as a valid species in this paper but suggest that farther studies, especially molecular, might show it to be a geographic color variant of *A. oenea*.

Distribution. *Argia oenea* has the widest distribution of the Middle American metallic red species, extending from Arizona, New Mexico and Texas in the United States and Baja California in Mexico south through Panama (Fig. 790); we have seen no records from South America and doubt its occurrence there. It appears to be absent from the Central Plateau in Mexico. In Central America it ranges from 5 to 2800 m. Males with pale violaceous colors (Figs. 101, 962) inhabit Arizona, New Mexico, W Texas and the W flank of Mexico including Baja California, Sonora, Sinaloa and Jalisco. The blue form (Figs. 102, 961) occurs along the E flank of Mexico south into Central America. We have examples of both violaceous and blue morphs taken together in sympatry from Hidalgo (Río Tecozautla).

Argia pallens Calvert, 1902

Figs. 103 (head, thorax, S1–4 ♂); 104, 105 (thorax ♂); 234 (head, thorax, S1–4 ♀); 355 (S7–10 ♂); 461 (S7–10 ♀); 554 (mesostigmal plates ♀); 633 (genital ligula), 714 (appendages ♂); 786 (map); 947 (body scan ♂); 948 (body scan ♀).

[Key locators: ♂ G-2, couplet 10'; ♂ M-4, couplet 5'; ♀ F-7, couplet 4', F-15, couplet 2(1')]

Argia violacea var. *pallens* Calvert 1902: 98 (description ♂, ♀, pl. IV, figs. 25, 61, 61s);—Calvert & Hagen 1902: 117 (“Types in Colls. Adams, Godman, Calvert, Deam.”);—Calvert 1907: 376 (key);—Kimmins 1970: 189 (syntype ♀ label data).

Argia pallens: Paulson 1982: 253 (synonymy of *A. solita* with *A. pallens*, recognition of specific rank for *A. pallens*, U. S. A., Mexico, Guatemala);—González-Soriano 1993: 295 (Mexico);—Garrison 1994: 322 (♂, ♀, key diagnosis, figs. 13, 49, 97);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Behrstock 2000: 6 (new record for Texas);—Abbott 2001: 198 (distribution in Texas);—Förster 2001: 56, 59, (key ♂, ♀, fig. C24);—Alonso-Eguía *et al.* 2002: 352 (Querétaro, Mexico);—Paulson 2002b: 362 (Nayarit, Mexico);—Abbott 2005a: 81 (♂, ♀, key, figs. 14, 17, photo 9f, distribution in New Mexico, Texas);—Westfall & May 2006: 206 (key, description, figs. 82D, 86C, 94C, 99G, 103C);—Behrstock *et al.* 2007a: 57 (Chihuahua, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Upson *et al.* 2007: 32 (Sonora, Mexico);—González-Soriano *et al.* 2008: 310 (Morelos, Mexico);—Caesar & Wenzel 2009: 102 (phylogeny within genus *Argia*);—Escoto-Moreno *et al.* 2009: 154 (Aguascalientes, Mexico);—Paulson 2009: 153 (♂, ♀, description, diagnosis, fig., photos);—Gómez-Anaya & Novelo-Gutiérrez 2010: 292 (Michoacán, Mexico);—Abbott 2011: 144 (♂, ♀, figs., diagnosis, distribution in Texas);—Escoto-Moreno *et al.* 2014: 1051 (Hidalgo, Mexico);—Bailowitz *et al.* 2015: 136 (diagnosis, photos);—Escoto-Moreno *et al.* 2015: 153 (Zacatecas, Mexico);—González-Soriano *et al.* 2016: 156 (Colima, Mexico);—Torres-Pachón *et al.* 2017: 415 (molecular phylogeny of larvae within *Argia*).

Argia solita Kennedy 1918: 256 (description ♂ figs. 1–4.);—Garrison & von Ellenrieder 2019: 45 (holotype data).

Types. *Argia fumipennis* var. *pallens*: holotype ♂, U. S. A., Tucson, Arizona, 20 April 1896, Charles C. Adams leg. [not examined, in ANSP] (<http://clade.ansp.org/entomology/detail.php?id=6172&return=%2Fentomology%2Fsearch.php%3Ffam%3D%26gen%3DArgia%26spe%3Dviolacea%26ssp%3D%26aut%3DCalvert%26cou%3D%26submitbut%3DSearch>);—*Argia solita*: holotype ♂, U. S. A., Arizona, C. U. Lot 35 [examined, in MCZ; Garrison & von Ellenrieder, 2019].

Specimens examined. 158 ♂♂, 46 ♀♀: **U. S. A., Arizona:** 2 ♂♂, Santa Maria River at Highway 93, 34.3693°N, 113.185°W, 535 m, 8 October 1990, R. W. Garrison [RWG]; 1 ♂, Agua Fria River just E of Highway 17 at Bumble Bee exit, 34.2331°N, 112.098°W, 950 m, 1 September 1994, R. W. Garrison [RWG]; 2 ♂♂, 1 ♀, Agua Fria River at Black Canyon City, 34.0617°N, 112.158°W, 590 m, 5 September 1983, S. W. Dunkle [RWG]; 1 ♂, Hassayampa River, 5 mi N of Wickenburg {34.0458°N, 112.726°W}, 670 m, 13 May 1937, L. K. Gloyd [RWG]; 6 ♂♂, 2 ♀♀, Seven Springs Picnic Ground, about 12 mi N of Carefree, Tonto National Forest, 33.9675°N, 111.8647°W, 1012 m, 17 August 1974, R. W. Garrison [RWG]; 1 ♂, same data but 1 August 1992 [RWG]; 3 ♂♂, 2 ♀♀, Cave Creek at end of Ocotillo Road, Cave Creek, 33.8436°N, 111.963°W, 630 m, 4 August 1992, R. W. Garrison [ONHI, RWG]; 3 ♂♂, Cave Creek at Ocotillo Road, Cave Creek, 33.8394°N, 111.9629°W, 619 m, 10 August 1975, R. W. Garrison [RWG]; 7 ♂♂, same data but 20 May 1977 [RWG]; 2 ♂♂, 1 ♀, same data but 10 August 1984 [RWG]; 13 ♂♂, 16 ♀♀ same data but 13 August 1995 [RMNH, RWG]; 5 ♂♂, 1 ♀, same data but 13 July 1998 [RWG]; 1 ♂, Sycamore Creek, Sugarloaf Mountain, 2 mi W of Highway 87, Forest Road 402, Tonto National Forest, 33.685°N, 111.512°W, 696 m, 23 July 1984, R. W. Garrison [RWG]; 7 ♂♂, 1 ♀, same data but 3 August 1992 [RWG]; 1 ♂, slough ponds by Verde River, by Highway 87, Fort McDowell Indian Reservation, 33.6758°N, 111.672°W, 31 August 1976, R. W. Garrison [RWG]; 4 ♂♂, 1 ♀, polluted stream below Ray Mine, by Highway 177 at turnoff to Kelvin, 5.2 mi N of Kearny, 33.1225°N, 110.975°W, 560 m, 23 July 1984, R. W. Garrison [RWG]; 4 ♂♂, Bonita Creek, 32.9289°N, 109.495°W, 1011 m, 18 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, same data but 29 September 2002, R. W. Garrison & N. von Ellenrieder [CSCA]; 8 ♂♂, 2 ♀♀, Bonita Creek, tributary to Gila River, 32.9097°N, 109.487°W, 978 m, 18 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 2 ♂♂, 1 ♀, Hot Springs Canyon, about 2 mi by foot NW of Hookers Hot Springs, 32.3528°N, 110.244°W, 1250 m, 20–21 September 1996, R. W. Garrison [MHNN, RWG]; 1 ♂, Muleshoe Ranch, Bass Creek, Hot Springs, 32.3528°N, 110.257°W, 1196 m, 17 August 2002, J. A., R. W. Garrison, N. von Ellenrieder [CSCA]; 2 ♂♂, Upper Sabino Canyon, about 3 mi N of visitor center, N of Tucson, 32.3433°N, 110.783°W, 974 m, 20 July 1987, R. W. Garrison [RWG]; 9 ♂♂, Sabino Canyon, Coronado National Forest, 32.3389°N, 110.786°W, 953 m, 5 August 1992, R. W. Garrison [RWG]; 4 ♂♂, 2 ♀♀, Hot Springs Canyon, about 0.5 mi by foot NW of Hookers Hot Springs, 32.3375°N, 110.237°W, 1250 m, 11 August 1997, Rosser W., J. A. & P. A. Garrison [RWG]; 2 ♂♂, Catalina

Mountains, 1340 m, 6 August 1930, L. K. Gloyd [UMMZ]; 1 ♂, Molino Basin Forest Camp, Coronado National Forest, Santa Catalina Mountains, 32.3367°N, 110.69°W, 1340 m, 24 July 1984, R. W. & J. A. Garrison [CUMZ]; 9 ♂♂, small pools at lower Sabino Canyon, N of Tucson, Coronado National Forest, 32.3151°N, 110.81°W, 830 m, 1 August 1974, R. W. & J. A. Garrison [RWG]; 12 ♂♂, 1 ♀, same data but 25 July 1984 [RWG]; 4 ♂♂, Tanque Verde Road at Tanque Verde Wash, 32.2532°N, 110.674°W, 1362 m, 25 August 1989, R. W. & J. A. Garrison [RWG]; 1 ♂, 3–4 mi up confluence of Bonita Creek Canyon {32.0124°N, 109.354°W}, 1630 m, 25 March 1988, M. Harging [RWG]; 1 ♂, Quitobaquito Springs, Organ Pipe National Monument, 31.9431°N, 113.02°W, 320 m, 26 August 1973, R. W. Garrison [RWG]; 1 ♂, Sonoita Creek, Sonoita Creek Ranch on way to Salero Canyon, about 2 mi W of Patagonia by Highway 82, 31.5159°N, 110.793°W, 1200 m, 19 August 1972, R. W. Garrison [RWG]; 1 ♂, Sycamore Canyon, 31.4269°N, 111.194°W, 1196 m, 27 September 2002, R. W. Garrison & N. von Ellenrieder [BMNH]; **New Mexico**: 1 ♂, 1 ♀, Gila River at Red Rock, 32.6901°N, 108.738°W, 1220 m, 6 August 1995, R. W., J. A. & P. A. Garrison [RWG]; **Texas**: 1 ♂, intermittent creek just E of Las Cuevas Amarillas, Big Bend Ranch State Park {29.4636°N, 103.96°W}, 1275 m, 25 April 2000, R. A. Behrstock [RWG]. **MEXICO, Sonora**: 1 ♂, El Jaralito, W of Baviacora {29.5167°N, 110.267°W}, 631 m, 5 January 2001, S. Upson [RWG]; 2 ♂♂, 1 ♀, Hermosillo {29.0706°N, 110.919°W}, 218 m, 25 November 1923, J. H. Williamson [RWG, UMMZ]; 3 ♂♂, 2 ♀♀, San José de Pimas River, 53 mi SE of Hermosillo, Highway 16, 28.6903°N, 110.249°W, 461 m, 7 August 1992, B. C. Villegas [RWG]; 1 ♂, N of Esperanza, Yaqui River at Highway 15 {27.595°N, 109.93°W}, 30 m, 2 September 1965, D. R. Paulson [FSCA]; 1 ♀, same data but 25 March 1964, R. D. Cuyler [FSCA]; **Jalisco**: 4 ♂♂, Encarnación de Díaz River, near embankment {21.3333°N, 102.133°W}, 1851 m, 13 April 1995, E. González-Soriano [RWG]; 6 ♂♂, 6 ♀♀, Rancho San Diego near Cocula {20.3425°N, 103.804°W}, 1300 m, 12–16 November 1923, J. H. Williamson [RWG, UMMZ]; 1 ♂, between Tecolotlán and Colotitlán {20.1306°N, 104.114°W}, 1219 m, 23 August 1940, H. R. Roberts [FSCA]; 1 ♂, region of Lake Chapala {20.1167°N, 102.867°W}, 1600 m, 2 December 1923, J. H. Williamson [UMMZ]; **Guerrero**: 3 ♂♂, 1 ♀, 4 mi E of Silao {20.9558°N, 101.369°W}, 1823 m, 16 August 1932, H. M. Smith & E. H. Taylor [RWG]; **Hidalgo**: 1 ♂, 1 ♀, Zimapán, stream crossing highway 0.5 mi S of town {20.7256°N, 99.3873°W}, 1680 m, 8 August 1958, G. & A. Beatty [RWG]; **Michoacán**: 1 ♀, El Sabino, 20 mi SSE of Uruapán {20.0081°N, 102.3169°W}, 1560 m, 20 July 1936, H. D. Thomas [RWG]; **Morelos**: 1 ♂, 1 ♀, Totolapán {18.9813°N, 98.9217°W}, 2000 m, 18 February 1954 [RWG]; 1 ♂, Amacuzac River and stream at Tehuixtla, Balneario Las Palmas {18.5475°N, 99.2704°W}, 866 m, 20 July 1992, S. W. Dunkle [FSCA]; **Puebla**: 1 ♂, Atla River at Highway 115, W of Izucar de Matamoros, 66–151, {18.6172°N, 98.4678°W}, 1310 m, 21 June 1966, D. R. Paulson [FSCA]; **Oaxaca**: 1 ♂, stream just W of Huajuapán de León, 67–231 {17.8244°N, 97.7981°W}, 1710 m, 27 August 1967, D. R. Paulson [FSCA]; 1 ♂, 20 km S of Oaxaca by Highway 175 {16.8731°N, 96.6725°W}, 1590 m, 7 August 1982, J. E. Hafernik, Jr. [RWG]; 1 ♂, Heroica Ciudad de Ejutla de Crespo {16.558°N, 96.7354°W}, 1430 m, 16 October 1948, E. D. Wagner [UMMZ]; 2 ♂♂, stream 14 mi E of El Camarón, 67–228 {16.4983°N, 95.7967°W}, 850 m, 26 August 1967, D. R. & M. L. Paulson [FSCA]; **Chiapas**: 1 ♂, La Revancha, about 30 km NE of Lagunas de Montebello {16.2364°N, 91.5725°W}, 764 m, 26 August 1972, E. C. Welling M. [RWG]. **GUATEMALA, Huehuetenango**: 1 ♂, stream at La Mesilla, 9.3 mi SE on Highway 1, 67–216 {15.6117°N, 91.8683°W}, 960 m, 23 August 1967, D. R. Paulson [FSCA]; **Santa Rosa**: 1 ♂, Agua Caliente {14.9167°N, 90.4°W}, 569 m, 2 June 1909, E. B. Williamson [RWG]; **El Progreso**: 1 ♂, 1 ♀, between El Rancho and Sanarate {14.8518°N, 90.103°W}, 520 m, 27 January 1905, E. B. Williamson [UMMZ].

A relatively small species (Table 2); male predominantly pink-violet (Fig. 947) usually (although not always, Fig. 105) lacking a forked humeral stripe (Figs. 103, 104), space between cerci in dorsal view wider than width of each cercus at base and tooth between inner and outer branches of cercus easily visible (Fig. 714c), in posterior view tooth separated from outer branch by a deep U-shaped concavity (Fig. 714d); female (Fig. 948) with ventral tubercle of mesostigmal lobe formed by recurved mesal margin of mesostigmal lobe not visible in dorsal view (Figs. 554c, d).

Diagnosis. Both sexes of *A. pallens* were diagnosed against *A. agrioides*, *A. fumipennis violacea*, *A. leonorae* and *A. nahuana* by Garrison (1994) and were redescribed in Westfall & May (2006). Male of *A. pallens* shares with the five species mentioned above the inner branch of the cercus in the form of a decumbent lobe and genital ligula consisting of a single flexible flagellum and a pair of falcate lateral lobes basally. See keys M-4, F-7 and F-15 and diagnosis under *A. f. violacea* and *A. leonorae* for differentiation from the other five species.

Remarks. Four males from Encarnación de Díaz River (Fig. 105) are unusual in possessing a forked humeral stripe, otherwise unknown in all other specimens we have examined.

In their phylogenetic tree combining morphological and molecular data, Caesar & Wenzel (2009, figs. 2, 3) placed *A. pallens* as sister to *A. f. violacea*, and the similarity of the male caudal appendages and mesostigmal laminae in both species supports their conclusion. According to Torres-Pachón *et al.* (2017, fig. 3) *A. pallens* forms part of a “tarascana” clade based on larval characters as follows: [(*Argia tarascana* (*Argia munda*, *A. pallens*))], which is not supported based on our examination of the morphology of the male genital ligula, caudal appendages and female mesostigmal plates. Their results differ considerably from those of Caesar & Wenzel (2009).

Habitat. *Argia pallens* is primarily a species of arid landscapes, found along small desert streams and stillwater pools where adults rest on stones by the water’s edge. Upson *et al.* (2007) noted that *A. pallens* is the most widespread species in Sonora, occurring at smaller perennial streams cutting through open rocky areas, but also perching in full sun on rocks or on the sandy, muddy or gravel edges of larger rivers, and that it is one of the few *Argia* often found at pond edges.

Distribution. Although Kiauta & Kiauta (1980) stated that the “... subspecies [of *A. fumipennis*] *pallens* Calv., [is] recorded from South Carolina and Alabama to Arizona, Mexico and Guatemala,” *A. pallens* does not occur in South Carolina and Alabama. In Mexico, *A. pallens* is not known from Baja California, and it appears to be largely absent from the Colorado Desert, although Garrison collected this species at Quitobaquito Springs in Arizona near the Sonora border. Further collecting in E Chihuahua will likely reveal its presence there, as the species has been collected in SW Texas. *Argia pallens* extends farther south (Guatemala) than any of the five other species belonging to the *A. fumipennis* group noted above (Fig. 786). This species ranges from about 30 m to about 2000 m in Mexico.

***Argia paludicola* Garrison & von Ellenrieder, n. sp.**

Figs. 106 (head, thorax, S1–4 ♂); 235 (head, thorax, S1–4 ♀); 277 (wings); 356 (S7–10 ♂); 462 (S7–10 ♀); 555 (mesostigmal plates ♀); 715, 716 (appendages ♂); 789 (map); 833, 834 (field photos ♂); 835 (field photo ♀); 951 (body scan ♂); 952 (body scan ♀).

[Key locators: ♂ G-2, couplet 10’; ♂ M-6, couplet 33’; ♀ key to groups, couplet 33(32)]

Argia sp. González-Soriano & Novelo-Gutiérrez 1991: 77, 90, fig. 35 (stream in Ciénaga de Los Caballos).

Etymology. *paludicola*, Latin (adjective) meaning ‘dwelling in swamps or marshes’ in reference to its type locality, Bog Tank.

Primary types. *Argia paludicola*: holotype ♂, U. S. A., Arizona, Apache County, Bog Tank, N of Highway 260, Fort Apache Reservation, sitting on bare patches of dirt (or cow dung) some distance from the water, 34.0467°N, 109.683°W, 1400 m, 1 July 2016, Pierre Deviche [examined, in CSCA].

Specimens examined. 11 ♂♂, 3 ♀♀ (all types): **U. S. A., Arizona:** 5 ♂♂, 3 ♀♀, Bog Tank, N of Highway 260, Fort Apache Reservation, sitting on bare patches of dirt (or cow patties) some distance from the water, 34.0467°N, 109.683°W, 1400 m, 4 July 2016, P. Deviche [RWG]; 2 ♂♂, same data but 11 June 2016 [RWG; CNIN]; 1 ♂ (holotype), same data but 1 July 2016 [CSCA]; 2 ♂♂, Ditch Camp, N fork of White River, Fort Apache Reservation, 34.0447°N, 109.727°W, 2300 m, 16 July 2016, P. Deviche [RWG]. **MEXICO, Durango:** 1 ♂, Ciénaga de Los Caballos, stream, Reserva de la Biósfera La Michilía {23.4438°N, 104.264°W}, 2550 m, 13 April 1987, E. González-Soriano & R. Novelo-Gutiérrez [RWG].

A small stocky species (Table 2); male largely pale blue (Figs. 833, 834, 951) with dorsal abdominal black markings reduced (Fig. 106) and cercus longer than wide with medial margin strongly convex at base in dorsal view (Figs. 715, 716); female (Figs. 835, 952) with smoothly convex mesostigmal lobe, with mesal margin appressed against lateral branch of middorsal carina (Fig. 555).

Description of male holotype. Head: Labrum, ante- and postclypeus, ante- and postfrons, base of mandibles and genae blue; epicranium blue with irregular crossband of black extending across ocelli and ending at eye margin, a narrow black offshoot extending anteriorly to base of black antenna and a narrow inverted black T-spot anterior to median ocellus; postocular spots large and connecting with postoccipital bar; postocular lobe narrowly rimmed with black as in Fig. 106; rear of head pale. Prothorax black with following areas pale blue: medial margin of anterior lobe, large dorsolateral spot on middle lobe as well as a narrow geminate spot dorsally, propleuron with anterior

margin rimmed narrowly with black, and lateral margin of posterior lobe. Pale areas of pterothorax pale blue, with black middorsal stripe slightly widening dorsally, about as third as wide as blue antehumeral stripe, anterior fourth of mesinfraepisternum black, continuous with narrow humeral stripe at base forked above at basal half, both branches approximately of equal width, the posterior branch not reaching antealar carina; remainder of thorax pale blue, becoming paler ventrally, with a narrow black metapleural stripe as in Fig. 106. Wings hyaline with venation black (as in Fig. 277); Pt dark brown, surmounting 1 cell in all wings; px Fw 12/12, Hw 10/10; pq cells Fw 4/4, Hw 3/3; RP2 at Fw 6/6, Hw 5/5. Coxae and trochanters pale blue; extensor surface of femora black, flexor surface pale; tibiae pale with flexor surface pale, tarsi and armature black. S1 blue with a small dorsal spot at basal fourth; S2 blue with a small irregular triangular black spot dorsolaterally at apical third, its tip almost meeting the other dorsally, another small black spot above genital lobe, annulus black; S3 blue, laterally with a black spot at apical fifth disjunct from apical black annulus; S4–6 similar with preapical fifth black increasingly larger and forming a complete ring; S7 blue dorsally and black laterally with black expanding distally and connecting above at apical fifth; S8–10 blue, black laterally, S10 with posterior margin rimmed in black up to torus; torus pale, its ventral margin rimmed with black; cercus brown; paraproct blue dorsobasally, remainder black.

Genital ligula in paratype (Fig. 634; part of ligula missing in holotype) in ectal view with distal segment anterior to lateral lobes linear ending in a flexible flagellum-like process, ectal surface dark, chitinized and extending to apical half; lateral lobes large, roundly spatulate in lateral and entolateral views.

Torus pale, transversely parallel-sided, occupying entire ventral margin of torifer but not overlapping bilobed epiproct (Fig. 715c); epiproct apically raised with a narrow cleft, pale, black laterally; cerci not approximate, their inner surfaces separated by a distance greater than width of epiproct (Fig. 715c); cercus in lateral view linear, about twice as long as wide (Fig. 715b), the apex slightly bifid with medial branch forming a recurved tooth and mediobasal margin with well-developed arcuate lobe in mediodorsal view (Fig. 715a); paraproct bilobed, dorsal branch forming an obtuse triangle, and ventral branch a rounded lobe (Fig. 715b).

Dimensions. Hw 13.9, abdomen 16.4, total length 21.5.

Description of female paratype (U. S. A., Arizona, Apache County, Bog Tank, Figs. 235, 462, 952) similar to male but pale color tan; pale triangular spot encompassing lateral ocellus. Wings as in male; Pt dark brown, surmounting 1 cell in all wings; px Fw 11/12, Hw 10/10; pq cells Fw 4/4, Hw 3/3; RP2 at Fw 6/6, Hw 5/6. S2 with black dorsolateral stripe, expanding dorsally anteriorly and narrowing medially and briefly interrupted at posterior fourth, ventrally with a small isolated black spot at apical fourth; S4–7 similar but stripe complete and with a dorsal offshoot at apical fifth but not connecting above, ventral spot also larger but still isolated from dorsolateral stripe; succeeding segments with black markings becoming more extensive; S8–10 with a black dorsolateral stripe; cerci brown, ovipositor pale.

Mesepisternal tubercles absent, in dorsal view mesostigmal lobe separated from opposite by a space greater than the width of each lobe, its mesal margin appressed against lateral branch of middorsal carina (Fig. 555c); in lateral view mesostigmal lobe forming a slanting medially directed lobe (Fig. 555h).

Dimensions. Hw 14.8, abdomen 17, total length 22.4.

Diagnosis. Male of *A. paludicola* is most similar to *A. alberta* in appendage morphology but differs as follows (characters for *A. alberta* in parentheses): medial margin of cercus of *A. paludicola* in dorsal view strongly convex at base, Figs. 715c, 716c (medial margin of cercus in dorsal view linear, Fig. 663c); S2–7 blue dorsally except for apical black ring, Figs. 106, 356 (S2–7 black dorsally except for blue basal ring, Figs. 30, 289); 4 Fw pq cells, Fig. 277 (3 Fw pq cells); robust species, S3–6 each about four times as long as high, Figs. 106, 951 (slender species, S3–6 each about six times as long as high, Figs. 30, 949); smaller species, HW 12.7–14.7; abdomen length 16–17.4; total length 21–23.1 (larger species, HW 16.4–17.7; abdomen length 21.6–23.7; total length 28.1–30.8). Appendages of *A. paludicola* also resemble those of *A. sedula*, but the ventral branch of the paraproct is not serrate, Figs. 715a, b, 716a, b (serrate in *A. sedula*, Fig. 731a, b) and is rounded, Figs. 715a, b, 716a, b (ventral branch triangular, Figs. 731a, b).

Female *A. paludicola* differs from that of *A. alberta* by the number of Fw pq cells as noted above for males. A distinct mesostigmal lobe is present in *A. paludicola* (Fig. 555) but the lobe is vestigial in *A. alberta* (Fig. 496). The mesostigmal plates in *A. paludicola* are suggestive of *A. agrioides*, but there is no rounded mesepisternal tubercle under mesostigmal lobe in posterior view in *A. paludicola* (Fig. 555e); a rounded mesepisternal tubercle is present under base of mesostigmal lobe in posterior view in *A. agrioides* (Fig. 495e). *A. paludicola* is a smaller species (Hw 13.8–14.8; abdomen length 16.4–17; total length 21.6–22.4); *A. agrioides* is a larger species (Hw 16–20.5; abdomen

length 21.1–25.4; total length 27.2–33.2). For both sexes, Fw pq are normally 4 in *A. paludicola* (Fig. 277) and 3 in *A. alberta* (Fig. 271).

Remarks. This species was first made known when Enrique González-Soriano sent the male from Mexico referenced in the synonymy above to Garrison. Based on the appendages similar to those of *A. alberta*, Garrison judged the specimen to be a lightly marked male of *A. alberta*. No other specimens came to our attention until Pierre Deviche shared photos of a small *agrioides/nahuana*-like *Argia* from Apache County, Arizona, that he could not identify. Later, Deviche sent a small series of specimens of both sexes, and a comparison of them with a series of *A. alberta* revealed several specific differences as outlined above.

Habitat. Deviche (pers. comm.) reported that this species was sitting on bare patches of dirt (or cow patties) some distance from the water.

Distribution. The Mexico locality is about 1300 km from the Arizona locality (Fig. 789), and we expect *A. paludicola* to occur in intervening areas. This is a species occurring at high elevation, 2550 m in Mexico and 1400 m in Arizona.

Argia paulsoni Garrison & von Ellenrieder, n. sp.

Figs. 107 (head, thorax, S1–4 ♂); 357 (S7–10 ♂); 635 (genital ligula), 717 (appendages ♂); 782 (map); 930 (body scan ♂).

[Key locators: ♂ G-2, couplet 6(5); ♂ M-6, couplet 34(32')]

Types. *Argia paulsoni*: holotype ♂, COSTA RICA, San José, 7.5 km NE of Londres, on road to Rancho Tinamú Lodge, Haber 9827, 5 July 2019, William A. Haber leg. [examined, in UCR].

Etymology. Named *paulsoni* (Latinized name) in honor of our friend and colleague Dennis R. Paulson, in recognition of his keen knowledge of the biology and taxonomy of the Odonata worldwide, his constructive criticisms of our ongoing work on *Argia* and his generous help in specimens and knowledge pertaining to our studies.

Specimens examined. 3 ♂♂: COSTA RICA, San José: 1 ♂ paratype, 20 km ENE of Quepos, Londres road, tributary of Savegre River, small rocky stream crossing road, spring trickle on rocky road bank, 9.4864°N, 83.9905°W, 650 m, 16 August 2012, W. A. Haber [RWG]; 1 ♂ holotype, 7.5 km NE of Londres, on road to Rancho Tinamú Lodge, #9827, 9.4856°N, 83.9911°W, 700 m, 5 July 2019, W. A. Haber [UCR]; 1 ♂ paratype, same data but #9826 [RWG].

A medium-size species (Table 2); male brilliant blue (Figs. 107, 357, 930) with inner branch (tooth) of cercus slightly surpassing the outer branch (Fig. 717a) and distal segment of genital ligula bearing a single flagellum (Fig. 635). Female unknown.

Description of male holotype. Head (Fig. 107): Labrum, anteclypeus, ante- and postfrons, base of mandibles and genae blue; postclypeus black, epicranium black but interrupted by large blue postocular spots each broadly confluent with compound eyes, blue occipital bar represented by lateral spot, a small triangular pale spot anterolateral to lateral ocellus and a small blue triangular spot on vertex between lateral ocelli; antennae black; rear of head black with pale line along eye margin.

Prothorax black with following areas blue: anterior lobe, dorsolateral spot on middle lobe, propleuron except for anterior margin rimmed in black, and extreme lateral margins of posterior lobe; propleuron blue, connecting posteriorly with lateral blue area of posterior lobe. Pale areas of pterothorax vivid blue, with black middorsal stripe of uniform width, slightly broader than middorsal carina; remainder of mesepisternum blue; anterior 0.80 of mesinfraepisternum black, continuous with broad humeral stripe at base then forked at dorsal fifth along mesopleural suture, the posterior fork broad and confluent with antealar crest and abbreviated vestigial interpleural stripe; upper portion of humeral stripe narrower expanding again at mesopleural fossa; remainder of thorax blue except for vestige of interpleural stripe and a narrow black stripe on metapleural suture (Fig. 107). Wings hyaline with venation black; Pt dark brown, surmounting 1 cell in all wings; px Fw 13/14, Hw 11/11; pq cells Fw 3/3, Hw 3/3; RP2 at Fw 6/6, Hw 5/5. Coxae and trochanters pale blue except for black on dorsum of trochanters; femora black, flexor surface pale; tibiae black with extensor surface pale, tarsi and armature black.

Abdomen (Figs. 107, 357) mostly blue; S1 blue, dorsally with a black basal spot; S2 blue laterally with a broad black stripe terminating at apical fifth, its posterior portion expanded as an inverted triangle dorsally at apical fourth,

its tip almost meeting the other dorsally, annulus black; S3 blue, with a complete ventral black stripe beginning at basal tenth, interrupted medially with narrow ventral stripe, then expanding dorsally at apical fifth as a blunt triangle, remainder of stripe connected to black annulus; S4–7 similar but black lateral stripe parallel, extending full length of each segment and forming a black ring at apical fifth; S8–9 blue dorsally and laterally with continuous black stripe; S10 black with a small vestigial blue dorsolateral spot; torus pale, its ventral margin rimmed with black; cercus and paraproct black.

Genital ligula similar to *A. medullaris* (Fig. 625) but with a single unbranched flagellum (Fig. 635), in lateral view distal segment lacking a raised sclerotized boss, lateral lobe broadly hook-shaped with a distinct U-shaped concavity separating lobe from base of genital ligula.

Torus large, swollen, transversely triangular, occupying entire ventral margin of torifer but not overlapping bilobed epiproct (Figs. 717a, c); epiproct apically with a narrow cleft, pale, black laterally; cerci not approximate, their inner surfaces separated by a distance greater than width of epiproct (Fig. 717c); cercus in dorsal view longer than wide, with inner and outer margins subequal in length, and space between cerci about four times basal width of each cercus (Fig. 717c); cercus in lateral view subequal in length to paraproct (Fig. 717b), mediobasal margin of cercus in dorsomedial view slightly concave or almost linear, its apical margin expanding into a broadly based ventrally directed tooth that surpasses outer branch (Fig. 717a) and is visible in lateral view (Fig. 717b).

Dimensions. Hw 20.3, abdomen 27.5, total length 35.2.

Variation in paratypes. No variation from the holotype was seen in the two paratypes. Pt surmounting 1 cells in males; px: Fw 12–14, Hw 11–12; pq: Fw 3, Hw 3; RP2 at Fw 5–6, Hw 4–5. Dimensions. ♂: Hw 20.2 ± 0.2 [19.6–20.7], abdomen 27.0 ± 1.0 [25.9–27.6], total length 34.4 ± 1.4 [32.8–35.3].

Diagnosis. This species is similar in body markings to *A. gonzalezi* and the more widespread *A. medullaris* but differs in the morphology of the male appendages, genital ligula and number of pq. All three males of *A. paulsoni* have 3 Fw pq, whereas these number 4 in both *A. gonzalezi* and *A. medullaris*. The terminal segment of the genital ligula in *A. paulsoni* bears a single flagellum (Fig. 635) which is not bifid at apical 0.20 as in both *A. gonzalezi* and *A. medullaris* (Fig. 625b). Finally, the inner branch (tooth) of cercus slightly surpasses the outer branch in *A. paulsoni* in mediodorsal view (Fig. 717a), whereas it is anteapical in both *A. gonzalezi* (Fig. 692a) and *A. medullaris* (Fig. 707a).

Remarks. This species was only recently (2012) discovered by William A. Haber, who recognized it as undescribed. The female is unknown.

Habitat. Specimens collected on a spring trickle on a rocky road bank tributary of Savegre River.

Distribution. *Argia paulsoni* is so far known from the type locality and a nearby locality in San José, Costa Rica (Fig. 782), from 650 to 700 m.

Argia percellulata Calvert, 1902

Figs. 108–110 (head, thorax, S1–4 ♂); 111 (head, thorax ♂); 236 (head, thorax, S1–4 ♀); 278 (wings ♂); 358, 359 (S7–10 ♂); 463 (S7–10 ♀); 556 (mesostigmal plates ♀); 636 (genital ligula); 718 (appendages ♂); 792 (map); 964–966 (body scans ♂); 967 (body scan ♀).

[Key locators: ♂ G-4, couplet 8(7'); ♂ M-5, couplet 13'; ♀ Key to groups, couplet 18(17'); ♀ shortcut 3]

Argia percellulata Calvert 1902: 74 (♂, ♀, description, pl. IV, figs. 5, 27);—Calvert & Hagen 1902: 111 (“Types in Coll. Godman”);—Ris 1918: 102 (description ♂);—Kimmins 1970: 190 (holotype data ♂);—Paulson 1982: 253 (Mexico);—González-Soriano 1993: 295 (Mexico);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Cuevas-Yañez 2007: 86 (Puebla, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—von Ellenrieder & Garrison 2007a: 20 (examination of holotype in BMNH);—Novelo-Gutiérrez & Gómez-Anaya 2012: 46 (description of larva, figs. 1–12);—Torres-Pachón *et al.* 2017: 416 (molecular phylogeny of larvae within *Argia*);—Novelo-Gutiérrez & Gómez-Anaya 2021: 442 (diagnosis of larva of *A. cuprea* against *A. percellulata*).

Primary types. *Argia percellulata*: holotype ♂, MEXICO, Veracruz, Atoyac, April–May 1888, Herbert H. Smith [examined, in BMNH; von Ellenrieder & Garrison 2007a].

Specimens examined. 17 ♂♂, 4 ♀♀: **MEXICO, Puebla:** 6 ♂♂, 3 ♀♀, San Marcos River, Km 1 Highway 130 between Avila Camacho-Petlacotla {20.3928°N, 97.8914°W}, 236 m, 22 July 1987, R. Novelo-Gutiérrez [CSCA,

FSCA, RWG]; 1 ♂, Necaxa River at Patla (labeled as Patla River; data corrected by R. Baumann, Sept. 6, 2016) {20.2333°N, 97.8167°W}, 380 m, 19 August 1994, R. Baumann & B. Kondratieff [BYU]; **Veracruz**: 1 ♂, Misantla {19.9322°N, 96.8509°W}, 301 m, July 1914, W. Gugelmann [UMMZ]; 1 ♂, Coatepec, Huehueyapán River, 19.445°N, 96.9712°W, 1221 m, 19 August 1996, R. Novelo-Gutiérrez [RWG]; 1 ♂, Puente Texolo, near Teocelo, 19.4028°N, 96.9867°W, 1065 m, 8 June 1980, R. López [RWG]; 1 ♂, Barranca de Cayoapa, Tejería, Teocelo, 19.3733°N, 96.9267°W, 900 m, 11–13 September 1981, E. González-Soriano [RWG]; 1 ♂, Atoyac {18.9155°N, 96.775°W}, 450 m, Herbert H. Smith [BMNH]; 1 ♂, river near Concordia, S of Jalapa on route 7, 18.8028°N, 96.7225°W, 360 m, 12 July 1992, S. W. Dunkle [RWG]; **Oaxaca**: 1 ♀, San Mateo Yetla {17.7551°N, 96.3159°W}, 120 m, 12 September 1961, E. C. Welling M. [UMMZ]; 1 ♂, vicinity of Sierra Juarez, 17.1406°N, 96.6247°W, 1980 m, August 1983, G. Nogueira [RWG]; 1 ♂, same data but April 1994 [RWG]; **Chiapas**: 1 ♂, 8 km S of Solosuchiapa, 17.3683°N, 93.0089°W, 230 m, 27 August 1980, E. S. & C. E. Ross [RWG]. **GUATEMALA**, **Alta Verapaz**: 1 ♂, Cobán, 64x068 {15.5°N, 90.4°W}, 1200 m, 5 September 1964, T. W. Donnelly [FSCA].

A large species (Table 2) recognizable by the 6 pq in Fw (Fig. 278); male blue and black (Figs. 108, 358, 359, 964–966), acquiring a dusting of gray pruinosity on thorax when mature, especially on mesepisternum (Figs. 109–111, 964, 966), with deeply forked cerci (Figs. 718a, c); female (Fig. 967) with characteristic arcuate mesostigmal lobes separated from each other by about twice the width of each lobe (Fig. 556c).

Redescription. Calvert's (1902) description was based on four males and three females of which only one female was not teneral. His illustration of the caudal appendages is slightly distorted due to the teneral condition of the holotype male. When von Ellenrieder & Garrison (2007a) compared fully adult males with the holotype in the BMNH, they noted that the tips of the cerci of the holotype were missing. Ris (1918) had two fully adult males at his disposal, and he considered that their identity was scarcely doubtful, although the specimens did not entirely agree with Calvert's figure. Due to the teneral condition of the type series described by Calvert (1902), we provide a redescription modified from Ris (1918) as well as a description of the female.

Male (Mexico, Veracruz, Puente Texolo, Figs. 108, 359, 965). Labrum, base of mandibles, genae, postclypeus blue, anteclypeus blue with a small midlateral black spot on each side and a narrow transverse black line basally, antefrons blue, epicranium matte black except for blue postocular spots the anterolateral border of each confluent with eye and a pair of small brown elongate streaks dorsolateral to lateral ocellus, pale postocular bar represented by small transverse lateral spot on each side, rear of head entirely black except for a pale narrow stripe bordering eye margin. Prothorax mostly black with following blue: anterior lobe, dorsolateral spot on middle lobe and propleuron and lateral margin of hind lobe; middorsal stripe about two-thirds as wide as blue antehumeral stripe on pterothorax, broad black humeral stripe forked above at dorsal fourth, the anterior fork narrow, the posterior fork as wide as basal sixth, its dorsal end extending to antealar sinus and interpleural suture, thus enclosing an irregular narrow blue stripe; remainder of thorax blue except for narrow black metapleural stripe. Coxae pale, femora black, pale medially, tibiae black, extensor surfaces pale, armature entirely black. Wings hyaline, Pt surmounting 1 cell in all wings, px Fw: 19/18, Hw: 16/16; pq Fw: 6/5, Hw: 5/5, Rp2 at Fw: 8/8, Hw: 7/7. Abdomen black. S1 blue laterally, black dorsally with an isolated transverse blue stripe at apical fourth; S2 black, a narrow blue oval dorsal spot extending to apical fourth before abruptly continuing as a narrow middorsal line to black annulus, laterally with a pale blue stripe interrupted ventrally by an irregular incomplete ventral stripe above genital lobe; S3–7 black with a trace of a narrow pale middorsal line on S3–5 and each segment with a narrow blue basal ring connecting ventrally with a narrow pale ventral stripe, the latter of which becoming isolated on S6 and completely absent on S7; S8 black with a narrow pale lateral stripe; S9–10 dull blue with a ventral black stripe; appendages black.

Genital ligula (as in Fig. 636) Distal segment with a coiled bifid flagellum arching entally toward first segment, attached to ental surface of a narrow digit-like to quadrate basal membranous hood, with two pairs of lateral lobes, the more basal pair including a small laterally extended lobe near flexure on each side (these often hidden by membranous terminal fold), and the more apical pair represented by a flexible chitinized multispinose branch, arising from a narrow stem extending laterad of the ligula on each side.

Tori transversely oval, each not as wide as epiproct; cercus linear, about 2.5 times as long as wide, divided apically, the inner branch (tooth) longer, robust, and about as wide as outer branch, cleft between branches roundly U-shaped (as in Fig. 718c); paraproct with dorsal branch roughly triangular, its tip directed anterodorsally, the ventral branch small, thumb-like (as in Figs. 718a, b).

Dimensions. Hw 30.1, abdomen 41.0, total length 21.5.

Female (Mexico, Puebla, San Marcos River, Figs. 236, 463, 967 [in tandem with male]). Similar to male but

differs as follows: base of labrum black, black on epicranium with narrow black line connecting with black antefrons, pale postocular spots smaller, not connected to eye margin, and pale postocular bar absent; pro- and pterothorax as in male but pale areas tan; legs as in male but pale areas more extensive; wings hyaline, Pt surmounting 1.5–2 cells in Fw, 1.5–2 cells in Hw, px Fw: 19/19, Hw: 16/17; pq Fw: 5/6, Hw: 5/5, Rp2 at Fw: 9/9, Hw: 7/7. S1–2 as in male, S3–6 black dorsally with a narrow middorsal pale stripe forming almost a line on more posterior segments, a pale basal ring narrowly interrupted middorsally by a narrow black line, ventrally connecting to pale lateral stripe followed ventrally by a narrow black ventral stripe; S7 black with a pale basal ring, S8–10 pale blue, each with a dorsal and an ventral dark brown stripe, the former occupying the basal two thirds, the latter as long as the segments; cerci black, ovipositor pale, narrowly lined with black ventrally, ovipositor teeth robust.

Mesostigmal lobe separated from each other by about twice the width of each lobe, erect, its posterior margin gently concave in dorsal view (Fig. 556c); medial margin of lobe recurved ventrally (Fig. 556f).

Dimensions. Hw 29.7, abdomen 35.5, total length 46.1.

Diagnosis. Genital ligula morphology places *A. percellulata* in the group consisting of metallic red species and the largely blue species *A. barretti*, *A. harknessi*, *A. insipida* and *A. pipila* (mostly black abdomen in *A. percellulata*), but the robust inner branch of the cercus of *A. percellulata* differs from the slenderer acuminate inner branch of the cercus in all other species mentioned above. The presence of pruinosity, especially on the mesepisterna (Figs. 109–111, 964, 966), is unique among members of this group and may superficially resemble fully mature males of *A. moesta* (Figs. 92, 910), but it differs from it by the absence of a metepimeral black stripe (present in *A. moesta*), genital ligula lacking a strap-like terminal process typical of *A. moesta* (Fig. 626), apically divided cercus, Fig. 718 (cercus apically rounded in *A. moesta*, Fig. 708), and S9–10 dorsally blue, Figs. 964–966 (S9–10 dorsally tan with black in *A. moesta*, Figs. 910, 911). Female differs from other species by its large size, generally possessing 6 Fw pq (as in Fig. 278), and its erect mesostigmal lobe with posterior margin gently concave in dorsal view (Fig. 556c) and ventrally recurved medial margin (Fig. 556f).

Remarks. Although Calvert (1901) in his key to males stated that the inferior appendages of *A. percellulata* were not bifid at tip, our examination of specimens shows the presence of a small but distinct ventral lobe on the paraproct of all males.

This is a variable species in the extent of thoracic markings that vary geographically and ontogenetically. The thorax in fully adult males may become entirely pruinose (e. g., photo at <https://www.inaturalist.org/observations/87667879>), though most males have light gray pruinosity confined to the mesepisterna obscuring the black middorsal stripe (Figs. 111, 964, 966). The broad humeral stripe may be unforked and parallel sided (Figs. 109–111).

Novelo-Gutiérrez & Gómez-Anaya (2012) described its larva and noted that it falls into the group of *Argia* larvae with very prominent ligula and one palpal seta and shows a great resemblance to *A. barretti*, *A. harknessi*, *A. insipida* and *A. joergenseni*, which is in accord with our observations based on genital ligula morphology.

In their molecular and morphological phylogenetic analysis of *Argia* larvae, Torres-Pachón *et al.* (2017) noted that the “percellulata” clade showed a polytomy at its base, including six species with the following arrangement (*Argia percellulata* (*Argia cuprea*, *Argia tezpi*) (*Argia joergenseni* (*Argia barretti*, *Argia harknessi*))) which, with the exception of *A. tezpi*, again indicates that *A. percellulata* is closely related to the group of *Argia* species mentioned in our diagnosis.

Habitat. Novelo-Gutiérrez & Gómez-Anaya (2012) noted that the original vegetation at all localities of *A. percellulata* was cloud forest, although in Coatepec the forest has been largely replaced by coffee plantations and pastureland.

Distribution. According to Novelo-Gutiérrez & Gómez-Anaya (2012), this is an endemic Mexican species with a restricted distribution, thus far known only from the states of Puebla, Veracruz, Oaxaca and Chiapas. However, we have also seen a male from Alta Verapaz in Guatemala (Fig. 792). Elevation ranges from 380 m at Río Tecpatliin, Zihuateutla, Puebla (Cuevas-Yañez 2007), to 1980 m at the vicinity of Sierra de Juárez, Oaxaca.

***Argia pima* Garrison, 1994**

Figs. 112 (head, thorax, S1–4 ♂); 237 (head, thorax, S1–4 ♀); 360 (S7–10 ♂); 464 (S7–10 ♀); 557 (mesostigmal plates ♀); 637 (genital ligula); 719 (appendages ♂); 777 (map); 836 (field photo ♂); 901 (body scan ♂); 902 (body scan ♀).

[Key locators: ♂ G-3, couplet 4'; ♂ M-5, couplet 15(14), M-6, couplet 29(28'); ♀ F-10, couplet 3(2'), F-11, couplet 8']

Argia pima Garrison 1994: 323 (♂, ♀, key, description, comparison with *A. lacrimans*, figs. 23, 63, 105, 113, 114);—Hoekstra & Smith 1999: 893 (key, description of larva, comparison with *A. sabino*, figs. 2–6);—Hoekstra & Smith 2000: 85 (reproductive behavior);—Upson 2000: 19 (comparison with *A. lacrimans* in SE Arizona);—Westfall & May 2006: 207 (♂, ♀, key, description, figs. 94D, 99H, 103D);—Behrstock *et al.* 2007a: 57 (Chihuahua, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Upson *et al.* 2007: 32 (Sonora, Mexico);—Caesar & Wenzel 2009: 106 (phylogeny within genus *Argia*);—Paulson 2009: 162 (♂, ♀, description, diagnosis, photos);—Bailowitz *et al.* 2015: 138 (diagnosis, photos).

Primary types. *Argia pima*: holotype ♂, U. S. A., Arizona, Pima Co., Upper Sabino Canyon, about 3 mi N of visitor center, NE of Tucson, 22 Sept 1988, Rosser W. & Jo A. Garrison leg. [examined, in USNM; Garrison 1994].

Specimens examined. 20 ♂♂, 22 ♀♀: **U. S. A., Arizona:** 2 ♂♂, 3 ♀♀, Sycamore Spring, Fossil Creek Road, Forest Road 708, Coconino National Forest, 34.395°N, 111.65°W, 1065 m, 2 August 1992, M. & M. Van Dam, C. Fujida & R. W. Garrison [RWG]; 6 ♂♂, 5 ♀♀, Hot Springs Canyon, about 2 mi by foot NW of Hookers Hot Springs, 32.3525°N, 110.247°W, 1250 m, 20–21 September 1996, J. Hoekstra & R. W. Garrison [INCOL, RWG]; 1 ♂, 3 ♀♀, Muleshoe Ranch, Bass Creek, Hot Springs, 32.3528°N, 110.257°W, 1196 m, 17 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 3 ♂♂, 1 ♀, Upper Sabino Canyon, about 3 mi N of visitor center, N of Tucson, 32.3433°N, 110.783°W, 974 m, 9 September 1983, S. W. Dunkle [BMNH, RWG]; 2 ♂♂, 3 ♀♀, same data but 22 September 1988, R. W. & J. A. Garrison [RWG, USNM]; 2 ♂♂, 1 ♀, Upper Sabino Canyon, Tucson, 32.3433°N, 110.78°W, 974 m, 23 September 1989, J. J. Daigle [JJ]; 3 ♀♀, Sabino Canyon, 7 mi NE of Tucson, 32.3389°N, 110.786°W, 953 m, 20 September 1955, T. W. Donnelly [FSCA]; 1 ♂, 1 ♀, same data but 9 September 1983, S. W. Dunkle [FSCA]. **MEXICO, Sonora:** 1 ♂, cypress-lined stream 16 mi of Yécora, on road to Trigo de Corodepe, 28.585°N, 108.917°W, 1500 m, 28 June 2005, R. A. Bailowitz [RWG]; 1 ♀, Maycoba River E of Yécora at Highway 16, 28.3742°N, 108.758°W, 1201 m, 14 September 2004, R. A. Bailowitz [RWG]; 1 ♂, 1 ♀, small river W of Yécora, Route 16 {28.3606°N, 108.941°W}, 1550 m, 23 August 1986, B. Kondratieff [FSCA]; **Nayarit:** 1 ♂, 22.3 miles SE of Tepic, 21.2211°N, 104.938°W, 947 m, 20 July 1960 [RWG].

A medium to large species (Table 2), with posterior fork of humeral stripe more robust and thicker than anterior fork in both sexes (Figs. 901, 902); male blue and black (Figs. 82, 338, 836, 901), with inner branch (tooth) of cercus visible in dorsal view so that cercus appears equally branched (Fig. 719c); female (Fig. 902) with mesepisternum under base of mesostigmal lobe with a low transverse tubercle in posterior view (Fig. 557e).

Diagnosis. Both sexes were keyed from its closest congener, *A. lacrimans*, in Garrison (1994), and were also keyed and redescribed by Westfall & May (2006). The genital ligula of *A. pima* (Fig. 687) is the same as in *A. lacrimans* and is similar to that of *A. chelata* (Fig. 604) and *A. tonto* (Fig. 653). *Argia pima* is diagnosed against both *A. lacrimans* and *A. tonto* under *A. lacrimans*.

Habitat. Hoekstra & Smith (2000) reported on the reproductive behavior of *A. pima* along with the localized *A. sabino* along the upper reaches of Sabino Canyon in Arizona. Upson *et al.* (2007) reported this species along with *A. lacrimans* above 1300 m in Yécora and Sahuaripa Municipalities in Sonora, Mexico, at small, shaded mountain streams. *Argia pima* does not appear to be common; Bailowitz *et al.* (2015) considered it to be rare and local in Arizona, as it appears to prefer large perennial pools along partially wooded, slow-moving mountain creeks. Garrison (1994) hypothesized that, as with other species of *Argia* found in the largely arid areas of the SW United States, abundance of this species can vary from year to year, presumably due to the unpredictable nature of summer rains. Bailowitz *et al.* (2013) failed to relocate the species in the Muleshoe Ranch Region (Cochise County, Arizona) after a decade of drought.

Distribution. Our records show *A. pima* to occur from central Arizona below the Mogollon Rim south to E Sonora and W Chihuahua with one additional record from Nayarit, Mexico (Fig. 777) at elevations from about 950 to 1780 m (shallow stream in open meadow at Highway 16 in Chihuahua; Behrstock *et al.* 2007a).

Argia pipila Calvert, 1907

Figs. 113 (head, thorax, S1–4 ♂); 114 (thorax ♂); 238 (head, thorax, S1–4 ♀); 239, 240 (thorax ♀); 361 (S7–10 ♂); 362 (S1–10 ♂); 465 (S7–10 ♀); 558 (mesostigmal plates ♀); 720 (appendages ♂); 792 (map); 837 (field photo ♂); 975 (body scan ♂); 976 (body scan ♀).

[Key locators: ♂ G-4, couplet 8'; ♂ M-6, couplet 22'; ♀ F-16, couplet 5'; ♀ shortcut 7]

Argia pipila Calvert 1907: 373 (♂, ♀, description, pl. X. figs. 16, 16s, 18);—Calvert 1908a: xxix (clarification of holotype data);—Paulson 1982: 253 (Mexico);—González-Soriano 1993: 295 (Mexico);—Dunkle 1998: 45 (Honduras);—Boomsma & Dunkle 1996: 25 (Belize);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Garrison *et al.* 2003: 36 (holotype data);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—González-Soriano & Paulson 2011: 307 (Chiapas, Mexico).

Argia (Chalcargia) pipila: Kennedy 1920: 85 (in subgenus *Chalcargia*).

Primary types. *Argia pipila*: holotype ♂, GUATEMALA, Escuintla, 31 January 1905, Edward B. Williamson leg. [examined, in UMMZ; Garrison *et al.* 2003].

Specimens examined. 185 ♂♂, 85 ♀♀: **MEXICO, Veracruz:** 1 ♀, Puente Nacional, 19.3286°N, 96.4843°W, 90 m, 31 July 1966, O. S. Flint & M. A. Ortiz B. [USNM]; 2 ♂♂, 1 ♀, same data but 19 July 1992, G. Harp [RWG]; 1 ♂, Balneario Hotel, 2 km S of Puente Nacional on Route 140, rocky stream {19.3237°N, 96.4853°W}, 92 m, 13 July 1992, S. W. Dunkle [FSCA]; 3 ♂♂, 1 ♀, Tizapa River, toll road 150 at km 45 {18.7653°N, 96.4692°W}, 73 m, 19 July 1992, S. W. Dunkle [FSCA, RWG]; 1 ♂, 2 ♀♀, La Tinaja, Tizapa River at Choata, Highway 150 {18.7422°N, 96.4562°W}, 100 m, 19 July 1992, W. F. Mauffray [FSCA]; 2 ♂♂, Otapa River, 8 km S of La Tinaja, 18.6858°N, 96.4361°W, 90 m, 20 August 1976, R. W. & J. A. Garrison [RWG]; 1 ♂, La Palma River and pond near Sontecomapán, near Los Tuxtlas Biological Station, {18.5619°N, 95.0592°W}, 18 m, 17 July 1992, S. W. Dunkle [FSCA]; 1 ♀, Salto de Eyipantla {18.3842°N, 95.2064°W}, 150 m, 23 June 1961, D. R. Paulson [FSCA]; 1 ♂, same data but 15 June 1962 [FSCA]; 5 ♂♂, 19 ♀♀, same data but 15 August 1976, R. W. & J. A. Garrison [KPMNH, RWG]; 24 ♂♂, 4 ♀♀, same data but 15 June 2009, R. W. Garrison & N. von Ellenrieder [BMNH, CSCA, FAAL, RWG, UFMG]; **Tabasco:** 1 ♀, February 1914, W. Gugelmann [UMMZ]; 1 ♂, 1 ♀, Teapa, Puyacatango River, small shaded stream, 17.5569°N, 92.9508°W, 42 m, 17 October 1971, C. E. & M. Welling [RWG]; 1 ♂, 2 ♀♀, Teapa River in Teapa {17.55°N, 92.95°W}, 60 m, 3 July 1965, D. R. & M. L. Paulson [FSCA]; 1 ♂, 1 ♀, river 3 km E of Teapa {17.5333°N, 92.9168°W}, 40 m, 5 July 1965, D. R. Paulson [FSCA]; **Oaxaca:** 1 ♂, 11 miles N of Matías Romero, Highway 185 {17.0044°N, 95.014°W}, 85 m, 30 April 1965, H. V. Weems, Jr. [FSCA]; **Chiapas:** 1 ♂, 1 ♀, 4 km NW of Chiapa de Corzo {16.743°N, 93.0341°W}, 420 m, 23 April 1943, I. J. Cantrall [RWG]; 1 ♂, 4 km NW of Chiapa de Corzo {16.743°N, 93.0341°W}, 420 m, 23 April 1943, I. J. Cantrall [UMMZ]; 1 ♂, 1 ♀, Reserva Montes Azules, 16.3872°N, 91.1336°W, 574 m, 10–16 July 1987, F. Arias, R. Barba & L. Cervantes [RWG]; 1 ♂, Urbina River, 4.2 mi NW of Pijijiapán {15.7167°N, 93.2667°W}, 46 m, 1 August 1965, D. R. Paulson [FSCA]; 1 ♂, 1 ♀, Arenas River, 27.5 mi SE of Pijijiapán {15.7°N, 93.2333°W}, 84 m, 1 August 1965, D. R. Paulson [FSCA]; 1 ♂, Despobaldo River, 8.7 mi NW of Huixtla {15.15°N, 92.5°W}, 50 m, 31 July 1965, D. R. & M. L. Paulson [FSCA]; 2 ♂♂, 6 mi NW of Tapachula {14.9°N, 92.2833°W}, 60 m, 28 July 1965, D. R. & M. L. Paulson [FSCA]; 1 ♂, 1 ♀, Tapachula, Unión Juárez, Puente Colorado, 14.9°N, 92.2667°W, 174 m, 26 March 1986, F. Arias, H. Velasco & M. Vertiz [RWG]. **BELIZE, Orange Walk:** 1 ♂, Cedar Crossing, 17.6842°N, 89.0207°W, 103 m, 13 October 1992, T. Boomsma [RWG]; **Cayo:** 2 ♂♂, 1 ♀, Roaring Creek at W Highway, a small clear river with rapids, 17.2669°N, 88.8125°W, 40 m, 19 March 1986, S. W. Dunkle [FSCA, RWG]; 1 ♂, 1 ♀, river and small tributary just E of Roaring Creek at W Highway {17.2619°N, 88.7906°W}, 40 m, 27 March 1986, S. W. Dunkle [FSCA]; 3 ♂♂, 3 ♀♀, small stream 4 mi W of Ontario Village on W Highway with riffles and pond-like edges, 17.2144°N, 88.9344°W, 93 m, 20 March 1986, S. W. Dunkle [FSCA, RWG]; 1 ♂, 1 ♀, Caves Branch, Hummingbird Highway and tributaries to Caves Branch {17.1332°N, 88.7°W}, 200 m, 31 May 1993, S. W. Dunkle [FSCA]; **Stann Creek:** 1 ♂, Alabama, Cockscomb Jaguar Wildlife Preserve, tributaries to and along S Stann Creek {16.75°N, 88.45°W}, 85 m, 3 June 1993, W. F. Mauffray [FSCA]; **Toledo:** 1 ♂, 1 ♀, Medina Bank, S Highway at Deep River {16.4419°N, 88.7448°W}, 20 m, 7 June 1993, W. F. Mauffray [FSCA]; 2 ♂♂, 2 ♀♀, Bif Fall, S Highway at Grande River, 16.2561°N, 88.8865°W, 20 m, 4 June 1993, S. W. Dunkle & W. F. Mauffray [FSCA]; 1 ♂, Blue Creek Village, Blue Creek {16.1978°N, 89.0421°W}, 42 m, 5–8 June–January 1993–1989, W. F. Mauffray [FSCA]; 1 ♂, 1 ♀, Golden Stream at S Highway, 16.1°N, 88.7833°W, 25 m, 7 June 1993, S. W. Dunkle [FSCA].

GUATEMALA, El Petén: 1 ♂, Santa Teresa on Subín River {16.637°N, 90.1831°W}, 120 m, 12 April 1933, L. C. Stuart [FSCA]; 1 ♂, Subín River, 20 km S of La Libertad, 83x041 {16.6332°N, 90.1833°W}, 130 m, 20 July 1983, T. W. Donnelly [FSCA]; 2 ♂♂, 2 ♀♀, same data but 4 April 1935, C. L. Hubbs & H. Vander Schalie [UMMZ]; 7 ♂♂, 4 ♀♀, de la Pasión River {16.2333°N, 90.3466°W}, 150 m, 6 April 1935, C. L. Hubbs & H. Vander Schalie [RWG, UMMZ]; **Alta Verapaz:** 1 ♂, Lanquín River at Samastún, 15.6°N, 89.9167°W, 1100 m, 3 January 1989, B. Kondratieff [FSCA]; **Zacapa:** 1 ♂, between Gualán and El Rancho {15.1156°N, 89.361°W}, 138 m, 25 January 1905, E. B. Williamson [RWG]; 5 ♂♂, 5 ♀♀, Gualán {15.1041°N, 89.3607°W}, 138 m, 1–18 January 1905, E. B. Williamson [RWG, UMMZ]; 9 ♂♂, 1 ♀, same data but 12 June 1909, E. B. Williamson [RWG, UMMZ]; **El Progreso:** 1 ♂, El Rancho {14.8667°N, 90°W} 270 m, 25 January 1905, E. B. Williamson [UMMZ]; **Guatemala:** 38 ♂♂, 9 ♀♀, Agua Caliente {14.7467°N, 90.3242°W}, 900 m, 1–2 June 1909, E. B. Williamson [UMMZ]; 3 ♂♂, between Agua Caliente and Guatemala City, 28 January 1905, E. B. Williamson [UMMZ]; **Quezaltenango:** 1 ♂, Santa María {14.7167°N, 91.5333°W}, 1452 m, 4 February 1905, E. B. Williamson [UMMZ]; **Suchitepequiz:** 6 ♂♂, Mazatenango {14.5333°N, 91.5°W}, 363 m, 3 February 1905, E. B. Williamson [RWG, UMMZ]; **Amatitlán:** 8 ♂♂, 2 ♀♀, Amatitlán {14.4833°N, 90.6167°W}, 1209 m, 8 June 1909, E. B. Williamson [RWG, UMMZ]; **Escuintla:** 7 ♂♂, 4 ♀♀ (holotype and paratypes), Escuintla, collected along a small stream near town, 14.305°N, 90.785°W, 355 m, 31 January 1905, E. B. Williamson [CSCA, FSCA, RWG, UMMZ]; 4 ♂♂, 1 ♀, Santa Lucía {14.2833°N, 90.7833°W}, 335 m, 1 February 1905, E. B. Williamson [RWG, UMMZ]. **HONDURAS, Yoro:** 1 ♂, 1 ♀, Uchapa River, Olanchito {15.485°N, 86.5596°W}, 150 m, 22 March 1923, T. H. Hubbell [RWG]; **Olanchito:** 1 ♂, Matadero River, small, clear gravel bottom, S of San Esteban near Gualaco {15.15°N, 85.9333°W}, 480 m, 4 March 1990, S. W. Dunkle [FSCA]; 8 ♂♂, 3 ♀♀, Telica River near Telica, wide, clear, rocky, 14.7203°N, 86.1447°W, 368 m, 17 December 1987, S. W. Dunkle [FSCA, RWG]; 2 ♂♂, 1 ♀, Guayape River, clear shallow gravel bars, E of Campamento {14.5333°N, 86.65°W}, 600 m, 3 March 1990, S. W. Dunkle [FSCA]; **Francisco Morazán:** 4 ♂♂, 4 ♀♀, Zamorano, Escuela Agrícola Panamericana, 30 km ESE of Tegucigalpa, ponds and Yeguaré River with riffles and pools {14.0134°N, 87.0094°W}, 799 m, 9–11 December 1987, S. W. Dunkle [FSCA]; 5 ♂♂, Zamorano, Yeguaré River, rocky, medium-sized, clear green water, 14.0086°N, 87.0097°W, 799 m, 27 February 1990, S. W. Dunkle [FSCA]; **El Paraíso:** 1 ♂, Chiquito River on road to Teupasenti, E of Zamorano, wide, rocky, a little murky, 12.5333°N, 87.0832°W, 200 m, 10 December 1987, S. W. Dunkle [FSCA]. **NICARAGUA, Matagalpa:** 1 ♂, Waswali Bridge, 10 km W of Matagalpa, 62x075 {12.9187°N, 85.9665°W}, 620 m, 23 June 1962, T. W. Donnelly [FSCA].

A relatively large species (Table 2); male mostly blue (Figs. 113, 114, 361, 837, 975), with cercus linear, about twice as long as wide, divided apically and with inner branch distinctly longer than outer branch in dorsal and mediodorsal views (Figs. 720a, c), and paraproct ventral branch shorter than dorsal branch and directed posterodorsally in lateral view (Fig. 720b); female similar to male, blue or tan (Figs. 238–240, 976), with mesostigmal lobe occupying about 0.33 of plate and with posterolateral margin of mesostigmal lobe in dorsal view distinctly concave, clearly differentiated from remainder of mesostigmal plate (Fig. 558).

Diagnosis. The color pattern of the male of *A. pipila* (Figs. 113, 114, 361, 837, 975) is almost identical to that of *A. barretti* (Figs. 36, 37, 294, 973) which, coupled with Calvert's (1907) extensive description, renders a redescription unnecessary. This species is diagnosed under *A. barretti* and *A. harknessi*. In addition to the morphological characters separating *A. barretti* from *A. pipila*, dorsal blue on S6 in *A. pipila* (Fig. 975) is generally limited to the basal half to fifth, while in *A. barretti* dorsal blue is more extensive, wider and extends to the apical third of S6 (Fig. 973).

Remarks. Nothing more has been written on *A. pipila* since Calvert's (1907) original detailed description and, as the above synonymy shows, little has been recorded other than its occurrence within various Mexican states. The type series was extensive (76 ♂♂, 21 ♀♀), and Calvert keyed this species against the male of *A. barretti*, of which only the holotype male was known at the time.

Habitat. At Salto Eyipantla, *A. pipila* was abundant, and adults were found perching on concrete foundations (Fig. 837) below and above the falls.

Distribution. *Argia pipila* extends from S Veracruz in Mexico south through N Nicaragua, from an altitude of 18 to 1452 m (Guatemala, Quezaltenango, Santa María; from Calvert 1907). The E portion of the Trans-Mexican Volcanic Belt (ca. 96.8°N), where it extends nearly to the Gulf of Mexico, would appear to act as a geographic barrier separating it from the similar *A. barretti*, which occurs to the north (Fig. 792).

Argia pocomana Calvert, 1907

Figs. 115 (head, thorax, S1–4 ♂); 241 (head, thorax, S1–4 ♀); 363 (S7–10 ♂); 466 (S7–10 ♀); 559 (mesostigmal plates ♀); 721, 722 (appendages ♂); 785 (map); 838 (field photo ♂); 839 (field photo ♀); 926 (body scan ♂); 927 (body scan ♀).

[Key locators: ♂ G-2, couplet 4(3); ♂ M-5, couplet 23(21'); ♀ F-14, couplet 1]

Argia pocomana Calvert 1907: 375 (♂, ♀, description, pl. X. figs. 15, 15s, 24);—Calvert 1908a: xxix (clarification of holotype data);—Paulson 1982: 253 (Mexico);—Paulson 1984: 51 (El Salvador);—Dunkle 1988: 45 (Honduras);—González-Soriano 1993: 295 (Mexico);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Ramírez *et al.* 2000: 249 (Costa Rica);—Förster 2001: 11, 56 (key ♂, fig. C24);—Garrison *et al.* 2003: 36 (holotype data);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Heckman 2008: 356, 386, fig. 3.1.410 (key ♂, ♀, Central America, Colombia);—Pérez-Gutiérrez *et al.* 2007: 206 (considers earlier records of *A. pocomana* from Colombia incorrect);—González-Soriano & Paulson 2011: 307 (Chiapas, Mexico);—Garrison & von Ellenrieder 2013: 16 (Costa Rica);—Paulson & Haber 2021: 110 (diagnosis, photos).

Primary types. *Argia pocomana*: holotype ♂, GUATEMALA, Mazatenango, 3 February 1905, Edward B. Williamson leg. [examined, in UMMZ; Garrison *et al.* 2003].

Specimens examined. 44 ♂♂, 22 ♀♀: **MEXICO, Oaxaca:** 2 ♂♂, Granja Montecarlo, NW of Santa María {15.9833°N, 96.0832°W}, 950 m, 10 July–10 August 1972, R. Gambón [RWG]; **Chiapas:** 2 ♂♂, 0.4 mi SW of Unión Juárez {15.1°N, 92.1°W}, 790 m, 30 July 1965, D. R. & M. L. Paulson [FSCA]. **GUATEMALA, Alta Verapaz:** 1 ♂, Tamahú {15.3333°N, 90.1668°W}, 1100 m, 19 November 1963, E. C. Welling [RWG]; 1 ♀, Los Alpes near Pancajche {15.3167°N, 89.9667°W}, 600 m, 2 September 1974, T. W. Donnelly [FSCA]; **Zacapa:** 1 ♀, 10 km NE of Teculután {15.0281°N, 89.6311°W}, 300 m, 16 July 1963, T. W. Donnelly [FSCA]; 1 ♀, Panaluya near Río Hondo, 70X032A {15.0417°N, 89.5832°W}, 174 m, 21 August 1970, T. W. Donnelly [FSCA]; 6 ♂♂, 3 ♀♀, La Unión {14.9667°N, 89.2833°W}, 850 m, 30 August–30 December 1972, E. C. Welling M. [UMMZ]; **El Progreso:** 1 ♂, tributary of Quebrada El Chorro, road between Morazón and San Jerónimo {14.95°N, 89.8833°W}, 1300 m, 17 August 1968, T. W. Donnelly [FSCA]; 2 ♂♂, Hondo River, San Agustín Acasaguastlán {14.9428°N, 89.9708°W}, 300 m, 11–21 August 1965, O. S. Flint, Jr. & M. A. Ortiz B. [USNM]; 1 ♂, same data but 23 July 1971, O. S. Flint, Jr. & M. A. Ortiz B. [FSCA]; 1 ♂, Finca La Cajeta near Estación de la Virgen {14.7833°N, 90.7333°W}, 1446 m, 20 August 1965, T. W. Donnelly [FSCA]; **Guatemala:** 2 ♂♂, El Fiscal {14.7217°N, 90.3917°W}, 1120 m, 4 June 1909, E. B. Williamson [RWG, UMMZ]; 3 ♂♂, Mariscal River {14.5717°N, 90.5856°W}, 1400 m, 24 May 1980, W. Brehme & T. W. Donnelly [FSCA]; **Suchitepéquez:** 2 ♂♂, 1 ♀, Finca Moca Grande {14.5336°N, 91.2517°W}, 400 m, 7–11 July 1977, M. J. Westfall, Jr. [FSCA]; 1 ♂, 1 ♀, Mazatenango {14.5333°N, 91.5°W}, 363 m, 3 February 1905, E. B. Williamson [UMMZ]; **Chimaltenango:** 1 ♂, San Pedro Yepocapa {14.5042°N, 90.9569°W}, 1403 m, 28 June 1977, M. J. Westfall, Jr. [FSCA]; 1 ♂, Chimaltenango {14.6667°N, 90.8167°W}, 1770 m, 1948, H. T. Dalmat [FSCA]; **Escuintla:** 3 ♂♂, 1 ♀, Escuintla, Finca El Salto {14.305°N, 90.785°W}, 355 m, 22 June 1977, M. J. Westfall, Jr. [FSCA]. **HONDURAS, Atlántida:** 1 ♂, Yaruca, 10 km S {15.5714°N, 86.6656°W}, 600 m, 12 August 1976, A. J. & T. W. Donnelly [FSCA]; **Comayagua:** 1 ♂, Guique River, bridge and curve, 7.7 km S of Siguatopeque, pools and boulder rapids {14.5325°N, 87.8036°W}, 930 m, 12 December 1987, S. W. Dunkle [FSCA]; **Francisco Morazán:** 1 ♂, Zamorano, Quebrada Seca, SE of Yeguaré River bridge {14.0072°N, 87.0461°W}, 1000 m, 16 March 1990, S. W. Dunkle [RWG]. **EL SALVADOR, Santa Ana:** 2 ♀♀, El Limo Ranch and parking lot at main road, 15 km N of Metapán, below the large waterfall in the protected area {14.4142°N, 89.4068°W}, 1136 m, 28 August 2011, R. A. Bailowitz [RWG]; **La Libertad:** 1 ♀, waterfall, 2.9 mi SE of Highway 1 and Highway 8 junction on Highway 1, 66-167 {13.6956°N, 89.3192°W}, 791 m, 25 June 1966, D. R. Paulson [RWG]. **COSTA RICA, Guanacaste:** 1 ♀, E of La Cruz, village of Ánimas, Ánimas River, junction with Highway 4, 11.0502°N, 85.5865°W, 205 m, 6 December 2005, W. W. A. Haber & F. Morrison [RWG]; 1 ♂, Llanos de Cortez Waterfall, Potrero River, 4 km W of Bagaces, stream below falls, clear water bordered by *Lindenia rivalis*, bordered by forest, 10.5247°N, 85.2975°W, 100 m, 9 December 2006, W. W. A. Haber & F. Morrison [RWG]; 1 ♀, same data but 10.5245°N, 85.2974°W, 100 m, 3 February 2005, W. A. Haber [RWG]; **Heredia:** 1 ♂, **Finca La Selva**, 1.5 mi. S of Puerto Viejo, 67-58 {10.4667°N, 84.0167°W}, 60 m, 15 April 1967, D. R. Paulson [FSCA]; **Puntarenas:** 2 ♂♂, road to highway, Los Cerros, spring stream in pasture near Cheche Nuñez, 10.2797°N, 84.8439°W, 1050 m, 27 December 2007, W. Haber & A. Cruz [CSCA, RWG]; 1 ♀, La Guaria, Los Cerros, 6 km SW of Santa Elena, Quebrada Guaria, Finca Aristides Campos, 10.2644°N, 84.8454°W, 845 m, 19 July 2010, W. Haber & A. Cruz

[RWG]; 1 ♂, 800 m down San Luis Road from bus stop on main road to highway from Santa Elena, 10.2569°N, 84.8387°W, 725 m, 26 June 2004, W. A. Haber [RWG]; 1 ♀, road from Monteverde to Interamerican Highway, 8.3 km SW of Monteverde, Haber 2738, 10.2422°N, 84.8484°W, 716 m, 26 June 2004, W. A. Haber [RWG]; 1 ♀, Nicoya Peninsula, Finca of Larry, 9.7249°N, 85.0351°W, 100 m, 5 January 2006, M. Wainwright [RWG]; 1 ♂, Mesas, Centro Turístico los Chocuacos, lagoon, seepages and inlet stream, 8.9657°N, 83.175°W, 296 m, 25 January 2018, W. F. Maufray [FSCA]; **Alajuela**: 1 ♀, Grande de Tarcoles River, 50 m upstream from bridge on Highway 3, tiny spring trickle from steep bank and pool on large rock shelf in sun, 9.9864°N, 84.3443°W, 480 m, 15 February 2005, D. L. Wagner & W. A. Haber [RWG]; 1 ♂, 1 ♀, same data but hillside creek that is drying out W of ridge, 481 m, 17 February 2005, D. L. Wagner, W. A. Haber & G. Corrales [RWG]; 1 ♂, 1 ♀, Alajuela Mine, 0.5 mi S of Highway 11 on Highway 133 {9.9833°N, 84.3332°W}, 520 m, 9 July 1967, M. J. Westfall, Jr. & D. N. Westfall [FSCA]; 1 ♂, Atenas {9.9817°N, 84.3803°W}, 700 m, 7 May 1916, A. Alfaro [FSCA]; 1 ♀, San Mateo, 9.1 km E, {9.9631°N, 84.4492°W}, 641 m, 18 July 1963, D. M. Thompson [FSCA]; 1 ♂, San Mateo, 8.7 km E {9.9332°N, 84.5167°W}, 550 m, 22 June 1963, F. G. Thompson [FSCA]; 1 ♂, San Miguel, small stream crossing road about 900 m up from Peñas Blancas River bridge, 10.3566°N, 84.6366°W, 525 m, 12 February 2006, W. Haber, J. Hyland & J. Wolfe [RWG]; **San José**: 1 ♂, Hacienda El Rodeo, 7 km W of Villa Colón, L-03-1040 {9.9167°N, 84.25°W}, 795 m, 23 November 1989–9 June 1990, C. Esquivel-Herrera [UNH]. **PANAMA, Panamá**: 1 ♀, Alajuela {9.2279°N, 79.5491°W}, 80 m, 5 April 1911, A. Busck [FSCA].

A medium-size species (Table 2); male violaceous (Figs. 115, 363, 838, 926) with distal segment of genital ligula with large saccoid lateral lobes and entally directed flared process on each side distal to them (as in Fig. 648), paraproct in lateral view with ventral branch vestigial or small, and cercus with inner branch forming a posteroventrally directed tooth (Figs. 721b, 722b); female (Fig. 927) with mesostigmal lobe in dorsal view very small, slightly wider than long, occupying basal fourth or fifth of mesostigmal plate (Fig. 559c).

Redescription. Calvert's description was based on two pairs collected in Guatemala; we supplement his description as follows.

Male (Costa Rica, Guanacaste, Potrero River, Figs. 115, 361, 926): Head: Labium, ante- and postclypeus, genae and ante- and postfrons entirely violaceous, epicranium black with small pale spot anterolateral to lateral ocellus, black appearing as a broad cross-band delimited posteriorly by violaceous postocular spots bordering eye, pale occipital bar lacking, dorsal surface of postocular lobe black; antennae black, rear of the head pale with ill-defined black marks around the occipital foramen and laterally along eye. Prothorax black with following areas violaceous: anterior lobe, mediolateral spot on middle lobe and propleuron and extreme lateral margin of posterior lobe. Pale areas of pterothorax violet, with broad black middorsal stripe about as wide as each pale parallel antehumeral stripe; black humeral stripe broad, extending from base of mesinfraepisternum and narrowing at mid-height, connecting with black antecular carina, vestigial black stripe on interpleural suture; remainder of thorax pale violet with well-defined metapleural stripe. Wings hyaline, with venation black; Pt brown, surmounting 1.5 cells in Fw, 1 cell in both Hw; px Fw 15/15, Hw 12/12; pq cells Fw 3/3, Hw 3/3; RP2 at Fw 7/7, Hw 5/5. Coxae pale violet; remainder of legs black. Abdomen violaceous and black; S1 black distally with a narrow violaceous half ring; S2 black, dorsally with pale spot narrowing preapically before expanding at black annulus; S3 with basal ring of violet and dorsally prolonged posteriorly and ending at apical fifth, laterally with a longitudinal black stripe interrupted medially by an incomplete pale stripe, remainder of black stripe enlarging forming a black apical ring at apical 0.20; S4–6 as in S3 but lateral black stripe gradually connecting above at apical fifth; S7 similar but lacking interrupted pale lateral stripe.

Genital ligula (as in Fig. 648) with large saccoid lateral lobes and with an entally directed flared process on each side distal to them, distal segment ending in a flexible flagellum-like process.

Torus linear, swollen ventrally, occupying entire ventral margin of torifer but not overlapping bilobed epiproct (Figs. 721c, 722c), base of epiproct and surrounding area black; cercus (Figs. 721a, c, 722a, c) long, about subequal to paraproct, sides more or less parallel but medial margin slightly concave, slightly convex dorsomedially, bifid apically with slightly decumbent inner branch (tooth) separated from outer branch by a U-shaped cleft; inner branch forming a glabrous tooth visible in lateral view (Figs. 721b, 722b); paraproct bilobed, its ventral branch much smaller than long slightly anteriorly directed dorsal branch, in lateral view, tip of dorsal branch with small acuminate tooth, emarginate anteriorly; paraproct in lateral view with apicoventral margin linear (Figs. 721b, 722b).

Dimensions. Hw 21.6, abdomen 28.4, total length 36.4.

Female (Costa Rica, Alajuela, Grande de Tarcoles River, Fig. 927): Head, pro- and pterothorax and S1–2 as

in male but pale colors largely blue; vestige of pale occipital bar represented by small pale lateral spots, black middorsal slightly wider than pale antehumeral stripe, black stripes on thorax slightly narrower; black stripes on S2 meeting on the mid-dorsum at apical third; S3–7 black with a narrow transverse basal blue ring, on S3–5 prolonged posteriorly as a middorsal stripe reaching to three-fourths of S3–4 and two-thirds of S5; S3–6 with a pale incomplete lateral longitudinal stripe on the middle third and becoming progressively smaller on S5–6; S7–8 entirely black except for pale basal ring, 10 as in the male, but S9 with a pair of basal dorsal black spots one fifth as long as the segment, each narrowly confluent at extreme base with the ventral black stripe. Pt surmounting 1 cell in Fw and Hw; px Fw 13/14, Hw 11/11; pq cells Fw 3/3, Hw 3/3; RP2 at Fw 6/6, Hw 4/4. Mesostigmal lobe in dorsal view very small, slightly wider than long, occupying basal fourth or fifth of mesostigmal plate (Fig. 559c).

Dimensions. Hw 22.1, abdomen 25.5, total length 33.5.

Diagnosis. Morphology of the genital ligula of *A. pocomana* is the same as that of *A. talamanca* (Fig. 648) and separates these two species from all others. Males of these two species may be separated as follows: distal margin between inner and outer branches of cercus of *A. pocomana* in dorsal view U-shaped, deeply concave, Figs. 721c, 722c (cercus in dorsal view with distal margin between inner and outer branches shallowly concave, Fig. 732c, or almost linear, Fig. 737c in *A. talamanca*). The black middorsal stripe in *A. pocomana* is subequal in width to the pale antehumeral stripe (Figs. 115, 926); the middorsal stripe in most males of *A. talamanca* is reduced to a narrow line no wider than middorsal carina (Figs. 131–134, 928) or as wide as one fourth of antehumeral stripe (Fig. 135). Male caudal appendages of *A. pocomana* (Figs. 721, 722) superficially resemble those of *A. mayi* (Fig. 706), and the male is diagnosed under the latter species. The female of *A. pocomana* is at once distinguished by the combination of abdominal pattern described above coupled with the very small mesostigmal lobe that is slightly wider than long and occupies the basal fourth or fifth of mesostigmal plate (Fig. 559c). Females of *A. pocomana* from Costa Rica and Panama may be difficult to separate from some *A. talamanca*; see under *A. talamanca* for further comments.

Habitat. According to Paulson & Haber (2021), *A. pocomana* is an infrequently encountered species found at seeps and small trickles from springs, usually in sunny areas. Haber noted a male (Potrero River) guarding a small waterfall-sheet of water draining down a vertical rock wall with some vegetation and moss.

Distribution. *Argia pocomana* occurs from Jalisco in Mexico (El Limón, Balneario Las Higueras, CNIN; not seen) south through Panama (Fig. 785), at elevations between 12 and 1555 m (Chiapas, 24.1 km northwest and 6.6 km west of Tapachula; from González-Soriano & Paulson 2011). We have seen no records from Nicaragua, though the species must occur there.

Argia popoluca Calvert, 1902

Figs. 116–119 (head, thorax, S1–4 ♂); 242, 243 (head, thorax, S1–4 ♀); 279 (wings ♂); 364–367 (S7–10 ♂); 467 (S7–10 ♀); 560, 561 (mesostigmal plates ♀); 638, 639 (genital ligula); 723, 724 (appendages ♂); 764 (type labels); 782 (map); 840 (field photo ♂); 1015, 1016 (body scans ♂); 1017, 1018 (body scans ♀).

[Key locators: ♂ G-5, couplet 12(11); ♂ M-6, couplet 23(12'); ♀ F-4, couplet 1']

Argia popoluca Calvert 1902: 82 (♂, ♀, description, pl. IV, figs. 8, 38, 38s);—Calvert & Hagen 1902: 113 (“Types in Coll. Godman”);—Kimmins 1970: 190 (holotype data ♂);—Paulson 1982: 253 (Mexico, Guatemala);—Brooks 1989: 50 (Costa Rica);—Dunkle 1991: 132 (Honduras);—Donnelly 1992: 83 (Panama);—González-Soriano 1993: 295 (Mexico);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Ramírez *et al.* 2000: 249 (Costa Rica);—Förster 2001: 11, 54, 56 (key ♂, ♀, fig. C24);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—von Ellenrieder & Garrison 2007a: 20 (holotype illustrated, figs. 60–q);—Garrison & von Ellenrieder 2013: 16 (Costa Rica);—Garrison & von Ellenrieder 2017: 28 (comparison with *A. schorri*, material examined, figs. 29, 52, 78, 79, 102, 122, 123, 143; 144, 163, 164, 170, photos 188, 189);—Garrison & von Ellenrieder 2018: 6 (Ecuador);—Mauffray & Tennessen 2019: 44 (Ecuador);—Paulson & Haber 2021: 96 (diagnosis, photos).

Argia (Chalcargia) popoluca: Kennedy 1920: 85 (placed in new subgenus).

Argia variata Navás 1935: 34 (Colombia, fig. 1);—Garrison *et al.* 2003: 39 (lectotype data, recognition as species);—Heckman 2008: 350 (key);—Garrison & von Ellenrieder 2017: 28 (footnote, as synonym of *A. popoluca*);—Garrison & von Ellenrieder 2018: 6 (as synonym of *A. popoluca*, Ecuador).

Primary types. *Argia popoluca*: holotype ♂, MEXICO, Tabasco, Teapa, March 1888, Herbert H. Smith leg. [examined, in BMNH; von Ellenrieder & Garrison 2007a, Garrison & von Ellenrieder 2017];—*Argia variata*: lectotype ♂, COLOMBIA, Villavicencio, September 1912 (Fig. 764) [examined, in MNHN].

Specimens examined. 90 ♂♂, 20 ♀♀ (see Garrison & von Ellenrieder 2017 for additional material examined not listed here): **MEXICO, Veracruz:** 1 ♀, near Jamapa River, 4 mi N of Coscomatepec {19.0667°N, 97.0333°W}, 1463 m, 23 July 1966, O. S. Flint, Jr. & M. A. Ortiz B. [USNM]; 1 ♂, 4.7 mi. N of Huatusco, Ruiz Cortines Bridge {19.25°N, 96.9833°W}, 1280 m, 23–24 July 1966, O. S. Flint, Jr. & M. A. Ortiz B. [USNM]; **Tabasco:** 1 ♂, 1 ♀ (paratypes), Teapa {17.55°N, 92.95°W}, 95 m, March 1888, H. H. Smith [BMNH]. **HONDURAS, Comayagua:** 1 ♂, Guique River, bridge and curve, 7.7 km S of Siguatepeque, pools and boulder rapids, ca. 10 mi SW of Siguatepeque {14.5325°N, 87.8036°W}, 930 m, 12 December 1987, S. W. Dunkle [FSCA]. **COSTA RICA, Alajuela:** 5 ♂♂, 8 km S of Santa Cecilia, Pitilla Biological Station, shaded stream riffle {10.9891°N, 85.4258°W}, 680 m, July 1988, S. J. Brooks [BMNH, CSEA, RWG]; **Heredia:** 1 ♂, 1 ♀, Braulio Carrillo National Park, Quebrada Cantarrana, 11 km ESE of La Virgen, very dark seepage area along Quebrada, 10.35°N, 84.0568°W, 30 m, 20 February 2004, D. L. Wagner [RWG]; **Limón:** 1 ♀, Guápiles, in forest {10.2158°N, 83.7867°W}, 304 m, 7 July 1967, M. J. Westfall, Jr. & D. N. Westfall [FSCA]; **Puntarenas:** 1 ♂, along road to Playa Dominical, km 26 {9.2786°N, 83.8571°W}, 500 m, 23 March 1986, H. Platt, H. Gómez & D. Hernández [USNM]; 1 ♀, Península de Osa, Marengo Biological Station, L-03-1157 {8.6878°N, 83.7056°W}, 41 m, 20 February 1990, C. Esquivel-Herrera [RWG]; 1 ♂, Refugio de Vida Silvestre Golfito, grasslands and streams at La Lechería, L-03-1037 {8.65°N, 83.1668°W}, 100 m, 16–18 July 1990, C. Esquivel-Herrera [RWG]. **PANAMA, Colón:** 3 ♂♂, 1 ♀, Portobelo {9.5507°N, 79.6541°W}, 50 m, 18 April 1912, A. Busck [FSCA, RWG]; **Panamá:** 1 ♂, 2 ♀♀, Canal Zone, Cocoli {8.9829°N, 79.5973°W}, 30 m, September 1946, N. L. H. Krauss [RWG]. **COLOMBIA, Risaralda:** 1 ♂, Corregimiento Santa Cecilia, Alto Amurrapá Preserve, Quebrada Ranas de Cristal stream {5.3202°N, 76.1736°W}, 620 m, 22 February 2017, J. Sandoval & C. Bota-Sierra [RWG].

A medium-size species (Table 2); male violaceous (Figs. 116, 117, 840, 1015) to largely blue (Figs. 118, 119, 1016) with broadly ovate male tori occupying the ventral half of the torifer and not overlapping the epiproct (Figs. 723a, c) and genital ligula with a long bifid flagellum and broadened laminate base (Figs. 638, 639); female (Figs. 1017, 1018) with broadly semicircular almost approximate mesostigmal lobes and middorsal carina branching at distal margin of mesostigmal lobes.

Redescription. Calvert's (1902) description was based on two males and a female from Teapa in Mexico. Our redescription of the male of *A. pocomana* generally applies also to *A. popoluca* but differs as follows (alternative states for *A. pocomana* in parentheses): postocular spots small, almost never confluent with eye margin (large, confluent with eye margin), rear of head black (mostly pale), black humeral stripe of equal length, sometimes enclosing a small pale spot just below antealar crest (black humeral stripe narrowing at mid-height).

Diagnosis. Male of *A. popoluca* resembles *A. schorri* superficially in the form of appendages (Fig. 730) but differs by torifer not overlapping the epiproct (Figs. 723a, c; in *A. schorri* torifer is contiguous with its opposite along its entire medial margin, and both completely conceal bilobed epiproct in dorsal view, Fig. 730c) and by genital ligula lacking a pair of entolaterally directed quadrate lobes at base (Figs. 638, 639; with a pair of entolaterally directed quadrate lobes at base in *A. schorri*, Fig. 646). A more complete diagnosis of these two species is provided by Garrison & von Ellenrieder (2017).

Female of *A. popoluca* shares the middorsal thoracic carina branching at distal level of mesostigmal lobes (Figs. 561c) only with *A. hinei* (Fig. 531c) within Central America. Besides the differences in their mesostigmal lobes mentioned in key F-4, female of *A. popoluca* is mostly black and lacks a pale postocular bar on head (Figs. 1017, 1018), whereas in *A. hinei* pale areas are more extensive, and there is a pale postocular bar confluent with pale postocular spots on head (Fig. 936).

Remarks. According to Paulson & Haber (2021), *A. popoluca* in Costa Rica occurs in two color forms, a Caribbean slope form with much blue on the abdomen (Fig. 364) and a Pacific slope (Osa Peninsula) form with middle abdominal segments (including S7) almost entirely black and also with posterolateral black marking on S8 (e. g., Figs. 366–367). Our specimens from the Osa Peninsula do not possess a largely black abdomen, but Paulson & Haber (2021) provided a photograph of a male with a largely black abdomen labeled as “Pacific form.” Garrison & von Ellenrieder also noted that *A. popoluca* was a variable species in terms of Fw pq cells (4 in Mexico, 3 farther south) and extent of the middorsal blue stripe, extending for most of the dorsum on S3 variably through S7.

In a footnote, Garrison & von Ellenrieder (2017) considered *A. variata* a junior synonym of *A. popoluca*. Navás' poorly executed illustration of the now missing appendages (Fig. 365), coupled with our examination of the specimen (Fig. 119), matching type locality label (Fig. 764) and matching counts of px veins, leave us no doubt that the specimen examined is the lectotype.

Distribution. *Argia popoluca* ranges from central Veracruz through Tabasco in Mexico, and south to Honduras, Costa Rica, Colombia, and Ecuador (Fig. 782), between 12 and 1555 m (Mexico, Chiapas, 24.1 km northwest and 6.6 km west of Tapachula; Gonzalez-Soriano & Paulson 2011) There are no records for Nicaragua, but the species mostly likely occurs there; very little collecting has been done in that Central American country.

Argia pulla Hagen in Selys, 1865

Figs. 20 (head ♂), 120, 121 (head, thorax, S1–4 ♂); 244 (head, thorax, S1–4 ♀); 280 (wings ♀); 368, 369 (S7–10 ♂); 468 (S7–10 ♀); 562, 563 (mesostigmal plates ♀); 640 (genital ligula); 725 (appendages ♂); 801 (map); 1028, 1029 (body scans ♂); 1030 (body scan ♀).

[Key locators: ♂ G-5, couplet 14'; ♂ M-2, couplet 2(1); ♀ key to groups, couplet 30(29), F-6, couplet 10(9); F-9, couplet 2(1); ♀ shortcut 10]

Argia pulla Hagen in Selys, 1865: 410 [38 reprint] (description ♂, Vénézuéla, Coll. Hagen, de Selys);—Calvert 1899: 382 (description ♂, ♀, Tepic, Mexico, pl. 25, fig. 4);—Kirby 1899: 371 (Panama);—Calvert 1902: 79 (description ♂, ♀, pl. iv. figs. 33, 33ss);—Calvert 1902: 13 (“Types in Colls. M. C. Z., Selys”, pl. 1, figs. 16, 16a);—Calvert 1907: 364 (comparison with *Argia frequentula* Calvert 1907, pl. X, figs. 6–8);—Ris 1918: 104 (Guatemala, Panama);—Calvert 1919: 163 (Guatemala);—Geijskes 1932: 240 (Trinidad);—Fraser 1948: 58 (appendages from Argentina, fig. 5);—Soukop 1954: 12 (Peru);—Rácenis 1959: 477 (Peru);—May 1979: 16 (Panama);—Gloyd 1981: 133 (El Salvador);—Paulson 1982: 253 (Mexico south through South America);—Garrison 1983: 24 (Venezuela);—Paulson 1984: 51 (El Salvador);—Dunkle 1988: 45 (Honduras);—Maes *et al.* 1988: 34 9 (Nicaragua);—Michalski 1988: 6 (Trinidad);—Brooks 1989: 50 (Costa Rica);—Convey 1989: 57 (Venezuela);—Maes 1989: 6 (Nicaragua);—Dunkle 1991: 132 (Honduras);—Rodrigues Capítulo *et al.* 1991: 61 (Argentina, after Fraser 1948);—Donnelly 1992: 83 (Panama);—Novelo-Gutiérrez 1992: 55 (description of larva, figs. 9, 16, 41, 47, 67, 70, 89);—Rodrigues Capítulo 1992: 54 (Argentina, after Fraser 1948);—González-Soriano 1993: 296 (Mexico);—Boomsma & Dunkle 1996: 25 (Belize);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Ramírez *et al.* 2000: 249 (Costa Rica);—Förster 2001: 11, 54, 58, (key ♂, ♀, fig. C25);—Abbott *et al.* 2002: 127 (Nicaragua);—Alonso-Eguía *et al.* 2002: 352 (Mexico);—Paulson 2002b: 362 (Mexico);—Lencioni 2006: 101 (Brazil);—Esquivel 2005: 147 (description ♂, ♀, Costa Rica, photos 45, 46);—Westfall & May 2006: 210 (♂, ♀, key, description, figs. 81B, 95B, 103F);—Upson *et al.* 2007: 32 (Sonora, Mexico);—Caesar & Wenzel 2009: 104 (phylogeny within genus *Argia*);—Ussa Cristiano & Arango Díaz 2009: 41 (Colombia, photo ♀, figs. 37, 38);—Pérez-Gutiérrez & Palacino-Rodríguez 2011: 212 (Colombia); Amaya-Perilla & Palacino-Rodríguez 2012: 34 (Colombia);—Garrison & von Ellenrieder 2013: 16 (Costa Rica, fig. 21, appendages of lectotype ♂, photo 26 ♂);—Pérez-Gutiérrez *et al.* 2013: 103 (Colombia, photos 226–232);—Escoto-Moreno *et al.* 2015: 153 (Zacatecas, Mexico);—Bailowitz *et al.* 2015: 142 (Sonora, Mexico, photos ♂, ♀);—Escoto-Moreno *et al.* 2015: 153 (Zacatecas, Mexico);—Garrison & von Ellenrieder 2015: 67 (♂, ♀, key synonymy, lectotype designation, diagnosis, figs. 1g, 3e2, 4o2–q2, 5a2, 6x, y, 7j3, k3, 8c, 9u–w, 10k5–m5, 13e, 15q, r);—Michalski 2015: 94 (key, Trinidad, photos ♂, ♀);—González-Soriano *et al.* 2016: 156 (Colima, Mexico);—Torres-Pachón *et al.* 2017: 417 (molecular phylogeny of larvae within *Argia*);—Bota-Sierra *et al.* 2019: 45 (brief diagnosis, photos, Colombia);—Garrison & von Ellenrieder 2019: 42 (lectotype data);—Maufray & Tennesen 2019: 44 (Ecuador, photo 16b);—Carillo-Muñoz & García-Miranda 2020: 199 (Oaxaca, Mexico);—Koroiva *et al.* 2020: 8 (Amazonas, Brazil);—Palacino-Rodríguez *et al.* 2020: 1567 (Chocó, Colombia, photo 3D);—von Ellenrieder *et al.* 2020: 11 (Napo, Ecuador);—Paulson & Haber 2021: 107 (diagnosis, photos);—Smith 2021: 21 (Sonora, photo 5a).

Agrion puella: Baker, 1905: 86 (“Frequent at Chinandega, Nicaragua. Det. Calvert and Banks”);—Calvert 1907: 364 (synonymy).

Argia (Chalcargia) pulla: Kennedy, 1920: 85 (placed in new subgenus).

Argia lobata Navás, 1924: 329 (17 reprint);—Lencioni (2006: 101, mention as synonym after Garrison pers. comm.);—Garrison & von Ellenrieder 2015: 67 (type status, synonymy, fig. 13e).

Primary types. *Argia pulla*: lectotype ♂, VENEZUELA [examined, in MCZ; Garrison & von Ellenrieder 2015];—*Argia lobata*: holotype ♂, COLOMBIA, Meta, Cumaral, December 1913 [Lost?].

Specimens examined. 332 ♂♂, 138 ♀♀: (see Garrison & von Ellenrieder 2015 for additional material examined not listed here). **MEXICO, Veracruz:** 1 ♂, 1 ♀, Cerro Gordo {19.4333°N, 96.698°W}, 580 m, 10 March 1964, R. D. Cuyler [FSCA]; 1 ♀, stream 1.9 mi S of Cuitlahuac {18.7877°N, 96.7289°W}, 335 m, 13 August 1965, D. R. Paulson [FSCA]; **Morelos:** 2 ♂♂, Balneario Las Palmas, S of Tehuixtla, stream into Amacuzac River, just down river, 18.5475°N, 99.2704°W, 866 m, 20 July 1992, W. F. Maufray [FSCA]; **Oaxaca:** 2 ♂♂, Route 190, ca. 1.5 mi W of road to canal in large drainage or irrigation ditches, 30 m, 28 July 1966, R. W. Cruden [UMMZ]. **HONDURAS, Gracias a Dios:** 1 ♀, Brus pond {15.7558°N, 84.5378°W}, 3 m, 17 December 1940, C. W. Cook [FSCA]; 1 ♂, same

data but 14 April 1947 [FSCA]; **Yoro**: 4 ♂♂, 4 ♀♀, Coyoles, edge of pond and field {15.4074°N, 86.6986°W}, 500 m, 15–27 October 1948, E. C. Becker [CSCA, UMMZ]; 1 ♀, Csame data but 7 March 1949 [UMMZ]. **COSTA RICA, Guanacaste**: 1 ♂, Guanacaste National Park, trail to Maritza Biological Station, L-03-895 {10.9568°N, 85.495°W}, 590 m, August 1990 [UNH]; 1 ♂, 1 ♀, Fortuna, Abangares {10.6738°N, 85.2072°W}, 408 m, 30 June 1989, C. Esquivel-Herrera [UNH]; 1 ♂, 1 ♀, same data but L-03-873, 10 April 2001 [UNH]; 4 ♀♀, Hacienda La Pacífica, L-03-468, 26–30 June 1989, C. Esquivel-Herrera [UNH]; 1 ♂, La Pacífica Biological Center, 5 km N of Las Cañas, 10.453°N, 85.1297°W, 40 m, 12 September 1990, N. D. Penny [CAS]; **Cartago**: 3 ♀♀, Palo Verde, L03-235 {9.7833°N, 83.95°W}, 29 January 1981, C. Esquivel-Herrera [UNH]; **Puntarenas**: 1 ♂, near Sardinal along road to finca del Coco, dry lowland forest with secondary and remnant primary trees along ravine and stream {10.35°N, 85.65°W}, 757 m, 3 March 1984, A. M. Young, J. Jass & S. Sullivan Borkin [USNM]; 1 ♂, 4 ♀♀, about 15 km N of Puntarenas, Barranca site, semi-dry tropical forest along Pan American highway {9.9667°N, 84.8333°W}, 757 m, 2 March 1984, A. M. Young, J. Jass & S. Sullivan Borkin [USNM]; 1 ♀, Parque Nacional Manuel Antonio, L-03-210 {9.3833°N, 84.1411°W}, 11–24 February 1982, C. Esquivel-Herrera [UNH]; 1 ♀, La Gamba, Pacific slope, stream gallery forest strip in open landscape {8.703°N, 83.1875°W}, 80 m, February 2007, S. Schneeweis & F. Hofhansl [UNH]; 1 ♀, waterfall stream, near Rincón de Osa, 69-11 {8.7°N, 83.4833°W}, 13 m, 10 March 1969, D. R. Paulson [FSCA]; 1 ♂, 1 ♀, Osa Pensinsula, Marengo Biological Station, L-03-1238 {8.6878°N, 83.7056°W}, 41 m, 20 February 1990, C. Esquivel-Herrera [UNH]; 1 ♀, Cerro de Oro, L-03-236, 874 m, 28 January 1980, C. Esquivel-Herrera [UNH]; 1 ♀, Corcovado National Park, L09-227 {8.5708°N, 83.5056°W}, 5 April 1982, C. Esquivel-Herrera [UNH]; **Limón**: 1 ♂, Pocora, L-03-1330 {10.168°N, 83.6064°W}, 111 m, 20–22 July 1991, F. Mejia A. [UNH]; 1 ♀, Finca La Lola, Agricultural Research Station near Siquirres {10.1°N, 83.5°W}, 20 October 1983, A. M. Young [USNM]; 2 ♂♂, 1 ♀, same data but 4 July 1987, A. M. Young, S. Sullivan Borkin & R. J. Sullivan [USNM]; **San José**: 1 ♀, Braulio Carrillo National Park, L-03-421 {10.16°N, 83.9631°W}, 742 m, 5 November 1988, C. Esquivel-Herrera [UNH]. **PANAMA, Chiriquí**: 1 ♀, David, San Pablo, Quebrada Sira, bridge to Cola {8.4811°N, 82.4168°W}, 17 April 2011, G. Caballero S. [UNH]; **Colón**: 1 ♀, Fort Sherman, mangroves {9.3718°N, 79.9488°W}, 1 m, 4 April 1971, E. S. Morton [FSCA]; **Panamá**: 1 ♂, Clayton {9.0036°N, 79.5759°W}, 33 m, 1 January 2003, K. Kemp [BYU]; 2 ♂♂, 2 ♀♀, La Chorrera Falls, 98-146 {8.876°N, 79.7767°W, 78 m}, 1 April–15 May 1898, C. H. Dolby-Tyler [BMNH]; 1 ♀, same data but 13 April 1912, A. Busck [FSCA]; 1 ♀, Paraíso {8.6931°N, 79.9028°W}, 150 m, 17–30 January 1911, A. Busck [FSCA]. **COLOMBIA, Antioquia**: 2 ♀♀, Tule Napa Experimental Station, Finca Augura, 7.7794°N, 76.6733°W, 48 m, 6 February 2009, N. Uribe [CEUA, RWG]; **Caldas**: 2 ♀♀, 12 miles S of Anserma, 5.1456°N, 75.8308°W, 1030 m, 12 November 2011, E. I. Schlinger & E. S. Ross [CAS]; **Narino**: 1 ♀, Tumaco {1.7846°N, 78.8001°W}, 10 m, July 2000, E. A. Pena leg. [FSCA]. **TRINIDAD, St. George**: 1 ♀, Arima River at St. Pat's bridge, 3.75 mi north of Arima {10.6868°N, 61.2904°W}, 190 m, 31 May 1964, C. T. Collins [FSCA]; **Arima**: 1 ♂, Arima, 10.6167°N, 61.2667°W, 40 m, 12 March 1964, E. S. & C. E. Ross [CAS]. **VENEZUELA, Carabobo**: 1 ♀, Punta Palmito, 1 February 1976, F. Fernandez Yopez [FSCA]; **Aragua**: 2 ♂♂, 1 ♀, El Limón, stream flowing into swamp near Sensenig house {10.2469°N, 67.5958°W}, 450 m, 5 September 1980, M. J. Westfall, Jr. [FSCA]; **Distrito Federal**: 1 ♀, Caracas, Puerto Escondido, IORI # 00087499 {10.5°N, 66.9168°W}, 910 m, September 1930 [FSCA]; **Bolívar**: 1 ♀, Canaima at Carrao River, 6.2417°N, 62.8481°W, 415 m, 12–14 August 1990, R. W. Garrison [RWG]. **ECUADOR, Napo**: 2 ♂♂, Ishpinga-yacu, rocky stream and side rivulet, N of Muyuna, 0.974°S, 77.8532°W, 541 m, 17 January 2020, R. W. Garrison & N. von Ellenrieder [RWG, USFQ]; 1 ♂, Napo River watershed, Oriente {1.2°S, 77.8332°W}, 700 m, 8 April 1935, W. Clarke-Macintyre [UMMZ]. **PERU, Huánuco**: 1 ♀, Cucharas, tropical jungle in the Huallaga River valley {9.1667°S, 76°W}, 500 m, February 1954, F. Woytkowski [RWG].

A small species (Table 2); male violet or purple (Figs. 1028, 1029) and female tan (Fig. 1030).

Diagnosis. Descriptions of both sexes of *A. pulla* are provided by Calvert (1899) and Westfall & May (2006). Both sexes are diagnosed under *A. frequentula*. Paulson & Haber (2021) provided the following additional differences (alternative characters for *A. frequentula* in parentheses): eyes of mature male *A. pulla* in life dark blue to purple, Fig. 20 (black above and green below) female with broader humeral stripe, Fig. 244 (humeral stripe narrower and with shorter posterior fork, e. g., Fig. 195).

Remarks. Garrison & von Ellenrieder (2015) discussed the synonymy between *A. lobata* and *A. pulla* and argued against the occurrence of *A. pulla* in Argentina as reported (and illustrated) by Fraser (1948) and repeated by Rodrigues Capítulo *et al.* (1991) and Rodrigues Capítulo (1992).

Habitat. Paulson and Haber (2021) reported that *A. pulla* occurs in open forest areas and is one of the most

common species in Costa Rica, living in a great range of habitats including clear rocky streams and rivers, isolated stagnant ponds, flood pools, and polluted ditches.

Distribution. Garrison & von Ellenrieder (2015) registered the species from S Sonora and Veracruz in Mexico, south through Central America (Fig. 801) and into Colombia and Ecuador, with one record from central Peru and to the east occurring along the upper Amazon basin where it is abundant in Venezuela. Our records indicate an elevation range from near sea level to about 1500 m.

Argia rhoadsi Calvert, 1902

Figs. 122 (head, thorax, S1–4 ♂); 245 (head, thorax, S1–4 ♀); 281 (wings ♀); 370 (S7–10 ♂); 469 (S7–10 ♀); 564 (mesostigmal plates ♀); 641 (genital ligula); 726 (appendages ♂); 799 (map); 841 (field photo ♂, ♀); 1024 (body scan ♂); 1025 (body scan ♀).

[Key locators: ♂ G-5, couplet 14(13'); ♂ M-5, couplet 4(3); ♀ F-6, couplet 8(7'); ♀ shortcut 11]

Argia rhoadsi Calvert 1902: 92 (description ♂, pl. iv. figs. 55, 55s);—Kimmins 1970: 191 (holotype data);—Johnson 1972a: 83, 86 (Texas, ♂, ♀, key, figs. 8C, D);—Paulson 1982: 253 (U. S. A., Mexico);—Novelo-Gutiérrez & Peña-Olmedo 1991: 130 (Hidalgo, Mexico);—Novelo-Gutiérrez 1992: 57 (description of larva, figs. 10, 22, 42, 46, 68, 71, 93);—González-Soriano 1993: 296 (Mexico);—Peña-Olmedo & Novelo-Gutiérrez 1993: 129, 139 (key ♂, ♀, Hidalgo, Mexico, figs. 38, 68);—Garrison 1994: 328 (key ♂, ♀, diagnosis, figs. 7, 41);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Abbott & Stewart 1998: 207 (Texas, Mexico);—Abbott 2001: 198 (Texas);—Alonso-Eguía *et al.* 2002: 352 (San Luis Potosí, Mexico);—Abbott 2005a: 82 (key ♂, ♀, Texas, figs. 14, 17, photo 10c);—Westfall & May 2006: 211 (♂, ♀, key, description figs. 75B, 95C, 99J, 103G);—Behrstock *et al.* 2007b: 30 (San Luis Potosí, Mexico);—Cuevas-Yañez 2007: 86 (Puebla, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Behrstock 2009: 3 (Coahuila, Mexico);—Caesar & Wenzel 2009: 104 (phylogeny within genus *Argia*);—Paulson 2009: 150 (♂, ♀, description, diagnosis, photo 84);—Abbott 2011: 118 (♂, ♀, figs, diagnosis, distribution in Texas);—González-Soriano *et al.* 2011: 184 (San Luis Potosí, Mexico);—Escoto-Moreno *et al.* 2014: 1051 (Hidalgo, Mexico);—Torres-Pachón *et al.* 2017: 416 (molecular phylogeny of larvae within *Argia*);—Rangel-Sánchez *et al.* 2018: 924 (estimation of distribution in Mexico);—Ortega-Salas & González-Soriano 2019: 120 (Coahuila, Mexico).

Primary types. *Argia rhoadsi*: holotype ♂, MEXICO, Nuevo León, Monterey, 25 April 1899, Samuel N. Rhoads leg. [not examined, in BMNH].

Specimens examined. 90 ♂♂, 20 ♀♀ (see Garrison & von Ellenrieder 2017 for additional material examined not listed here): **MEXICO, Nuevo León:** 1 ♀, near Sabinas Hidalgo, flying over stream of northernmost mountain range in Nuevo León {26.5517°N, 100.24°W}, 714 m, 8 June 1932, H. M. Smith & E. H. Taylor [RWG]; 1 ♂, Arroyo Elizondo {25.6122°N, 100.315°W}, 843 m, 2 July 1987, M. J. Westfall, Jr., H. Quiroz, & A. Contreras [FSCA]; **San Luis Potosí:** 2 ♂♂, rain pond 0.6 mi NW of Highway 80 on road to El Salto {22.52°N, 99.33°W}, 300 m, 19 June 1966, D. R. Paulson [FSCA]; 1 ♂, Cascada de Micos, near aqueduct {22.0992°N, 99.15°W}, 140 m, 25 June 1990, K. J. Tennessen [FSCA]; 1 ♂, Coy River, Highway 85, S of Ciudad Valles {21.9833°N, 99.0167°W}, 70 m, 24 June 1990, K. J. Tennessen [FSCA]; 1 ♂, Tamasopo, falls in park {21.9303°N, 99.4169°W}, 42 m, 26 June 1990, K. J. Tennessen [FSCA]; 1 ♀, Huichihuayán {21.4817°N, 98.9675°W}, 100 m, 18 June 1941, H. S. Dybas [USNM]; 2 ♂♂, Huichihuayán River, Highway 85, SW of Huichihuayán {21.4522°N, 98.9383°W}, 90 m, 23 June 1990, J. J. Daigle [FSCA]; 1 ♂, Palictla Bridge {21.2916°N, 98.7889°W}, 252 m, 28 June 1990, K. J. Tennessen [FSCA]; **Tamaulipas:** 2 ♂♂, 2 ♀♀, Sabinas River at Highway 85 near Gómez Farías, tropical deciduous forest, clear spring-fed with water lilies {23.0314°N, 99.0932°W}, 99 m, 19 March 1992, S. W. Dunkle [FSCA]; **Hidalgo:** 6 ♂♂, Laguna Azteca, 2 km N of Molango {20.8017°N, 98.7422°W}, 1310 m, 24 July 1992, T. W. Donnelly [FSCA]; **Puebla:** 1 ♂, Stream Piedras Negras {20.3936°N, 97.8744°W}, 240 m, 25 October 1987, A. Gómez [RWG].

A medium-size species (Table 2) with amber wings in both sexes (Fig. 281, 841); male largely blue (Fig. 1024) with a largely black abdomen dorsally (Figs. 122, 370, 841) and genital ligula distal segment rectangular with a bifid flagellum and small poorly developed lateral lobes at flexure (Fig. 641); female (Fig. 841, 1025) with largely foliate mesostigmal lobes with a shallow mesepisternal depression (Fig. 564).

Diagnosis. Redescriptions of both sexes of *A. rhoadsi* were provided by Westfall & May (2006). Both sexes were keyed and diagnosed against species occurring in the U. S. A. by Garrison (1994). Male is diagnosed under *A. haberi* and further diagnostic differences between the two species are provided by Garrison & von Ellenrieder

(2017). Within its range (S Texas, NE Mexico), female is recognizable by combination of amber wings (Fig. 281, 841), largely pale (tan) coloration (Figs. 245, 469, 1025), and medially directed spatulate mesostigmal lobes coupled with shallow mesepisternal depressions immediately posterior to each lobe (e. g., Fig. 564).

Remarks. This easily recognizable species was described by Calvert based on the holotype male from Nuevo León. The female was first keyed by Johnson (1972a), and the species has subsequently been collected in various areas within Texas and NE Mexico. Although the appendages of the male differ, the morphology of the genital ligula places it together with *A. frequentula*, *A. gaumeri*, *A. pulla* (Fig. 640) and *A. sedula* (Fig. 647), as does Caesar & Wenzel's (2009) phylogenetic tree based on morphology and 16S data, where *A. rhoadsi* is nested as follows: (*A. sedula* (*A. pulla*, *A. rhoadsi*)), corroborates its placement within this group. A similar result by Torres-Pachón *et al.* (2017) was achieved based on a mitochondrial and larval morphology data set.

Habitat. Garrison collected a few examples of this species in S Texas near the Mexican border, where a few adults were found in shade under thick brush. Adults were commonly seen in San Luis Potosí at small patches of bare earth within forested areas. Abbott (2011) reported that nymphs were found clinging to roots of a water hyacinth (*Eichhornia* sp.) at the edge of a lagoon, laboratory emergences occur in the late morning, males commonly perch in streamside vegetation, and it was seen more commonly later in the day, as they generally spend the cooler morning hours perched higher up in trees, away from the water's edge.

Distribution. *Argia rhoadsi* occurs primarily along the E margin of the Sierra Madre Oriental south through N Puebla, although there are records from Coahuila and lowlands of SE Texas and Tamaulipas (Fig. 799). Our records indicate an elevation range from near sea level to over 1400 m.

Argia rogersi Calvert, 1902

Figs. 21 (head ♂), 123, 124 (head, thorax, S1–4 ♂); 246, 247 (head, thorax, S1–4 ♀); 371, 372 (S7–10 ♂); 470–472 (S7–10 ♀); 565 (mesostigmal plates ♀); 642 (genital ligula); 727 (appendages ♂); 783 (map); 983, 984 (body scans ♂); 985, 986 (body scans ♀).

[Key locators: ♂ G-5, couplet 3'; ♂ M-6, couplet 1; ♀ F-12, couplet 1; ♀ shortcut 1]

Argia rogersi Calvert 1902: 83 (description ♂, pl. iv, figs. 40, 40s);—Calvert & Hagen 1902: 14 ("Type in Coll. Godman.");—Kimmins 1970: 191 (holotype data);—Paulson 1982: 253 (Costa Rica);—Brooks 1989: 50 (Costa Rica);—Donnelly 1992: 83 (Panama);—Suhling 1999: 51 (Panama);—Ramírez *et al.* 2000: 249 (Costa Rica);—Förster 2001: 11, 53 (key ♂, fig. C25);—Garrison & von Ellenrieder 2013: 16 (Costa Rica, fig. 21);—Garrison 2019: 482 (diagnosis against *A. nataliae* Garrison 2019, figs. 3, 5–7, 9, 14, 15, 17, 18, 21, 23, 24);—Paulson & Haber 2021: 92 (diagnosis, photos, Costa Rica).
Argia (*Chalcargia*) *rogersi*: Kennedy 1920: 85 (placed in new subgenus).

Primary types. *Argia rogersi*: holotype ♂, COSTA RICA, Caché, H. Rogers leg. [not examined, in BMNH].

Specimens examined. 82 ♂♂, 23 ♀♀: **COSTA RICA, Guanacaste:** 4 ♂♂, Guanacaste National Park, San Josecito River, L-09-112 {10.9578°N, 85.4969°W}, 600 m, 10–13 July 1989, C. Esquivel-Herrera [UNH]; **Alajuela Province:** 1 ♂, Monteverde, Cloud Forest Reserve, Vargas farm, Quebrada Saino, 10.2969°N, 84.7708°W, 1220 m, 31 March 2005, W. A. Haber [RWG]; 1 ♀, Monteverde, Cloud Forest Reserve, Peñas Blancas, second quebrada on Saino trail, 360 m from main trail, 10.2939°N, 84.7697°W, 1210 m, 7 June 2005, W. A. Haber [RWG]; 1 ♀, San Ramón Forestal Preserve, San Lorencito River and tributaries {10.216°N, 84.607°W}, 980 m, 30 March–1 April 1987, R. Hozenthal, S. W. Hamilton & M. J. Heyn [RWG]; 1 ♀, 8.7 km E of San Mateo {9.9332°N, 84.5167°W}, 550 m, 22 June 1963, F. G. Thompson [FSCA]; **Puntarenas:** 10 ♂♂, 2 ♀♀, San Luis Valley below Monteverde, Finca Mauricio Ramírez, shaded trickle in secondary forest [CR23], 10.2817°N, 84.8022°W, 1187 m, 5 June 2013, R. W. Garrison & N. von Ellenrieder [CSCA, BYU, RWG, USNM]; 1 ♂, Los Cerros, road to Highway, spring stream in pasture near Cheche Nuñez, in forested area of stream, 10.2797°N, 84.8439°W, 1050 m, 27 December 2007, W. A. Haber [RWG]; 2 ♂♂, Monteverde, San Luis River, stony river through forest [CR22], 10.2781°N, 84.7861°W, 1176 m, 5 June 2013, R. W. Garrison & N. von Ellenrieder [RWG]; 1 ♂, 1 ♀, 4.5 km SW of Monteverde, road from San Luis to main highway, Finca Murillo, 10.2683°N, 84.8282°W, 800 m, 15 September 2006, L. Ramírez [RWG]; 1 ♂, same data but 10 April 2007, W. A. Haber & L. Ramírez [RWG]; 1 ♂, lower San Luis, 5.5 km SSW of Monteverde, Chepe Rojas farm, small branch of Quebrada San Francisco, tiny trickle tributary, 10.2597°N, 84.8289°W, 700 m, 15 August 2005, W. A. Haber [RWG]; 1 ♂, same data but 10 April 2007, W. W. A. Haber [RWG]; 1 ♂, 800 m

down San Luis Road from bus stop on main road to highway from Santa Elena, 10.2569°N, 84.8386°W, 725 m, 29 January 2008, W. A. Haber [RWG]; **Limón:** 1 ♀, 11 km SSW of Pocora, Las Brisas Preserve, Erick Berlin owner, lower end of Quebrada Caña Agria, 10.0694°N, 83.6325°W, 850 m, 14 June 2007, W. A. Haber & R. Vargas [RWG]; 1 ♂, 1 ♀, same data but Quebrada Cuarenta y Cinco, 10.0694°N, 83.6325°W, 850 m, 23 June 2009, W. A. Haber, R. Vargas & J. Chacón [RWG]; 4 ♂♂, 1 ♀, approx. 20 km SE of Siquirres, Las Brisas de Pacuarito, L-09-122, 138, 168, 192, {10.1°N, 83.5°W}, 59 m, 2 February 31 March 1990, T. B. Herman [UNH]; **Heredia:** 2 ♂♂, transecta altitudinal La Selva, Barba, L-03-1258 {9.8465°N, 83.5956°W}, 1070 m, 11 April 2000, Ronald Vargas [UNH]; **San José:** 2 ♂♂, Hacienda El Rodeo, 7 km W of Villa Colón, L03-1112 {9.9136°N, 84.2694°W}, 859 m, 22 April 1990, T. B. Herman [UNH]; 1 ♂, 1 ♀, same data but 25 May 1990, C. Esquivel-Herrera [UNH]; 2 ♂♂, same data but 795 m, 26 May–9 June 1990, S. J. Brooks [BMNH]; 2 ♂♂, same data but Quebrada Cora, L03-1120, 2 July 1990, T. B. Herman [UNH]; 1 ♂, same data but 90x018, 800 m, 10–13 July 1990, T. W. Donnelly [FSCA]; 1 ♂, 1 ♀, same data but 18 June 1991, G. Pritchard [RWG]; 1 ♂, 1 ♀, same data but L03-854, 31 March 2000, C. Esquivel-Herrera [UNH]; 1 ♂, same data but Quebrada Tanques, primary forest, L03-1055, 19 July 2011, C. Esquivel-Herrera [UNH]; 13 ♂♂, 2 ♀♀, same data but [CR7], 28 May 2013, R. W. Garrison & N. von Ellenrieder [CNIN, CSCA, RWG]; 1 ♂, 15 km WNW of San Isidro de El General, Yoga Ashram of Tamara Budowski, small tributary of División River, Quebrada Grande, tiny trickle in forest above ashram, 9.41°N, 83.8314°W, 1124 m, 2 May 2010, W. A. Haber [RWG]; **Cartago:** 2 ♂♂, 1 ♀, Cachí (holotype and paratypes) {9.8333°N, 83.8°W}, 1181 m, 1877, H. Rogers [BMNH]; 1 ♂, 1 ♀, same data but 8 October 1910, C. H. Lancaster [ANSP]. **PANAMA, Chiriquí:** 2 ♂♂, March 1912, O. Garlepp. [UMMZ]; 1 ♂, Lino {8.8°N, 82.4333°W}, 800 m, May 1912, O. Garlepp. [UMMZ]; 11 ♂♂, 4 ♀♀, Chiriquí Mountains, Boquete {8.7747°N, 82.4319°W}, 1083 m, 12–24 March 1923, F. M. Gaige [RWG, UMMZ]; **Colón:** 4 ♂♂, Porto Bello {9.5507°N, 79.6541°W}, 50 m, 19 March 1911, A. Busck [FSCA, RWG]; 1 ♂, Rita Arriba River, Sierra Llorona Lodge, Ojo de Agua Trail, 12x090, 9.3463°N, 79.7736°W, 210 m, 22 August 2012, J. C. Michalski [FSCA]; 1 ♂, same data but Llano Sucio River, 12x099, 9.3466°N, 79.7731°W, 140 m, 24 August 2012 [FSCA]; **Panamá:** 1 ♂, Cerro Azul via Cerro Jefe {9.2353°N, 79.4059°W}, 900 m, 25 February 1970, E. S. Morton [FSCA]; 1 ♂, 2 ♀♀, Cerro Campana near Chica, ca. 60 km W of Panama City, 70x023 {8.7167°N, 79.9°W}, 222 m, 14 August 1970, T. W. Donnelly & E. S. Morton [FSCA]; 1 ♂, 1 ♀, Cerro Campana National Park, 8.6822°N, 79.9289°W, 830 m, 15 February 2014, L. G. Bezark [RWG].

A medium-size (Table 2) largely dark species, lacking pale postocular spots in both sexes (Figs. 21, 123, 124, 246, 247, 983–986); male cercus in dorsal view roughly rounded with a small subapical medially directed tooth on inner margin (Fig. 727c); female with black labrum and diminutive, as wide as long, mesostigmal lobes (Fig. 565).

Redescription. Calvert's (1902) original description of *A. rogersi* was based only on two poorly preserved males. Subsequent collecting (Paulson & Haber 2021) has shown the existence of two distinct phenotypic forms, although their morphological characters (genital ligula, male caudal appendages and female mesostigmal plates) are essentially the same (Garrison 2019). We describe both color forms (male and female) here.

Caribbean slope populations (same as Calvert's original description). **Male** (Costa Rica: Puntarenas, Monteverde, San Luis River, Figs. 123, 372, 984): Genae and base of mandibles blue (as in Fig. 21), the remainder including rear of head entirely black; prothorax black with following violaceous areas: anterior lobe, propleuron and extreme lateral margin of hind lobe; front of pterothorax entirely black with slight metallic reflections, dorsal black extending to obsolete interpleural suture; metepisternum and metepimeron violaceous becoming yellow ventrally except for narrow black metapleural stripe. Wings slightly amber, with venation black; Pt brown, surmounting 1.5 cells in all wings; px Fw 18/18, Hw 15/16; pq cells Fw 4/4, Hw 3/3; RP2 at Fw 9/8, Hw 7/7. Coxae and remainder of legs black. S1 violaceous with basal third black; S2 black with an oval violaceous middorsal spot extending to and narrowing at three-fifths of segment, genital lobe and small pale lateral apical spot violaceous; S3 black with a basal violaceous ring extending dorsally as a narrowing prolongation ending at basal fourth; S4–7 entirely black; S8 with basal 0.60 black, entirely black ventrally, apical 0.40 dorsally and laterally blue; S9–10 blue with a black ventral stripe; appendages black.

Genital ligula with ental surface of distal segment distal to flexure enlarged in the form of a semicircular or keel-like medio-longitudinal membranous process, basal hood represented by paired (left and right) small digit-like processes along each side flagellum base (as in Fig. 642); lateral lobes digitiform, not widened distally (as in Fig. 642).

Torus swollen, occupying entire margin of torifer and about half as wide as base of cercus (as in Fig. 727c); cercus short, slightly longer than wide, the distal and dorsal margins evenly convex apically with a small medially

directed tooth (as in Figs. 727a, c); paraproct bifid, the branches subequal in length with dorsal branch rounded, larger than acute ventral branch (as in Fig. 727a, b).

Dimensions. Hw 23.5, abdomen 31.0, total length 39.0.

Female (Costa Rica: Alajuela, Monteverde, Cloud Forest Reserve, Figs. 246, 470, 985): Head and prothorax as in male but pale colors tan, pterothorax with narrow tan antehumeral stripe about one fifth as wide as black middorsal stripe; broad black humeral stripe of uniform width, forked above enclosing a small tan spot just below antealar carina, remainder of thorax pale tan except for narrow black metapleural stripe extending ventrally over dark metinfraepisternum; abdomen black with following areas tan: S1 laterally, S2 laterally but interrupted medially by black, S8 dorsolaterally with a small vestigial pale spot. Pt surmounting 1–1.5 cells; px Fw 16/17, Hw 14/15; pq cells Fw 4/4, Hw 3/3; RP2 at Fw 8/8, Hw 7/7. Mesostigmal lobes (as in Fig. 565) not approximate, small, occupying medial fourth of mesostigmal plate, the lobe slightly higher than wide, digit-shaped.

Dimensions. Hw 25.1, abdomen 30.9, total length 38.8.

Pacific Slope populations. Male (Costa Rica: Puntarenas, San Luis Valley below Monteverde, Finca Mauricio Ramírez, Figs. 124, 371, 983): as in male described above but pale colors blue and more extensive. Head with anteclypeus, antefrons, genae and base of mandibles blue, remainder of head black except for narrow pale margin bordering rear of eyes; prothorax with a small blue spot laterally above propleuron, lateral margin of posterior lobe blue; pterothorax with blue antehumeral stripe about one third as wide as black middorsal, mesopleural fossa black, humeral stripe black, of uniform width with dorsal half extending dorsolaterally from humeral suture and connecting above and widening at antealar carina; remainder of thorax blue, becoming pale yellow below except for narrow brown metapleural stripe; abdomen black but with blue (not violet) areas more extensive as follows: lateral blue stripe on S2 interrupted medially by smaller incomplete diffuse brown stripe, S3–5 black with blue basal ring, each segment with blue prolonged posteriorly to basal half on S3, then receding on successive segments to just a blue basal ring on S6; S7 black with vestige of incomplete basal blue ring interrupted by black dorsally; S8–10 blue dorsally, black ventrally. Pt surmounting 1 cell; px Fw 15/15, Hw 13/13; pq cells Fw 4/4, Hw 3/3; RP2 at Fw 6/7, Hw 5/6.

Dimensions. Hw 21.7, abdomen 28.9, total length 37.1.

Female (Costa Rica: Puntarenas, San Luis Valley below Monteverde, Finca Mauricio Ramírez, Figs. 247, 471, 472, 986): Similar to male but pale areas tan. Head as in male but labrum with a pair of obscure dorsolateral spots and small elongate spot anterolateral to each lateral ocellus; prothorax and thorax as in male but black metapleural stripe confined to metapleural fossa; S1 pale laterally, black dorsally interrupted medially by a pale narrow transverse stripe; S2 black dorsally, tan laterally, S3 as in S2 but dorsally with an incomplete pale hairline stripe and laterally with a narrow ventral black stripe connecting to dorsal black at apical fifth; S4–6 as in S3 but lateral pale stripe absent on S5–6; S7 black with a small pale lateral spot at base and distally; S8–9 black with narrow dorsal spot at apical fifth and extending anterolaterally to basal fifth; S10 black, distal fourth of ovipositor pale. Pt surmounting 1 cell; px Fw 16/16, Hw 13/13; pq cells Fw 4/5, Hw 4/4; RP2 at Fw 7/7, Hw 5/5.

Dimensions. Hw 23.1, abdomen 30.2, total length 38.2.

Diagnosis. Within its range (Costa Rica and Panama) both sexes are easily recognized in the field by the lack of pale postocular spots (Figs. 21, 123, 124, 246, 247, 983–986). Male cercus roughly rounded with a small subapical medially directed tooth on inner margin in dorsal view is unique (Fig. 727c). In the female, the combination of a black labrum (also found in *A. adamsi* and some females of *A. oculata*) and mesostigmal lobes as wide as long (Fig. 565, mesostigmal lobes wider than long in *A. adamsi*, Figs. 493a, b, and *A. oculata*, Figs. 549a–551a) is diagnostic.

Remarks. The original description of *A. rogersi*, based on two males from Caché, Costa Rica, did not mention the presence or absence of postocular spots, and noted the following: entire thoracic dorsum black with no pale humeral stripes (as in Fig. 123) and S8 very much faded, possibly blue, with an inferior black stripe on each side as long as the segment; 9 (much faded) probably blue, with an inferior black stripe each side as in 8 (similar to Fig. 371). We have seen no males with a thoracic color pattern as in Fig. 123 in combination with a terminal abdominal pattern as described by Calvert (e. g., Fig. 371) and suspect that S8 of his specimens were more likely marked as in Fig. 372.

This species was compared with the South American (Colombia) *A. nataliae* by Garrison (2019), the only other *Argia* species besides *A. rogersi* that consistently lacks postocular spots. As noted by Garrison, *A. rogersi* and *A. nataliae* appear to be sister species sharing an almost identical genital ligula morphology (Fig. 642 versus fig. 19 in Garrison 2019).

Haber (*in* Garrison 2019), who has had much experience with *A. rogersi*, noted two distinct phenotypic forms in Costa Rica, mostly allopatric. According to him, the Caribbean slope population of *A. rogersi* is dark with the pale markings purple and lacks the antehumeral stripe (Figs. 123, 372, 984), while the Pacific slope population, stretching at least from Monteverde to San Isidro, has sky blue markings including a prominent antehumeral stripe and all blue S8 (Figs. 124, 371, 983). In the Río San Luis, the dark form spills over the Continental Divide (where the divide has a low spot) from the Caribbean side to the east into the wet, upper end of the Río San Luis valley, and just a little downstream (1.5 km) (Mauricio Ramirez's farm) the sky-blue color form is present. He obtained barcode results for one blue and two dark specimens, and they were 99.56 % similar, which supports our conclusion that the color forms are geographic variants and not different species. The differences exhibited by the males correspond to differences in females, with the darker females (Figs. 236, 470, 985) associated with the Caribbean (dark) males, and the lighter females (Figs. 247, 471, 472, 986) associated with the Pacific (blue) males. All the specimens we have examined from Panama are of the blue form.

Based on a similarity in the morphology of the genital ligula, we suggest a possible relationship of *A. rogersi* (and *A. nataliae*) with *A. oculata*.

Habitat. Garrison & von Ellenrieder collected adults of both forms of *A. rogersi* within densely shaded trickles in secondary forest at 1187 m in Puntarenas Province, Costa Rica, where they were difficult to see. Other specimens are labeled as occurring in pasture in a forested area with spring streams.

Distribution. This is largely a montane species, occurring in Costa Rica and Panama (Fig. 783) from about 50 to over 1220 m.

***Argia rudolphi* Garrison & von Ellenrieder, 2017**

Figs. 125 (head, thorax, S1–4 ♂); 248 (head, thorax, S1–4 ♀); 373 (S7–10 ♂); 473 (S7–10 ♀); 566 (mesostigmal plates ♀); 643 (genital ligula); 728 (appendages ♂); 773 (map); 894 (body scan ♂); 895 (body scan ♀).

[Key locators: ♂ G-1, couplet 11(8'); ♂ M-5, couplet 19(18), M-6, couplet 9(7'); ♀ F-10, couplet 2(1')]

Argia rudolphi Garrison & von Ellenrieder 2017: 23 (♂, ♀, key, description, diagnosis, figs. 19, 43, 68, 92, 113, 154, 168).

Primary types. *Argia rudolphi*: holotype ♂, MEXICO, Puebla, Zihuateutla, Sierra de Huauchinango, La Unión, in drainage area (20°14'25" N, 97°53'38" W, 596 m), 21 v 1987, Rodolfo Novelo-Gutiérrez & A. Gómez leg. [examined, in CSCA].

Specimens examined. 23 ♂♂, 7 ♀♀ (see Garrison & von Ellenrieder 2017 for material examined not listed here): **MEXICO, Tamaulipas:** 1 ♂, 1 ♀, El Salto falls near El Mico, ca. 12 km N of El Naranjo {22.5858°N, 99.3883°W}, 400 m, 9 May 1964, R. E. Woodruff [FSCA]; **Hidalgo:** 1 ♀, stream near Otongo, 5 km S, 9 km W of Tlanchinol {20.9686°N, 98.7644°W}, 1162 m, 22 July 1992, G. Harp [RWG]; **Puebla:** 3 ♂♂, Sierra de Huauchinango, km 3 Highway La Unión-Zona Cafetalera, in drainage area {20.2586°N, 97.8681°W}, 570 m, 23 July 1987, R. Novelo-Gutiérrez [RWG]; **Veracruz:** 1 ♂, Puente Texolo, near Teocelo {19.4028°N, 96.9867°W}, 1065 m, 8 June 1980, J. Llorente [RWG].

A medium-size species (Table 2); male largely violaceous-blue (Figs. 125, 373, 894) with approximate cerci (Fig. 728); female (Fig. 895) with almost approximate large erect oval mesostigmal lobes (Fig. 566c), each with medial margin swollen and slightly recurved (Fig. 566d).

Diagnosis. This species was recently described and diagnosed against *A. anceps*, *A. fissa* and *A. westfalli* by Garrison & von Ellenrieder (2017). Of these three species, the cerci in male *A. rudolphi* (Fig. 728c) are most similar to those of *A. fissa* (Fig. 681c), as their inner surfaces nearly touch in normal position; in both *A. anceps* (Fig. 664c) and *A. westfalli* (Fig. 753c), the cerci are widely separated by a gap subequal to the basal width of each cercus. In dorsomedial view, the cercus of *A. rudolphi* (Fig. 728a) is less elongate than in either *A. anceps* (Fig. 664a) or *A. westfalli* (Fig. 753a). The transverse width of the torus in *A. fissa* (Fig. 681c) is subequal to the transverse width of each cercus; in *A. rudolphi* the transverse width of each torus is about half the width of each cercus (Fig. 728c). The tip of the terminal segment of the genital ligula in *A. rudolphi* is short and narrow, ending in a more or less ridged trough-shaped tip (Fig. 643); the tip in the other three species is longer and flexible and assumes the shapes illustrated for *A. anceps* Figs. 593–595 (also essentially the same for *A. fissa* and *A. westfalli* and not illustrated).

The ectobasal boss of the terminal segment of the genital ligula in *A. anceps* (Figs. 593a, b), *A. fissa*, and *A. westfalli* forms a prominent narrow mound-like lobe that is absent in *A. rudolphi* (Figs. 643a, b). The following markings will also aid in distinguishing among males of *A. rudolphi* from *A. anceps*, *A. fissa* and *A. westfalli*: The black postbasal streaks (sometimes extensive) present on S4–6 in *A. rudolphi* (Fig. 894) are absent in *A. anceps* (Fig. 881), *A. fissa* (Fig. 883) and *A. westfalli* (Fig. 885); the wings are hyaline in *A. rudolphi* but strongly tinged with amber in *A. anceps* (as in Fig. 272), *A. fissa*, and *A. westfalli*, and the pale coloration is violaceous blue in *A. rudolphi* (Fig. 894) and vivid blue in *A. anceps*, *A. fissa*, and *A. westfalli* (Figs. 881, 883, 885).

The large, oval mesostigmal lobes in *A. rudolphi* are almost vertically erect (Fig. 566h) and approximate (Fig. 566c), similar only to those of *A. fissa* (Fig. 515) and, to a lesser extent, *A. westfalli* (Figs. 590, 591) and *A. anceps* (Fig. 497). A transverse swollen tubercle is present at the base of the mesostigmal lobe in posterior view in *A. anceps* (Fig. 497e); no tubercle is present in *A. rudolphi* (Fig. 566e), *A. fissa* (Fig. 515e) or *A. westfalli* (Fig. 591e). In *A. rudolphi*, the medial margin of the mesostigmal lobe is swollen and slightly recurved (Fig. 566d); no such swollen area is present in *A. fissa* (Fig. 515d) or *A. westfalli* (Fig. 591d).

In the field, females of *A. rudolphi* (Figs. 43, 895) are easily distinguished from those of the other three species (Figs. 44–46; 181–183, 882, 884, 886) by the overall more extensive dark markings on the head (mostly black epicranium), thorax (prominent middorsal and humeral stripes), and abdomen (postbasal streaks coupled with distal and ventral black); the other three species are almost immaculate, with only vestiges of black on the epicranium, a thin middorsal thoracic stripe, a narrow to absent humeral stripe, and vestiges of a distal black spot laterally on abdominal segments. The ovipositor in *A. rudolphi* is black (Fig. 92), not pale as in the other three species (Figs. 93–95).

Remarks. Morphology of the genital ligula of *A. rudolphi* (Fig. 643a) suggests a relationship with *A. annae* (Fig. 596a), *A. elongata* (Fig. 610a) and *A. haberi* (Fig. 610a); the ental tip of the distal segment in lateral view in all four is not enlarged and is not distinctly wider than preceding portion. Nothing is known of the biology of this species.

Distribution. *Argia rudolphi* is a submontane species thus far known from the E slope of the Sierra Madre Oriental, with one record from the E portion of the Trans-Mexican Volcanic Belt (Fig. 773), occurring from 400 to 1300 m. At Teocelo, *A. rudolphi* is sympatric with *A. anceps*, *A. extranea*, *A. oculata*, *A. noveloi*, and *A. percellulata*, though not necessarily at the same time of the year.

Argia sabino Garrison, 1994

Figs. 126 (head, thorax, S1–4 ♂); 127, 128 (thorax ♂); 249 (head, thorax, S1–4 ♀); 374 (S7–10 ♂); 474 (S7–10 ♀); 567 (mesostigmal plates ♀); 644, 645 (genital ligula); 729 (appendages ♂); 775 (map); 842 (field photo ♂); 878 (body scan ♂); 879 (body scan ♀).

[Key locators: ♂ G-1, couplet 10'; ♂ M-6, couplet 28(26'), couplet 31'; F-10, couplet 3', F-14, couplet 3(2'); ♀ shortcut 8]

Argia sabino Garrison 1994: 23 (♂, ♀, key, description, diagnosis figs. 27, 60, 102, 117, 118, 119);—Hoekstra & Smith 1999: 888: (description of larva, figs. 1–5);—Hoekstra & Smith 2000: 89 (reproductive behavior);—Westfall & May 2006: 212 (♂, ♀, key, description, figs. 95D, 99K, 103H);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Upson *et al.* 2007: 32 (Sonora, Mexico);—Caesar & Wenzel 2009: 104 (phylogeny within genus *Argia*);—Escoto-Moreno *et al.* 2009: 154 (Aguascalientes, Mexico);—Paulson 2009: 163 (♂, ♀, description, diagnosis, photos 97);—Bailowitz *et al.* 2015: 144 (diagnosis, photos).

Primary types. *Argia sabino*: holotype ♂, U. S. A., Arizona: Pima Co., Upper Sabino Canyon, about 3 mi N of visitor center, NE of Tucson, 22 September 1988, Rosser W. & Jo A. Garrison leg. [examined, in USNM].

Specimens examined. 56 ♂♂, 27 ♀♀: **U. S. A., Arizona:** 1 ♀, forested stream by turnout, 4.6 mi N of Molino Basin Forest Camp, Coronado National Forest, Santa Catalina Mountains, 32.3628°N, 110.712°W, 1 August 2000, R. W. & J. A. Garrison [RWG]; 12 ♂♂ (holotype and paratypes), Upper Sabino Canyon, about 3 mi N of visitor center, N of Tucson, 32.3433°N, 110.783°W, 974 m, 22 September 1988, R. W. & J. A. Garrison [BYU, RWG, USNM]; 13 ♂♂ (paratypes), same data but E. González-Soriano [CNIN]; 1 ♀, same data but 9 September 1983, S. W. Dunkle [RWG]; 3 ♂♂, 4 ♀♀, same data but about 6 mi N of visitor center, Sabino Canyon just above

confluence with E Fork Sabino Canyon, 16 May 1996, J. Hoekstra [RWG]; 9 ♂♂, 3 ♀♀ (paratypes), Sabino Canyon, 7 mi NE of Tucson {32.3389°N, 110.786°W}, 953 m, 18–20 September 1955, T. W. Donnelly [FSCA]; 3 ♂♂, 3 ♀♀ (allotype and paratypes), Molino Basin Forest Camp, Coronado National Forest, Santa Catalina Mountains, 32.3389°N, 110.786°W, 953 m, 7 September 1961, T. W. Donnelly [FSCA]; 1 ♂ (paratype), same data but 5 August 1992, R. W. Garrison [RWG]; 4 ♂♂, 8 ♀♀, Sabino Canyon, Santa Catalina Mountains, Coronado National Forest, 32.3389°N, 110.786°W, 953 m, 23 September–4 October 1997, J. D. Hoekstra [RWG]; 1 ♂, 1 ♀, Molino Basin Forest Camp, Coronado National Forest, Santa Catalina Mountains, 32.3371°N, 110.69°W, 1221 m, 26 August 1998, R. W. & J. A. Garrison [RWG]; 2 ♀♀, Molino Basin Forest Camp, Coronado National Forest, Santa Catalina Mountains, 32.3367°N, 110.69°W, 1351 m, 1 August 2000, R. W. Garrison [RWG]; 3 ♂♂, 3 ♀♀, Coronado National Forest, Adobe Canyon, Bathtub Tank, stream & tank, 31.6786°N, 110.769°W, 1442 m, 23 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, Molino Basin Forest Camp, Coronado National Forest, Santa Catalina Mountains, 32.3367°N, 110.692°W, 1350 m, 24 July 1984, R. W. Garrison [RWG]; 4 ♂♂, Sycamore Canyon, 31.4269°N, 111.194°W, 1196 m, 27 September 2002, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]. **MEXICO, Sonora:** 1 ♀, Los Pilares Stream at El Castillo Bridge on Highway 16, E of Yécora, 28.4011°N, 108.796°W, 1310 m, 14 September 2004, D. R. Paulson & N. Smith [RWG]; **Jalisco:** 2 ♂♂ (paratypes), Highway 41, K7-8 N of Guadalajara, rocky stream in rocky hills, 20.8389°N, 103.3289°W, 1490 m, 4 August 1966, R. W. Cruden [RWG, UMMZ].

A medium-size species (Table 2) with a characteristic black dumbbell-shaped mark traversing median ocellus in both sexes (Figs. 126, 249, 879); male largely blue to indigo (Figs. 126–128, 374, 842, 878) and with nearly approximate cerci (Fig. 729c); female with nearly approximate transversely oval mesostigmal lobes, distance between them less than half the width of each lobe, each lobe occupying about 50 % of entire mesostigmal plate length (Fig. 567).

Diagnosis. This species was described and diagnosed against sympatric congeners occurring in Arizona and NW Mexico by Garrison (1994) and by Westfall & May (2006).

Both sexes most closely approach the more widespread *A. tarascana*. In males of *A. sabino* the distance between cerci in dorsal view is shorter than the width of each cercus (Fig. 729c); genital ligula distal segment anterior to lateral lobes is elliptical, with convex lateral margins in ectal view; the basal sclerotized boss is triangular and projects distally (Fig. 644a) and is linear in ectal view (Fig. 645), and the lateral lobe is small and forms a small, recurved process (Figs. 644, 645). In males of *A. tarascana*, the distance between cerci in dorsal view is about equal to width of each cercus (Fig. 738c); genital ligula distal segment anterior to lateral lobes is narrow, subrectangular, roughly parallel-sided in ectal view (Fig. 649b); the sclerotized boss is roundly quadrate and is bisected posteriorly in ectal view (Fig. 649b), and the lateral lobe is large and explanate (Fig. 649a).

Female mesostigmal lobe in *A. sabino* is transversely as wide as the interval separating both lobes (Figs. 567a, c), and its mesal margin is slightly recurved (Fig. 567e); mesostigmal lobe in *A. tarascana* is transversely smaller and narrower than the interval separating both lobes (Figs. 575a, c), and its mesal margin is not recurved. Female of *A. sabino* may be confused with *A. pima* (Fig. 557), *A. rudolphi* (Fig. 566), and *A. variabilis* (Fig. 588), as all four species have transversely oval mesostigmal lobes that are almost approximate. In *A. variabilis*, the black middorsal stripe is abruptly widened at dorsal 0.50 and is often accompanied by a small pointed ventral offshoot laterally (Fig. 268), and each mesostigmal lobe occupies about 75 % of entire plate length (Fig. 588c). In the other three species the black middorsal stripe is parallel, not abruptly widened dorsally (Figs. 237, 248, 249), and each mesostigmal lobe occupies about 50 % or less of entire plate length (Figs. 557c, 566c). In *A. rudolphi*, the mesostigmal lobe is strongly erect, almost perpendicular to mesepisternum when viewed laterally (Fig. 566h), and S8–10 are black ventrally (Fig. 473). The mesostigmal lobes in *A. pima* and *A. sabino* are directed posterodorsally and partially overlie the mesepisternum when viewed laterally, and S8–10 are mostly pale ventrally (Figs. 464, 474). In *A. sabino*, the mesepisternum under the base of the mesostigmal lobe lacks a tubercle, the mesal margin of the lobe is recurved ventrally (Fig. 567e), and the dorsum of S8–9 is entirely pale (Fig. 474). In *A. pima*, a tubercle is present on the mesepisternum under the base of the mesostigmal lobe (Fig. 557e), and the dorsum of S8–9 has paired black markings (Fig. 464).

Remarks. In their key to females, Westfall & May (2006) separate females of *A. sabino* from *A. tarascana* based on the shape of anterior branch of forked humeral stripe, well developed, not a mere hairline, in *A. sabino*, versus a mere hairline over much of its length in *A. tarascana*, but some *A. tarascana* have a relatively thickened anterior branch (e. g., Fig. 254) approximating that of *A. sabino* (Fig. 249).

Garrison (1994) considered *A. tarascana* the nearest ally of *A. sabino*, recognizing it as a distinct species because a parallel occurrence in morphology of appendages is found in two other closely related species: *A. fissa*, with approximate male cerci and nearly approximate, transverse tori, and *A. anceps*, with both tori and cerci more widely separated, exposing the epiproct, mirroring those of *A. tarascana*. Subsequent examination of the genital ligula of both species leaves no doubt that both are valid species. Caesar & Wenzel (2009) in their phylogeny of North American species of *Argia* based on combined morphology and 16S data show *A. sabino* as sister to *A. anceps* and *A. westfalli* (the latter not known to occur in the U. S. A.) and with *A. tarascana* being sister to *A. tezpi* and both sister to *A. apicalis*. Whether their phylogenetic tree is correct will need confirmation from further studies but based on our analysis of their morphology we doubt of the placement of *A. tarascana* so far apart from *A. sabino*.

Habitat. *Argia sabino* occurs sporadically along montane splash pools where adults frequent the pool's edge; *A. tarascana* is found along calmer areas of small creeks and is not limited (or may not even frequent) to splash pools. Hoekstra & Smith (2000) provided details on the reproductive behavior of *A. sabino* along the upper reaches of Sabino Canyon in Arizona. They noted that copulation lasted about 30 minutes and pairs would often submerge for up to 30 minutes or more to oviposit on rock surfaces.

Distribution. This species ranges from SE Arizona in the United States south to Jalisco in Mexico (Fig. 775), being found at elevations between 35 and 275 m.

***Argia schorri* Garrison & von Ellenrieder, 2017**

Figs. 129 (head, thorax, S1–4 ♂); 250 (head, thorax, S1–4 ♀); 375 (S7–10 ♂); 475 (S1–5 ♀), 476 (S7–10 ♀); 568 (mesostigmal plates ♀); 646 (genital ligula); 730 (appendages ♂); 783 (map); 924 (body scan ♂); 925 (body scan ♀).

[Key locators: ♂ G-2, couplet 7(5'); ♂ Key to groups, couplet 4(3'); ♀ Key to groups, couplet 2(1)]

Argia schorri Garrison & von Ellenrieder 2017: 27 (♂, ♀, key, description, diagnosis figs. 28, 51, 77, 100, 101, 121, 125, 142, 162, 170, photo 190);—Paulson & Haber: 2021: 98 (diagnosis, photos).

Primary types. *Argia schorri*: holotype ♂, COSTA RICA, Puntarenas: 2.8 mi E of Golfito {8°39' N, 83°7' W, 35 m}, 4 vii 1967, Oliver. S. Flint, Jr. & M. A. Ortiz B. leg. [examined, in USNM].

Specimens examined. 6 ♂♂, 1 ♀ (see Garrison & von Ellenrieder 2017 for material examined).

A medium-size (Table 2) dark species (Figs. 924, 925); male with unique diminutive rim-like torus and adjacent torifer completely overlapping epiproct (Fig. 730c), and genital ligula with a long, ridged single flagellum and a pair of entolaterally directed quadrate lobes at base (Fig. 646); female with a unique recurved mesostigmal lobe arising from lateral branch of middorsal carina (Fig. 568).

Diagnosis. This species was described and diagnosed against sympatric congeners by Garrison & von Ellenrieder (2017). Both sexes are unique as noted above. A further diagnosis against *A. popoluca* is given by Garrison & von Ellenrieder (2017).

Habitat. Paulson & Haber (2021) state that this species was found on small streams and trickles within forest on the Pacific slope.

Distribution. *Argia schorri* is thus far known only from Costa Rica (Fig. 783), from near sea level up to 300 m.

Argia sedula (Hagen, 1861)

Figs. 130 (head, thorax, S1–4 ♂); 251 (head, thorax, S1–4 ♀); 252 (thorax ♀); 376 (S7–10 ♂); 477 (S7–10 ♀); 569 (mesostigmal plates ♀); 647 (genital ligula); 731 (appendages ♂); 797 (map); 843 (field photo ♂); 1010 (body scan ♂); 1011 (body scan ♀).

[Key locators: ♂ G-5, couplet 10(9'); ♂ M-3, couplet 2(1); F-6, couplet 7(5'); F-7, couplet 1]

Agrion sedulum Hagen 1861: 94 (description ♂);—Garrison & von Ellenrieder 2019: 44 (lectotype data).

Argia sedula: Hagen in Selys 1865: 411 (39 reprint) (description ♂);—Calvert 1902: 79 (♂, ♀, description pl. IV, figs. 7, 32, 32s);—Calvert & Hagen 1902: 114 (synonymy, figs. appendages, pl. I, figs. 10, 10a, “Types in M. C. Z.”);—Kennedy 1902: 166 (key ♀, pl. II, figs. 3, 4);—Calvert 1907: 363 (reference to Calvert & Hagen 1902);—Seemann 1927: 11 (♂, ♀, key larva, figs.);—Johnson & Westfall 1970: 64, 68 (♂, ♀, key, figs. 7D, 8E, 9C, 9F);—Johnson 1972a: 84, 87 (♂, ♀, key, diagnosis, figs. 9A, B, 10A, B);—Kiauta 1972: 82 (chromosome number);—Kiauta & Kiauta 1980: 42 (cytotaxonomy, figs. 30, 31);—Bick & Bick 1981: 262 (heterospecific pairing of *A. sedula* with *Enallagma basidens* Calvert);—Paulson 1982: 253 (U. S. A., Mexico);—Pritchard 1982: 231 (distribution in U. S. A., Mexico, fig. 9);—Robinson *et al.* 1983: demography and habitat use);—Justus *et al.* 1990: 147 (SEM of mesostigmal plates, figs. 2B, 3B);—González-Soriano 1993: 296 (Mexico);—Garrison 1994: 332 (key, diagnosis, lectotype designation, figs. 19, 42, 91);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Abbott & Stewart 1998: 207 (U. S. A., Mexico);—Abbott 2001: 198 (Texas);—Alonso-Eguía *et al.* 2002: 352 (Querétaro, Mexico);—Abbott 2005a: 83 (♂, ♀, key, figs. 16, 17, photo 10d, distribution in New Mexico, Texas, Oklahoma, Arkansas, Louisiana);—Westfall & May 2006: 213 (key, description, larva, figs. 80A, 82A, 96A, 99L, 103I);—Behrstock *et al.* 2007a: 57 (Chihuahua, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Upton *et al.* 2007: 33 (Sonora, Mexico);—Behrstock 2009: 3 (Coahuila, Mexico);—Caesar & Wenzel 2009: 104 (phylogeny within genus *Argia*);—Escoto-Moreno *et al.* 2009: 154 (Aguascalientes, Mexico);—Paulson 2009: 146 (♂, ♀, description, diagnosis, figs., photo 81);—Abbott 2011: 110 (♂, ♀, figs., diagnosis, distribution in Texas);—González-Soriano *et al.* 2011: 185 (San Luis Potosí, Mexico);—Paulson 2011: 153 (♂, ♀, description, diagnosis, figs., photo 79);—Escoto-Moreno *et al.* 2014: 1051 (Hidalgo, Mexico);—Bailowitz *et al.* 2015: 146 (diagnosis, photos);—Torres-Pachón *et al.* 2017: 415 (molecular phylogeny of larvae within *Argia*);—Stewart & Vodopich 2018: 189 (effects of seasonal and year to year variation on wing shape);—Ortega-Salas & González-Soriano 2019: 120 (Coahuila, Mexico).

Argia (Chalcargia) sedula: Kennedy 1920: 85 (in subgenus *Chalcargia*).

Primary types. *Agrion sedulum*: lectotype ♂, U. S. A., West Virginia, Berkeley Springs, Osten Sacken leg. [examined, in MCZ; Garrison 1994, Garrison & von Ellenrieder 2019].

Specimens examined. 168 ♂♂, 64 ♀♀: **U. S. A., Nebraska:** 1 ♂, Muleshoe Creek at Niobrara River, 5.5 mi NW of Norden Bridge, FCS13-747, 42.8225°N, 100.135°W, 660 m, 24 July 2013, F. C. Sibley [RWG]; **West Virginia:** 1 ♂ (lectotype), Berkeley Springs {39.627°N, 78.2272°W, 185 m}, O. Sacken [MCZ]; **Maryland:** 1 ♂, Williamsport, along canal bordering Potomac River near Route 11 overpass, 39.5998°N, 77.8265°W, 105 m, 20 June 1966, R. W. Garrison [RWG]; **Virginia:** 1 ♂, Beaverdam Dam, Leesburg, 39.0267°N, 77.5417°W, 20 August 2001, N. von Ellenrieder [CSCA]; 1 ♂, Shenandoah River at Route 602 (boat loading), Shenandoah, 38.7142°N, 78.475°W, 23 August 2001, R. W. Garrison [RWG]; 3 ♂♂, 1 ♀, Joseph Bryan Park, 37.5974°N, 77.4769°W, 64 m, 22 August 2001, N. von Ellenrieder [CSCA]; 2 ♂♂, 1 ♀, Belle Isle, 37.5297°N, 77.4521°W, 30 m, 21 August 2001, N. von Ellenrieder [CSCA]; 4 ♀♀, Reedy Creek Trail, James River, 37.525°N, 77.4562°W, 21 m, 18 August 2018, R. W. Garrison & P. Evans [RWG]; 1 ♂, 1 ♀, Pocahontas State Park, Swift Creek Lake, 37.3881°N, 77.575°W, 58 m, 29 June 2002, R. W. Garrison & N. von Ellenrieder [CSCA]; **Texas:** 3 ♂♂, 3 ♀♀, Fort McKavett State Historic Park, small, shaded stream, 36.826°N, 100.11°W, 652 m, 14 July 2001, N. von Ellenrieder [CSCA, RWG]; 1 ♂ (paralectotype), Pecos River {32°N, 103.979°W} [MCZ]; 1 ♂, 2 ♀♀, San Saba River, 0.7 mi E of Fort Mc Kavett by Highway 130, 30.8347°N, 100.0939°W, 637 m, 14 July 2001, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, Camp Sol Mayer, 2.8 mi E of Fort Mc Kavett, 30.8347°N, 100.06°W, 619 m, 14 July 2001, N. von Ellenrieder [CSCA]; 18 ♂♂, 7 ♀♀, Mustang Creek, by Carlos G. Parker Boulevard (= Loop 427), Taylor, 30.5769°N, 97.455°W, 17 August 1975, R. W. Garrison [CSCA, MHNN, RWG]; 6 ♂♂, same data but 3 August 1983, J. E. Hafernik, Jr. [RWG]; 4 ♂♂, N Llano River at Farm Road 271, 30.5161°N, 99.8053°W, 506 m, 15 July 2001, R. W. Garrison & N. von Ellenrieder [CSCA]; 1 ♂, Little Hackberry, Rte 55, 10 mi N Barbsdoke creek, 29.8406°N, 100.105°W, 529 m, 13 July 2001, N. von Ellenrieder [CSCA]; 1 ♂, Nueces River at Barksdale on Route 55, 29.7211°N, 100.034°W, 449 m, 22–23 July 1977, R. W. Garrison [RWG]; 4 ♂♂, same data but 13 July 2001, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♀, Palmetto State Park, 6 mi S of Luling, near Highway 183, 29.5894°N, 97.5822°W, 18 August 1975, R. W. Garrison [RWG]; 1 ♂, Guadalupe River, 4 mi S of Gonzales, 29.4477°N, 97.4105°W, 74 m, 19 August 1975, R. W. Garrison [RWG]; 2 ♂♂, 1 ♀, same data but 28 August 1976,

J. E. Haferník, Jr. [RWG]; 1 ♂, Pinto Creek, 15 mi SE of Del Rio {29.1892°N, 100.703°W}, 260 m, 1 September 1992, B. & C. Villegas [RWG]; 2 ♀♀, Rio Grande River at Falcon Dam {26.5579°N, 99.1678°W}, 61 m, 26 May 1996, B. & C. Villegas [RWG]; 1 ♂, 1 ♀, Santa Ana Wildlife Refuge {26.0783°N, 98.1373°W}, 26 m, 9 May 1985, S. W. Dunkle [RWG]; **Arkansas**: 1 ♂, 1 ♀, S Fork Ouachita River at Mount Ida {34.558°N, 93.6266°W}, 185 m, 28 May 1981, S. W. Dunkle [RWG]; **Arizona**: 1 ♂, Santa Maria River at Highway 93, 34.3693°N, 113.185°W, 535 m, 31 July 1987, R. W. Garrison [RWG]; 5 ♂♂, Agua Fria River at Horseshoe Ranch, 5.2 mi E of Highway 17, Forest Road 269, 34.2575°N, 112.064°W, 980 m, 14 July 1998, R. W., J. A., P. A. & A. V. Garrison [RMNH, RWG]; 1 ♂, 1 ♀, Cave Creek at Ocotillo Road, 33.8394°N, 111.9629°W, 619 m, 13 August 1995, R. W. Garrison [RWG]; 5 ♂♂, 2 ♀♀, slough ponds by Verde River, by Highway 87, Fort McDowell Indian Reservation, 33.6758°N, 111.672°W, 31 August 1976, R. W. Garrison [RWG]; 2 ♂♂, Gila River at Highway 70, 33.1667°N, 110.136°W, 1797 m, 29 September 2002, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, polluted stream below Ray Mine, by Highway 177 at turnoff to Kelvin, 5.2 mi N of Kearny, 33.1225°N, 110.975°W, 560 m, 23 July 1984, R. W. Garrison [RWG]; 2 ♂♂, 2 ♀♀, Bonita Creek, 32.9289°N, 109.495°W, 1011 m, 18 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, 1 ♀, same data but 29 September 2002, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 5 ♂♂, 3 ♀♀, Bonita Creek, tributary to Gila River, 32.9097°N, 109.487°W, 978 m, 18 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, Gila River at Spring Canyon Picnic Ground, 32.8881°N, 109.497°W, 985 m, 18 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA]; 17 ♂♂, 5 ♀♀, Gila River at Highway 95, NW of Yuma, 32.7617°N, 114.411°W, 62 m, 25 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, MHNN, RWG]; 1 ♀, Colorado River at Yuma Territorial Prison, 32.7261°N, 114.613°W, 68 m, 25 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA]; 1 ♂, S of Safford, Dankworth Park by Highway 191, ponds, 32.7207°N, 109.707°W, 989 m, 18 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA]; 2 ♂♂, Mohawk, Gila River at Mohawk Valley Blvd., 32.7144°N, 114.014°W, 80 m, 30 September 2002, R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 2 ♂♂, pond at Saint David by Highway 80, 31.8906°N, 110.213°W, 1120 m, 22 July 1987, R. W. Garrison [RWG]; 2 ♂♂, San Pedro River at Hereford Road, 31.4383°N, 110.108°W, 1267 m, 6 August 1992, R. W. Garrison [RWG]; **California**: 2 ♂♂, Thousand Palms Oasis, Coachella Valley Preserve, Thousand Palms Road, ca. 6 mi N of Highway 10, 33.8375°N, 116.309°W, 31 m, 13–14 April 1991, R. W. Garrison [RWG]; 1 ♂, Indio, canal at Jackson Road and Highway 10, 33.739°N, 116.216°W, -10 m, 27 May 1984, R. W. & J. A. Garrison [RWG]; 5 ♂♂, 2 ♀♀, Mecca, irrigation ditch at junction of Highway 195 and 66th Avenue, 33.5693°N, 116.078°W, -60 m, 27 May 1984, R. W. & J. A. Garrison [RWG]; 2 ♂♂, Dos Palmas Preserve, 4.8 mi E of Salton Sea North Shore, 33.4972°N, 115.832°W, -46 m, 4–5 May 1991, R. W. Garrison [RWG]; 13 ♂♂, 3 ♀♀, same data but ca. 2 mi E of Salton Sea Recreation Area, -22 m, 30 May 1999, R. W., J. A. & P. A. Garrison [RWG]; 1 ♀, same data but 0 m, 12–13 May 2001, N. von Ellenrieder [CSCA]; **New Mexico**: 3 ♂♂, Bottomless Lakes State Park, 33.3347°N, 104.333°W, 1063 m, 29 July 1984, R. W. & J. A. Garrison [RWG]; 1 ♂, Pecos River at Carlsbad, 32.4465°N, 104.258°W, 940 m, 30 July 1984, R. W. & J. A. Garrison [RWG]; **Florida**: 1 ♀, Gainesville, drainage ditch along NW 53rd Avenue {29.7032°N, 82.3647°W}, 55 m, 21 October 1986, R. E. McLaughlan & Willis [RWG]; 1 ♀, same data but {29.6272°N, 82.3569°W}, 25 m [RWG]; 1 ♀, Palmdale, Fisheating Creek at Route 27 {26.9372°N, 81.3179°W}, 15 m, 17 April 1989, S. W. Dunkle [RWG]. **MEXICO, Chihuahua**: 1 ♂, 1 ♀, San Pedro River at Meoqui, 67-239 {29.2614°N, 105.477°W}, 1189 m, 30 August 1967, D. R. Paulson [FSCA]; 1 ♂, 1 ♀, Conchos River, Ciudad Camargo {27.7129°N, 105.187°W}, 1569 m, 17 August 1952, J. D. Lattin [UCB]; **Coahuila**: 1 ♂, 5.6 mi W of Cuatro Ciénegas, Cuatro Ciénegas Basin {26.9894°N, 101.972°W}, 700 m, 11 August 1968, W. L. Minckley [RWG]; **Tamaulipas**: 1 ♀, Carrizal River at Highway 180 {26.0219°N, 97.953°W}, 23 m, 6 July 1975, J. E. Gillaspay [FSCA UMMZ]; 4 ♂♂, 2 ♀♀, Sabinas River at Route 85, near Gómez Farías, tropical deciduous forest, clear spring-fed with water lilies {23.0314°N, 99.0932°W}, 99 m, 19 March 1992, S. W. Dunkle [FSCA RWG]; **Nuevo León**: 1 ♂, 1 ♀, Arroyo Elizondo {25.6122°N, 100.315°W}, 843 m, 2 July 1987, M. J. Westfall, Jr., H. Quiroz & A. Contreras [FSCA]; 1 ♂, Bustamante {26.5343°N, 100.505°W}, 460 m, 12 October 1975, R. Schmidt [UMMZ]; 1 ♂, Nacatáz Touristic Park {25.8014°N, 100.649°W}, 767 m, 4 July 1987, M. J. Westfall, Jr. & A. Contreras [FSCA]; **San Luis Potosí**: 1 ♂, El Salto Falls {22.5857°N, 99.3843°W}, 470 m, 12 June 1963, R. E. Woodruff [FSCA]; 3 ♂♂, 2 ♀♀, Cascada de Micos, NW of Ciudad Valles, 22.0992°N, 99.15°W, 140 m, 22 August 1999, R. W. & J. A. Garrison [RWG]; 1 ♂, Coy River {21.9833°N, 99.0167°W}, 70 m, 24 June 1990, K. J. Tennessen [FSCA]; 18 ♂♂, 3 ♀♀, Coy River headwaters, 28 km S of Ciudad Valles, 21.7331°N, 98.9781°W, 42 m, 21 August 1999, R. W. & J. A. Garrison [BYU, CSCA, RWG]; 1 ♀, Axtla {21.4334°N, 98.8794°W}, 85 m, 23 June 1941, H. S. Dybas [FSCA]; **Veracruz**: 1 ♂, 2 ♀♀, stream at Plan del Río Bridge, near

Rinconada, about 34 km SE of Xalapa {19.4019°N, 96.6309°W}, 270 m, 11 July 1987, M. J. Westfall, Jr. [FSCA]; 2 ♂♂, Puente Nacional, Carretera Jalapa to Veracruz on ruta 125 {19.3286°N, 96.4843°W}, 60 m, 11 July 1987, M. J. Westfall, Jr. [FSCA]; **Morelos**: 1 ♂, km 18.3 of Highway 95, 5 km S of Acatlipa (flooded River) {18.8042°N, 99.2256°W}, 1100 m, 7 July 1987, M. J. Westfall, Jr. [FSCA].

A medium-size species (Table 2), with male vivid blue and black (Figs. 130, 843, 1010) with distinctive elongate linear cerci twice as long as wide (Fig. 731c), the tip truncate with the inner branch (tooth) decumbent (Fig. 731a) and dorsal margin of paraproct serrate (Figs. 731a, b); female pale tan (Figs. 251, 1011) with some degree of darkening on abdominal S2–8 to almost entirely pale (Fig. 477), black middorsal stripe usually a mere hairline (Fig. 252), mesostigmal lobe directed posteromesally and elevated, with medial tip perpendicular to mesepisternum and venter of apical part of lobe visible in dorsal view (Fig. 569c).

Diagnosis. This species was keyed and diagnosed against sympatric congeners occurring in the U. S. A. by Garrison (1994), and both sexes were keyed and redescribed by Westfall & May (206). The overall coloration of the male (Figs. 130, 376, 843, 1010) is similar to that of *A. alberta* (Figs. 30, 289, 949), and the elongate cerci with a truncate end and with the inner branch forming a decumbent tooth is common to both species. Males of both species are diagnosed under *A. alberta*. In addition to the differences noted there, the distal segment of the genital ligula of *A. sedula* has a bifid flagellum, the lateral lobes are small, and there is a small basal hood at the base of the flagella (Fig. 647); in *A. alberta*, the distal segment of the genital ligula has a single apical flagellum, the lateral lobes are large, digitiform and darkened, and there is no basal membranous hood (Fig. 634).

Argia sedula is sexually dichromatic, with an almost immaculate pale tan female with amber wings (Figs. 251, 252, 477, 1011) that may be confused with *A. immunda*. There are generally 4 Fw pq in *A. sedula* (generally 3 Fw pq in *A. immunda*); the black middorsal stripe in *A. sedula* is usually a mere hairline, Fig. 252 (black middorsal stripe in *A. immunda* broad, slightly narrower than pale antehumeral stripe, Fig. 211) and the mesostigmal lobe in *A. sedula* is elevated and directed posteromesally, with medial tip perpendicular to mesepisternum and venter of apical part of lobe visible in dorsal view, Fig. 569c (mesostigmal lobe in *A. immunda* vestigial, almost linear, Figs. 532, 533).

Males of *A. sedula* also share a similar color pattern with *A. gaumeri* and may be confused in the field but both species are allopatric. Their differences are discussed under *A. gaumeri*.

Remarks. Stewart & Vodopich (2018) in their study of a population of *A. sedula* in Texas suggested that differences in seasonal and year-to-year environmental conditions, but not geographical location, influenced wing shape and wing size in *A. sedula*.

In the phylogenetic analysis based on mitochondrial and morphology data set of larvae by Torres-Pachón *et al.* (2017), *A. sedula* clustered within their “rhoadsi” clade as follows: (*A. rhoadsi* (*A. pulla*, *A. sedula*)). See Remarks under *A. alberta* and *A. rhoadsi* concerning comments regarding phylogenetic placement of *A. sedula*.

Distribution. This is a common widespread species occurring throughout much of the U. S. A. from SE Canada south through Florida and west to Nebraska, New Mexico, Arizona, S Utah, Nevada and S California. It extends south into Sonora, Chihuahua, Coahuila and along the E coast of Mexico into Veracruz, with one record from Morelos (Fig. 797), at elevations ranging from 23 to 1742 m (Mexico, Durango, Peñón Blanco; not seen, Portal de datos abiertos UNAM). It overlaps in its distribution with *A. alberta* in S California, Arizona, New Mexico, and W Texas.

Argia talamanca Calvert 1907

Figs. 131 (head, thorax, S1–4 ♂); 132–135 (thorax ♂); 253 (head, thorax, S1–4 ♀); 377 (S7–10 ♂); 378, 379 (S1–10 ♂); 478 (S7–10 ♀); 570–574 (mesostigmal plates ♀); 648 (genital ligula); 732–735, 737 (appendages ♂); 785 (map); 844 (field photo ♂); 928 (body scan ♂); 929 (body scan ♀).

[Key locators: ♂ G-2, couplet 4'; ♂ M-5, couplet 5', couplet 23; ♀ key to groups, couplet 2', couplet 30; F-9, couplet 3(1')]

Argia talamanca Calvert 1907: 371 (key ♂, description ♂, pl. VIII, figs. 34, 34s);—Kimmins 1970: 192 (holotype data);—May 1979: 16 (Panama);—Paulson 1982: 253 (Costa Rica, Panama, South America);—Donnelly 1992: 83 (Panama);—Ramírez *et al.* 2000: 249 (Costa Rica);—Förster 2001: 11, 54 (key, fig. C25);—von Ellenrieder & Garrison 2007a: 20 (holotype examined, figs. 60–q);—Pérez-Gutiérrez *et al.* 2007: 212 (Colombia);—Heckman 2008: 350, 380 (♂, ♀, key in part, Central America, Colombia only);—Pérez-Gutiérrez & Palacino-Rodríguez 2011: 2013 (Colombia);—Amaya-Perilla &

Palacino-Rodríguez 2012: 34 (Colombia);—Garrison & von Ellenrieder 2013: 16 (Costa Rica);—Paulson & Haber 2021: 99 (diagnosis, photos).

Argia (Heliargia) talamanca: Kennedy 1920: 85 (in subgenus *Heliargia*).

Primary types. *Argia talamanca*: holotype ♂, COSTA RICA, San José, Carrillo, Cecil F. Underwood leg. [examined, in BMNH; von Ellenrieder & Garrison 2007a].

Specimens examined. 76 ♂♂, 27 ♀♀: **COSTA RICA, Heredia:** 1 ♀, Finca La Selva, 1.5 mi S of Puerto Viejo, 67-52 {10.4667°N, 84.0167°W}, 60 m, 9 April 1967, D. R. Paulson [RWG]; 1 ♂, Santo Domingo de Heredia, on the grounds of the Hotel Bougainvillea {9.98°N, 84.0792°W}, 1187 m, 8 March 1992, A. M. Young & S. Sullivan Borkin [RWG]; **Alajuela:** 2 ♂♂, Angel River, L-03-1011 {10.2583°N, 84.1833°W}, 930 m, 30 October 1989, C. Esquivel-Herrera [UNH]; 1 ♂, 1 ♀, San Ramón, 6.8 mi SW, stream, 67-185 {10.0347°N, 84.5206°W}, 910 m, 31 July 1967, D. R. Paulson [FSCA, RWG]; 3 ♀♀, Grecia, Los Chorros, L03-377 {10.0317°N, 84.2831°W}, 17 September 1988, C. Esquivel-Herrera [UNH]; 1 ♂, same data but L03-411, 3 December 1988 [UNH]; 1 ♂, Sarapaquí River, 16 km N of Vara Blanca, 10.3061°N, 84.1671°W, 505 m, 12 August 1979, R. W. & J. A. Garrison [RWG]; 1 ♂, 1 ♀, same data but streams and waterfalls, 67-123 {10.3°N, 84.1875°W}, 762 m, 16 June 1967, D. R. Paulson [FSCA]; **Limón:** 3 ♂♂, 1 ♀, Guápiles, in forest {10.2158°N, 83.7867°W}, 268 m, 5–7 July 1967, M. J. Westfall, Jr. & D. N. Westfall [FSCA]; 1 ♂, 1 ♀, ca. 20 km SE of Siquirres, Las Brisas de Pacuarito, L-09-194 {10.1°N, 83.5°W}, 59 m, 2 February 1990, T. Herman [UNH]; **San José:** 1 ♂ (holotype), Carrillo {10.1477°N, 83.9479°W}, 460 m, C. F. Underwood [BMNH]; 1 ♂, 20 km ENE of Quepos, Londres road, 8.2 km ENE of Londres, tributary of Savegre River, small rocky stream crossing road, spring trickle on rocky road bank, 9.4856°N, 83.9911°W, 650 m, 16 August 2012, W. A. Haber [RWG]; **Puntarenas:** 3 ♂♂, 13 km SE of Buenos Aires, Cataratas River at crossing of Pan-American Highway, junction of two rivers with boulders and high waterfall, 10.0693°N, 83.6326°W, 140 m, 8 March 2009, W. A. Haber & Fred S. Sibley [CSCA, RWG]; 1 ♂, Cataratas River at crossing Pan-American Highway N of Paso Real, 9.0633°N, 83.27°W, 155 m, 23 January 2005, F. C. Sibley [FSCA]; 1 ♂, same data but FCS09-0054, 8 March 2009 [FSCA]; 1 ♂, vicinity of Rincón de Osa, 67-29 {8.7°N, 83.4833°W}, 270 m, 8–12 November 1966, D. R. Paulson [FSCA]; 3 ♂♂, 1 ♀, same data but 67-24, 26 {8.4°N, 83.3°W}, 270 m, 7–9 March 1967, D. R. & M. L. Paulson [RWG]; 1 ♂, Reserva Biológica Golfito, 1 km NW of Golfito, 90x023 {8.65°N, 83.1668°W}, 100 m, 17–18 July 1990, T. W. Donnelly [FSCA]; 1 ♂, 1 ♀, waterfall on road to Pacífica, 5–6 mi SW of Rincón {8.6°N, 83.4833°W}, 50 m, 28 February 1968, J. Vandermeer [RWG]; 1 ♂, vicinity of Rincón de Osa, 66-285 {8.4°N, 83.3°W}, 270 m, 13 November 1966, D. R. & M. L. Paulson [FSCA]; **Cartago:** 1 ♀, Jabillos, 2 mi NE of Chitaria River, 66-212 {9.9186°N, 83.6033°W}, 795 m, 2 August 1966, D. R. & M. L. Paulson [FSCA]; 1 ♂, Turrialba {9.9°N, 83.65°W}, 1000 m, 9 May 1960, R. B. Cumming [FSCA]; 1 ♂, 1 ♀, Juan Viñas {9.8867°N, 83.752°W}, 800 m, 29 July 1909, P. P. Calvert [UMMZ]; 1 ♂, same data but 2 December 1909 [UMMZ]; 1 ♂, same data but 66-240 {9.8867°N, 83.752°W}, 800 m, 1 September 1966, D. R. & M. L. Paulson [FSCA]; 3 ♂♂, 1 ♀, vicinity of Juan Viñas, near Infernillo and Quebrada Honda, near waterfalls, 62x055, 1000 m, 15 June 1962, T. W. Donnelly [FSCA]; 1 ♂, same data but 800 m, 1 September 1966 [FSCA]. **PANAMA: Ngäbe-Buglé:** 1 ♂, Büri Corregimiento, tributary to Guabo River, seepages and road puddles at junction of Highway 10 and road to Willie Mazu, 8.7936°N, 82.1933°W, 520 m, 19 May 2019, W. F. Mauffray [FSCA]; **Veraguas:** 3 ♂♂, near Santa Fe, Santa Fe National Park, new road to Caribbean large stream and waterfall; 12x052, 12x053, 8.5655°N, 81.1879°W, 345 m, 6 August 2012, T. W., A. Donnelly & J. Michalski [FSCA, RWG]; 3 ♂♂, 1 ♀, Quebrada Piedra de Moler, road to Luis River, 8.5567°N, 81.1789°W, 410 m, 13 September 2016, J. J. Daigle [FSCA, RWG]; 1 ♂, road to Luis River, Llanito River and waterfall area, 8.5655°N, 81.1881°W, 350 m, 31 March 2017, W. F. Mauffray [FSCA]; **Colón:** 4 ♂♂, Fort San Lorenzo {9.3239°N, 80.0006°W}, 25 m, 31 December 1950 [RWG, UMMZ]; **Coclé:** 1 ♀, El Valle de Antón, 50 mi NW of Panama City {8.6167°N, 82.1333°W}, 624 m, 27 January 1946, D. W. Jenkins [RWG]; **Panamá:** 1 ♂, Chagres National Park, NE of Salamanca, tributary of Boquerón River, 9.3932°N, 79.5596°W, 120 m, 18 August 2019, W. F. Mauffray [FSCA]; 2 ♂♂, 1 ♀, Chagres Valley, Madden Dam {9.2122°N, 78.6169°W}, 66 m, Ward's Nat. Sci. Estab. [RWG]; 3 ♂♂, 1 ♀, Barro Colorado Island, near stream in clearing {9.15°N, 79.85°W}, 62 m, 14 August 1938, N. A. Weber [RWG]; 1 ♂, same data but K-6 Road {9.15°N, 79.85°W}, 62 m, 25 January 1970, E. S. Morton [FSCA]; 1 ♂, 1 ♀, same data but 29 May 1970 [FSCA]; 1 ♂, same data but Allee Stream, 22 February 1974, M. L. May [FSCA]; 1 ♂, Sardanilla River {9.1194°N, 79.5908°W}, 145 m, 5 December 1916, E. B. Williamson [RWG]; 1 ♂, Pipeline Road, Agua Salud River {9.1°N, 79.7°W}, 8–13 July 1967, O. S. Flint, Jr. & M. A. Ortiz B. [FSCA]; 1 ♂, Madden Forest, roadside waterfall {9.0939°N, 79.6189°W}, 122 m, 12 May 1979, K. W. Knopf [RWG]; 1 ♂, Canal Zone {9.0667°N, 79.65°W}, 75 m, Wards Nat. Sci. Estab. [RWG]; 2 ♂♂, 1 ♀, forest

road at Gaillard Highway at mi 12, 7.4 km SE of Gamboa, 9.0667°N, 79.6668°W, 75 m, 3 August 1979, R. W. & J. A. Garrison [RWG]; **Darién:** 1 ♀, Cerro Chucantí, base camp, 8.7919°N, 78.4515°W, 875 m, 13–16 February 2012, L. G. Bezark [RWG]. **COLOMBIA, Risaralda:** 1 ♂, 1 ♀, Santa Cecilia, Reserva Alto Amurupá, Quebrada Cinto {5.3456°N, 76.1514°W}, 387 m, 3 February 2017, J. Sandoval, B. Cardenas & C. Bota-Sierra [RWG]; 1 ♂, 1 ♀, same data but Quebrada Ranas de Cristal, {5.3202°N, 76.1735°W}, 584 m, 7 February 2017, C. Bota-Sierra & J. Sandoval, [RWG]; 1 ♂, 1 ♀, same data but C. Florez & C. Bota [CEUA]; **Chocó:** 1 ♂, 1 ♀, Bochoromá, Guarato, Quebrada Muchiro, N tributary of Lloravido, 5.2996°N, 76.3954°W, 584 m, 8 February 2017, B. Cardenas, J. Sandoval & C. Bota-Sierra [CEUA]; 1 ♂, 1 ♀, same data but 5.2833°N, 76.3833°W, 340 m, 17 August 2017, B. Cardenas, J. Sandoval & C. Bota-Sierra [CEUA]; **Valle del Cauca:** 1 ♂, Juntas, Dagua River {3.7742°N, 76.7444°W}, 400 m, March 1909 [UMMZ]; 2 ♂♂, Anticaya River, road to the sea {3.6500°N, 76.9333°W}, 320 m, 19 May–02 June 1969, G. Wolffhugel [FSCA]; 1 ♂, 1 ♀, Bajo Anchicayá, Quebrada {3.6175°N, 76.9158°W}, 227 m, 14 January 2008, V. Amaya & C. Bermúdez [CEUA]. 7 ♂♂, 1 ♀, same data but Digua River Dam {3.6175°N, 76.9100°W}, 240 m, 14–18 January 2008, V. Amaya & C. Bermúdez [RWG].

A medium-size species (Table 2); male pale violet-blue (Figs. 131–135, 844, 928) with black middorsal black stripe reduced to a narrow line no wider than middorsal carina (Figs. 131–134) to one fourth as wide as antehumeral stripe (Fig. 135); largely black abdomen with blue confined to S1–2 and dorsal 0.60 of S3 or S3–4 and dorsum of S8–10; distal segment of genital ligula with large sacoid lateral lobes and with an entally directed flared process on each side distal to them (Fig. 648); female (Fig. 929) variable with regards to mesostigmal plate morphology, either with a digitiform accessory mesostigmal lobe (sometimes small, Fig. 573c) arising from ridge connecting posteromesal corner of mesostigmal plate to mesepisternum (Figs. 573c, d, 574c, d), or without (Fig. 572).

Redescription. Calvert's (1907) description was based on a single male from Carrillo, Costa Rica; we supplement his description of this little-known species as follows.

Male (Costa Rica, Puntarenas, 13 km SE Buenos Aires, Figs. 131, 134, 378, 928): Head. Labium, ante- and postclypeus, genae and ante- and postfrons entirely violaceous blue, epicranium black with small pale spot anterolateral to lateral ocellus, black appearing as a broad cross-band delimited posteriorly by large violaceous postocular spots bordering eye, pale occipital bar lacking, dorsal surface of postocular lobe black; antennae black, rear of the head pale with ill-defined black marks around the occipital foramen and dorsally along postocular lobes. Prothorax black with following areas violaceous blue: anterior lobe, mediolateral spot on middle lobe and propleuron and posterior lobe, the last with a pair of small mediolateral black streaks. Pale areas of pterothorax pale violet, with a narrow black middorsal stripe confined to middorsal carina, remainder of mesepisternum correspondingly pale violet; black humeral stripe broad only at base, remainder confined to humeral suture and mesopleural fossa, vestigial black stripe on interpleural suture; remainder of thorax pale violet with narrow well-defined metapleural stripe. Wings hyaline, with venation black; Pt brown, surmounting 1 cell in all wings; px Fw 14/14, Hw 12/13; px Fw 3/3, Hw 3/3; RP2 at Fw 7/7, Hw 5/5. Coxae pale violet; remainder of legs black. Abdomen mostly black; S1 violaceous; S2 violaceous with an incomplete black stripe ending at apical fifth, its end slightly enlarged dorsally and with a complete narrow ventral black stripe, annulus black; S3 with basal ring of violet and dorsally prolonged posteriorly and ending at black apical annulus but constricted by dorsal black at apical fifth, laterally with a longitudinal black stripe expanding but not meeting dorsally at apical fifth before narrowing and meeting apical black annulus; S4–7 black with a pale basal ring; S8–9 blue dorsally, black laterally, S10 black.

Genital ligula (Fig. 648) with large sacoid lateral lobes and with an entally directed flared process on each side distal to them, distal segment ending in a single flexible flagellum.

Torus linear, swollen ventrally, occupying entire ventral margin of torifer but not overlapping bilobed epiproct (Fig. 734a), base of epiproct and surrounding area black; cercus (Figs. 734a) short, about subequal in length to paraproct (as in Figs. 732b, 735b), sides more or less parallel but medial margin slightly convex, slightly concave dorsomedially, slightly bifid apically with slightly decumbent inner branch (tooth) separated from outer branch by a shallow concavity; paraproct bilobed, its ventral branch smaller than slightly anteriorly directed dorsal branch, in lateral view, tip of dorsal branch bluntly acuminate (as in Fig. 735b), ventral branch gently convex.

Dimensions. Hw 20.0, abdomen 26.0, total length 33.0.

Female (Costa Rica, Puntarenas, vicinity of Rincón de Osa, Figs. 253, 478, 929): similar to male but pale colors blue. Head, as in male but postclypeus black, prothorax as in male but posterior lobe black only with lateral margins pale; pterothorax differs from male as follows: black middorsal stripe about half as wide as pale antehumeral stripe, black humeral stripe about a fourth as wide as pale antehumeral, this stripe parallel and forked above at dorsal fifth,

the posterior fork vestigial, the anterior half as wide as remainder of humeral stripe, its dorsal end extending to antealar carina, remainder of thorax as in male; black stripes on S2 complete, meeting on the mid-dorsum at apical third; S3–7 as in male but lateral black stripe interrupted medially by a narrow pale isolated stripe, S8 blue dorsally, black ventrally, S9 black with a narrow blue middorsal stripe connecting with a narrow blue transverse dorsal stripe at apical fifth, S10, cerci and ovipositor black. Pt surmounting 1 cell in all wings; px Fw 15/15, Hw 12/13; px Fw 3/4, Hw 3/3; RP2 at Fw 6/7, Hw 5/5.

Dimensions. Hw 21.2, abdomen 26, total length 34.4.

Diagnosis. The largely pale thorax with black middorsal stripe largely confined to middorsal carina will separate males of this species from all others occurring within its range (Costa Rica to Colombia). The abrupt change of the broad middorsal blue stripe on S3 or S4 to its absence on S4–7 or S5–7 is also present in *A. underwoodi* (Fig. 159), but the latter species has broad middorsal and humeral black stripes (Fig. 931), and the appendages differ. The cercus of *A. talamanca* is relatively short, about as long as wide, the medial margin relatively linear, and the emarginate area between the outer and inner branches is shallow (Figs. 732a, c); in *A. underwoodi* the cercus is twice as long as wide, the medial margin gently convex at the apical half, and the emarginate area between the outer and inner branches is deeply concave (Figs. 750a, c). The distal segment of genital ligula in *A. talamanca* with large sacoid lateral lobes and an entally directed flared process on each side distal to them (Fig. 648) is shared only with the sympatric *A. pocomana* but, as with *A. underwoodi*, the cercus in the latter species is longer than wide, and the emarginate area between the outer and inner branches is deeply concave (Figs. 722a, c).

Diagnosing female *A. talamanca* can be difficult due to the variation in the morphology of the mesostigmal plates and similarity in coloration to females of other sympatric species. The overall color pattern in female *A. talamanca* (Figs. 253, 929) is similar to that of *A. underwoodi* (Figs. 266, 932), and especially to that of *A. pocomana* (Figs. 241, 466, 927), but they differ in the morphology of the mesostigmal plates as follows: The posterolateral corner of mesostigmal plate in *A. underwoodi* forms a prominent raised mesostigmal lobe so that lateral portion of mesostigmal plate is subquadrate (Figs. 587c, d); the mesostigmal lobe in *A. talamanca* is evenly convex and lacks the quadrate posterolateral corner. Separation between *A. talamanca* and *A. pocomana* in Costa Rica (where the species are sympatric) can be difficult, as the small mesostigmal plates in *A. pocomana* (Fig. 559) can be similar to some examples of *A. talamanca* that lack the accessory digital mesostigmal lobe (e. g. Fig. 571). Generally (but not always), the extent of black on S9 in *A. talamanca* (Fig. 478) is more extensive than in *A. pocomana* (Fig. 466); in the latter species, the black is limited to a pair of dorsolateral wedge-shaped spots confined to the basal third of S9 (Figs. 466, 927). In *A. talamanca*, the black is more extensive with blue often limited to a narrow middorsal stripe ending posteriorly with an incomplete narrow transverse stripe (Figs. 478, 929).

Remarks. This species is highly variable both in color pattern and morphology of the male caudal appendages and female mesostigmal plates, as evidenced by the multiple figures. Within Central America, the male of *A. talamanca* always has a narrow black middorsal stripe, but it may vary in thickness as shown in figures 131 and 134 versus 132, 133 and 135. The middorsal stripe tends to be broader, slightly overspreading the middorsal carina in Panamanian specimens, and they tend to be more heavily marked with black on other areas of the thorax. The cerci in Panamanian males also differ from those from Costa Rica, with distal margin of cercus almost linear (Figs. 737a, c) rather than gently concave (Figs. 732a, c, d, 733, 734).

The female is unusual in apparently exhibiting two different forms of mesostigmal plates. Many possess a simple digitiform accessory lobe at the mediobasal margin of each mesostigmal lobe (Figs. 573, 574) while others lack this structure (Figs. 570, 571). The digitiform accessory lobe also varies as to placement in relation to the base of the mesepisternum; the accessory lobe may be raised and free of the mesepisternum (Fig. 574i) or adnate (Fig. 573i). The mesostigmal lobe also varies from having an almost linear posterior margin (e. g., Figs. 570, 571) to a smoothly convex margin (e. g., Figs. 572–574). However, a female from Panama (Fig. 572) shows remnants of an accessory lobe on the left side but with a more pronounced ridge on the right. Finally, the posteromedial margin may differ in either being swollen (e. g., Figs. 570e, 571e) or not (e. g., Fig. 572). These differences in morphology first led us to suspect that the females represented two different species, but each of these morphotypes are known to have been taken in tandem with males (e. g., Costa Rica, Reserva Biológica Golfito, pair taken in tandem with female with digitiform accessory lobe; Costa Rica, vicinity of Juan Viñas, pair taken in tandem with female lacking digitiform accessory lobe), all of which represent *A. talamanca*. The color pattern of S8–10 also varies from almost entirely black to the entire dorsum blue. The few examples of both sexes we have examined from Colombia are like those of the typical forms found in Costa Rica. Our illustration of the holotype of *A. talamanca* also shows an

anomaly; the dorsal surface of the left paraproct (Fig. 732b) is truncate, but the right one is normally digitiform as shown in Figs. 735 and 737b. The robust condition of the cerci as well as the morphology of the paraproct and general color pattern for specimens from Costa Rica and Panama suggests that all represent the same species.

The variability within *A. talamanca* also led us to examine the closely related *A. variegata* Förster, 1914, known from Venezuela, Colombia, Ecuador, and Peru. The relationship between these two species is perplexing, as the male genital ligula, caudal appendage and female mesostigmal plate morphology tally with those of *A. talamanca* from Costa Rica, although the color pattern differs. Our samples of *A. talamanca* from Central America are too few to arrive at a satisfactory conclusion at the present time as to whether both names should be considered synonyms. Males of *A. variegata* from Venezuela are violaceous, those from Colombia south through Peru blue. The difficulty in determining the status of the two names was also mentioned by Ris (1918), who reported on specimens from Colombia (San Antonio, Sosomuco, Buenavista, Villavicencio) determined as *A. talamanca*. His illustrations of the male caudal appendages suggest either of these two species as currently used in the literature, but his description suggests that he determined specimens of *A. variegata* as *A. talamanca*. Our examination of Förster's ♂ and ♀ syntypes of *A. variegata* housed in the UMMZ show no significant differences in the black epicranial markings compared to those of males of *A. talamanca* from Central America and agrees with Ris' description above. We illustrate the appendages of the lectotype of *Argia trifoliata* Fraser, 1942 (deposited at BMNH, Fig. 736), which we consider to be a junior synonym of *A. variegata*.

Within Mexico and Central America, *A. pocomana* and *A. talamanca* are the only two species that share the unique genital ligula morphology described above, and the similarity in their caudal appendages and mesostigmal plate morphology suggests that both are sister species. It is, therefore, no surprise that females of these two species might be difficult to separate.

Habitat. *Argia talamanca* seems to prefer trickles, seepages, and waterfalls and does not seem to be commonly encountered, based on the number of specimens we have been able to examine. However, Fred Sibley recorded this species (Costa Rica, Cataratas River) as being fairly common in vegetation just below large falls on a rocky, fast-flowing forest stream, and a male (Costa Rica, 20 km ENE of Quepos) on a small rocky stream, and spring trickle on a rocky road bank.

Distribution. This is a primarily a submontane species, extending from Costa Rica south to the Pacific slope of Colombia (Fig. 785) and ranging in elevation from near sea level to over 1100 m.

Argia tarascana Calvert 1902

Figs. 136, 137 (head, thorax, S1–4 ♂); 138, 139 (thorax ♂); 254, 255 (head, thorax, S1–4 ♀); 380, 381 (S7–10 ♂); 479 (S7–10 ♀); 575 (mesostigmal plates ♀); 649 (genital ligula); 738 (appendages ♂); 775 (map); 845 (field photo ♂); 846 (field photo ♂, ♀); 870, 871 (body scans ♂); 872, 873 (body scans ♀).

[Key locators: ♂ G-1, couplet 6(5); ♂ M-5, couplet 22'; M-6, couplet 31(30); ♀ key to groups, couplet 21(20'); F-6, couplet 3(2), couplet 15'; F-7, couplet 2(1'); F-11, couplet 3(2'), couplet 6'; F-14, couplet 3'; ♀ shortcut 8]

Argia tarascana Calvert 1902: 90 (♂, ♀, description, pl. IV, figs. 14, 51, 518, 51ss);—Calvert & Hagen 1902: 115, ("Types in Colls. Godman, U. S. Nat. Mus., Adams, Calvert");—Calvert 1907: 374 (Oaxaca, Mexico);—Kimmins 1970: 192 (supposed holotype data);—Paulson 1982: 253 (U. S. A., Mexico);—Westfall 1990: 66 (description of larva from Arizona, fig. 3);—González-Soriano & Novelo-Gutiérrez 1991: 77, 78, 88 (Durango, Mexico, ♂, ♀, key, figs. 38, 45);—Novelo-Gutiérrez & González-Soriano 1991: 112, 131 (key larva, Morelos, Mexico, figs. 19, 33);—Novelo-Gutiérrez 1992: 66 (description larva, figs. 11, 26, 31, 53, 63, 75, 88);—González-Soriano 1993: 296 (Mexico);—Garrison 1994: 332 (key, diagnosis, figs. 25, 26, 44, 45, 92, 120);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Alonso-Eguía *et al.* 2002: 352 (San Luis Potosí, Mexico);—Westfall & May 2006: 214 (♂, ♀, key, description figs. 96B, 100A, 103J);—Behrstock *et al.* 2007a: 57 (Chihuahua, Mexico);—Danforth 2006: 13 (Arizona, U. S. A.);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Upton *et al.* 2007: 33 (Sonora, Mexico);—Caesar & Wenzel 2009: 104 (phylogeny within genus *Argia*);—Escoto-Moreno *et al.* 2009: 154 (Aguascalientes, Mexico);—Paulson 2009: 161 (♂, ♀, description, diagnosis, photo 94);—Bailowitz *et al.* 2013: 13, 14 (Arizona, U. S. A.);—Escoto-Moreno *et al.* 2014: 1051 (Hidalgo, Mexico);—Bailowitz *et al.* 2015: 148 (diagnosis, photos);—Escoto-Moreno *et al.* 2017: 386 (Hidalgo, Mexico);—Torres-Pachón *et al.* 2017: 416 (molecular phylogeny of larvae within *Argia*).

Argia deami: Calvert 1902: 90 (in part, paratype females from Oaxaca).

Primary types. *Argia tarascana*: holotype ♂, MEXICO, Morelos, Cuernavaca, October 1897, Otis W. Barrett leg. [not examined, in ANSP; Westfall & May 2006] (<http://clade.ansp.org/entomology/detail.php?id=6170&return=%2Fentomology%2Fsearch.php%3Ffam%3D%26gen%3DArgia%26spe%3Dtarascan%26ssp%3D%26aut%3DCalvert%26cou%3D%26submitbut%3DSearch>).

Specimens examined. 151 ♂♂, 30 ♀♀: **U. S. A., Arizona:** 11 ♂♂, Hot Springs Canyon, about 2 mi by foot NW of Hookers Hot Springs, 32.3528°N, 110.257°W, 1196 m, 20–21 September 1996, R. W. Garrison [CUMZ, RWG, UT]; 17 ♂♂, 2 ♀♀, Muleshoe Ranch, Bass Creek, Hot Springs, 32.3528°N, 110.257°W, 1196 m, 17 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA RWG]; 3 ♂♂, San Bernardino Ranch about 15 mi E of Douglas {31.3364°N, 109.279°W}, 1160 m, 13 July 1958, M. J. Westfall, Jr. [RWG, UMMZ]. **MEXICO, Sonora:** 4 ♂♂, 2 ♀♀, Cajón Bonito at Rancho Los Ojos, 25 mi E of Agua Prieta, 31.2386°N, 109.066°W, 1667 m, 30 May 2002, S. Upson [RWG]; 1 ♂, same data but 7 July 2002 [RWG]; 1 ♂, same data but 23 April 2017, R. A. Bailowitz [RWG]; 1 ♂, Guirocoba River at El Sabino, 24 mi E of Alamos, 28.5482°N, 109.824°W, 388 m, 28 October 2004, R. A. Bailowitz [RWG]; 1 ♂, E of Yécora, Route 16 near Chihuahua border, Los Pilaes Stream near El Castillo Bridge {28.3667°N, 108.917°W}, 1310 m, 19 July 2006, S. W. Dunkle [FSCA]; **Durango:** 23 ♂♂, El Saltito {24.0067°N, 104.727°W}, 1900 m, 3 July 1985, C. Castillo & P. Reyes C. [BYU, CNIN, RWG]; 8 ♂♂, Km 21 road Suchil-Reserva de la Biósfera La Michilia, Corralitos, 23.5921°N, 104.066°W, 2006 m, 26 August 1987, E. González-Soriano [CNIN, RWG]; 1 ♂, same data but San Miguel de la Michilia Stream [CNIN]; 13 ♂♂, 1 ♀, Temazcal Stream, Reserva de la Biósfera La Michilia, 23.3653°N, 104.231°W, 2389 m, 28 August 1987, E. González-Soriano [CNIN, RWG]; **Jalisco:** 1 ♂, Teocaltiche {21.4333°N, 102.5669°W}, 1700 m, 25 September 1975, B. Villegas [UCD]; 5 ♂♂, San Diego Rancho near Cocula {20.3425°N, 103.804°W}, 1300 m, 12–15 November 1923, J. H. Williamson [FSCA, RWG, UMMZ]; 1 ♂, Hacienda de San Marcos, near Villegas {20.23°N, 103.8761°W}, 1602 m, 23 November 1923, J. H. Williamson [RWG]; 1 ♂, region of Chapala Lake {20.1167°N, 102.867°W}, 1600 m, 2 December 1923, J. H. Williamson [RWG]; **Zacatecas:** 5 ♂♂, Presa Las Tuzas, Nochistlán {21.3771°N, 102.851°W}, 1887 m, 17 August 1992, B. & C. Villegas [RWG]; 3 ♂♂, Nochistlán de Mejía {21.35°N, 102.833°W}, 1700 m, 22 September 1975, B. Villegas [RWG, UCD]; **Hidalgo:** 3 ♂♂, 1 ♀, ditches around Tasquillo {20.5347°N, 99.315°W}, 1710 m, 20 June 1966, D. R. & M. L. Paulson [FSCA, RWG]; **Michoacán:** 1 ♂, La Luna District, Rancho Limón, SSE of Tancitaro Peak {20.1463°N, 20.1463°E}, 1500 m, 12 May 1949, T. H. Hubbell [UMMZ]; 1 ♂, Zamora {19.9724°N, 102.295°W}, 1500 m, 28 August 1954, E. G. Linsley, J. W. MacSwain & R. F. Smith [RWG]; 1 ♂, 3 ♀♀, Lago de Camécuaro, 9 mi E of Zamora {19.9039°N, 102.2099°W}, 1702 m, 12 May 1949, J. A. Peters [UMMZ]; 2 ♂♂, same data but 13 km E of Zamora, 17 July 1947, T. H. Hubbell [UMMZ]; 1 ♀, ca. 10 mi S of Tacambaro, along de la Alberca River near Chupio {19.1654°N, 101.429°W}, 1100 m, 6 March 1949, G. M. Sutton [UMMZ]; **Guanajuato:** 1 ♂, 1 ♀, Acambaro {20.0333°N, 100.733°W}, 1850 m, 30 March 1889, S. N. Rhoads [BMNH, UMMZ]; **Morelos:** 1 ♀, Cuernavaca {18.9342°N, 99.2317°W}, 1569 m, C. C. Plummer [UMMZ]; 1 ♂, same data but 1 August 1935, H. R. Roberts [FSCA]; 1 ♂, same data but 9 August 1938, L. J. Lipovsky [RWG]; 1 ♂, same data but 1 July 1944, N. L. H. Krauss [UMMZ]; 3 ♂♂, 1 ♀, Balneario Itzamatlán, 5 km SW of Yautepec, 18.9072°N, 99.0318°W, 1200 m, 2 October 1983, R. W. Garrison [RWG]; 1 ♂, same data but 7 July 1987, M. J. Westfall, Jr. [FSCA]; 1 ♂, 1 ♀, 4 mi S of Cuernavaca {18.8784°N, 99.2316°W}, 1300 m, 12 August 1938, L. J. Lipovsky [UMMZ]; 1 ♂, 1 ♀, Las Fuentes, spring and stream {18.877°N, 99.1657°W}, 1340 m, 8 July 1987, M. J. Westfall, Jr. [FSCA]; 3 ♂♂, 4 ♀♀, Balneario on River S of Temixco on Highway 95, 18.8303°N, 99.2272°W, 1220 m, 21 July 1992, S. W. Dunkle [FSCA, RWG]; 1 ♂, Alpuyeca, S of Cuernavaca on Route 95 {18.8303°N, 99.2272°W}, 1020 m, 23 June 1963, R. E. Woodruff [FSCA]; 1 ♂, Cuautla {18.8098°N, 98.9486°W}, 1290 m, 7 August 1944, N. L. H. Krauss [UMMZ]; 1 ♂, flooded River at km 18.3 of Highway 95, 5 km S of Acatlipa {18.8042°N, 99.2256°W}, 1100 m, 7 July 1987, M. J. Westfall, Jr. [FSCA]; 1 ♂, Sabinos River, S of Acatlipa, 21 July 1992, K. J. Tennessen [FSCA]; 1 ♂, 1 ♀, 2 mi S of Cuautla {18.7908°N, 98.9719°W}, 1250 m, 27 June 1948, P. Dowling [RWG]; 3 ♂♂, 1 ♀, river 0.3 km NE of Pueblo Cocoyotla on Highway 421 {18.7678°N, 99.4572°W}, 1070 m, 23 July 1992, S. W. Dunkle & K. J. Tennessen [FSCA]; 2 ♂♂, 1 ♀, ca. 5 km N of Pueblo Cocoyotla on Route 421, small clear tributary and adjacent field below dam, 23 July 1992, W. F. Mauffray [FSCA]; 1 ♂, 3 km S of Pueblo Cocoyotla on Highway 421, larger of two side by side streams {18.7678°N, 99.4572°W}, 1070 m, 22 July 1992, W. F. Mauffray [FSCA]; 1 ♂, Xochitepec, Highway 95 at Balneario Campestre, Sabinos River {18.7647°N, 99.2608°W}, 1100 m, 21 July 1992, W. F. Mauffray [FSCA]; 1 ♂, Las Estacas, spring and stream {18.73°N, 99.1133°W}, 980 m, 8 July 1987, M. J. Westfall, Jr. [FSCA]; 1 ♂, 1 ♀, Acamilpa {18.7167°N, 99.15°W}, 980 m, 12 October 1981, L. Deloya [UMMZ]; 1 ♂, 1 ♀, Cerro del Higuerón, Jojutla {18.5122°N, 99.1525°W}, 800 m, 12 September 1981, L. Deloya [UMMZ];

1 ♂, same data but 30 August–8 September 1981 [UMMZ]; 6 ♂♂, 2 ♀♀, La Fuente, Jiutepec Municipality, 10 km W of Cuernavaca, 18.2558°N, 99.2822°W, 1300 m, 1 October 1983, R. W. Garrison [RWG, RMNH]; **Puebla:** 2 ♂♂, 1 ♀, just NW of Tehuacán, ditch {18.4777°N, 97.4392°W}, 1706 m, 16 August 1965, D. R. Paulson [FSCA]; **Guerrero:** 1 ♀, Rincón, 10 mi S of Chilpancingo {17.3832°N, 99.5°W}, 850 m, 25 June 1932, H. M. Smith & E. H. Taylor [RWG]; **Oaxaca:** 1 ♂, Oaxaca {17.0505°N, 96.7295°W}, 1540 m, 28 June 1900, C. C. Deam [UMMZ]; 2 ♀♀ same data (paratypes of *A. deami*) [UMMZ]; 2 ♂♂, 0.8 mi E of Tamazulapán, ditch {16.9991°N, 96.2878°W}, 2010 m, 27 August 1967, D. R. & M. L. Paulson [FSCA]; 2 ♂♂, Miahuatlán {16.3105°N, 96.6026°W}, 1600 m, 1 July 1971, E. C. Welling M. [UMMZ]; **Chiapas:** 1 ♂, Tuxtla Gutiérrez {16.7652°N, 93.0792°W}, 1300 m, 9 July 1955, University of Kansas Mexico Expedition [FSCA].

A medium-size species (Table 2); male with predominantly blue abdomen (Figs. 48, 305, 845, 846, 870, 871) with cercus posteromesal border roundly angulate in dorsomedial view (Fig. 738a); female blue to tan (Figs. 846, 872, 873) with small digit-like mesostigmal lobes about as wide as long and with medial margin located medially to anterior end of lateral branch of middorsal carina (Fig. 575c).

Diagnosis. *Argia tarascana* was keyed and diagnosed against *A. extranea*, *A. pima*, and *A. sabino* by Garrison (1994) and was again treated by Westfall & May (2006), although its genital ligula has not yet been described. Its distal segment anterior to lateral lobes is narrow, subrectangular, about twice as long as wide or longer and roughly parallel-sided in ectal view, with a basal boss bisected posteriorly in ectal view (Fig. 649b). This species is diagnosed against *A. deami* and *A. sabino* under their accounts. *Argia tarascana* is sympatric with two other species with largely blue males that share a similar color pattern: *A. lacrimans* and *A. pima*. Both sexes of *A. lacrimans* (♂ total length: ♂ 40.0–46.8, ♀ 39.1–43.8) and *A. pima* (♂ total length: ♂ 37.7–43.6, ♀ 36–43.4) are larger compared to *A. tarascana* (♂: TL 32.8–41.3; ♀: TL 34.8–38.7), the dorsal branch of the paraproct in *A. lacrimans* (Figs. 703a, b) and *A. pima* (Figs. 719a, b) is digitiform, but it is triangular in *A. tarascana* (Figs. 738a, b). The epiproct of *A. tarascana* (Fig. 738c) is distinctly narrower than the transverse width of each torus, but in *A. lacrimans* (Fig. 703c) and *A. pima* (Fig. 719c) the epiproct is large, swollen, and is about as wide as the transverse width of one torus. The genital ligula in *A. lacrimans* (as in Fig. 637) and *A. pima* (Fig. 637) is trowel-shaped with a long flexible flagellum; the genital ligula in *A. tarascana* (Fig. 649) has a linear distal segment, lacking a trowel-shaped hood and long flexible flagellum. The mesostigmal lobes of *A. lacrimans* (Figs. 537, 538) and *A. pima* (Fig. 567) are large, broad distally, and meet the lateral arm of the middorsal thoracic carina at an acute angle in *A. lacrimans* and *A. pima*; these lobes are narrower and meet the lateral arm of the middorsal thoracic carina at an obtuse angle in *A. tarascana* (Fig. 575).

Remarks. Kimmins (1970) listed the male housed in the BMNH from Acambaro labeled “♂ TYPE, P. P. Calvert” det. 1902, B.C.A. Neur. p. 91” and “Original of pl. iv, f. 51ss” as holotype. Garrison (1994) illustrated this male and, following Kimmins, also listed it as holotype. However, Westfall & May (2006) correctly noted that even though labeled as such, that specimen is not the true holotype, and the male from which the principal figures were made by Calvert is in the collection of the Academy of Natural Sciences in Philadelphia. As noted under *A. deami*, two of the four paratypes of *A. deami* from Oaxaca represent *A. tarascana*.

Males of this species are variable both in color pattern of the thorax and S7. The black humeral stripe varies from being a mere hairline at upper half with an isolated (Fig. 136) or connected (Fig. 137) posterior fork that does not reach the antealar sinus to more heavily marked with a well-defined forked stripe whose posterior fork is about twice as thick as the narrow anterior fork (Fig. 138) or to a broad stripe forked above and enclosing a small, largely triangular blue spot (Fig. 139). S7 of most males of *A. tarascana* from SE Arizona is almost entirely black with a blue basal ring (Figs. 380, 845, 846, 871) and, as noted by Bailowitz *et al.* (2015), will serve as a good field character separating them from *A. lacrimans* (Fig. 138) and *A. pima* (Fig. 360), both with S7 largely blue on dorsum. Farther south in Mexico, the majority of specimens we have seen have the black on S7 reduced to a lateral stripe expanding posteriorly at apical fifth (Figs. 381, 870). Females can be light blue (Figs. 254, 872) or tan (Figs. 255, 873), and the black humeral stripe is reduced, with the upper half often a mere hairline and with no vestige of a posterior fork.

Habitat. *Argia anceps*, *A. funebris*, *A. lacrimans*, and *A. tarascana* were abundant at a large artificial pool at La Fuente, 10 km W of Cuernavaca, where Garrison collected a male in tandem with a female of *A. anceps* on 1 October 1983. We have collected adults along small creeks and streams in SE Arizona, and Bailowitz *et al.* (2015) report this species as occurring at calmer sections of canopied, permanent creeks and along the secondary channels of larger streams, with blue males easily spotted in light gaps on boulders, fallen tree trunks and streamside vegetation.

Distribution. This is primarily a submontane species ranging in elevation from 400 to over 2500 m, occurring

from SE Arizona along the Sierra Madre Occidental as far south as Chiapas and east to San Luis Potosí; it appears to be absent from the Central Plateau (Fig. 775).

***Argia telesfordi* Meurgey, 2009**

Figs. 22 (head ♂); 140 (head, thorax, S1–4 ♂); 256 (head, thorax, S1–4 ♀); 382 (S7–10 ♂); 480 (S7–10 ♀); 576 (mesostigmal plates ♀); 650 (genital ligula); 739 (appendages ♂); 779 (map); 908 (body scan ♂); 909 (body scan ♀).

[Key locators: ♂ G-3, couplet 2'; ♂ M-6, couplet 15'; ♀ F-3, couplet 1'; ♀ shortcut 4]

Argia insipida: Kirby 1894 (St. Vincent, Grenada, misidentified);—Woodruff *et al.* 1998: 203 (misidentified).

Argia telesfordi Meurgey 2009: 391 (description#, ♀, diagnosis from *A. concinna*, figs. 2, 4, 7–8, 10, 12, 14, 16, 18, 20, 22);—Meurgey 2010: 11 (verification of *A. telesfordi* for St. Vincent);—Meurgey 2011: 47 (description of larva);—Meurgey & Poiron 2012: 310 (St. Vincent & Grenada);—Poiron & Meurgey 2012: 19 (St. Vincent);—Meurgey 2013: 306 (St. Vincent & Grenada).

Primary types. *Argia telesfordi*: holotype ♂, GRENADA, St Andrew Parish, Saint Margarets Falls, 1350 ft, river and trail, 12°05'40" N 61°40'49.5" W, 9 May 2009, François Meurgey leg. [not examined, in MHNN].

Specimens examined. 7 ♂♂, 6 ♀♀: GRENADA, 1 ♂, 1 ♀ (paratypes), Saint Margarets Falls, river and trail, 12.0944°N, 61.6803°W, 410 m, 9 May 2009, F. Meurgey [RWG]; 1 ♂, 1 ♀ (paratypes), Annandale Falls, Annandale Estate, Willis, waterfall and ditch along the trail, 12.0931°N, 61.6342°W, 180 m, 3 May 2009, F. Meurgey [RWG]; 1 ♂, La Sagesse Bay, 12.025°N, 61.6711°W, 21 m, 16 March 1995, S. W. Dunkle [RWG]. SAINT VINCENT, 4 ♂♂, 4 ♀♀, South Rivers, Colonarie River, 13.2333°N, 61.1333°W, 47 m, 9 May 2010, F. Meurgey [RWG].

A medium-size species (Table 2) with pale postocular spots transversely linear, not rounded, as wide as pale postocular bar in both sexes (Figs. 45, 185, 908); male blue and black (Fig. 908) with cercus bifid in dorsal view with concavity between with inner tooth and outer branch deep, U-shaped (Fig. 739c), and paraproct with ventral branch well developed forming a bluntly pointed lobe (Figs. 739a, b); female tan (Fig. 909).

Diagnosis. This species was recently described and diagnosed by Meurgey (2009). It is closest to *A. concinna* and is diagnosed under that species.

Habitat. Meurgey (2009) noted that in Grenada, *A. telesfordi* occurs on slower-flowing parts of fast-flowing mountain streams and small rivers in open areas, and near stagnant water such as lakes, meadows, and seepages.

Distribution. *Argia telesfordi* is thus far known only from Grenada and St. Vincent in the Lesser Antilles (Fig. 779). Meurgey (2009) noted that this species is uncommon in Grenada, occurring at an altitude between about 120 and 450 m. Poiron & Meurgey (2012) found that in St. Vincent *A. telesfordi* was the most abundant and ubiquitous species, being present throughout the island and in almost all the available habitats from sea level to over 900 meters high.

***Argia terira* Calvert 1907**

Figs. 141, 142 (head, thorax, S1–4 ♂); 257 (head, thorax, S1–4 ♀); 383, 384 (S7–10 ♂); 481 (S7–10 ♀); 577 (mesostigmal plates ♀); 651 (genital ligula); 740 (appendages ♂); 784 (map); 847 (field photo ♂); 848 (field photo ♀); 865, 866 (body scans ♂); 867 (body scan ♀).

[Key locators: ♂ G-1, couplet 5'; ♂ M-5, couplet 7(6); F-6, couplet 4']

Argia terira Calvert 1907: 362 (♂, ♀, description, pl. IV, figs. 3, 3s, 14);—Calvert 1911: 381 (Costa Rica);—Ris 1918: 104 (Costa Rica);—Garrison 1982: 6 (Costa Rica);—Paulson 1982: 253 (Costa Rica);—Ramírez *et al.* 2000: 249 (Costa Rica);—Förster 2001: 11, 54, 58 (key ♂, ♀, fig. C24);—von Ellenrieder & Garrison 2007a: 20 (compared with specimens in BMNH & RBINS);—Garrison & von Ellenrieder 2013: 16 (Costa Rica, fig. 21, photo 27);—Paulson 2013b: 11 (Panama, photo);—Paulson & Haber 2021: 101 (diagnosis, photos).

Argia (Heliargia) terira: Kennedy 1920: 85 (in *Heliargia* new subgenus).

Primary types. *Argia terira*: Holotype ♂, COSTA RICA: San José, Camino de La Palma between Guadalupe and El Alto, April 1905, Paul Biolley leg. [not examined, in CMNH].

Specimens examined. 54 ♂♂, 13 ♀♀: **COSTA RICA, Heredia:** 1 ♂, San Ramón, road above Finca Murillo, 10.45°N, 84.2°W, 168 m, 27 March 2005, G. Corrales [RWG]; 1 ♀, Barva Volcano, 5.3 km N of San José de la Montaña {10.1°N, 84.1°W}, 2164 m, 20 July 1963, D. M. Thompson [FSCA]; 1 ♂, same data but 6.6 km N of San José de la Montaña, 2350 m [RWG]; 1 ♂, same data but Vara Blanca, L-03-1087, 2000 m, 7 May 2005 [UNH]; 1 ♂, 1 ♀, stream 5.1 mi N of San Rafael, 66-2171 {10.0167°N, 84.1°W}, 1830 m, 6 August 1966, D. R. Paulson [UMMZ]; 1 ♂, transecta altitudinal La Selva, Barba, L-03-1262 {9.8465°N, 83.5956°W}, 1070 m, 11 April 2000, R. Vargas [UNH]; **Puntarenas:** 1 ♂, Monteverde, Guacimal River and Quebrada Máquina, small clear rocky streams {10.6°N, 85.3°W}, 1600 m, 26 February 1987, S. W. Dunkle [FSCA]; 1 ♂, Monteverde {10.3086°N, 84.7847°W}, 1586 m, 31 March–4 April 2003, T. W. Donnelly [RWG]; 10 ♂♂, Monteverde, Bosque Nuboso Biological Station, rain pool and swampy stream in forest ca. 2 km from Station along Sendero Pantanoso [CR25], 10.3086°N, 84.7847°W, 1586 m, 7 June 2013, R. W. Garrison & N. von Ellenrieder [CSCA, HZ, MNRJ, RWG]; **San José:** 1 ♂, 1 ♀, tributary of Cascajal River at Bajo La Rosa, 10.0333°N, 83.95°W, 1600 m, 3 May 1995, B. O. Huntsman & R. W. Baumann [RWG]; 8 ♂♂, 3 ♀♀, small stream near Hacienda Zurqui and Finca La Reina on Highway 220, NE of San José, 10.0289°N, 84.0253°W, 1405 m, 11–13 August 1979, R. W. & J. A. Garrison [BYU, RWG]; 1 ♀, Santa Ana, L-03-232 {9.8683°N, 84.1587°W}, 1980 m, 31 December 1976, C. Esquivel-Herrera [UNH]; 1 ♂, 1 mi S of El Empalme, small streams in pasture {9.7333°N, 83.95°W}, 2316 m, 22 June 1967, M. J. Westfall, Jr. & D. N. Westfall [FSCA]; 1 ♂, Villa Mills, Cerro de la Muerte, Cuerici, by Pan American Highway, 9.5647°N, 83.7081°W, 2986 m, 23 February 1998, D. Wagner [RWG]; 1 ♂, km 118 on Pan American Highway, Bosque del Tolomuco, at large overgrown seep area with small trickle of water on trail, 9.4717°N, 83.6968°W, 1710 m, 26 March 2011, F. C. Sibley [FSCA]; **Cartago:** 4 ♂♂, 1 ♀, Irazú Volcano {9.9733°N, 83.8625°W}, 3372 m, 1877, H. Rogers [BMNH, RBINS, RWG]; 4 ♂♂, 1 ♀, same data but 1913, O. Garlepp. [RWG, UMMZ]; 1 ♂, 1 ♀, Sanatorio above Tierra Blanca {9.9167°N, 83.9°W}, 2286 m, 1 January 1921, A. G. M. Gillott [FSCA]; 1 ♂, 1 ♀, 13 km by road NW of Trinidad, km 50 on Pan American Highway at small marshy area with small stream running through, 9.7469°N, 83.9514°W, 1987 m, 23 March 2011, F. C. Sibley [FSCA]; 2 ♂♂, Tapantí National Park, Dos Amigos River and falls, ca. 6 km NW of tunnel {9.7042°N, 83.7831°W}, 1562 m, 4–5 August 1990, R. W. Holzenthal, R. Blahnik & F. J. Muñoz [RWG]; 1 ♂, 7 km by road SE of Trinidad, km 70 on Pan American Highway, on rock in tiny trickle out of small bog in brushy mountain forest, 9.6633°N, 83.8514°W, 2667 m, 27 March 2011, F. C. Sibley [FSCA]. **PANAMA, Chiriquí:** 1 ♂, Mount Totumas Cloud Forest Lodge, stream in forest, Bajareque Trail, 11x032, 8.8869°N, 82.6836°W, 1960 m, 20 June 2011, T. W. Donnelly [FSCA]; 2 ♂♂, same data but 2020 m, 12 August 2012 [FSCA]; 1 ♂, vicinity of Mount Totumas Cloud Forest Lodge seep, Puma trail, 8.8844°N, 82.6775°W, 1900 m, 10 August 2012, T. W. Donnelly [FSCA]; 2 ♂♂, 1 ♀, Cerro Punta {8.8522°N, 82.5742°W}, 1953 m, 1–2 July 1965, H. Real [RWG]; 1 ♂, Barú Volcano Base, Bajo Mono {8.8128°N, 82.4623°W}, 1412 m, 15 August 2009, K. R. Kemp & M. Mansell [RWG]; **Veraguas:** 1 ♂, near Santa Fe, Alto de la Piedra, 10x018, 8.5132°N, 81.1178°W, 900 m, 12 June 2010, T. W. Donnelly [FSCA]; **Coclé:** 1 ♀, El Valle, vicinity of Hotel Campestre, Antón River {8.614°N, 80.113°W}, 650 m, 19 August 2012, Thomas W., A. Donnelly & J. Michalski [FSCA]; **Panamá Oeste:** 2 ♂♂, 1 km S of Alto del María, small streams and seepages, FCS16-0194, 0195, 8.6506°N, 80.0925°W, 1010 m, 22 May 2016, F. C. Sibley [FSCA]; 2 ♂♂, Mata Ahogado, 1 km S of Alto del María, small streams and seepages, 8.6083°N, 80.1189°W, 1015 m, 21 May 2016, W. F. Mauffray [FSCA, RWG].

A large species (Table 2) easily recognized by the uniformly amber wings (Figs. 847, 848), male with a bright blue thorax with a broad black middorsal and forked humeral stripes and a largely black abdomen with S1 and basal half of S2 blue (Figs. 141, 847, 865, 866), and female with most of metepisternum generally yellow contrasting with remainder of thoracic coloration pale tan (Figs. 257, 848, 867), or blue.

Redescription. Both sexes were keyed and described in detail by Calvert (1907) based on six males and three females from Costa Rica. His description is abstracted and augmented below.

Male (Costa Rica, Puntarenas, Monteverde, Estación Biológica Bosque Nuboso, Figs. 141, 866): Labrum, anteclypeus, antefrons, base of mandibles and genae blue; postclypeus blue with a pair of lateral quadrate black spots at base, postfrons black; epicranium entirely black interrupted by blue postocular spots not reaching compound eyes, blue occipital bar absent, a small blue triangular pale spot anterolateral to lateral ocellus; antennae black; rear of head black except for small pale spot along eye margin. Prothorax mostly black with following blue: anterior pronotal lobe, dorsolateral spot on middle lobe and propleuron, lateral spot on hind margin of posterior pronotal

lobe. Broad black middorsal stripe on pterothorax about three times as wide as narrow blue antehumeral stripe, the latter narrowing slightly dorsally; black humeral stripe forked above, lower half about 0.33 as wide as blue antehumeral stripe, the posterior fork twice as thick as anterior, remainder of thorax blue except for narrow black metapleural stripe; black humeral stripe slightly wider than pale antehumeral, forked at its upper end with both branches half as wide as base, the posterior branch extending posterodorsally connecting with black on interpleural suture, remainder of thorax blue except for pale yellow at ventral 0.20 of metepisternum and black metapleural stripe. Coxae pale blue, legs and armature black. Wings uniformly amber, Pt surmounting 1.5 cells in all wings, px Fw: 18/19, Hw: 15/15; pq Fw: 5/5, Hw: 4/4, Rp2 at Fw: 8/8, Hw: 6/7. S1 blue with a black dorsolateral spot occupying basal half; S2 with a blue spot dorsally extending to apical half, posterior half black connected laterally to a black stripe extending the full length of segment with a small ventral offshoot at medial half, remainder of segment including genital lobe blue; S3 with basal half blue, posterior half black with a narrow black line ventrally; S4–7 entirely black; S8–10 blue dorsally, black laterally, with a narrow black basal spot extending to distal 0.30 and a larger lateral disjunct triangular postbasal spot, its dorsal tip not extending to middorsal line, annulus black.

Genital ligula (Fig. 651) with distal segment lacking a flagellum or strap-like-process, distal segment anterior to lateral lobes narrow, subrectangular, about three times as long as wide and roughly parallel-sided in ectal view, lacking a basal sclerotized boss in ectal view (Fig. 651b), lateral lobes prominent, falcate.

Torus swollen, transversely ovaloid, occupying entire ventral margin of torifer but not overlapping bilobed epiproct (as in Figs. 740a, c); epiproct apically raised with a narrow cleft, black except for posterior lobes, black laterally; cerci not approximate, their inner surfaces separated by a distance greater than width of epiproct (as in Fig. 740c); cercus entire, quadrate in dorsal view, inner branch with a pronounced apical tooth along posterior margin; in mediodorsal view dorsal surface evenly convex with posterior margin appearing trifid, mesal border broadly convex, apically with the posterolateral margin falcate (as in Fig. 740a), a U-shaped concavity between narrow outer branch and swollen inner branch; paraproct with posterior margin linear, ventral branch, in both lateral and inner mediodorsal views, represented by a low, angular obtuse lobe, the dorsal branch broadly acuminate (as in Fig. 740b).

Dimensions. Hw 26.4, abdomen 31.7, total length 41.1.

Female (Costa Rica, San José, Hacienda Zurqui, Figs. 257, 481, 867) with pale colors on head and thorax tan, on abdomen pale blue, otherwise as in male but differs as follows: lateral quadrate black spots on postclypeus extending anteriorly thus isolating medial tan quadrate spot; humeral stripe narrower with narrow posterior fork not reaching antealar carina, entire metepisternum pale yellow; S2 with only an apical dark spot at apical third; basal 0.60 of S3 pale, remainder black, a small black dorsolateral spot at base; a narrow pale basal ring barely connecting above, a blue diamond-shaped spot dorsally occupying basal third and laterally with an incomplete lateral stripe ending at posterior third, remainder of segment black; S4–6 as in S3 but pale blue diamond spot lacking and pale lateral stripes becoming progressively shorter; 8 and 10 with a transverse basal black ring slightly extending posterolaterally to basal fourth on S8, to distal third on S9 and to distal fourth on S10, S8–10 with a ventral black stripe each side and confluent basal black rings; cerci and ovipositor black. Pt surmounting 1–1.5 cells, px Fw: 16/16, Hw: 14/14; pq Fw: 4/4, Hw: 4/4, Rp2 at Fw: 8/8, Hw: 6/6. Spatulate mesostigmal lobe occupying mesal half of mesostigmal plate, medial margin of lobe with a small accessory lobe, mesostigmal lobe followed posteriorly by a semicircular non-costate depression, mesepisternal tubercle prominent.

Dimensions. Hw 27.5, abdomen 30.9, total length 40.4.

Diagnosis. As noted by Paulson (2013b), the metepisternum of females is entirely and uniquely yellow, a characteristic gold stripe shared by immature males, the abdomen is black, with pale markings on S8–10, and the wings are golden in both sexes; no other species looks anything like it where it occurs, which coupled with its large size will easily serve to separate this species from all others from Central America.

Remarks. Some males recently collected in Panama (Figs. 142, 865) differ from those from Costa Rica in having blue basal rings occupying basal third of S3–6 while others from both Costa Rica and Panama have small blue dorsolateral spots as in Fig. 383. A series of three males (BMNH) and a pair in the RBINS all *ex* McLachlan collection and labeled “Irazu” / “6-7000 ft” / “H. Rogers” had received the manuscript name *Argia flavipennis* by Selys due, no doubt, to the amber wings present in both sexes. According to Calvert (1908a), Rogers collected the series in 1877.

Habitat. Garrison (1982) collected *A. terira* and *A. lacrimans* perched on fern fronds along streams at 1500 m that were mostly shaded with light drizzle and heavy mist, interspersed with occasional periods of sunshine.

von Ellenrieder & Garrison (2013) found several males at a rain pool and swampy stream at Estación Biológica Bosque Nuboso at 1586 m, within the forest. Paulson (2013b) found this species in Panama to be common at a small cloud-forest stream on a trail at about 2300–2400 m elevation, where males perched on a stone fence, leaves, and the ground in the late-morning sun where the stream crossed the trail. He (Paulson 2013b) reported that it lives in a variety of habitats in and out of forest, from small streams to marshy and boggy ponds, and shares with *A. chelata* the highest elevation records for *Argia* in Costa Rica and Panama, the latter species averaging a bit lower elevation and being the only other *Argia* known to occur with *A. terira*, and both species having been seen active when it is cool and even cloudy, perhaps a prerequisite for living in a cool, cloudy climate.

Distribution. *Argia terira* is thus far known only from Costa Rica and W Panama (Fig. 784). This is strictly a montane species and occurs at among the highest known elevations for any species of *Argia* from Mexico and Central America, as first noted by Calvert (1911). Paulson (2013b) reported that the known elevation range of *A. terira* in Costa Rica and Panama is about 1500–2800 m; our records show an elevation range of about 1000 to 3000 m, with only one lowland record (Costa Rica, Heredia, San Ramón, road above Finca Murillo, 168 m) which could possibly correspond to a mislabeled specimen.

Argia tezpi Calvert, 1902

Figs. 143 (head, thorax, S1–4 ♂); 144, 145 (thorax ♂); 258, 259 (head, thorax, S1–4 ♀); 282 (wings ♂); 385, 386 (S7–10 ♂); 483 (S1–10 ♀); 578 (mesostigmal plates ♀); 652 (genital ligula); 741 (appendages ♂); 793 (map); 849 (field photo ♂); 850 (field photo ♀); 1019 (body scan ♂); 1020, 1021 (body scans ♀).

[Key locators: ♂ G-5, couplet 13(11'); ♂ M-6, couplet 18(17); key to females, couplet 22(21'); F-6, couplet 4(3'); F-11, couplet 2(1); shortcut 7]

Argia cupraea: Calvert 1895: 479 (description ♂, ♀, misidentification, Baja California Sur, pl. XV, fig. 12).

Argia tezpi Calvert 1902: 77 (♂, ♀, description, pl. IV, figs. 19, 31, 31s);—Calvert & Hagen 1902: 115 (“Types in Colls. Godman, Calif. Acad. Sci., McLachlan, Calvert”);—Calvert 1907: 362 (supplementary description ♂, ♀);—Calvert 1908a: xxix (correction of holotype data);—Calvert 1947: 604 (lectotype and lectallotype ♂, ♀ in CAS);—Paulson 1982: 253 (U. S. A., Mexico, Guatemala);—Paulson 1984: 51 (El Salvador);—Dunkle 1988: 45 (Honduras);—Maes *et al.* 1988: 34 (Nicaragua);—Brooks 1989: 50 (Costa Rica);—Maes 1989: 6 (Nicaragua);—Novelo-Gutiérrez 1992: 66 (description larva, figs. 12, 25, 34, 44, 59, 80, 94);—González-Soriano 1993: 296 (Mexico);—Garrison 1994: 333 (key, diagnosis, figs. 20, 58, 94, 82);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Ramírez *et al.* 2000: 249 (Costa Rica);—Förster 2001: 11, 54 (key ♂, fig. C25);—Paulson 2002b: 362 (Nayarit, Mexico);—Abbott 2005a: 85 (♂, ♀, key, figs. 16, 17 photo 10e, distribution in New Mexico);—Westfall & May 2006: 216 (key, description ♂, ♀, figs. 96C, 100b, 104A);—Behrstock *et al.* 2007a: 57 (Chihuahua, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Upson *et al.* 2007: 33 (Sonora, Mexico);—González-Soriano *et al.* 2008: 310 (Morelos, Mexico);—Bailowitz *et al.* 2009: 16 (Sinaloa, Nayarit, Mexico);—Caesar & Wenzel 2009: 104 (phylogeny within genus *Argia*);—Escoto-Moreno *et al.* 2009: 154 (Aguascalientes, Mexico);—Paulson 2009: 176 (♂, ♀, description, diagnosis, photo 107);—Gómez-Anaya & Novelo-Gutiérrez 2010: 292 (Michoacán, Mexico);—Abbott 2011: 122 (♂, ♀, figs., diagnosis, distribution in Texas);—González-Soriano & Paulson 2011: 307 (Chiapas, Mexico);—Bailowitz *et al.* 2012: 9 (El Salvador);—Garrison & von Ellenrieder 2013: 16 (Costa Rica);—Escoto-Moreno *et al.* 2014: 1051 (Hidalgo, Mexico);—Bailowitz *et al.* 2015: 150 (diagnosis, photos);—Escoto-Moreno *et al.* 2015: 153 (Zacatecas, Mexico);—González-Soriano *et al.* 2016: 156 (Colima, Mexico, photo 4);—Nava-Bolaños *et al.* 2017: 807 (reproductive isolation, photo 1D);—Torres-Pachón *et al.* 2017: 416 (molecular phylogeny of larvae within *Argia*);—Paulson & Haber 2021: 113 (diagnosis, figs., Costa Rica).

Argia (Chalcargia) tezpi: Kennedy 1920: 85 (placed in new subgenus).

Primary types. *Argia tezpi*: lectotype ♂, MEXICO, Baja California Sur, San José del Cabo, Charles D. Haines leg. [not examined, in CAS; Calvert 1947].

Specimens examined. 238 ♂♂, 83 ♀♀: **U. S. A., Arizona:** 1 ♂, 1 ♀, Cottonwood Canyon {31.8433°N, 109.442°W}, 1582 m, 10 August 1995, R. J. Beckemeyer [RWG]; 1 ♂, Chiricahua Mountains, Upper Rucker Canyon, above Bathtub, perching on rock at head of pool in intermittently flowing stream, 31.7836°N, 109.305°W, 1891 m, 27 May 2002, S. Upson [RWG]; 1 ♂, same data but Rucker Canyon at junction of 74 and 74A Roads, 31.7572°N, 109.37°W, 1714 m, 28 May 2001 [RWG]. **MEXICO, Sonora:** 1 ♀, Cajón Bonito at Rancho Los Ojos, 25 mi E of Agua Prieta, 31.2386°N, 109.066°W, 1667 m, 30 June 2002, S. Upson [RWG]; 1 ♂, Álamos {27.005°N, 108.79°W}, 341 m, 29 August 1971, J. L. Petty [BYU]; **Baja California Sur:** 12 ♂♂, 2 ♀♀, La Purísima {26.1833°N,

112.067°W}, 85 m, 12–13 October 1923, J. H. Williamson [CSCA, RWG, UMMZ]; 1 ♂, 1 ♀, San José de Comondú {26.05°N, 111.817°W}, 260 m, 10 October 1923, J. H. Williamson [UMMZ]; 1 ♂, Primer Agua, 7 km W of Highway 1 and 6 km S of Loreto at km 114, 26.0081°N, 111.404°W, 61 m, 2 October 1984, R. W. & J. A. Garrison [RWG]; 4 ♂♂, 1 ♀, arroyo 14 km W of Highway 1 on road to San Javier, SW of Loreto, 25.9756°N, 111.436°W, 165 m, 2–5 October 1984, R. W. & J. A. Garrison [RWG]; 1 ♂, Las Parras, about 18 km from Highway 1 on road to San Javier, SW of Loreto, 25.967°N, 111.489°W, 442 m, 1 September 1985, R. W. Garrison [RWG]; 8 ♂♂, 2 ♀♀, same data but on shaded part of creek below dam, 6 October 1923, J. H. Williamson [RWG, UMMZ]; 2 ♂♂, small ponds about 22 km W of Highway 1 on road to San Javier, SW of Loreto, 25.9517°N, 111.482°W, 480 m, 1 September 1985, M. Pearson [RWG]; 3 ♂♂, brackish water area by Highway 1 at km 108, 12 km S of Loreto, 25.9017°N, 111.345°W, 43 m, 3 October 1984, R. W. Garrison [CSCA, RWG]; 1 ♂, Cañón San Bernardino, Boca de la Sierra, 3 mi NW of Miraflores {23.35°N, 109.75°W}, 200 m, 1–19, H. B. Leech [FSCA]; **Sinaloa**: 1 ♂, stream at km 265 on Hwy 40, E of Mazatlán {23.246°N, 106.133°W}, 72 m, 12 July 1976, S. W. Dunkle [RWG]; 7 ♂♂, 1 ♀, stream 2 mi NE of Concordia on Highway 40 {23.295°N, 106.036°W}, 120 m, 30 August 1965, D. R. & M. L. Paulson [FSCA]; **Nayarit**: 14 ♂♂, 7 ♀♀, Acaponeta {22.4964°N, 105.359°W}, 37 m, 1–2 November 1923, J. H. Williamson [FSCA, RWG, UMMZ]; 1 ♂, small rocky and muddy river 20.1 mi S of Acaponeta, 22.2422°N, 105.268°W, 53 m, 27 August 1965, D. R. Paulson & N. Smith [FSCA]; 1 ♀, San Blas {21.5775°N, 105.283°W}, 0 m, 5 July 1956 [UMMZ]; 1 ♂, 4 mi E of San Blas {21.5719°N, 105.236°W}, 27 m, 16 July 1963, J. P. Donahue [RWG]; 1 ♂, Ixtapa {16.8021°N, 92.9022°W}, 1200 m, 27 April 1941, I. J. Cantrall [RWG]; **Jalisco**: 4 ♂♂, stream 14.6 mi WNW of Magdalena {21°N, 104.15°W}, 1100 m, 25 August 1965, D. R. & M. L. Paulson [FSCA]; 1 ♂, 1 ♀, Highway 15, Km 718 {20.7595°N, 103.619°W}, 1530 m, 13 July 1966 [UMMZ]; 2 ♂♂, Route 110, ca. 6 mi E of Atotonilco el Alto {20.5698°N, 102.428°W}, 1850 m, 9 August 1966 [UMMZ]; 5 ♂♂, San Diego Rancho near Cocola {20.3425°N, 103.804°W}, 1300 m, 13–14 November 1923, J. H. Williamson [RWG, UMMZ]; 3 ♂♂, Hacienda de San Marcos near Villegas, on rocks in Tixpán River {20.23°N, 103.893°W}, 1500 m, 22 November 1923, J. H. Williamson [RWG, UMMZ]; 1 ♂, Tecolotlán {20.1992°N, 104.048°W}, 1196 m, 11–15 August 1992, B. & C. Villegas [RWG]; 1 ♂, region of Chapala Lake {20.1167°N, 102.867°W}, 1600 m, 5 December 1923, J. H. Williamson [UMMZ]; 2 ♂♂, 11 mi N of Chapala on road to Guadalajara {20.1167°N, 102.8333°W}, 1600 m, 15 July 1947, T. H. Hubbell [UMMZ]; 1 ♀, ca. 4 km SW of La Huerta, by Route 80 at km 1104–1105 {19.4599°N, 104.653°W}, 515 m, 30 August 1966 [UMMZ]; **Michoacán**: 2 ♂♂, 2 ♀♀, El Sabino, 20 mi SSE of Uruapán {20.0081°N, 102.3169°W}, 1560 m, 20 July 1936, H. D. Thomas [RWG]; 1 ♂, La Majada, Apatzingán, pool and stream {19.1253°N, 102.408°W}, 280 m, 16 August 1941, R. Haag [UMMZ]; 1 ♂, Apatzingán, over stream {19.0942°N, 102.44°W}, 329 m, 22 July 1941, T. H. Hubbell [UMMZ]; 4 ♂♂, same data but 12 August 1941, R. Haag [RWG, UMMZ]; **Colima**: 1 ♂, 1 ♀, stream 24.2 mi S of Colima {19.2333°N, 103.717°W}, 60 m, 21 August 1965, D. R. Paulson [RWG]; 2 ♂♂, Poblado de La Presa, 4 km NE of Ixtlahuacán, El Salado Stream {19.0086°N, 103.717°W}, 160 m, 27 August 2006, E. González-Soriano [CNIN]; **Veracruz**: 1 ♂, Fortín de las Flores, electric plants {18.9019°N, 96.9897°W}, 1008 m, 10 July 1968, H. V. Weems [FSCA]; **Morelos**: 1 ♂, Pueblo Cocoyotla, small clear flowing stream 1.6 km S on Highway 421 {18.7678°N, 99.4572°W}, 1070 m, 22 July 1992, W. F. Mauffray [FSCA]; 1 ♂, Temixco {18.7647°N, 99.2608°W}, 1100 m, 9 September 1944, N. L. H. Krauss [UMMZ]; 3 ♂♂, Calavera River, km 103 on Route 160, at border between Morelos and Puebla {18.6644°N, 98.7272°W}, 1325 m, 12 August 1984, V. García & R. Novelo-Gutiérrez [RWG]; 1 ♀, Huajintlán {18.6097°N, 99.4244°W}, 927 m, 24 August 1956, R. R. Dreisbach [UMMZ]; 1 ♀, same data but 27 September 1957 [UMMZ]; 3 ♂♂, 1 ♀, San Rafael Vicente Aranda {18.5622°N, 99.2369°W}, 852 m, 2–5 February 1985, R. Novelo-Gutiérrez & V. García [FSCA, RWG]; 5 ♂♂, 1 ♀, Amacuzac River and stream, at Balneario Las Palmas, Tehuixtla {18.5475°N, 99.2704°W}, 866 m, 20 July 1992, S. W. Dunkle W. F. Mauffray [FSCA, RWG]; **Guerrero**: 1 ♂, 1 ♀, 13 km S of Michapa {18.6292°N, 99.5111°W}, 950 m, 7 September 1980, E. S. Ross [CAS]; 1 ♂, small sedimentary bottom stream on Highway 55 between Taxco Junction and Huajintlán {18.55°N, 99.5667°W}, 1700 m, 22 July 1992, W. F. Mauffray [FSCA]; 1 ♀, near Maztlán, 10 mi S of Chilpancingo, near lake {17.3832°N, 99.5°W}, 850 m, 25 June 1932, H. M. Smith & E. H. Taylor [UMMZ]; 1 ♂, same data but 2 July 1932 [UMMZ]; **Puebla**: 2 ♂♂, Atla River at Highway 115, W of Izucar de Matamoros, 66–151 {18.6172°N, 98.4678°W}, 1310 m, 21 June 1966, D. R. Paulson [FSCA]; 2 ♂♂, km 221–222 on Route 190, ca. 23 km NW of Tehuiztzingo, clear sandy stream {18.4667°N, 98.3667°W}, 1100 m, 12 August 1966, R. W. Cruden [CSCA, UMMZ]; **Oaxaca**: 1 ♂, ca. 11 km N of San Juan Bautista Cuicatlán, km 108 on Highway 131, 17.86°N, 97.0228°W, 566 m, 22 October 2004, C. L. Bellamy [RWG]; 2 ♂♂, 2 ♀♀, stream and marsh 5 mi W of Jalapa del Marquez, 66–152 {17.0378°N, 96.7483°W}, 1500 m, 22 June

1966, D. R. & M. L. Paulson [FSCA, RWG]; 5 ♂♂, stream 14 mi E of El Camarón, 67–228, 229 {16.4983°N, 95.7967°W}, 850 m, 26 August 1967, D. R. & M. L. Paulson [FSCA]; 1 ♂, 1 ♀, 49.9 mi WNW of Tehuantepec {16.4869°N, 95.8931°W}, 800 m, 3 August 1965, D. R. Paulson [FSCA]; 1 ♂, 43 mi W of Tehuantepec, at pool of mountain stream {16.4442°N, 95.8503°W}, 800 m, 22 August 1963, H. V. Weems, Jr. [FSCA]; 3 ♂♂, 1 ♀, Los Piletes Bridge, km 717–718 on Highway 190, ca. 77 km NW of Tehuantepec {16.4172°N, 95.8087°W}, 630 m, 15–16 August 1966, E. C. Welling M. [RWG, UMMZ]; 2 ♂♂, canal 24.7 mi WNW of Tehuantepec, 3 August 1965, D. R. Paulson [FSCA]; 1 ♀, Tehuantepec {16.3203°N, 95.2411°W}, 41 m [RWG]; 3 ♂♂, 5 ♀♀, Candelaria Loxicha {15.9264°N, 96.4928°W}, 500 m, 22 November–3 December 1967, E. C. Welling M. [UMMZ]; 1 ♂, 1 ♀, Copalita River, 9 km NE of road junction Salina Cruz-Santa Cruz Huatulco {15.8497°N, 96.1114°W}, 60 m, 11 February 2005, E. González-Soriano [CNIN]; 2 ♂♂, El Arenoso Stream, 3.4 km of road junction Salina Cruz-Santa Cruz Huatulco {15.7997°N, 96.1658°W}, 96 m, 6 July 2005, A. & E. González-Soriano [CNIN]; **Chiapas**: 1 ♂, 1.1 mi N of Tuxtla Gutiérrez {16.8°N, 93.0832°W}, 550 m, 19 July 1965, D. R. Paulson [FSCA]; 1 ♀, El Aguacero, near Ocozacoautla {16.7672°N, 93.1427°W}, 680 m, 26 October 1986, E. Fisher [RWG]; 1 ♂, stream 10 km SW of Ixtapa {16.7147°N, 92.9044°W}, 1130 m, 27 April 1941, I. J. Cantrall [RWG]; 2 ♂♂, same data but 17 July 1965, D. R. Paulson & F. G. Thompson [FSCA]. **GUATEMALA, Zacapa**: 2 ♀♀, between Gualán and El Rancho {15.1156°N, 89.361°W}, 138 m, 25 January 1905, E. B. Williamson [UMMZ]; 1 ♂, Aldea Jesus María, 10 km E of Río Hondo, Atlantic Highway {15.1127°N, 89.4194°W}, 170 m, 14 August 1965, T. W. Donnelly [FSCA]; 12 ♂♂, 3 ♀♀, Gualán {15.1041°N, 89.3607°W}, 138 m, 11 January–22 June 1905, E. B. Williamson [FSCA, RWG, UMMZ]; 3 ♂♂, same data but 12–18 June 1909, E. B. Williamson [RWG, UMMZ]; 2 ♂♂, Zacapa {14.9622°N, 89.5448°W}, 226 m, 22 January 1905, E. B. Williamson [RWG, UMMZ]; **El Progreso**: 9 ♂♂, 4 ♀♀, El Rancho {14.8667°N, 90°W}, 270 m, 13–25 January 1905, E. B. Williamson [RWG, UMMZ]; 5 ♂♂, en route by mule from El Rancho to Sanarate {14.8565°N, 90.0896°W}, 480 m, 27 January 1905, E. B. Williamson [RWG, UMMZ]; 1 ♂, Sanarate {14.8041°N, 90.1982°W}, 830 m, 10 February 1905, E. B. Williamson [UMMZ]; **Chiquimula**: 1 ♂, tiny stream W of Jocotán {14.8222°N, 89.3967°W}, 500 m, 7 July 1962, T. W. Donnelly [FSCA]; 1 ♀, near Tierra Colorada, 62x103 {14.5769°N, 89.3389°W}, 800 m, 19 July 1962, T. W. Donnelly [FSCA]; **Guatemala**: 4 ♂♂, 1 ♀, Agua Caliente {14.7467°N, 90.3242°W}, 900 m, 1–2 June 1909, E. B. Williamson [RWG, UMMZ]; 7 ♂♂, 3 ♀♀, El Fiscal, {14.7217°N, 90.3917°W}, 1120 m, 3–5 June 1909, E. B. Williamson [RWG, UMMZ]; **Escuintla**: 1 ♂, Escuintla, Finca El Salto {14.305°N, 90.785°W}, 355 m, 29 June 1977, M. J. Westfall, Jr. [FSCA]; **Jutiapa**: 1 ♂, 1 ♀, 27.2 mi ESE of Chiquimulilla, 18 mi ESE of Santa Rosa Department border {14.0858°N, 90.3767°W}, 215 m, 3 September 1964, F. G. Thompson [FSCA]. **HONDURAS, Cortés**: 1 ♂, 1 ♀, ditch 3 mi N of Lindo River {15.0333°N, 87.9833°W}, 609 m, 29 August 1964, F. G. Thompson [FSCA]; **Copán**: 2 ♂♂, 1 ♀, Copán, Sesemil Creek {14.8473°N, 89.149°W}, 625 m, 20 February 1937, C. C. Roys [UMMZ]; **San Marcos**: 2 ♂♂, 1 ♀, Los Limones {14.5749°N, 92.1448°W}, 16 m, 4 June 1966, J. Mattan [FSCA]; **Comayagua**: 1 ♂, Guique River, bridge and curve, 7.7 km S of Siguatopeque, pools and boulder rapids {14.5325°N, 87.8036°W}, 930 m, 12 December 1987, S. W. Dunkle [FSCA]; **El Paraíso**: 3 ♂♂, 1 ♀, small, narrow, rocky stream on Pan American Highway, E of El Zamorano near Jacaleapa {14.0216°N, 86.6724°W}, 829 m, 10 December 1987, S. W. Dunkle [RWG]; 2 ♂♂, Chiquito River on road to Teupasenti, E of Zamorano, wide, rocky, a little murky {12.5333°N, 87.0832°W}, 200 m, 10 December 1987, S. W. Dunkle [FSCA]; **Francisco Morazán**: 4 ♀♀, Zamorano, Quebrada El Gallo, small stream {14.0167°N, 87.0333°W}, 650 m, 15 March 1990, S. W. Dunkle [FSCA]; 1 ♀, Zamorano, 800 m, 17 January 1946, W. P. Cocherell [FSCA]; 4 ♂♂, 4 ♀♀, Zamorano, Escuela Agrícola Panamericana (EAP), 30 km ESE of Tegucigalpa, ponds and Yeguaré River with riffles and pools {14.0134°N, 87.0094°W}, 799 m, 9–11 December 1987, S. W. Dunkle [FSCA, RWG]; **Choluteca**: 1 ♂, 1 ♀, 2 mi E of San Francisco de la Paz {13.3667°N, 86.9°W}, 1280 m, 25 August 1964, F. G. Thompson [FSCA]; 3 ♂♂, 1 ♀, Choluteca {13.2506°N, 87.1422°W}, 100 m, 21 July 1957, D. R. Lauck [RWG, UMMZ]. **EL SALVADOR, Santa Ana**: 2 ♂♂, Lago de Coatepeque {13.8883°N, 89.55°W}, 670 m, 22 December 1983, V. Hellebuyck [FSCA]; **Ahuachapán**: 1 ♂, San Francisco River, El Imposible Forest {13.85°N, 90°W}, 250 m, 14 December 1983, V. Hellebuyck [UMMZ]; 1 ♀, Quebrada de la Cascada and San Francisco River {13.8333°N, 89.9333°W}, 600 m, 15 December 1983, V. Hellebuyck [FSCA]; **La Libertad**: 1 ♂, 1 ♀, Bocana de Julupitor, ca. 25 km W of La Libertad {13.5167°N, 89.4667°W}, 791 m, 1 December 1983, V. Hellebuyck [FSCA]. **NICARAGUA, Matagalpa**: 1 ♂, Matagalpa River at Sebaco, 12.8483°N, 86.1009°W, 463 m, 2 September 2003, F. C. Sibley [FSCA]; 1 ♂, 4.8 mi SSE of Darío {12.695°N, 86.1036°W}, 411 m, 23 August 1964, F. G. Thompson [FSCA]; **Boaco**: 1 ♂, streams 15 km E of Boaco {12.4774°N, 85.5467°W}, 350 m, 21 June 1974, A. J. & T. W. Donnelly [FSCA]; 1 ♂, creek in Comapala {12.2814°N, 85.5118°W}, 140 m, 1 December 1976, W.

H. Cross [FSCA]; **León:** 1 ♂, Tamarindo River, 17.5 mi SE of León {12.2426°N, 86.716°W}, 21 m, 21 August 1964, F. G. Thompson [FSCA]; 2 ♂♂, Highway 12 at Chala River, 12.1454°N, 86.6511°W, 55 m, 17 December 2005, R. M. Caesar & A. Gillogly [RWG]. **COSTA RICA, Guanacaste:** 1 ♂, 1 ♀, Guanacaste National Park, Maritza Station, Quebrada Uno, L-03-999 {10.9568°N, 85.495°W}, 590 m, 19 August 1990, [UNH]; 1 ♂, Quebrada El Guapote, ca. 2 km from Administration Area on road to Hacienda Rosa María, Santa Rosa National Park {10.8667°N, 85.6467°W}, 300 m, 15–16 June 1988, Carlos de la Rosa [USNM]; 4 ♂♂, 4 ♀♀, Santa Rosa, Guajiniquil River, L09-89, 90, 116 {10.8546°N, 85.6099°W}, 295 m, 11–15 July 1989, C. Esquivel-Herrera [UNH]; 3 ♂♂, 1 ♀, Azufrado River, 14 mi N of Liberia {10.8°N, 85.5333°W}, 122 m, 26 May 1991, J. Zloty [RWG]; **Puntarenas:** 1 ♂, stony & muddy creek ca. 11 km N of Sardinal [CR29], 10.1556°N, 84.8514°W, 214 m, 8 June 2013, R. W. Garrison & N. von Ellenrieder [RWG]; 1 ♂, Ciruelas River at Highway 1 {10.0878°N, 84.7533°W}, 295 m, 13 May 1995, B.O. Huntsman & R. W. Baumann [BYU]; 1 ♂, Naranjo River, 6.4 km W of Barranca River on Route 1, clear shaded stream with riffles and pools {10.0608°N, 84.7589°W}, 60 m, 25 February 1987, S. W. Dunkle [FSCA]; 1 ♂, 1 ♀, Barranca River at Route 1, rocky river with some gravel mining {9.9969°N, 84.6947°W}, 51 m, 25 February 1987, S. W. Dunkle [FSCA]; 3 ♂♂, 8.1 mi WNW of Esparta, stream 67-4, {9.9833°N, 84.6668°W}, 60 m, 26 June 1967, M. J. Westfall, Jr. & D. N. Westfall [FSCA]; **Alajuela Province:** 1 ♂, Atenas {9.9817°N, 84.3803°W}, 700 m, 7 May 1916, A. Alfaro [USNM]; 1 ♂, railroad W of Turrúcares {9.9667°N, 84.3167°W}, 609 m, 16 August 1909, P. P. Calvert [FSCA]; 1 ♂, Tizate River S of Turrúcares, 610 m, 23 December 1909, P. P. Calvert [FSCA]; 1 ♂, Turrúcares, L-03-35 {9.9642°N, 84.3325°W}, 610 m, 16 April 1988, C. Esquivel-Herrera [UNH]; 1 ♂, Jesus María {9.95°N, 84.5832°W}, 200 m, January 1907, P. Biolley [UMMZ]; 1 ♂, Orotina {9.9°N, 84.5167°W}, 230 m, 18 July 1915, A. Alfaro [USNM]; 1 ♀, Machuca River {9.8833°N, 84.65°W}, 70 m, January 1907, P. Biolley [UMMZ]; 1 ♂, 1 ♀, same data but 6 March 1987, J. Belle [RWG].

A medium size (Table 2) predominantly dark species (Figs. 143–145, 385, 386, 849, 850, 1019–1021); male usually (but not always) with amber wings (Figs. 282, 849), and with genital ligula lacking medio-longitudinal process (Fig. 652a) and cercus with U-shaped convexity between outer and inner branches (Figs. 741a, c); female with an enlarged mesepisternal tubercle (Fig. 578e).

Diagnosis. Both sexes were keyed and diagnosed against *A. cuprea* and *A. translata* by Garrison (1994) and were again treated by Westfall & May (2006). The differences among these three species as noted by Garrison (1994) are modified and augmented here. The outer branch of the cercus in dorsal view in *A. tezpi* (Fig. 741c) is about 3–4 times as wide as the mesal branch (tooth); in *A. translata* inner and outer branches are poorly developed (Figs. 743c, 744c), and in *A. cuprea* (Fig. 677c) inner and outer branches are equal in width. The ventral branch of the paraproct in *A. translata* (Figs. 743b, 744b) is longer than the dorsal branch, the dorsal and ventral branches of the paraproct in *A. tezpi* are subequal (Fig. 741c). The genital ligula in all three species also differs: the more apical pair of flexible chitinated multispinose lobes present in *A. cuprea* (Figs. 607, 608) is lacking in *A. tezpi* (Fig. 652) and *A. translata* (Fig. 654). The mediolongitudinal process in *A. translata* (Figs. 654a, c) is lacking in *A. tezpi* (Fig. 652a) and the enlarged sclerotized lateral lobes in *A. tezpi* (Fig. 652) are represented by small hyaline lobes in *A. translata* (Fig. 654a).

Females are most likely to be confused with *A. translata*, but the morphology of the mesostigmal lobe and mesepisternal tubercle distinguishes them. The prominent mesepisternal tubercle in *A. tezpi* is almost as high as the mesostigmal lobe (Figs. 578a, b) and a large mesostigmal tubercle is present directly beneath the mesostigmal lobe (Fig. 578e); in *A. translata*, the mesepisternal tubercle is low and does not extend as high as the erect mesostigmal lobe (Figs. 581a, b) and there is no prominent mesostigmal tubercle beneath the mesostigmal lobe (Fig. 581e). *Argia tezpi* may be confused with *A. cuprea*; however, the mesal margin of the mesostigmal lobe of *A. cuprea* (Fig. 511e) is deflected posteriorly whereas *A. tezpi* has a completely planar mesostigmal lobe (Fig. 578e).

In the field, the brilliant red eyes, metallic labrum and thoracic dorsum in males of *A. cuprea* (Fig. 47) will easily separate this species from *A. tezpi* (Figs. 143–145) and *A. translata* (Figs. 150–154). The eyes of fully mature males of *A. translata* are entirely bright purple (Figs. 150, 151), a unique character; in males of *A. pulla*, eyes are bright purple dorsally shading to blue ventrally (Figs. 20, 120, 1028), those of *A. tezpi* are dark brown (Fig. 143) to dark purple. The entire dorsum of S8–10 in females of *A. translata* is generally black (Figs. 485, 979), whereas dorsal black is normally restricted to all of S8, basal 0.80 or less of S9 and absent from S10 in *A. tezpi* (Figs. 482, 483, 1020, 1021).

Remarks. Calvert (1895) first described this species under the name *A. cupraea* based on 13 males and 13 females all from the Baja California peninsula; no type was selected. Later, he (Calvert 1902) described both sexes

under the name *A. tezpi* and figured a male from Tepic in Nayarit and Dos Arroyos in Guerrero. Because Calvert (1908a) specified that types (holotypes) were to be determined based on the principal figures on the plates, he corrected the type locality to San José del Cabo, Baja California (coll. Calif. Acad. Sci.). The holotype of *A. tezpi* was later destroyed by the San Francisco earthquake and fire of 1906, and Calvert (1947) selected a male from the surviving series (2 ♂♂, 1 ♀) he retained from the type locality as lectotype. Garrison (1994) confirmed that the lectotype ♂ of *A. tezpi* is in CAS as reported by Calvert (1947).

As noted by Paulson (2009), Bailowitz *et al.* (2015), and Paulson & Haber (2021), the female is dichromatic and can be either tan (Figs. 258, 1021) or blue (Figs. 259, 1020), and males may assume a faint metallic purple reflection on the thorax when they age. The late L. K. Gloyd considered more southerly populations (Guatemala to Costa Rica) as a possible new species based on slight differences in the male cerci but these differences seem to encompass the full range of variation for this widespread species.

In Caesar & Wenzel (2009, fig. 4) phylogenetic tree combining morphological and molecular data, *A. tezpi* is sister to *A. tarascana* and both are sister to *A. apicalis* [(*A. apicalis* (*A. tarascana*, *A. tezpi*))]. Based on our examination of these three species, we consider this arrangement unlikely. The genital ligula of *A. apicalis* (lateral lobes of distal segment of genital ligula represented by flattened ovoid flaps connected medially and diverging distally, Fig. 597) is unlike any other Mexican or Central American species of *Argia* although it approaches that of *A. tibialis* which is thus far not known to occur in Mexico, and the trifid cerci of both species (Fig. 667, fig. 5 in Garrison, 1994) also approach one another and suggest that these two are sister species. The genital ligula of *A. tarascana* (Fig. 649) lacks a flagellum and differs significantly from the ligula of *A. tezpi* which has a bifid flagellum (Fig. 652), and the male caudal appendages differ as well (Figs. 738 vs. 741). Previous authors have suggested a close relationship between *A. tezpi* and *A. translata* due to the overall similarity in the dark color pattern, male caudal appendages and female mesostigmal plate morphology. The morphology of the genital ligula of both species as noted above is more similar to each other than either is to *A. apicalis* and *A. tarascana*. According to Torres-Pachón *et al.* (2017), their combined morphological and molecular phylogenetic analysis of larvae place *A. tezpi* within the “percellulata” clade as follows: (*A. percellulata* (*A. cuprea*, *A. tezpi*) (*A. joergenseni* (*A. barretti*, *A. harknessi*))). Inclusion of *A. tezpi* within this cluster seems to us unlikely as the genital ligula of *A. tezpi* is the only one of all six species lacking the pair of more apical flexible chitinated multispinose lobes.

Nava-Bolaños *et al.* (2017) noted failed tandem attempts between males of *A. tezpi* and females of *A. anceps*, *A. extranea* and *A. oenea*.

Distribution. *Argia tezpi* is a common species occurring from Baja California, S Arizona, New Mexico and W Texas south into Puntarenas in Costa Rica. We have seen no records from the Central Plateau of Mexico nor from NE Mexico (Fig. 793). It is sympatric with *A. translata* in Arizona, New Mexico, W Texas and in Sonora and extreme W Chihuahua in Mexico as well as along the Pacific lowlands of Central America. The species ranges from near sea level to about 2500 m.

Argia tonto Calvert, 1902

Figs. 146 (head, thorax, S1–4 ♂); 147–149 (thorax ♂); 260 (head, thorax, S1–4 ♀); 387 (S7–10 ♂); 484 (S7–10 ♀); 579, 580 (mesostigmal plates ♀); 653 (genital ligula); 742 (appendages ♂); 777 (map); 899 (body scan ♂); 900 (body scan ♀).

[Key locators: ♂ G-3, couplet 4(1); ♂ M-6, couplet 14'; ♀ F-11, couplet 7(6)]

Argia tonto Calvert 1902: 89, footnote (♂, ♀, description, pl. IV, figs. 17, 48, 48s);—Calvert & Hagen 1902: 116 (“Types in Coll. Calvert”);—Calvert 1907: 374 (Cuernavaca, Mexico);—Calvert 1908a: xxix (clarification of holotype data);—Paulson 1982: 253 (U. S. A., Mexico);—Westfall 1990: 68 (description larva, fig. 4);—González-Soriano & Novelo-Gutiérrez 1991: 90 (key, Durango, Mexico, figs. 6, 12, 13, 33, 39, 42);—Novelo-Gutiérrez & González-Soriano 1991: 133 (key, description larva, figs. 18, 35);—Novelo-Gutiérrez 1992: 68 (description larva, figs. 13, 27, 30, 51, 62, 82, 85);—González-Soriano 1993: 296 (Mexico);—Garrison 1994: 334 (key, diagnosis, figs. 22, 65, 77, 89, 104);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Cole 1998: 10 (comparison with *A. lacrimans*);—Abbott 2005a: 86 (♂, ♀, key, distribution in New Mexico, figs. 16, 17, photos 11a, 11b);—Westfall & May 2006: 218 (♂, ♀, key, description, larva, figs. 85H, 97A, 100D, 104C);—Behrstock *et al.* 2007a: 57 (Chihuahua, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Upton *et al.* 2007: 33 (Sonora, Mexico);—Caesar & Wenzel 2009: 106 (phylogeny within genus *Argia*);—Escoto-Moreno *et al.* 2009: 154 (new for Aguascalientes, Mexico);—Paulson 2009: 170 (♂, ♀, description,

diagnosis, photos);—Escoto-Moreno *et al.* 2014: 1051 (Hidalgo, Mexico);—Escoto-Moreno *et al.* 2014: 1046 (Hidalgo, Mexico);—Bailowitz *et al.* 2015: 152 (diagnosis, photos);—Escoto-Moreno *et al.* 2017: 386 (Hidalgo, Mexico);—Torres-Pachón *et al.* 2017: 416 (molecular phylogeny of larvae within *Argia*);—Escoto-Moreno *et al.* 2020: 33 (new record for Aguascalientes, Mexico).

Argia (*Cyanargia*) *tonto*: Kennedy 1920: 85 (in subgenus *Cyanargia*).

Primary types. *Argia tonto*: holotype ♂, U. S. A., Arizona, Cochise Co., Tombstone, F. G. Willard leg. [not examined, in ANSP] <http://clade.ansp.org/entomology/detail.php?id=6171&return=%2Fentomology%2Fsearch.php%3Ffam%3D%26gen%3DArgia%26spe%3Dtonto%26ssp%3D%26aut%3DCalvert%26cou%3D%26submit%3DSearch>.

Specimens examined. 143 ♂♂, 65 ♀♀: **U. S. A., Arizona:** 2 ♂♂, Pine flat Forest Camp, Oak Creek Canyon, by Highway 89A, 14 mi S of Flagstaff, 35.0125°N, 111.739°W, 1700 m, 2 August 1975, J. A. Garrison [RWG]; 11 ♂♂, 2 ♀♀, same data but 18 July 1977, R. W. Garrison [RWG]; 3 ♂♂, 2 ♀♀, same data but 8 November 2001, N. von Ellenrieder [CSCA, MHNN]; 3 ♂♂, 1 ♀, Bootlegger Campground, by Highway 89A, 8 mi N of Sedona, 34.9697°N, 111.751°W, 1575 m, 19 July 1977, R. W. Garrison [RWG]; 2 ♂♂, Webber Creek, Camp Geronimo, Forest Road 440, Tonto National Forest, 34.4089°N, 111.377°W, 1704 m, 3 August 1992, R. W. Garrison [RWG]; 1 ♂, 1 ♀, Sycamore Spring, Fossil Creek Road, Forest Road 708, Coconino National Forest, 34.395°N, 111.65°W, 1065 m, 2 August 1992, R. W. Garrison & M. Van Dam [RWG]; 3 ♂♂, 2 ♀♀, Tonto Natural Bridge State Park, 4 mi S of Pine, 34.3212°N, 111.457°W, 1400 m, 3 August 1992, R. W. Garrison [RWG]; 9 ♂♂, 4 ♀♀, forested stream by turnout, 4.6 mi N of Molino Basin Forest Camp, Coronado National Forest, Santa Catalina Mountains, 32.3628°N, 110.712°W, 1 August 2000, R. W. & J. A. Garrison [RMNH, RV, RWG]; 5 ♂♂, 8 ♀♀, Herb Martyr Dam, Chiricahua Mountains, Coronado National Forest, 31.8742°N, 109.235°W, 12 August 1975, R. W. Garrison [RMNH, RWG]; 6 ♂♂, 1 ♀, same data but 26 August 1975 [RWG]; 1 ♂, 1 ♀, same data but 26 July 1984 [RWG]; 2 ♂♂, 1 ♀, same data but 8 August 1995 [RWG]; 1 ♀, Rucker Forest upper campground, Chiricahua Mountains, 31.7833°N, 109.304°W, 1882 m, 30 May 2001, S. Upson [RWG]; 18 ♂♂, 2 ♀♀, same data but 22 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, Upper Garden Canyon, 7 mi S of Fort Huachuca, 31.6667°N, 110.367°W, 1829 m, 29 July 1997, J. Cole [RWG]; 5 ♂♂, 3 ♀♀, Huachuca Canyon, 31.5106°N, 110.393°W, 1638 m, 16 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RMNH, RWG]; 1 ♂, 2 ♀♀, upper picnic area in Huachuca Canyon, N end of Huachuca Mtns., 2.6 mi beyond end of pavement {31.4978°N, 110.412°W}, 2020 m, 11 June 2001, S. Upson [RWG]; 1 ♂, 1 ♀, County Road 799, 0.5 mi S of The Little Outfit Ranch, W of Road 92, ephemeral manmade pond, 31.4806°N, 110.57°W, 1550 m, 16 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA]; 7 ♂♂, 9 ♀♀, Garden Canyon, Fort Huachuca, 31.4767°N, 110.364°W, 1727 m, 29 August 1998, R. W. Garrison [RWG]; 15 ♂♂, 2 ♀♀, same data but 31.4733°N, 110.352°W, 1638 m, 16 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, MHNN, RWG]; 4 ♂♂, 3 ♀♀, Ramsey Canyon, 31.4625°N, 110.289°W, 21 July 1987, R. W. Garrison [RWG]; 4 ♂♂, 1 ♀, Scotia Canyon, Coronado National Forest, Huachuca Mountains, 31.4492°N, 110.401°W, 1821 m, 24 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, Creek at Carr Canyon, Coronado National Forest {31.4421°N, 31.4421°E}, 1670 m, 7 August 1992, R. W. Garrison [RWG]; 2 ♂♂, small springs 0.6 mi W of Carr Canyon Road, near Miller Peak, 31.4339°N, 110.285°W, 1989 m, 22 July 1987, R. W. Garrison [RWG]; 17 ♂♂, 3 ♀♀, Coronado National Forest, Bear Creek at Lown Mountain Creek, 31.3828°N, 110.363°W, 1687 m, 24 August 2002, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; **New Mexico:** 9 ♂♂, Cherry Creek, by Highway 15, 13 mi N of Silver City, 32.8625°N, 108.839°W, 2133 m, 7 August 1995, J. A. Garrison [RWG]. **MEXICO, Chihuahua:** 2 ♂♂, 1 ♀, Arroyo Fresa, 3 mi N of junction of Río Piedras Verdes {30.3209°N, 108.223°W}, 1690 m, 22 June 1987, B. Kondratieff [FSCA]; 1 ♀, Río Piedras Verdes near Pacheco {30.0853°N, 108.393°W}, 2250 m, 22 June 1987, B. Kondratieff & R. Baumann [BYU]; 1 ♂, Arroyo Toro, Toro Basin {28.9333°N, 104.45°W}, 1720 m, 25 June 1987, B. Kondratieff & R. Baumann [BYU]; **Sonora:** 1 ♂, cypress-lined stream 16 mi of Yécora, on road to Trigo de Corodepe, 28.585°N, 108.917°W, 1500 m, 28 June 2005, R. A. Bailowitz [RWG]; 1 ♂, 1 ♀, small stream W of Yécora on Route 16 {28.3767°N, 108.897°W}, 1556 m, 24 August 1986, B. Kondratieff [FSCA]; **Nuevo León:** 1 ♂, Potrero Redondo {25.6765°N, 25.6765°E}, 650 m, 9 June 1985, A. Contreras R. [FSCA]; 1 ♂, 1 ♀, Villa de Santiago, Hacienda Vista Hermosa, Cascadas Cola de Caballo {25.366°N, 100.1621°W}, 700 m, 17 June 1940, H. Hoogstraal [UMMZ]; 1 ♂, 1 ♀, Mesa de Chipinque {25.6073°N, 100.356°W}, 1310 m, 28 March 1949, G. M. Sutton [RWG]; **Durango:** 1 ♂, 1 ♀, Arroyo El Taray, Reserva de la Biosfera La Michilia, 23.592°N, 104.066°W, 2006 m, 24 August 1987, E. González-Soriano [RWG]; **Guanajuato:** 1 ♂, 2 ♀♀, 3 mi NE of Santa Rosa, near mountain stream {21.0833°N, 101.1668°W}, 2500 m, 14

August 1932, H. M. Smith & E. H. Taylor [UMMZ]; 2 ♂♂, 2 ♀♀, Santa Rosa de Lima, Cañón de la Virgen, presa La Zanja {20.1442°N, 100.7811°W}, 1963 m, 16 June 1997, M. Cano [RWG]; **Mexico**: 3 ♂♂, 4 ♀♀, Parque Nacional Los Remedios, 19.4756°N, 99.2508°W, 2343 m, 10 July 1982, R. Mendoza Trejo [CNIN, RWG].

A large species (Table 2); male lavender and black (Figs. 146–149, 387, 899) with cercus in dorsal view with inner branch (tooth) prominent, as long as outer branch and with a deeply U-shaped concavity between inner and outer branches (Fig. 742c); female pale blue, violet or tan (Figs. 260, 900) with mesepisternum under base of mesostigmal lobe usually lacking a tubercle in posterior view (Fig. 579e).

Diagnosis. Both sexes were keyed from its closest congeners, *A. lacrimans* and *A. pima*, in Garrison (1994), and were also keyed and described by Westfall & May (2006). Mature adults of *A. tonto* assume a smoky lavender color unlike *A. chelata*, *A. lacrimans* and *A. pima*. Both sexes are further diagnosed under *A. lacrimans*. Variability in the female mesostigmal plates of *A. tonto* and its confusion with *A. lacrimans* is discussed under the latter species. The mesostigmal plates of Los Remedios female illustrated here (Fig. 580) differ considerably from those from Arizona (Fig. 579), but three other females were collected with three males at Los Remedios and the males correspond to *A. tonto* in all details.

Remarks. The thoracic maculation of the sexes of *A. tonto* differ; the middorsal black stripe is narrow and barely extends beyond the middorsal thoracic carina in the male (Fig. 149) but is thicker in the female (Fig. 217).

Habitat. *Argia tonto* is one of the more common damselflies in SE Arizona and can be found along streams as well as on exposed rocks and soil bordering streams.

Distribution. It occurs mostly along the W flank of Mexico, though it has been collected in E Chihuahua and in Nuevo León, extending south to Hidalgo and Mexico states (Fig. 777). González-Soriano & Novelo-Gutiérrez (1991) reported that García-Castillo (1987) questioned Calvert's (1907) subsequent determination of *A. tonto* from Cuernavaca. We have not seen the male in question but our notes indicate that it was examined by L. K. Gloyd in 1935 and she agreed with Calvert's determination. Like *A. chelata*, *A. lacrimans*, and *A. pima*, *A. tonto* is a montane species. Our records range from about 560 to 2700 m (10 mi NW of Los Adjuntas, based on specimens identified by L. K. Gloyd in the University of California, Berkeley; not seen). *Argia tonto* is broadly sympatric with *A. lacrimans* and *A. pima* (Figs. 777, 778).

Argia translata Hagen in Selys, 1865

Figs. 150, 151 (head, thorax, S1–4 ♂); 152–154 (thorax ♂); 261, 263 (head, thorax, S1–4 ♀); 262 (thorax ♀); 388, 389 (S7–10 ♂); 485 (S1–10 ♀); 581, 582 (mesostigmal plates ♀); 654 (genital ligula); 743, 744 (appendages ♂); type labels (765, 766); 793 (map); 977, 978 (body scans ♂); 979 (body scan ♀).

[Key locators: ♂ G-5, couplet 2(1); ♂ M-3, couplet 2', M-6, couplet 5(4); key to females, couplet 23(22'); F-11, couplet 3'; ♀ shortcut 7]

Argia translata Hagen in Selys, 1865: 410 (38 reprint) (description ♂, ♀);—Calvert 1902: 76 (key, description ♂, ♀, pl. IV, figs. 18, 30, 30s);—Calvert 1902: 116 (pl. 1, figs. 9, 9a, "Types in M. C. Z.");—Calvert 1907: 361 (further description ♂, ♀);—Calvert 1909: 123 (key, Colombia);—Ris 1918: 104 (Mexico, Panama);—Campos Ripadeneira 1922: 24 (Ecuador); Campos Ripadeneira 1927: 80 (Ecuador);—Geijskes 1932: 239 (Trinidad);—Geijskes 1946: 226 (description of larva, Tobago, fig. 2);—Soukop 1954: 12 (Peru);—Rácenis 1959: 477 (Peru);—Geijskes 1971: 660 (French Guiana);—Johnson 1972a: 83, 89 (key ♂, ♀, figs. 8M, N, 10Q, R);—May 1979: 16 (Panama);—Kiauta & Kiauta 1980: 43 (cytotaxonomy and evolutionary history, fig. 37);—Gloyd 1981: 133 (El Salvador);—Paulson 1982: 253 (Mexico S through South America);—Pritchard 1982: 231 (distribution in U. S. A. to South America, fig. 8);—Limongi "1983" [1985]: 51 (notes on larva, Venezuela);—Paulson 1984: 51 (El Salvador);—Moulton II *et al.* 1987: 286 (figs. 3A, B, SEM of ♀ mesostigmal plates);—Dunkle 1988: 45 (Honduras);—Maes *et al.* 1988: 34 (Nicaragua);—Michalski 1988: 6 (Trinidad);—Novelo-Gutiérrez *et al.* 1988: 19 (Mexico);—Brooks 1989: 50 (Costa Rica);—Maes 1989: 6 (Nicaragua);—De Marmels 1990: 337 (Venezuela);—Donnelly 1992: 83 (Panama);—González-Soriano 1993: 296 (Mexico);—Garrison 1994: 335 (key, diagnosis, figs. 28, 67, 93, 99, 107);—Measey 1994: 45 (Belize);—Boomsma & Dunkle 1996: 25 (Belize);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Abbott & Stewart 1998: 207 (U. S. A., Mexico);—Donnelly *et al.* 1998: 44 (Argentina);—Muzón & von Ellenrieder 1998: 23 (Argentina);—Dommanget & Papazian 2000: 139 (French Guyana);—Ramírez *et al.* 2000: 249 (Costa Rica);—Abbott 2001: 199 (Texas);—Förster 2001: 11, 54, 58 (key ♂, ♀, fig. C25);—Abbott *et al.* 2002: 127 (Nicaragua);—Alonso-Eguía *et al.* 2002: 352 (Moctezuma basin, east-central Mexico);—Paulson 2002b: 368 (Sinaloa, Mexico);—Abbott 2005a: 87 (♂, ♀, key, Texas, New Mexico, Oklahoma, Arkansas, figs. 16, 17, photo 11c);—Machet 2006: 36 (French Guiana);—Westfall & May 2006: 144, 150, 149, 219, figs. 72, 74, 79B,

81B, 97B, 100E, 104D, key, description ♂, ♀);—Behrstock *et al.* 2007a: 11 (Chihuahua, Mexico);—Cuevas-Yañez 2007: 86 (Puebla, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Pérez-Gutiérrez *et al.* 2007: 212 (Colombia);—Upson *et al.* 2007: 33 (Sonora, Mexico);—von Ellenrieder & Garrison 2007b: 90 (diagnosis, Argentina, figs. 89, 93, photo 91);—von Ellenrieder & Garrison 2007c: 28, 78 (key ♂, ♀, larva, photo 6);—von Ellenrieder & Muzón 2008: 60 (Argentina);—Heckman 2008: 366, 380, 392 (key to ♂, ♀, larva);—Heckman 2008: 366, 380, 392 (key ♂, ♀, larva, North America to Argentina, figs. 3.1.426, 3.1.450);—Behrstock 2009: 3 (Coahuila, Mexico);—Caesar & Wenzel 2009: 104 (phylogeny within genus *Argia*);—Escoto-Moreno *et al.* 2009: 154 (Aguascalientes, Mexico);—Hoffmann 2009: 65 (Peru);—Paulson 2009: 175 (♂, ♀, description, diagnosis, photos);—Abbott 2011: 134 (♂, ♀, figs, diagnosis, distribution in Texas);—González-Soriano & Paulson 2011: 307 (Chiapas, Mexico);—González-Soriano *et al.* 2011: 185 (San Luis Potosí, Mexico);—Paulson 2011: 163 (♂, ♀, description, diagnosis, photos);—Pérez-Gutiérrez & Palacino-Rodríguez 2011: 212 (Colombia);—von Ellenrieder 2011: 58 (Surinam);—Amaya-Perilla & Palacino-Rodríguez 2012: 34 (Colombia);—Bailowitz *et al.* 2012: 9 (El Salvador);—von Ellenrieder & Garrison 2013: 16 (Costa Rica);—Pérez-Gutiérrez *et al.* 2013: 105 (Colombia, photos 239–245);—Escoto-Moreno *et al.* 2014: 1051 (Hidalgo, Mexico);—Bailowitz *et al.* 2015: 154 (diagnosis, photos);—Escoto-Moreno *et al.* 2015: 154 (Zacatecas, Mexico);—Garrison & von Ellenrieder 2015: 73 (key, description ♂, ♀, diagnosis, distribution, figs. 1h, 3g2, h2, 4s2, t2, 5c2, d2, 6a2, 7t3–v3, 9d2–f2, 10y2–a6, 13d, photos 15s, t);—Michalski 2015: 94, 96 (key ♂, ♀, Trinidad, Tobago, figs. 70d, 71e, photos);—Torres-Pachón *et al.* 2017: 416 (molecular phylogeny of larvae within *Argia*);—Bota-Sierra *et al.* 2019: 51 (Colombia, brief description, fig. 35);—Garrison & von Ellenrieder 2019: 46 (syntype data);—Maufray & Tennesen 2019: 45 (Ecuador);—Molineri & Rodríguez 2013: 306 (key, diagnosis, larva, Argentina);—Ortega-Salas & González-Soriano 2019: 120 (Coahuila, Mexico);—Koroiva *et al.* 2020: 8 (Amazonas, Brazil);—Lozano *et al.* 2020: 18 (Argentina);—Palacino-Rodríguez *et al.* 2020: 1567 (Colombia);—Paulson & Haber 2021: 111 (diagnosis, photos).

Argia espinalensis Navás, 1935: 36 (description ♂);—Garrison 1994: 335 (synonym of *A. translata*, holotype [sic!; should be lectotype]).

Argia (*Chalcargia*) *translata*: Kennedy, 1920: 85 (in subgenus *Chalcargia*).

Argia sp. 8 Machet 2004: 147 (French Guiana).

Primary types. *Argia translata*: syntype ♂, VENEZUELA, Puerto Cabello. This syntype lacks the last 7 abdominal segments. At least one other male and a female with the same data were available to Hagen at the time of the original description, but we were unable to find those specimens. Pending their discovery, and due to the missing abdominal appendages, we refrain from designating the syntype as lectotype [examined, in MCZ; Garrison 1994; Garrison & von Ellenrieder 2019];—*Argia espinalensis* Navás, 1935: ♂ lectotype, COLOMBIA, Tolima Dept., Espinal, vii 1918 [examined, in FSCA; Fig. 765].

Specimens examined. 381 ♂♂, 169 ♀♀ (see Garrison & von Ellenrieder 2015 for additional material examined not listed here): **U. S. A., Arizona:** 1 ♂, Oak Creek at Cornville {34.718°N, 111.916°W}, 1000 m, 4 September 1983, S. W. Dunkle [RWG]; **Texas:** 1 ♀, Brownsville {25.9017°N, 97.4975°W}, 9 m, 17 October 2002, J. B. Heppner [FSCA]. **MEXICO, San Luis Potosí:** 1 ♀, El Salto Falls {22.5857°N, 99.3843°W}, 470 m, 8–9 August 1968, J. W. McReynolds [FSCA]; 1 ♂, same data but IORI # 00079707, 24 June 1960, G. N. Ross [FSCA]; 3 ♂♂, 1 ♀, Cascada de Micos, NW of Ciudad Valles, 22.0992°N, 99.15°W, 140 m, 22 August 1999, R. W. & J. A. Garrison [RWG]; **Veracruz:** 1 ♀, 2 km E of Catemaco, 18.4356°N, 95.09°W, 600 m, 25 August 1980, E. S., C. E. Ross [CAS]; 1 ♂, Salto de Eyipantla, 8 km S of San Andres Tuxtla, near Highway 180, 18.3842°N, 95.2064°W, 150 m, 15 June 2009, R. W. Garrison & N. von Ellenrieder [RWG]; **Tabasco:** 10 ♂♂, 1 ♀, Tepescuintle, {17.4435°N, 91.4006°W}, 25 m, 17 August–16 September 1962, E. C. Welling M. [UMMZ]; **Chiapas:** 1 ♂, 5 km SE of Jitotol, 17.0333°N, 92.85°W, 1676 m, 10 September 1981, D. E. & P. M. Breedlove [RWG]. **GUATEMALA, El Petén:** 1 ♀, Petén Itzá Lake {16.9729°N, 89.9074°W}, 15440 m, 5 October 2005, J. B. Heppner [FSCA]. **COSTA RICA, Guanacaste:** 1 ♂, Grande River at Nicoya {10.138°N, 85.4477°W}, 128 m, 5 May 1995, B. O. Huntsman & R. W. Baumann [BYU]; **Heredia:** 1 ♀, Sarapiquí, Chilamate, La Martita Farm {10.4497°N, 84.0645°W}, 37 m, 26 February 1992, R. L. Johnson & R. Ochoa [BYU]; 1 ♂, 1 ♀, Puerto Viejo, **La Selva Biological Station**, L-01-181/249 {10.4667°N, 84.0167°W}, 60 m, 28 April 1988, C. Esquivel-Herrera [UNH]; 1 ♂, 1 ♀, same data but L-01-250/349, 24 June 1988 [UNH]; 1 ♂, same data but L-01-227, 22 May 1988, C. Esquivel-Herrera [UNH]; 3 ♂♂, 3 ♀♀, La Rambla, river, L-03-519, 8 April 2000, C. Esquivel-Herrera [UNH]; **Limón:** 1 ♂, Finca La Lola, Agricultural Research Station, near Siquirres {10.1°N, 83.3667°W}, 15 m, 4 July 1987, S. Sullivan Borkin & R. J. Sullivan [USNM]; **Puntarenas:** 4 ♂♂, 2 ♀♀, Sardinal River at Sardinal {10.1004°N, 84.8098°W}, 102 m, 7 May 1995, B. O. Huntsman & R. W. Baumann [BYU]; 3 ♂♂, 2 ♀♀, Miramar, Los Negritos, L-03-898-890 {10.0833°N, 84.7167°W}, 60 m, 8 June 1990, C. Esquivel-Herrera [UNH]; 1 ♂, same data but L-03-1228, March 1990 [UNH]; 1 ♂, Puntarenas, L-03-430 {9.989°N, 84.7672°W}, 8 m, 2 March 1984, C. Esquivel-Herrera [UNH]; 1 ♂, Coloradito River, L03-244, 5 April 1981, C. Esquivel-Herrera [UNH]; 3 ♂♂, 1 ♀, Ciudad Cortez, L-03-248 {8.968°N, 83.5234°W}, 13 m, 4 April

1981, C. Esquivel-Herrera [UNH]; **San José**: 2 ♂♂, tributary of Pacuar River, 2 km E of Santa Rosa {9.6877°N, 84.3894°W}, 280 m, 11 May 1995, B. O. Huntsman & R. W. Baumann [BYU]; 1 ♂, unnamed stream 2 km W of San Isidro {9.3585°N, 83.7155°W}, 660 m, 11 May 1995, B. O. Huntsman & R. W. Baumann [BYU]. **PANAMA, Chiriquí**: 1 ♀, 5 km N of David, 8.4811°N, 82.4167°W, 100 m, 27 January 1987, E. S. Ross [CAS]; 1 ♀, David, San Pablo, Quebrada Sira, bridge to Cola, 17 April 2011, G. Caballero S. [UNH]; **Coclé**: 1 ♂, Mano de Piedra, ca. 4.6 km N of Penonomé, tributary to Coclé del Sur River, wide shallow intermittent rocky river, 8.5608°N, 80.3675°W, 70 m, 23 May 2016, W. F. Mauffray [FSCA]. **COLOMBIA, Magdalena**: 1 ♂, 1 ♀, Don Jaca River, 11.1°N, 74.2167°W, 1370 m, 16 December 1916, J. H. Williamson & E. B. Williamson [UMMZ]; **Valle del Cauca**: 1 ♂, Ponce River at El Topacio, CL 2423, 4.2°N, 75.8833°W, 1550 m, D. A. & J. T. Polhemus [USNM]. **VENEZUELA, Carabobo**: 1 ♂ (syntype), Puerto Cabello {10.4731°N, 68.0125°W}, 71 m, 1848–1859, K. F. Appun [MCZ]; 1 ♀, San Esteban {10.4167°N, 64.0667°W}, 231 m, 18 March 1971, F. Fernandez Y. & J. Salcedo [FSCA]; **Barinas**: 1 ♂, Ticoporo, 7.9333°N, 70.7167°W, 129 m, 22–28 May 1968, M. Gelvez & J. Salcedo [FSCA]. **GUYANA, Potaro-Sipurini Region**: 3 ♂♂, Iwokrama, 4.66°N, 58.6811°W, 20 January 2015, B. Willink & E. Svensson [CSCA, MZLU]. **ECUADOR, Manabí**: 1 ♂, Nalpe River, ca. 3 km E of El Achote, 0.0547°N, 79.9739°W, 90 m, 28 February 2010, K. J. Tennessen [FSCA]; **Los Ríos**: 4 ♂♂, 4 ♀♀, Palenque Biological Station River, 47 km S of Santo Domingo de los Colorados {0.5783°S, 79.361°W}, 151 m, 7–8 October 1988, S. W. Dunkle [FSCA]; 2 ♂♂, pond/stream 7.2 km E of Hwy E25, 1.2539°S, 79.3703°W, 80 m, 21–31 February 2010, K. J. Tennessen [FSCA]; **Guayas**: 1 ♂, stream, banana plantation 2 km E of Hwy 25 & Balao Jct., 2.91°S, 79.6919°W, 70 m, 28 March 2008, K. J. Tennessen [FSCA]; **El Oro**: 1 ♂, stream 12 km E of Arenillas, Highway 25, 3.5244°S, 79.9831°W, 30 m, 29 March 2008, Lago [FSCA]; 1 ♀, Buenaventura, main road, ACR-04595, DNA Sample RG-65, 3.6525°S, 79.7908°W, 342 m, 21 June 2016, Lago [RWG]. **PERU, Huánuco**: 1 ♂, Tingo María, 8.9667°S, 75.8332°W, 672 m, 27 November 1947, J. C. Pallister [FSCA]; **Junín**: 1 ♂, San Ramón District, Playa Hermosa, SE near El Triol Fall, Quebrada Puente Paloma, IORI # 00087716, 11.142°S, 73.3575°W, 350 m, 15 October 2005, J. L. H. [FSCA].

A medium size (Table 2) predominantly dark species (Figs. 150–154, 388, 389, 977–979); male with cercus lacking a distal U-shaped convexity (Figs. 743a, c, 744a, c) and genital ligula with a medio-longitudinal process (Fig. 654a); female lacking enlarged mesepisternal tubercles (Fig. 581e).

Diagnosis. Garrison (1994) gave a good account of this species, comparing it with other congeners within the United States. Both sexes were described thoroughly in Westfall & May (2006). Garrison & von Ellenrieder (2015) provided additional information, comparing it with species known from the Guiana Shield in NE South America. Both sexes are diagnosed under *A. tezpi*. In the field, the eyes of fully mature males of *A. translata* are entirely bright purple (Figs. 150, 151).

Remarks. Garrison (1994) designated an incomplete male missing the right Hw and S5–10 in the FSCA (Fig. 764) as holotype of *A. espinalensis*, because the original description suggested that Navás had only one specimen before him at the time. After that paper was written, Garrison received a series of Navás types of *Argia* from the MNHP on loan, and among these was a complete male of *A. espinalensis* with the same data as the first and also labeled “Typus. (Fig. 765)” We have compared both males to the original description, noting the same px counts for both specimens. As it is possible that Navás had both specimens (syntypes) before him at the time of the description, Garrison & von Ellenrieder (2015) invoked Art. 74.6 of the ICZN, emending Garrison’s designation of the specimen at FSCA from holotype to lectotype. The MNHP male was designated as lectotype (now paralectotype) by the late J. Legrand in 1996, and we have illustrated that specimen here (Fig. 743).

D. R. Paulson observed males of this species, from North Carolina south to Costa Rica, displaying distinct humeral and antehumeral stripes, the latter somewhat yellowish, thorax laterally pale, and abdominal tip with much blue when in tandem, and single males virtually all black, and he suspects that males change color when achieving tandem (D. R. Paulson, in litt.).

See under *A. tezpi* for comments concerning placement of *A. translata* within the molecular and morphological phylogenetic analyses proposed by Caesar & Wenzel (2009) and Torres-Pachón *et al.* (2017).

Habitat. *Argia translata* is one of the most successful species, apparently adapting to a variety of environmental conditions, if its widespread distribution is an indication of its success. In fact, it is one of two *Argia* species (the other being *A. gaumeri*) that breed in still waters in the Yucatan Peninsula, where streams are lacking (D. R. Paulson, pers. comm.).

Distribution. This species has the widest distribution of any known *Argia*, occurring from SE Ontario in Canada south to Jujuy and Salta in NW Argentina. In Mexico, *A. translata* occurs sparingly along the west coast in the E half

of Sonora south to the Sinaloa border, Chihuahua and Coahuila (Behrstock 2009), then east into Tamaulipas, San Luis Potosí, Puebla (Jopala Municipality, Hidroeléctrica de Patla, ex: portal de datos abiertos UNAM), and Veracruz through Chiapas (Fig. 793). We have seen no specimens or records from the remainder of the Central Plateau, though further collecting may yield specimens from that area. The species ranges from near sea level to about 1700 m (Mexico, Durango, Peñón Blanco, ex: portal de datos abiertos UNAM).

Argia ulmeca Calvert, 1902

Figs. 155, 156 (head, thorax, S1–4 ♂); 157 (thorax ♂); 264 (head, thorax, S1–4 ♀); 265 (thorax ♀); 390–392 (S7–10 ♂); 486 (S1–10 ♀); 583–586 (mesostigmal plates ♀); 655 (genital ligula); 745–749 (appendages ♂); 795 (map); 851 (field photo ♂, ♀); 852 (field photo ♂); 1001, 1002 (body scans ♂); 1003 (body scan ♀).

[Key locators: ♂ G-5, couplet 7'; ♂ M-6, couplet 20(19); F-5, couplet 2']

Argia ulmeca Calvert 1902: 80 (key, description ♂, ♀, pl. IV, figs. 9, 34, 34s, 34i);—Calvert in Calvert & Hagen 1902: 116 (“Types in Colls. Calvert, Godman”);—Calvert 1907: 366 (further notes on ♂, ♀);—Kimmins 1970: 192 (holotype data);—Paulson 1982: 252 (Mexico, Guatemala, Honduras, Costa Rica);—Dunkle 1988: 45 (Honduras);—Maes *et al.* 1988: 34 (Nicaragua);—Brooks 1989: 50 (Costa Rica);—Maes 1989: 6 (Nicaragua);—Dunkle 1991: 132 (Honduras);—Novelo-Gutiérrez & Peña-Olmedo 1991: 130 (Hidalgo, Mexico);—Donnelly 1992: 83 (Panama);—Novelo-Gutiérrez 1992: 61 (larva description, figs. 14, 23, 36, 54, 64, 83, 90);—González-Soriano 1993: 296 (Mexico);—Peña-Olmedo & Novelo-Gutiérrez 1993: 119 (Hidalgo, Mexico);—Boomsma & Dunkle 1996: 25 (Belize);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico); Ramírez *et al.* 2000: 249 (Costa Rica);—Förster 2001: 11, 54, 58 (key ♂, ♀, fig. C25);—Abbott *et al.* 2002: 126 (Nicaragua);—Alonso-Eguía *et al.* 2002: 352 (San Luis Potosí, Mexico);—Westfall & May 2006: 220 (♂, ♀, key, description, larva, figs. 83, 97C, 104E);—Behrstock *et al.* 2007a: 30 (San Luis Potosí, Mexico);—Cuevas-Yañez 2007: 86 (Puebla, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Caesar & Wenzel 2009: 104 (phylogeny within genus *Argia*);—González-Soriano & Paulson 2011: 307 (Chiapas, Mexico);—González-Soriano *et al.* 2011: 185 (San Luis Potosí, Mexico);—Garrison & von Ellenrieder 2013: 16 (Costa Rica);—Escoto-Moreno *et al.* 2014: 1051 (Hidalgo, Mexico);—Bailowitz *et al.* 2015 156 (diagnosis, figs., photos, Arizona, Sonora);—Escoto-Moreno *et al.* 2017: 386 (Hidalgo, Mexico);—Torres-Pachón *et al.* 2017: 415 (molecular phylogeny of larvae within *Argia*);—Garrison & von Ellenrieder 2018: 12 (comparison with *A. adamsi*, figs. 85–88, 102, 122–126);—Paulson & Haber 2021: 109 (diagnosis, photos, Costa Rica).

Argia (*Chalcargia*) *ulmeca*: Kennedy, 1920: 85 (in subgenus *Chalcargia*).

Argia cf. *ulmeca*: Paulson: 2002b: 362 (Nayarit, Mexico);—Upson *et al.* 2007: 34 (Sonora, Mexico).

Primary types. *Argia ulmeca*: holotype ♂, MEXICO: Veracruz, Atoyac, May 1888, Herbert H. Smith leg. [examined, in BMNH; von Ellenrieder & Garrison 2007a].

Specimens examined. 540 ♂♂, 123 ♀♀: **MEXICO, Chihuahua:** 1 ♀, Riito, 10 mi E of Yepachic, Highway 16 {28.4369°N, 108.477°W}, 1517 m, 28 June 1987, B. Kondratieff & R. W. Baumann [FSCA]; **Sonora:** 2 ♂♂, 1 ♀, Los Pilares River near El Castillo Bridge on Highway 16, near Chihuahua border, 28.4011°N, 108.796°W, 1260 m, 19 July 2006, S. W. Dunkle [FSCA]; 3 ♂♂, small tributary to Los Pilares River at El Castillo Bridge on Highway 16, km 301, 28.4°N, 108.783°W, 1260 m, 16 August 2003, S. Upson [RWG]; 2 ♀♀, El Trigo de Colón, S of km 296 on Highway 16, 28.3092°N, 108.793°W, 1399 m, 20 July 2006, S. W. Dunkle [FSCA]; 1 ♂, Maycoba River, 28.3742°N, 108.758°W, 1201 m, 21 August 1986, S. Upson [FSCA]; 1 ♀, Highway 16, km 294-5, crossing of La Cañada Ancha, 28.3728°N, 108.836°W, 1501 m, 26 June 2004, S. Upson [RWG]; 1 ♂, same data but 21 July 2004 [RWG]; 2 ♂♂, same data but 19 July 2006, S. W. Dunkle [FSCA]; 1 ♂, Taymuco River at Taymuco, 27.2377°N, 108.737°W, 524 m, 19 October 2007, R. A. Bailowitz [RWG]; **Nuevo León:** 1 ♂, Cañón del Huajuco {25.5888°N, 100.25°W}, 590 m, 19 June 1938 [FSCA]; 7 ♂♂, 4 ♀♀, Rancho Los Pinos, 25.4269°N, 100.152°W, 483 m, 3 July 1987, M. J. Westfall, H. Quiróz & A. Contreras [FSCA, RWG]; 1 ♂, 2.5 km NW of Rancho Los Atascosos {25.3806°N, 100.161°W}, 650 m, 2 July 1987, M. J. Westfall, Jr., H. Quiróz & A. Contreras [FSCA]; 2 ♂♂, Cascada Cola de Caballo, 35 km S of Monterrey, 25.366°N, 100.1621°W, 700 m, 2 September 1963, T. W. Donnelly [FSCA]; 1 ♀, same data but 38 km SW of Monterrey, 62x120, 550 m, 6 September 1962 [FSCA]; 1 ♂, Santiago, Cola de Caballo {25.35°N, 100.15°W}, 550 m, 17 June 1976, C. B. Weems [FSCA]; **Tamaulipas:** 1 ♂, Guerrero, Rancho Pano Ayuctle, Salinas River {23.0314°N, 99.0932°W}, 99 m, 20 May 1947, G. M. Sutton [FSCA]; **San Luis Potosí:** 1 ♂, Naranjo River, 4.8 mi NW of Highway 80 on road to El Salto {22.6°N, 99.5°W}, 365 m, 19 June 1966, D. R. & M. L. Paulson [FSCA]; 1 ♂, El Salto Falls {22.5857°N, 99.3843°W}, 470 m, 8 August 1963,

H. V. Weems, Jr. [FSCA]; 1 ♀, same data but 8–9 August 1968, J. W. McReynolds [RWG]; 1 ♂, Puente de Dios, NW of Tamasopo, 21.9303°N, 99.4169°W, 42 m, 26 June 1990, K. J. Tennessen [FSCA]; 1 ♂, same data but 20 August 1999, R. W. & J. A. Garrison [RWG]; 1 ♂, Huichihuayán River, Highway 85, SW of Huichihuayán, 21.4522°N, 98.9383°W, 90 m, 23 June 1990, J. J. Daigle [RWG]; 1 ♂, Las Pozas de Xilitla, 21.3903°N, 98.9958°W, 540 m, 28 August 1990, K. J. Tennessen [FSCA]; 34 ♂♂, 1 ♀, Las Pozas de Xilitla, 21.3903°N, 98.9958°W, 540 m, 23 August 1999, R. W. & J. A. Garrison [CSCA, DTU, RWG]; 1 ♂, 2 ♀♀, same data but small stream, 4 October 2007, S. W. Dunkle [FSCA]; 2 ♀♀, 4 mi W of Tamazunchale {21.3°N, 98.8°W}, 182 m, 26 June 1965, D. R. & M. L. Paulson [FSCA]; 1 ♂, Palictla Bridge {21.2916°N, 98.7889°W}, 252 m, 28 August 1990, K. J. Tennessen [FSCA]; 1 ♀, Tamazunchale {21.2667°N, 98.7833°W}, 180 m, 6 March 1964, R. D. Cuyler [FSCA]; 2 ♂♂, Waterfall WNW of Tamazunchale {21.2667°N, 98.7833°W}, 883 m, 27 June 1965, D. R. & M. L. Paulson [FSCA]; 1 ♂, 1 ♀, Rancho Quemado, 7 km S of Tamazunchale, 63x087 {21.2139°N, 98.8025°W}, 160 m, 4 September 1963, T. W. Donnelly [FSCA]; **Nayarit**: 1 ♂, Jumatán, low forest, 21.6442°N, 105.036°W, 360 m, 28 September 1979, R. López [RWG]; 1 ♂, 1 ♀, Jumatán, 12–13 July 1981, P. Escalante [CNIN, UMMZ]; 1 ♂, El Limón River, 6.3 road km W of Santa María del Oro, 01-126, 21.3403°N, 104.632°W, 1100 m, 18 September 2001, D. R. Paulson & N. Smith [RWG]; **Hidalgo**: 3 ♂♂, 25 km NE of Chapulhuacán, Highway 85, km 246 {21.2603°N, 98.8278°W}, 880 m, 22 June 1990, K. J. Tennessen & J. J. Daigle [FSCA]; 3 ♂♂, stream and fall, 7 km N of Tlanchinol, 21.0514°N, 98.6678°W, 1300 m, 21–23 July 1992, T. W. Donnelly & G. Harp [FSCA]; 7 ♂♂, stream nr Otongo, 5 km S, 9 km W of Tlanchinol [92x027], 20.9686°N, 98.7644°W, 1162 m, 22 July 1992, T. W. Donnelly & G. Harp [FSCA]; 10 ♂♂, 1 km S of Calnali River, 22 km E of Ixtalhuaco, 92x028 {20.8844°N, 98.5872°W}, 900 m, 23 July 1992, T. W. Donnelly & G. Harp [CSCA, FSCA, RWG]; **Michoacán**: 1 ♂, El Sabino, 20 mi SSE of Uruapán, 20.0081°N, 102.3169°W, 1560 m, 27 July 1936, H. D. Thomas [RWG]; **Veracruz**: 1 ♂, Orizaba, Ojo de Agua {19.0167°N, 97.2667°W}, 1158 m, 10 August 1965, D. R. & M. L. Paulson [FSCA]; 1 ♂ (holotype), Atoyac {18.9155°N, 96.775°W}, 450 m, April–May 1888, H. H. Smith [BMNH]; 1 ♀ (paralectotype), Atoyac {18.9155°N, 96.775°W}, 450 m, May 1888, H. H. Smith [UMMZ]; 4 ♂♂, 1 ♀, small stream S of highway, Posada Loma, Fortín de las Flores, 18.9014°N, 96.9911°W, 1008 m, 15 August 1957, G. H. Beatty, III [FSCA, RWG]; 2 ♂♂, Córdoba, 65x068, 18.8832°N, 96.9333°W, 1000 m, 9 September 1965, T. W. Donnelly [FSCA]; 4 ♂♂, 3.6 mi S of Orizaba, spring at Matzinga {18.7864°N, 97.0917°W}, 1240 m, 13 August 1965, D. R. Paulson [FSCA]; 9 ♂♂, 1 ♀, Arroyo near Playa Escondida, about 30 km NE of Catemaco, 18.6794°N, 95.1544°W, 35 m, 23 July–13 August 1982, R. W. Garrison [CSCA, RWG]; 1 ♂, same data but 28 August 1988 [RWG]; 1 ♂, Highway 180, 33 km SE of Paso Nacional toll bridge, 34 km SE of Alvarado {18.6192°N, 95.5005°W}, 213 m, 29 August 1966, R. W. Cruden [UMMZ]; 8 ♂♂, 1 ♀, river with log bridge, off Laguna Escondida, about 30 km NE of Catemaco {18.5895°N, 95.0804°W}, 175 m, 27 August 1988, J. C. Michalski [FSCA, RWG]; 7 ♂♂, Los Tuxtlas Tropical Biological Station, stream of Laguna Escondida, 18.5869°N, 95.0731°W, 124 m, 5–15 July 1992, W. F. Mauffray & S. W. Dunkle [FSCA]; 1 ♂, same data but research station along path leading W, 18.585°N, 95.0761°W, 170 m, 14 July 1992, W. F. Mauffray [FSCA]; 1 ♀, first stream on road to Laguna Escondida, Los Tuxtlas, 19 May 1977, Pilar Villeda [UMMZ]; 9 ♂♂, 10 ♀♀, vicinity of Azul and Emilia Ponds, Los Tuxtlas Tropical Biological Station, Universidad Nacional de México, about 30 km NE of Catemaco, 18.5781°N, 95.0922°W, 200 m, 7–14 August 1982, R. W. Garrison [CSCA, DTU, FSCA, RWG]; 14 ♂♂, 2 ♀♀, same data about, 27 August 1988, R. W. Garrison, J. C. Michalski, S. W. Dunkle & M. J. Westfall, Jr. [FSCA, RWG]; 1 ♂, same data but 3 mi W of Laguna Escondida, 27.9 km N of Catemaco, near Montepío, 92x017, 14 July 1992, T. W. Donnelly [FSCA]; 1 ♀, stream on road to Jicacal Beach and pond near Rancho La Esperanza {18.5627°N, 95.0571°W}, 28 August 1988, S. W. Dunkle [FSCA]; 1 ♀, stream at San Andrés Tuxtla {18.45°N, 95.2167°W}, 291 m, 22 July 1961, J. A. Harshaw [FSCA]; 17 ♂♂, 6 ♀♀, stream 2 km E of Coyame, 8 km ENE of Catemaco, 18.4417°N, 95.0036°W, 300 m, 14–18 August 1976, R. W. & J. A. Garrison [RWG]; 1 ♀, 2 km E of Catemaco, 18.4356°N, 95.09°W, 600 m, 25 August 1980, E.S. & C.E. Ross [CAS]; 1 ♂, 1 ♀, Tebanca, 18.4189°N, 95.1242°W, 350 m, 17 June 1992, E. González-Soriano [CNIN]; 10 ♂♂, 2 ♀♀, Arroyo Claro, Bastonal, Sierra Santa Marta, 8 km E of Tebanca {18.3496°N, 94.8941°W}, 1100 m, 29 August 1988, M. J. Westfall, Jr., R. W. Garrison & S. W. Dunkle [FSCA, RWG]; **Morelos**: 2 ♂♂, 2 ♀♀, Cuernavaca, 18.9167°N, 99.25°W, 1483 m, 30 July–1 August 1935, H. R. Roberts [RWG, UMMZ]; 1 ♂, Balneario on River S of Temixco on Highway 95, 18.8303°N, 99.2272°W, 1220 m, 21 July 1992, S. W. Dunkle [RWG]; 1 ♀, river on Highway 421, 0.3 km N of Pueblo Cocoyotla, 1045 m, 23 July 1992, S. W. Dunkle [RWG]; 1 ♂, stream in Pueblo Cocoyotla, Highway 421, 18.7678°N, 99.4572°W, 1070 m, 22 July 1992, K. J. Tennessen [FSCA]; **Chiapas**: 1 ♀, Palenque, 17.4869°N, 92.0181°W, 64 m, 6 June 1991, F. Skillman [FSCA]; 1 ♂, same data but 18 July 1949, M. L.

& C. J. Goodnight [UMMZ]; 1 ♂, Cascada Misol-Ha, km 47, Palenque-Ocotzingo Road, 20 km S of Palenque, 17.3342°N, 91.9769°W, 94 m, 25 September 1983, R. W. Garrison [RWG]; 2 ♂♂, 3 ♀♀, stream 4.5 mi N of Bochil {17.0167°N, 92.8667°W}, 1402 m, 17 July 1965, D. R. Paulson [FSCA]; 1 ♀, stream 0.8 mi N of Bochil {16.9833°N, 92.9168°W}, 1188 m, 17 July 1965, D. R. Paulson [FSCA]; 2 ♂♂, 9 mi N of Ixtapa {16.8944°N, 16.8944°E}, 1185 m, 17 July 1965, R. E. Woodruff [FSCA]; 2 ♀♀, 27.2 mi N of Ocozocoautla {16.8°N, 93.4°W}, 610 m, 21 July 1965, D. R. & M. L. Paulson [RWG]; 1 ♀, stream 22 mi N of Ocozocoautla, 609 m, 20 July 1965, D. R. & M. L. Paulson, [FSCA]; 3 ♂♂, 3 ♀♀, stream 21.4 mi N of Ocozocoautla, 20–21 July 1965, D. R. & M. L. Paulson, [FSCA]; 1 ♀, Escopetazo River, 0.8 mi N of Escopetazo {16.7771°N, 16.7771°E}, 1127 m, 11 July 1965, D. R. Paulson [FSCA]; 2 ♂♂, 20.1 mi N of Ocozocoautla, stream, 67–226 {16.7667°N, 93.3667°W}, 609 m, 25 August 1967, D. R. & M. L. Paulson [FSCA]; 2 ♂♂, Agua Azul, 16.7594°N, 90.775°W, 134 m, 25 September 1983, R. W. Garrison [RWG]; 1 ♂, 2 ♀♀, 20 km N of Acala on road along Grijalva River, 16.6231°N, 92.2422°W, 548 m, 30 July 1981, D. E. & P. M. Breedlove [CAS]; 2 ♂♂, El Chorreadero at km 25 on Tuxtla Gutiérrez-San Cristobal Road, 24 km S of Tuxtla Gutiérrez, 16.6106°N, 93.0844°W, 720 m, 27 September 1983, R. W. Garrison [RWG]; 1 ♂, 1 ♀, 8.2 mi NE of Arriaga {16.2°N, 93.9°W}, 365 m, 25 July 1965, D. R. Paulson [FSCA]; 2 ♂♂, stream 2.7 mi SW of Unión Juárez {15.1°N, 92.1°W}, 731 m, 30 July 1965, D. R. & M. L. Paulson [FSCA]; 1 ♂, Finca San José La Victoria, km 20 on road Tapachula-Cacahoatán, 14.9725°N, 92.1521°W, 485 m, 19 November 1982, R. Novelo-Gutiérrez [INECOL]; 1 ♂, stream 0.6 mi S and 0.9 mi SW of Tuxtla Chico {14.9286°N, 92.1683°W}, 270 m, 29 July 1965, D. R. Paulson [FSCA]; **Tabasco**: 35 ♂♂, 7 ♀♀, Tepescuintle, {17.4435°N, 91.4006°W}, 25 m, 9 August 8 October 1962, E. C. Welling M. [CSCA, RWG, UMMZ]. **BELIZE, Cayo**: 3 ♂♂, 1 ♀, Mountain Pine Ridge, S of Cayo {17.1833°N, 88.8°W}, 117 m, 7–8 March 1931, A. Murie [RWG, UMMZ]; 3 ♂♂, 1 ♀, same data but 16–17 August 1992, T. Boomsma [RWG]; 1 ♀, Pinole Creek on Chiquibul Road, N of Augustine, granite riffles, mostly in open cut forest {17.0141°N, 88.9804°W}, 400 m, 22 March 1986, S. W. Dunkle [FSCA]; 1 ♂, Hidden Valley Inn, 16.9833°N, 88.8°W, 757 m, 9 December 1992, T. Boomsma [RWG]; 3 ♂♂, Mountain Equestrian Trails, VEGA, 16.9831°N, 88.8°W, 765 m, 24 May 1993, T. Boomsma [RWG]; 2 ♂♂, 2 ♀♀, Frio River at Cave, 1 mi W of Augustine, a small forest stream in hardwoods, 16.9792°N, 89.0072°W, 460 m, 23 March 1986, S. W. Dunkle [RWG]; 2 ♂♂, Mountain Pine Ridge, stream on Wolfson Drive {16.9167°N, 88.8833°W}, 600 m, 23 July 1983, T. W. Donnelly [FSCA]; 2 ♀♀, Little Vaquero Creek on Chiquibul Road, N of Augustine, mostly in granite bedrock, also small tributary through grass {16.8839°N, 89.0128°W}, 568 m, 22 March 1986, S. W. Dunkle [FSCA]; 2 ♂♂, same data but Mountain Pine Ridge Forest Preserve, 1 June 1993, W. F. Mauffray [FSCA]; 1 ♂, 1 ♀, Cow Trail, tributary Macal River, 16.8647°N, 89.0386°W, 360 m, 16 August 1992, T. Boomsma [RWG]; **Stann Creek**: 1 ♂, Cockscomb, 16.7819°N, 88.6236°W, 370 m, 19 July 1992, T. Boomsma [RWG]; 1 ♂, Alabama, Cockscomb Jaguar Wildlife Preserve, tributaries to and along S Stann Creek {16.75°N, 88.45°W}, 85 m, 3 June 1993, W. F. Mauffray [FSCA]; **Toledo**: 1 ♂, 1 ♀, Columbia River Forest Reserve, 16.2703°N, 88.9533°W, 30 m, 4 April 1993, T. Boomsma [RWG]; 4 ♂♂, San Antonio, W at Jute Cove below falls {16.2358°N, 89.0344°W}, 118 m, 6 June 1993, W. F. Mauffray [FSCA]; 1 ♂, 1 ♀, Blue Creek Village, Blue Creek {16.1978°N, 89.0421°W}, 42 m, 5 June 1993, W. F. Mauffray [FSCA]; 1 ♂, Temash River {15.9764°N, 88.9419°W}, 11 m, May 1934, J. J. White [RWG]. **EL SALVADOR, La Unión**: 1 ♂, Monteca, Lajitas River, 13.8756°N, 87.8413°W, 925 m, 25–27 April 1998, V. Hellebuyck [RWG]. **GUATEMALA, Izabal**: 2 ♂♂, 1 ♀, ca. 8 mi SW of Livingston, Tatín River at mouth of El Golfete Lake {15.8333°N, 88.75°W}, 0 m, 2 July 1964, F. G. Thompson [FSCA]; 2 ♂♂, 8 mi SW of Puerto Matías de Galvez {15.7°N, 88.6167°W}, 7 m, 24 June 1964, F. G. Thompson & D. A. Dean [FSCA]; 1 ♂, Las Escobas, 5 km SW of Puerto Matías de Galvez {15.6833°N, 88.6333°W}, 56 m, 13 August 1965, T. W. Donnelly [FSCA]; 6 ♂♂, 2 ♀♀, same data but 68x020, 24–25 August 1968 [FSCA]; 1 ♀, Puerto Matías de Galvez {15.6768°N, 88.6121°W}, 60 m, 14–15 August 1965, P. J. Spangler [USNM]; **Alta Verapaz**: 2 ♂♂, Cahabón River at Chibite {15.5889°N, 89.7304°W}, 200 m, 3 January 1989, B. Kondratieff [FSCA]; 2 ♂♂, Cobán, 64x068 {15.5°N, 90.4°W}, 1200 m, 5 September 1964, T. W. Donnelly [FSCA]; 1 ♂, Chilax Creek, SE of Cobán {15.4333°N, 90.3332°W}, 1370 m, 17 August 1974, Klaus Böttger [CSCA]; 2 ♂♂, Chilax Creek, SE of Cobán, 15.4333°N, 90.3332°W, 1370 m, 17 August 1974, K. Böttger [RWG]; **Zacapa**: 1 ♂, Quebrada La Ceiba, 2 km W of Juan de Paz, 76x025 {15.2364°N, 89.1842°W}, 100 m, 24 August 1976, T. W. Donnelly [FSCA]; **El Progreso**: 4 ♂♂, Finca La Cajeta near La Virgen Station {14.7833°N, 90.7333°W}, 700 m, 10 September 1964, T. W. Donnelly [FSCA]; **Guatemala**: 26 ♂♂, 1 ♀, El Fiscal {14.7217°N, 90.3917°W}, 1120 m, 3–6 June 1909, E. B. Williamson [RWG]; **Chiquimula**: 3 ♂♂, Lucía Sazo River at Padre Miguel {14.5667°N, 89.45°W}, 800 m, 9–18 July 1962, T. W. Donnelly [FSCA]; **Suchitepéquez**: 1 ♂, Finca Moca Grande {14.5336°N, 91.2517°W}, 400 m, 12 July 1977, M. J. Westfall, Jr.

[FSCA]; 37 ♂♂, 5 ♀♀, Mazatenango {14.5333°N, 91.5°W, 363 m}, 3 February 1905, E. B. Williamson & J. S. Hine [RWG, UMMZ]; 4 ♂♂, 1 ♀, same data but 10–13 February 1905, Maxon & Hay [USNM]; **Amatitlán**: 1 ♀, Amatitlán {14.4833°N, 90.6167°W}, 1209 m, 8 June 1909, E. B. Williamson [RWG]; **Escuintla**: 15 ♂♂, 2 ♀♀, Escuintla, collected along a small stream near town {14.305°N, 90.785°W}, 355 m, 31 January–14 February 1905, A. & E. B. Williamson [RWG, UMMZ]; 3 ♂♂, 2 ♀♀, same data but Finca El Salto, 22 June 1977, M. J. Westfall, Jr. [FSCA]; 31 ♂♂, 2 ♀♀, Santa Lucía, 14.2833°N, 90.7833°W, 335 m, 1–2 February 1905, E. B. Williamson [CSCA, RWG, UMMZ]. **HONDURAS, Colón**: 1 ♀, Trujillo {15.9167°N, 85.9542°W}, 24 July 1968 [FSCA]; **Atlántida**: 1 ♂, Tela {15.7833°N, 87.45°W}, 2 m, 22 March 1923, T. H. Hubbell [UMMZ]; 2 ♂♂, 4 km S of Yaruca {15.5667°N, 86.65°W}, 300 m, 12 August 1976, A. J. & T. W. Donnelly [FSCA]; **Cortés**: 1 ♂, Santo Tomás Camp, Cusuco National Park, above river close to camp behind football field [mesothoracic leg removed for molecular studies], 15.5617°N, 88.3002°W, 489 m, 4 August 2009, M. Jocque, [RWG]; 3 ♂♂, 1 ♀, same data but river behind camp, muddy, on low vegetation, Cusuco National Park, ODO 22, 23, 15.5608°N, 88.2981°W, 520 m, 14–17 July 2011, M. Jocque [RWG]; 1 ♂, San Pedro Sula, 15.5°N, 88.0333°W, 83 m, 27 February 1905, E. B. Williamson [RWG]; **Olancho**: 2 ♂♂, Nance River and small tributary to the NE, just W of Campamento {14.5511°N, 86.6758°W}, 700 m, 3 March 1990, S. W. Dunkle [FSCA]; **Francisco Morazán**: 4 ♂♂, 1 ♀, Zamorano, Quebrada El Gallo, small stream {14.0167°N, 87.0333°W}, 650 m, 7–8 March 1990, S. W. Dunkle [FSCA]; 1 ♂, 30 km ESE of Tegucigalpa, Quebrada before Aguacate {13.9526°N, 87.1273°W}, 1665 m, 22 March 1983, Solís [FSCA]. **NICARAGUA, Jinotega**: 1 ♂, ford on road, 2 km S of Wiwili, 01x067, 13.5919°N, 85.8086°W, 500 m, 1 August 2001, T. W. Donnelly [FSCA]; **Matagalpa**: 3 ♂♂, stream 10 km SE San Ramón, 74x007 {12.9°N, 85.8°W}, 700 m, 18–20 June 1974, T. W. Donnelly [FSCA]; **Boaco**: 1 ♂, streams 15 km E of Boaco {12.4774°N, 85.5467°W}, 350 m, 21 June 1974, A. J. & T. W. Donnelly [FSCA]. **COSTA RICA, Cartago**: 1 ♂, Pitilla Station, Guanacaste Conservation Area, 9 km S of Santa Cecilia, L-N 330200, 380200, INBIO CRI0001113226, 10.9925°N, 85.4294°W, 700 m, November 1991, C. Moyaga [INBIO]; 1 ♂, Reventazón Valley below Juan Viñas (formerly Infiernillo) {9.9°N, 83.75°W}, 762 m, 28 June 1909, P. P. Calvert [FSCA]; 1 ♂, Turrialba, Azul River {9.9°N, 83.6833°W}, 638 m, 27 July 1909, P. P. Calvert [FSCA]; 1 ♀, same data but IICA, field forest edge, 17 July 1968 [UMMZ]; 5 ♂♂, Chirripo Valley, 30 mi SE of Turrialba, Tshipiri River, 9.6914°N, 83.4286°W, 760 m, 24 March 1989, J. Ryan [RWG]; **Guanacaste**: 4 ♂♂, 2 ♀♀, Maritza Biological Station, Guanacaste National Park, 10.9568°N, 85.495°W, 590 m, 6–17 May 1991, G. & V. Pritchard & J. Zloty [RWG]; 1 ♂, same data but Quebrada Tempisquito, L-09-288 {10.95°N, 85.5°W}, 600 m, 23 July 1991, C. Esquivel-Herrera [UNH]; 2 ♂♂, Parque Nacional Guanacaste, INBO CR1000113126-7, 10.9019°N, 85.7311°W, 40 m, 31 August 1990, M. A. Zumbado [INBIO]; 1 ♂, 1 ♀, Azufrado River, 14 mi N of Liberia {10.8°N, 85.5333°W}, 122 m, 26 May 1991, V. Pritchard [RWG]; 1 ♂, 1 ♀, Volcán Cacao slope, Cacao Station, 2 km SW of Cerro Cacao {9°N, 82.8256°W}, 1200 m, 21–29 May 1992, M. A. Zumbado [INBIO]; **Heredia**: 1 ♀, Sarapiquí, Magsasay (previously known as El Plástico), L-03-880, {10.4017°N, 84.0551°W}, 16 September 1993, J. P. Benstead [UNH]; 2 ♂♂, 1 ♀, Braulio Carrillo National Park, open river riffle, on stone and forest stream bankside, on leaf top {10.35°N, 84.0568°W}, 30 m, 25–26 May 1990, S. J. Brooks [BMNH]; 2 ♂♂, same data but Quebrada Cantarrana, 11 km ESE of La Virgen, L-03-856 {10.35°N, 84.0568°W}, 30 m, 19 July 1990, C. Esquivel-Herrera [RWG, UNH]; 1 ♂, La Selva Biological Station, 10 km SW of Horquetas [95x002], {10.3°N, 84.05°W}, 600 m, 24–28 March 1995, T. W. Donnelly & A. Ramírez [FSCA]; 4 ♂♂, Para Blanco River, Yerbabuena and Huacalillos Streets, L-03-831 {10.0328°N, 84.0212°W}, 1430 m, 24 April 2003, C. Esquivel-Herrera [UNH]; 1 ♂, transecta altitudinal La Selva, Barba, L-03-1259 {9.8465°N, 83.5956°W}, 1070 m, 11 April 2000, R. Vargas [UNH]; **Alajuela**: 1 ♂, Angel River, L-03-463 {10.2583°N, 84.1833°W}, 930 m, 30 October 1989, C. Esquivel-Herrera [UNH]; 1 ♂, San Lorencito River and tributaries, San Ramón Forestal Preserve, 10.2161°N, 84.6069°W, 1065 m, 13–16 June 1988, C. M., O. S. Flint, Jr. & R. W. Holzenthal [USNM]; **Limón**: 1 ♂, Guápiles, in forest {10.2158°N, 83.7867°W}, 304 m, 7 July 1967, M. J. Westfall, Jr. & D. N. Westfall [FSCA]; 1 ♂, Segundo River, affluent of Banano River, INBIO CRI001096821, 9.9°N, 83.1167°W, 110 m, 28 April 1985, A. Solís [INBIO]; **San José**: 2 ♂♂, 2 ♀♀, Braulio Carrillo National Park, Quebrada Sanguijuela, L-09-65 {10.16°N, 83.9631°W}, 800 m, 30 December 1988, J. Corrales M. [RWG, UNH]; 4 ♂♂, 1 ♀, same data but L-09-70, 84, 6 July 1989 [RWG, UNH]; 4 ♂♂, 1 ♀, same data but 742 m, 12 June 1988, C. M., O. S. Flint, Jr. & R. W. Holzenthal [CSCA, RWG]; 1 ♀, 8 km E of Dominical on road to San Isidro, 9.285°N, 83.825°W, 25 March 2006, F. C. Sibley [FSCA]; 1 ♂, San José {9.928°N, 84.0907°W}, 1160 m, 11 June 1900, H. Schmidt [FSCA]; 12 ♂♂, 1 ♀, Hacienda El Rodeo, 7 km W of Villa Colón [CR7], 9.9136°N, 84.2694°W, 859 m, 28 May 2013, R. W. Garrison & N. von Ellenrieder [RWG]; **Puntarenas**: 1 ♂, Macacona de Esparta {10°N, 84.6167°W}, 253 m, 1 January–28 February 1905, P. Biolley

[FSCA]; 1 ♂, 8.1 mi WNW of Esparta {9.9833°N, 84.6668°W}, 60 m, 26 June 1967, M. J. Westfall, Jr. & D. N. Westfall [FSCA]; 1 ♂, Cataratas River where it crosses Pan-American Highway N of Paso Real, 9.0633°N, 83.27°W, 155 m, 23 January 2005, F. C. Sibley [FSCA]; 1 ♂, 1 ♀, Las Alturas Preserve, second stream crossing after entering main gate on way to town of Las Alturas, 8.92°N, 82.8417°W, 1304 m, 16 March 2006, F. C. Sibley [FSCA]; 1 ♂, **San Vito, Coto Brus, Las Cruces**, INBIO CRI00096813, 8.8233°N, 82.9582°W, 1075 m, 11–16 July 1988, I. A. Chacón [INBIO]; 1 ♂, 3 mi S of San Vito, Finca Moss, 8.795°N, 82.9483°W, 1277 m, 14 March 2006, F. C. Sibley [FSCA]; 3 ♂♂, Campo Dos y Medio, stream along Villa Neily-San Vito road, 90x024 {8.7167°N, 82.9333°W}, 1000 m, 19 July 1990, T. W. Donnelly [FSCA]; 2 ♂♂, 5 km from Agua Buena on road to Ciudad Neily, forest stream, 8.7133°N, 82.935°W, 1048 m, 20 March 2006, F. C. Sibley [FSCA]. **PANAMA, Bocas del Toro**: 1 ♂, Charco la Pava, 2007-302, 9.2333°N, 82.5333°W, 180 m, 13 June 2007, J.-P. Haenni [LJ]; **Chiriquí**: 1 ♂, Boquete {8.7747°N, 82.4319°W}, 1083 m, 9 March 1923, F. M. Gaige [UMMZ]; 1 ♂, Potrerillos {8.65°N, 82.4833°W}, 664 m, 15 April 1934, D. V. Brown [FSCA]; 6 ♂♂, same data but 7–8 February 1935, J. W. MacSwain [RWG, UMMZ]; **Ngäbe-Buglé**: 2 ♂♂, Jirandai Burri, S of Willie Mazu pond, Carretera 10, 8.8133°N, 82.1808°W, 410 m, 5 April 2017, J. J. Daigle [JJD, RWG]; **Veraguas**: 3 ♂♂, road to Luis River, Quebrada Pera {8.5732°N, 81.1972°W}, 252 m, 13–16 September 2016, W. F. Mauffray [FSCA, RWG]; 4 ♂♂, near Santa Fé, Santa Fé National Park, road to Caribbean large stream and waterfall, 12x052, 8.5655°N, 81.1879°W, 345 m, 6 August 2012, Thomas W., A. Donnelly & J. Michalski [FSCA]; 2 ♂♂, road to Luis River, Quebrada Piedra de Moler, 8.5567°N, 81.1789°W, 410 m, 13 September 2016, J. J. Daigle [RWG]; 1 ♂, Santa Fé National Park near Santa Fé, road to Caribbean large stream, 12x050, 8.5503°N, 81.1651°W, 450 m, 6 August 2012, T. W. Donnelly [FSCA]; 1 ♂, Santa Fé, ca. 11 km NW of Alto de Piedra on Santa Fé National Park Road, tributary to Maluba River, 8.5314°N, 81.1494°W, 750 m, 25 May 2016, W. F. Mauffray [FSCA]; 1 ♂, Alto de la Piedra, Quebrada near Santa Fé, 10x022, 8.5147°N, 81.1219°W, 900 m, 14 June 2010, T. W. Donnelly [FSCA]; 2 ♂♂, same data but 850 m, 8 August 2012, T. W. Donnelly & J. Michalski [FSCA]; 1 ♂, San José, La Yeguada, Balneario and outlet tributary, 8.4617°N, 80.8436°W, 690 m, 14 June 2010, J. J. Daigle [RWG]; **Coclé**: 1 ♂, Altos de María, above El Valle de Antón, rainforest stream above lake, 8.6333°N, 80.1333°W, 800 m, 2 September 2012, D. R. Paulson [FSCA]; 1 ♂, El Valle de Antón, 50 mi NW of Panama City {8.6167°N, 82.1333°W}, 624 m, 7 January 1946, D. W. Jenkins [UMMZ]; **Colón**: 2 ♂♂, Rita Arriba River, Sierra Llorona Lodge, stream on Nances Trail, 12x091, 9.3428°N, 79.7744°W, 180 m, 23 August 2012, T. W. Donnelly, [FSCA]; **Panamá**: 1 ♂, Cerro Azul {9.1667°N, 79.4168°W}, 646 m, 4 April 1970, E. S. Morton [FSCA]; 1 ♂, Cerro Campana, stream and bog {8.7167°N, 79.9°W}, 640 m, 27 May 1974, M. L. May [FSCA]; 2 ♂♂, 2 ♀♀, Cerro Campana near Chicá {8.6931°N, 79.9028°W}, 200 m, 11–15 July 1967, O. S. Flint, Jr. & M. A. Ortiz B. [FSCA, USNM]; 4 ♂♂, same data but 12 June 1970, E. S. Morton [FSCA]; 1 ♂, Chicá, small stream, 12x085, 8.6653°N, 79.9369°W, 180 m, 21 August 2012, A. J. & T. W. Donnelly & J. Michalski [FSCA]. **COLOMBIA, Tolima**: 3 ♂♂, Mariquita {5.2011°N, 74.9128°W}, 450 m, 3 February 1917, J. H. Williamson & E. B. Williamson [UMMZ].

A medium to large species (Table 2); male predominantly black and violaceous (Figs. 155, 390, 391, 852, 1002) or blue (Figs. 156–158, 392, 851, 1001) with cercus bifid with inner branch longer than outer branch; female tan with a blue-tipped abdomen (Figs. 851, 1003) and mesostigmal lobe longer than wide (Figs. 583–586) and with a tubercle on mesepisternum posterolateral to mesostigmal lobe.

Diagnosis. Garrison & von Ellenrieder (2018) compared this species to *A. adamsi*, and both sexes of *A. ulmeca* were described thoroughly in Westfall & May (2006). Both sexes are diagnosed under *A. adamsi*.

Remarks. This is a highly variable species in size and color pattern. These differences coupled with variability of the male caudal appendages and mesostigmal plates led L. K. Gloyd to apply manuscript names for some and to label others as “ulmeca group,” as several of these specimens did not conform to Calvert’s original description of this species. Similar differences were noted by Paulson (2002b) and Upson *et al.* (2007). However, Calvert (1907) commented further on the variability of this species when supplementary material primarily from Guatemala differed from his original series: “Some Neuropterists may consider the Pacific Guatemalan specimens to be sufficiently distinct to receive a sub specific or racial name, but I think the transitions to the typical *ulmeca*, as indicated above, justify retaining all under the name here employed. I can find no structural differences.” We illustrate differences in the comparative sizes and length of the inner branch of the cercus. In some populations, the inner branch is about three times longer than wide (Figs. 746c, 747c) while in others, the inner branch is short and robust and is no more than twice as long as wide (Figs. 748c, 749c), the latter approaching the condition found in *A. adamsi* (Fig. 661c). Pale body coloration ranges from violaceous (Figs. 155, 390, 391, 852, 1002) to blue (Figs. 156–158, 392, 851,

1001) or combinations thereof. The Pacific Guatemalan form (Figs. 155, 1002) mentioned by Calvert has a thin black humeral stripe, while in most other populations, this stripe is broad and may be solid (Fig. 157) or forked at the dorsal end (Figs. 156, 158). S8 in most males of *A. ulmeca* is pale dorsally (Fig. 391) but those from the Los Tuxtlas area in Veracruz and from Nayarit (Paulson 2002b) are partially black (Fig. 392). We have also seen males from the same locality in Panama with an entirely pale (Fig. 391) or black (Fig. 390) S8. Despite these variations, all share a common morphology of cercus (inner branch longer than outer branch, Figs. 745c–749c) and genital ligula (distal segment with basal membranous hood quadrate and lateral lobes with tips aciculate, Fig. 655). The various lengths of the inner branch in the male of *A. ulmeca* are also matched by the differences in development of the female mesostigmal lobe, ranging from a small poorly developed lobe in those from Los Tuxtlas area (Fig. 586) to a well-developed lobe in other populations (e. g., Figs. 583–585). The differences mentioned and illustrated here seem to intergrade geographically, and we have been unable to find a set of disjunct characters that would reliably allow for placement into separate species.

Caesar & Wenzel (2009) in their phylogenetic analysis of adults based on molecular and morphological data placed *A. ulmeca* as sister to *A. garrisoni* and these two as sister to *Argia* new species (= *A. herberti*), as follows: (*A. herberti* (*A. garrisoni*, *A. ulmeca*)). Neither *A. adamsi* nor *A. calida* were included in their study. A similar study based on larvae by Torres-Pachón *et al.* (2017) placed *A. ulmeca* along with *A. moesta* as sister to *A. tezpi* and *A. translata* clade and the “percellulata” clade as follows: (*A. moesta*, *A. ulmeca* ((*A. cuprea*, *A. oenea*) ((*A. barretti*, *A. harknessi*) (*A. percellulata*, *A. joergensenii*)))), but they provided no comment pertinent to *A. ulmeca*. Further studies including morphological characters of adults will likely result in a placement of this species different from that shown in these two studies.

Garrison & von Ellenrieder (2015) reported a tandem of a ♀ *A. oculata* with a ♂ *A. ulmeca* (Hidalgo, small stream 25 km NE of Chapulhuacán).

Distribution. *Argia ulmeca* ranges from SE Sonora south through Panama, with one collection record from Colombia, and along the E coast of Mexico N to Nuevo León (Fig. 795). The distributions of *A. adamsi* and *A. ulmeca* overlap from Honduras to Colombia. This frequently encountered species occurs from near sea level to about 1800 m (Pinal de Amoles, escurridero 500 m before Puente de Dios, Querétaro, ex: portal de datos abiertos UNAM).

Argia underwoodi Calvert, 1907

Figs. 158 (thorax ♂), 159 (head, thorax, S1–4 ♂); 266 (head, thorax, S1–4 ♀); 393 (S7–10 ♂); 487 (S1–10 ♀); 587 (mesostigmal plates ♀); 656 (genital ligula); 750 (appendages ♂); 784 (map); 853 (field photo ♂); 931 (body scan ♂); 932 (body scan ♀).

[Key locators: ♂ G-2, couplet 6'; ♂ M-5, couplet 22(21); key to females, couplet 5(4')]

Argia underwoodi Calvert 1907: 366 (description ♂, ♀, pl. VIII, figs. 36, 37, 37s);—Kimmins 1970: 192 (holotype data);—Paulson 1982: 253 (Costa Rica);—Ramírez *et al.* 2000: 249 (Costa Rica);—Förster 2001: 11, 54, 58 (key ♂, fig. C25);—Garrison & von Ellenrieder 2013: 16 (Costa Rica, fig. 21, photo 28);—Paulson & Haber 2021: 100 (diagnosis, photos, Costa Rica).

Argia (Heliargia) underwoodi: Kennedy, 1920: 85 (in subgenus *Heliargia*).

Primary types. *Argia underwoodi*: holotype ♂, COSTA RICA, San José, Carrillo, Cecil F. Underwood leg. [examined, in BMNH].

Specimens examined. 99 ♂♂, 15 ♀♀: **COSTA RICA, Puntarenas:** 1 ♂, Monteverde, Guacimal River and small streams in biological reserve, 86x009 {10.6°N, 85.3°W}, 1600 m, 7 June 1986, T. W. Donnelly [FSCA]; 15 ♂♂, 2 ♀♀, Monteverde, Canadiense Biological Preserve, streams in primary cloud forest [CR24], 10.3225°N, 84.8086°W, 1534 m, 6 June 2013, R. W. Garrison & N. von Ellenrieder [CNIN, CSCA, MNRJ, RWG]; 1 ♂, Monteverde, Monteverde Biological Station, Peñas Blancas River, CR1001-113254-55 {10.3189°N, 84.8083°W}, 1540 m, 30 October 1990, E. Bello [INBIO]; 14 ♂♂, Monteverde, San Luis River, steep open seepage along trail [CR22], 10.2781°N, 84.7861°W, 1176 m, 5 June 2013, R. W. Garrison & N. von Ellenrieder [CSCA, HZ, RWG]; 1 ♂, Braulio Carrillo National Park, Quebrada Sanguijuela {10.16°N, 83.9631°W}, 800 m, 12 June 1988, C. M., O. S. Flint, Jr. & R. W. Holzenthal [RWG]; 1 ♂, same data but L-09-84 6 July 1989, C. Esquivel-Herrera [UNH];

1 ♀, Cataratas River where it crosses Pan-American Highway N of Paso Real, FCS05-0349, 9.0633°N, 83.27°W, 160 m, 23 January 2005, F. C. Sibley [RWG]; 1 ♂, Coto Brus Canton, 5 mi S of San Vito, Tower Pond, FCS11-136, 8.7883°N, 82.9881°W, 1453 m, 2 April 2011, F. C. Sibley [FSCA]; **Heredia**: 1 ♂, 1 ♀, Sarapiquí, Magsasay (previously known as El Plástico), L-03-880 {10.4017°N, 84.0551°W}, 29 November 1993, J. P. Benstead [UNH]; 2 ♂♂, waterfall 4.7 mi N of Vera Blanca, 66-251 {10.2073°N, 84.1638°W}, 1420 m, 22 September 1966, D. R. & M. L. Paulson [FSCA]; 1 ♂, waterfalls on Sarapiquí River, near Montaña Azul, 68x013 {10.1933°N, 84.1542°W}, 1600 m, 12 August 1968, T. W. Donnelly [FSCA]; 1 ♀, Barva Volcano, 2.7 km N of San José de la Montaña {10.109°N, 84.1013°W}, 2300 m, 20 July 1963, F. G. Thompson [FSCA]; 1 ♂, altitudinal transect La Selva, Barba, L-03-1254 {9.8465°N, 83.5956°W}, 1070 m, 11 April 2000, R. Vargas [UNH]; **Alajuela**: 3 ♂♂, Sarapaquí River, offside road to Sarapaquí River 16 km N of Vara Blanca, 10.3061°N, 84.1671°W, 505 m, 12 August 1979, R. W. & J. A. Garrison [RWG]; 1 ♂, 1 ♀, 10 mi N of Vara Blanca, waterfall on forest edge, 67-123 {10.3°N, 84.1875°W}, 762 m, 16 June 1967, D. R. Paulson [RWG]; 2 ♂♂, same data but streams and waterfalls, 24 June 1967, M. J. Westfall, Jr. & D. N. Westfall [FSCA]; 1 ♂, Cariblanco, open sunny stream {10.2678°N, 84.1818°W}, 730 m, 5 June 1990, S. J. Brooks [BMNH]; 1 ♂, San Lorencito and tributaries, San Ramón Forest Preserve {10.2161°N, 84.6069°W}, 1065 m, 13–16 June 1988, C. M., O. S. Flint, Jr. & R. W. Holzenthal [RWG]; 1 ♀, same data but 980 m, 1–4 May 1990, R. Hozenthal & R. J. Blahnik [RWG]; 2 ♂♂, waterfalls near Montaña Azul, 62x057 {10.2066°N, 84.1638°W}, 1425 m, 16 June 1962, T. W. Donnelly [FSCA]; 3 ♂♂, Vara Blanca River at Cascada La Paz, 11 May 1995, B. O. Huntsman & R. W. Baumann [BYU]; **San José**: 3 ♂♂, Carrillo {10.1477°N, 83.9479°W}, 470 m, C. F. Underwood [BMNH, MCZ, UMMZ]; 3 ♂♂, 1 ♀, tributary of Cascajal River at Bajo La Rosa {10.07°N, 83.9666°W}, 1000 m, 3 May 1995, B. O. Huntsman & R. W. Baumann [BYU, FSCA, RWG]; 6 ♂♂, Coronado, beginning of Quebrada Varela, primary and secondary forest, 13°C water, L-03-1052, 1053 {10.006°N, 83.9587°W}, 1900 m, 21 August 2001, C. Esquivel-Herrera [RWG, UNH]; 1 ♂, 1 ♀, same data but L-03-1059, 21 October 2003 [UNH]; 2 ♂♂, San Antonio, Escazú, Quebrada Herrera, L-03-876, 911 {9.9189°N, 84.14°W}, 1276 m, July 2001, C. Esquivel-Herrera [UNH]; 3 ♂♂, Aserri, small Quebrada ending at Curubres River, L-03-1103, 1006, 1109 {9.8747°N, 84.1044°W}, 24 July 2001, C. Esquivel-Herrera [UNH]; 1 ♂, Quebrada Quebradas, Cañas River, Salitrillos, Aserri, popen area, L-03-1067 {9.8747°N, 84.1044°W}, 1550 m, 24 July 2001, C. Esquivel-Herrera [UNH]; 3 ♂♂, 1 ♀, Santa Ana, Uruca River headwaters, in primary forest, L-03-907, 1002, 1063 {9.8683°N, 84.1587°W}, 1980 m, 25 June 2002, C. Esquivel-Herrera [UNH]; 1 ♂, same data but 5 May 2009, German Vega [RWG]; 1 ♂, km 118 on Pan American Highway, Tolomuco Forest, FCS11-010, 9.4717°N, 83.6968°W, 1710 m, 24 March 2011, F. C. Sibley [FSCA]; 2 ♂♂, same data but in brushy pasture on forested hillside, numerous seeps and trickles through pasture, mostly sunny, FCS06-0531, 27 March 2006 [FSCA]; 1 ♂, Mesón de Poas, L-03-875, 17 July 2001, C. Esquivel-Herrera [UNH]; **Cartago**: 1 ♂, 1 ♀, Chitaría River, 30.7 km SW of Siquirres {9.9186°N, 83.6033°W}, 795 m, 6 March 1987, S. W. Dunkle [RWG]; 1 ♂, Chitaría River, 15 km E of Turrialba, 86x011, 700 m, 9 June 1986, T. W. Donnelly [FSCA]; 1 ♂, Turrialba {9.9°N, 83.65°W}, 1000 m, 10 May 1960, R. B. Cumming [FSCA]; 1 ♂, railroad from Quebrada Honda to Juan Viñas {9.8996°N, 83.7753°W}, 1400 m, 1 August 1909, P. P. Calvert [FSCA]; 1 ♀, La Carpintera Hills, L-03-1070 {9.8992°N, 83.9708°W}, 1500 m, 14 August 2001, C. Esquivel-Herrera [UNH]; 1 ♂, 1 ♀, Juan Viñas {9.8867°N, 83.752°W}, 800 m, 29 July 1909, P. P. Calvert [FSCA]; 1 ♂, same data but coffee plantation, 27 July 1909 [FSCA]; 1 ♂, same data but 66-240 {9.8867°N, 83.752°W}, 800 m, 1 September 1966, D. R. & M. L. Paulson [FSCA]; 1 ♂, near waterfall near Reventazón bridge {9.8712°N, 83.7534°W}, 740 m, 1 May 1910, P. P. Calvert [FSCA]; 1 ♂, Tapantí National Park, tributary to Humo River ca. 8 km S of Tapantí, 86x003 {9.7258°N, 83.7761°W}, 1600 m, 28 May 1986, T. W. Donnelly [FSCA]; 8 ♂♂, 2 ♀♀, Tapantí National Park, unnamed tributaries ca. 9 km NW of tunnel, 9.72°N, 83.78°W, 1400 m, 8–9 June 1988, C. M., O. S. Flint, Jr. & R. W. Holzenthal [CSCA, RWG]; 1 ♂, Tapantí National Park, Dos Amigos River and falls, ca. 6 km NW of tunnel {9.7042°N, 83.7831°W}, 1562 m, 4–5 August 1990, R. W. Holzenthal, R. Blahnik, F. J. Muñoz [FSCA]; 1 ♂, Tapantí National Park, waterall ca. 1 km NW of tunnel {9.69°N, 83.76°W}, 1600 m, 10 June 1988, C. M., O. S. Flint, Jr. & R. W. Holzenthal [RWG]; 1 ♂, same data but 20 June 1991, J. Zloty [RWG]. **PANAMA, Chiriquí**: 1 ♂, Potrerillos {8.65°N, 82.4833°W}, 664 m, 8 February 1935, J. W. MacSwain [UMMZ].

A medium to large (Table 2), predominantly dark (Figs. 159, 393, 931, 932) species; male with thorax violaceous with black broad middorsal and humeral stripes and a largely black abdomen, with S1 and basal half of S2 violaceous (Figs. 158, 853); cercus unique, about twice as long as wide, bifid, with distal medial margin immediately before narrow decumbent inner branch (tooth) greatly swollen in dorsolateral view (Fig. 750a); female with uniquely shaped mesostigmal plate: posterolateral corner forming a prominent raised mesostigmal lobe so that lateral portion of mesostigmal plate is subquadrate (Figs. 587c, d).

Redescription. Calvert's (1907) description was based on nine males and one female from Carrillo, Costa Rica; we supplement Calvert's description of this little-known species as follows.

Male (Costa Rica, Puntarenas, Monteverde, Estación Biológica Canadiense, Figs. 159, 393, 931): Head. Labium, anteclypeus and genae and ante- and postfrons violaceous blue, postclypeus and base of mandibles black, epicranium black with small pale spot anterolateral to lateral ocellus, black appearing as a broad cross-band delimited posteriorly by large violaceous postocular spots confluent with eye margin, pale occipital bar lacking, dorsal surface of postocular lobe black; antennae black, rear of the head black with narrow pale line bordering eye margin. Prothorax black with following areas violaceous blue: anterior lobe, small mediolateral spot on middle lobe, propleuron and lateral margin of posterior lobe.

Pale areas of pterothorax violet (antehumeral stripe) to violet-blue, with a broad black middorsal stripe about four times as wide as narrow wedge-shaped antehumeral stripe; parallel black humeral stripe broad, about twice as wide as pale antehumeral and the former connecting with middorsal stripe along antealar carina and encompassing vestigial interpleural suture; remainder of thorax violet-blue with well-defined metapleural stripe. Wings hyaline, with venation black; Pt brown, surmounting 1 cell in all wings; px Fw 18/17, Hw 15/15; px Fw 3/3, Hw 3/3; RP2 at Fw 7.5/7.5, Hw 6/6. Coxae violet-blue posteriorly, black anteriorly; remainder of legs black. Abdomen mostly black; S1 blue with a black basal ring; S2 violet-blue dorsally, black laterally, black stripe on S2 with an anteapical projection not connecting dorsally, posterior violet-blue expanding laterally to ventral margin of segment, annulus black; S3 with violet-blue stripe dorsally prolonged posteriorly and ending at posterior fifth, remainder of segment black; S4–7 black; S8–9 blue dorsally, black laterally, S10 black.

Genital ligula (Fig. 656) with geniculate lateral lobes followed distally by flexible single slightly curved apical flagellum as well as a prominent longitudinal roundly quadrate boss.

Torus transversely oval, swollen, occupying entire ventral margin of torifer but not overlapping bilobed epiproct (Fig. 750c), base of epiproct and surrounding area black; cercus in dorsal view about twice as long as wide, and distance between cerci about twice each cercus width (Fig. 750c), bifid apically with slightly decumbent inner branch (tooth) separated from broader outer branch by a shallow concavity; the inner a decumbent tooth extending almost as far posteriorly as outer branch in dorsal and mediodorsal views; distal half of medial margin of cercus with a well-developed convex lobe in mediodorsal view; cercus subequal to slightly longer than paraproct, the latter bilobed, its ventral branch smaller than dorsal branch, in lateral view tip of dorsal branch bluntly acuminate (as in Fig. 750b), ventral branch bluntly triangular.

Dimensions. Hw 24.0, abdomen 30.9, total length 39.2.

Female (Costa Rica, Puntarenas, Monteverde, Estación Biológica Canadiense, in tandem with male, Figs. 266, 487, 932): similar to male but pale colors tan (antehumeral stripe) and blue. Head and prothorax as in male; pterothorax differs from male as follows: antehumeral stripe tan, a little wider than in male, remainder of pale areas blue; S2 entirely black except for pale dorsal spot at basal half and small blue posterolateral spot; S3–5 black except for pale basal half rings separated by black dorsally, S7 entirely black, S8 with a blue dorsolateral spot extending to distal fourth, remainder black; S9–10, cerci and ovipositor black. Pt surmounting 1 cell in all wings; px Fw 17/18, Hw 15/16; px Fw 3/3, Hw 3/3; RP2 at Fw 8/8, Hw 6/6. Mesostigmal plate with posterolateral corner forming a prominent raised mesostigmal lobe so that lateral portion of mesostigmal plate is subquadrate in profile (Fig. 587c, d).

Dimensions. Hw 24.4, abdomen 28.4, total length 36.0.

Diagnosis. Male easily distinguished from all congeners within Mexico and Central America by the well-developed convex lobe at distal half of cercus when viewed in mediodorsal view (750a). Female easily distinguished from all others by the posterolateral corner of mesostigmal plate forming a prominent raised mesostigmal lobe so that lateral portion of mesostigmal plate is subquadrate (Fig. 587c, d). Further differences are discussed under *A. herberti* and *A. talamanca*.

Remarks. Calvert's (1907) illustration of the cercus (pl. VIII, fig. 37s) is somewhat diagrammatic, showing a longitudinal seam dividing the dorsal and ventral parts of the cercus; this area consists only of a slight depression (Fig. 750a). Calvert's (1907) illustration of the left mesostigmal lobe (pl. VIII, fig. 36) depicts more of a rounded lateral margin compared to our illustrations, but subsequent examination of other females validates our characterization as illustrated in Fig. 587.

Habitat. We collected a series of this species along streams in primary cloud forest at Estación Biológica Canadiense, Monteverde. According to Paulson & Haber (2021) it is associated with waterfalls more than any other Middle American *Argia*.

Distribution. This is a poorly known species, thought until recently to be endemic to Costa Rica (Paulson & Haber 2021), but its occurrence in Panama documented here (Fig. 784) is not surprising. This montane species ranges from 160 to over 2500 m (Costa Rica: San José, Poas Volcano, in FSCA).

Argia variabilis Selys, 1865

Figs. 160 (head, thorax, S1–4 ♂), 161 (thorax ♂); 267 (head, thorax, S1–4 ♀); 268 (thorax ♀); 394 (S7–10 ♂); 488 (S1–10 ♀); 588 (mesostigmal plates ♀); 657 (genital ligula); 751 (appendages ♂); 767 (type labels); 774 (map); 863 (body scan ♂); 864 (body scan ♀).

[Key locators: ♂ G-1, couplet 3'; ♂ M-6, couplet 11'; F-10 couplet 1]

Argia variabilis Selys 1865: 406 (34 reprint) (description ♂);—Calvert 1902: 91 (description ♂ in part, pl. IV, fig. 53);—Calvert & Hagen 1902: 116 (“Types in Colls. Selys and M. C. Z.”, pl. 1, figs. 17, 17a);—Paulson 1982: 253 (in part, Mexico Guatemala only);—González-Soriano 1993: 296 (Mexico);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—González-Soriano & Paulson 2011: 308 (Chiapas, Mexico);—Escoto-Moreno *et al.* 2014: 1051 (Hidalgo, Mexico);—Garrison & von Ellenrieder 2018: 23 (confusion with *A. medullaris*);—Garrison & von Ellenrieder 2019: 46 (syntypes ♂, ♀ data).

Argia medullaris: Paulson 1982: 253 (misidentification, Mexico);—Novelo-Gutiérrez & Peña-Olmedo 1991: 130 (misidentification, Hidalgo, Mexico);—González-Soriano 1993: 295 (misidentification, Mexico);—Peña-Olmedo & Novelo-Gutiérrez 1993: 119 (misidentification, Hidalgo, Mexico);—González-Soriano & Novelo-Gutiérrez 1996: 163 (misidentification, Mexico);—González-Soriano & Novelo-Gutiérrez 2007: 128 (misidentification, Mexico);—Escoto-Moreno *et al.* 2014: 1051 (misidentification, Hidalgo, Mexico);—Escoto-Moreno *et al.* 2017 (misidentification, Hidalgo, Mexico).

Primary types. *Argia variabilis*: lectotype ♂ by present designation, MEXICO, Veracruz, Auguste Sallé leg. (Fig. 767) [examined, in RBINS].

Specimens examined. 15 ♂♂, 9 ♀♀: **MEXICO, Sinaloa:** 1 ♀, La Guayanera, Highway 40, near km 240 {23.4044°N, 105.886°W}, 940 m, 9 August 1992, B. & C. Villegas [RWG]; **Jalisco:** 1 ♀, Hacienda San Marcos, near Villegas {20.23°N, 103.8761°W}, 1602 m, 22 November 1923, J. H. Williamson [RWG]; **Michoacán:** 2 ♀♀, Tzararacua Falls, SSE of Uruapán {19.3525°N, 102.0789°W}, 1144 m, 17 June 1947, T. H. Hubbell [RWG]; **Veracruz:** 1 ♂, Metlac River about 3.5 km WNW of Fortín de las Flores, 18.9075°N, 97.0125°W, 1000 m, 10 August 1976, R. W. & J. A. Garrison [RWG]; 2 ♂♂, 1 ♀ (lectotype and paralectotypes), probably within the vicinity of Córdoba {18.8889°N, 96.9178°W}, 780 m, A. Sallé [MCZ, RBINS]; 1 ♂, between San Andres Tuxtla and San Martín Volcano, 18.6525°N, 9.1636°W, 1040 m, 18 August 1961, D. C. Robinson [FSCA]; 1 ♂, Tizatal Pond near Tapolapán, 6 km N of Santiago Tuxtla, 92x021 {18.5141°N, 95.3128°W}, 455 m, 17 July 1992, T. W. Donnelly [FSCA]; 1 ♂, 1 ♀, Encantada Pond, San Andres Tuxtla {18.4617°N, 95.1861°W}, 430 m, 23 July 1961, J. A. Harshaw [RWG]; 4 ♂♂, 1 ♀, stream 2 km E of Coyame, 8 km ENE of Catemaco, 18.4417°N, 95.0036°W, 300 m, 14–18 August 1976, R. W. & J. A. Garrison [RWG]; 1 ♂, 1 ♀, Salto de Eyipantla, 8 km S of San Andres Tuxtla, near Highway 180, 18.3842°N, 95.2064°W, 150 m, 15 August 1976, R. W. & J. A. Garrison [RWG]; **Oaxaca:** 1 ♂, stream 37.1 mi E of Totolapán {16.6244°N, 96.0264°W}, 1040 m, 3 August 1965, D. R. Paulson [FSCA]; 1 ♂, stream 11.6 mi E of Tapanatepec {16.4425°N, 94.0962°W}, 640 m, 2 August 1965, D. R. & M. L. Paulson [FSCA]; 1 ♂, 1 ♀, Candelaria Loxicha {15.9°N, 96.5167°W}, 534 m, 16–17 August 1973, E. C. Welling M. [RWG]. **GUATEMALA, Huehuetenango:** 1 ♂, stream 28.5 mi SE of La Mesilla on Highway 1, stream, 67-212 {15.4353°N, 91.7407°W}, 1490 m, 23 August 1967, D. R. Paulson [RWG].

A medium to large species (Table 2); male brilliant blue (Figs. 160, 161, 394, 863) with an unforked humeral stripe, irregular ventral black stripes on S3–6, genital ligula with tip of distal segment with a spatulate anteapical ental process (Fig. 657), and cercus inner branch (tooth) in mediodorsal view recessed at medial half (Fig. 751a); female (Fig. 864) with unique black middorsal thoracic stripe abruptly widened at dorsal 0.50, often with a small pointed ventral offshoot laterally (Fig. 268).

Redescription. This poorly known species has been confused with *A. medullaris* ever since Calvert's (1902, 1907) description and redescription. Calvert's (1902) description is a composite of both *A. variabilis* (type ♂ in MCZ) and *A. medullaris* and possibly *A. gonzalezi*. Due to their possible confusion, we redescribe this species as follows.

Male (Mexico: Veracruz, stream 2 km E of Coyame, Figs. 160, 161, 394, 863): Head. Labrum, ante- and postclypeus, ante- and postfrons, base of mandibles and genae blue; black on epicranium reduced to narrow lines, blue triangular spots anterolateral to lateral ocellus, occipital bar and postocular spots correspondingly large, the postocular spots broadly confluent with eye margin; postocular lobe narrowly lined with black, rear of head pale with black below around occipital foramen, antennae black. Prothorax black with following areas blue: lateral margins of anterior lobe, dorsolateral spot on middle lobe, propleuron except for anterior margin rimmed in black, and a small medial spot and lateral margins of posterior lobe. Pale areas of pterothorax vivid blue, with black middorsal stripe of uniform width, slightly broader than middorsal carina; remainder of mesepisternum blue; anterior 0.80 of mesinfraepisternum black, continuous with irregular unbranched humeral stripe, this stripe abruptly enlarged at ventral third below, upper portion of humeral stripe a hairline expanding again at mesopleural fossa; remainder of thorax blue except for vestige of interpleural stripe and a narrow black stripe on metapleural suture. Wings hyaline with venation black; Pt dark brown, surmounting 1 cell in all wings; px Fw 14/14, Hw 13/13; pq cells Fw 4/4, Hw 3/3; RP2 at Fw 7/7, Hw 6/6. Coxae and trochanters pale blue except for black on dorsum of trochanters; femora black, flexor surface pale; tibiae black with extensor surface pale, tarsi and armature black. Abdomen mostly blue; S1 blue, dorsally with a black basal spot and ventrobasal black spot; S2 blue laterally with a broad black stripe terminating at apical fifth, its posterior portion expanded as an inverted triangle dorsally at apical fourth, its tip almost meeting the other dorsally, annulus black; S3 blue, with a complete uniform ventral black stripe beginning at basal tenth with its anteapical dorsal margin extending dorsally as a blunt quadrate spot not connected dorsally, remainder of stripe connected to black annulus; S4–7 similar but with a small rectangular dorsal offshoot confined to basal fifth of ventral stripe; S8–10 blue dorsally and laterally with continuous black stripe; S10 black up to torus; torus pale, its ventral margin rimmed with black; cercus brown; paraproct narrowly blue dorsobasally, remainder black.

Genital ligula distal segment with a spatulate anteapical process on its ental surface (as in Fig. 657), in ectal view distal segment with apical tip not enlarged, not distinctly wider than preceding portion, ending in a rounded apical lobe (Fig. 657b), broad falcate lateral lobes present, in lateral view distal segment lacking a raised sclerotized boss, distal segment in ectal view with distance from base of arcuate lateral lobe to apex comparatively short, apex rounded (as in Fig. 657a).

Torus large, swollen, transversely oval, occupying entire ventral margin of torifer and slightly overlapping bilobed epiproct (Fig. 751c, lectotype); epiproct apically with a narrow cleft, pale, black laterally; cerci not approximate, gap between their inner surfaces separated by a distance slightly greater than width of epiproct (Fig. 751c); cercus in dorsal view subtriangular, with outer margin about twice as long as inner margin, and space between cerci about a third the basal width of each cercus (Fig. 751c); cercus in lateral view shorter than paraproct (Fig. 751b), mediobasal margin of cercus in dorsomedial view slightly concave, its apical margin expanding into a broadly based ventrally directed tooth (Fig. 751a) along medial half that is also usually visible in lateral view (Fig. 751b).

Dimensions. Hw 20.7, abdomen 28.2, total length 35.7.

Female (same data as male, Figs. 267, 268, 488, 864). Similar to male but pale colors a lighter blue. Head with slightly more extensive black on epicranium; prothorax as in male, pterothorax with broad fishhook-shaped black middorsal stripe about as wide as pale (bluish tan) antehumeral stripe; remainder of thorax and legs as in male but pale areas light blue; Pt dark brown, surmounting 1 cell in all wings; px Fw 14/14, Hw 12/12; pq cells Fw 4/4, Hw 3/3; RP2 at Fw 7/7, Hw 5/5. Abdominal pale colors blue dorsally, becoming off-white ventrally; S1 as in male; S2 blue dorsally with the following areas black: an inverted triangular spot dorsolaterally ending at basal fourth, a larger geminate spot on dorsal half, an incomplete ventral stripe, ventral pale area of segment merging to light blue to almost white; S3–6 similar to S3 but black markings longer, the inverted triangular postbasal stripes not connecting with posterior black spot, the latter connected to ventral black stripe, ventrally isolating a small pale spot just before black annulus; S7 similar but postbasal stripe barely connecting to posterior black spot; S8–10 blue dorsally, black laterally, a small isolated dorsolateral spot on S9; cerci and ovipositor black.

Mesepisternal tubercles absent, mesostigmal lobe transversely elongate, rounded laterally, occupying about 75% of entire plate length (as in Fig. 588c), a small supplementary lobe medially next to lateral branch of middorsal carina (as in Fig. 588d), mesostigmal plates almost approximate (Figs. 588a, c).

Dimensions. Hw 21.8, abdomen 26.2, total length 33.6.

Diagnosis. The foregoing synonymy for this species and that of *A. medullaris* illustrate the difficulty previous authors have had in applying a correct name for both taxa. The difficulties are increased with the description of *A.*

gonzalezi. The three species are diagnosed under *A. gonzalezi*. The fishhook-shaped middorsal stripe in the female appears to be unique to *A. variabilis*.

Remarks. See under *A. gonzalezi* for a discussion of Calvert's attempts to unravel the differences between *A. medullaris* and *A. variabilis*. Had Calvert been able to examine the genital ligula, we are sure that he would have been able to confidently separate this species. Calvert (1902, 1907) did not have a female of *A. variabilis* at his disposal when describing what he thought was the female of this species; his illustration of the mesostigmal plate of one of the two Cañas Gordas females (pl. IV, fig. 6) represents *A. medullaris*. As stated under *A. gonzalezi*, we have been unable to determine to what species his figure (pl. X, fig. 21), supposedly representing *A. variabilis* from Juan Viñas, represents. Due to the past taxonomic confusion, we designate the male syntype of *A. variabilis* in the RBINS as lectotype; its appendages (Fig. 751) and accompanying labels are illustrated here. The pair in the MCZ (Garrison & von Ellenrieder 2019) and the other female in the RBINS are paralectotypes. The type locality ("Vera Cruz") probably refers to the vicinity of "Cordova [= Córdoba]" and must have been collected sometime before 1856, according to Sclater (1856). Judging by the paucity of specimens we were able to examine, *A. variabilis* seems to be a rarely encountered species. It is possible that more specimens in collections from Mexico currently labeled as *A. medullaris* pertain to this species, as we have yet to see any *bona fide* specimens of *A. medullaris* from Mexico.

Habitat. In Chiapas (stream 20.1 mi N of Ocozocoautla), D. R. Paulson (pers. comm.) observed *A. variabilis* only in forested areas at waterfalls.

Distribution. This is a submontane species ranging from 150 to over 1600 m and extending from S Sinaloa into the Sierra Madre del Sur with one record from NE Guatemala, then north to the Río Metlac near Córdoba just south of the Trans-Mexican Volcanic Belt (ca. 96.8°N) (Fig. 774).

Argia vivida Hagen in Selys, 1865

Figs. 162 (thorax ♂); 163–165 (head, thorax, S1–4 ♂), 269 (head, thorax, S1–4 ♀); 395–397 (S7–10 ♂); 489 (S1–10 ♀); 492 (pronotum ♀); 589 (mesostigmal plates ♀); 658–660 (genital ligula); 752 (appendages ♂); 772 (map); 874–876 (body scans ♂); 877 (body scan ♀).

[Key locators: ♂ G-1, couplet 7(4'); ♂ M-6, couplet 6'; F-11 couplet 12']

Argia vivida Hagen in Selys 1865: 406 (34 reprint) (description ♂);—Calvert 1895: 478 (description ♂, ♀ Baja California, pl. XV, fig. 13);—Calvert 1902: 94 (description ♂, ♀, in part);—Calvert & Hagen 1902: 117 ("Types in M. C. Z.", pl. 1, figs. 5, 5a);—Kennedy 1915: 288 (description ♂, ♀, larva, habits, figs. 31–34, 37–38, 45–47, 49, 52–53, 62–64, 71–76);—Seemann 1927: 13 (figs.);—Gloyd 1941: 131 (synonymy between *A. kurilis* & *A. vivida*);—Valle 1942: 164 (Arizona);—Calvert 1947: 604 (listed in CAS);—Gloyd 1958: 19 (diagnosis of *A. plana* [= *A. funebris*] from *A. vivida*, pl. III, fig. 21);—Cruden 1968: 203 (chromosome data, fig. 110);—Pritchard 1971: 186 (breeding in thermal pools in Alberta and British Columbia);—Kiauta 1972: 82 (chromosome number);—Pritchard & Pelchat 1977: 1563 (larval growth in sulphur pools);—Garrison 1978: 223 (mark-recapture study);—Kiauta & Kiauta 1980: 43 (chromosome number);—Pritchard 1980: 101 (life cycle in Canada);—Bick & Bick 1981: 262 (heterospecific pairing between ♂ *Enallagma cyathigerum* & ♀ *Argia vivida*);—Paulson 1982: 253 (U. S. A., Mexico);—Pritchard 1982: 232 (distribution in U. S. A., Mexico, fig. 12);—Leggott & Pritchard 1985a: 2578 (effect of temperature on egg & larval development);—Leggott & Pritchard 1985b: 201 (life cycle);—Leggott & Pritchard 1986: 85 (thermal preference for adults and larvae);—Conrad & Pritchard 1988: 179 (mating behavior);—Conrad 1992: 335 (larval phenology & imaginal size to male pairing success);—Novelo-Gutiérrez 1992: 65 (comparison of larva of *A. plana* [= *A. funebris*] with *A. vivida*);—González-Soriano 1993: 296 (Mexico);—Garrison 1994: 336 (key ♂, ♀, diagnosis, figs. 29, 61, 78, 84, 88, 108, 109);—González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);—Pritchard & Kortello 1997: 733 (roosting patterns at geothermal springs);—Abbott 2005a: 88 (♂, ♀, key, fig. 16, 17, photo 11d, distribution in New Mexico);—Hornung & Pacas 2006: 40 (mark-recapture of adults);—Westfall & May 2006: 221 (key, description, figs. 78A, 84B, 97D, 100F, 104F);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Caesar & Wenzel 2009: 106 (phylogeny within genus *Argia*);—Paulson 2009: 166 (♂, ♀, description, diagnosis, fig., photos);—Bailowitz *et al.* 2015: 158 (diagnosis, photos);—Torres-Pachón *et al.* 2017: 415 (molecular phylogeny of larvae within *Argia*);—Garrison & von Ellenrieder 2019: 47 (holotype data).

Argia sp.?: Needham & Cockerell 1902: 714 (larva described, pl. XLII, fig. 4, probably this species).

Argia kurilis Hagen in Selys 1865: 406 (34 reprint) (description ♂);—Gloyd 1941: 131 (synonymy between *A. kurilis* & *A. vivida*);—Garrison & von Ellenrieder 2019: 38 (holotype data).

Argia (Heliargia) vivida: Kennedy 1920: 85 (in subgenus *Heliargia*).

Primary types. *Argia vivida*: holotype ♂, MEXICO, California, Cap. St. Lucas, Xantus, 1860 [examined, in MCZ; Garrison 1994; Garrison & von Ellenrieder 2019];—*Argia kurilis*: holotype ♀, Kuril Islands [examined, in MCZ; Gloyd 1941; Garrison & von Ellenrieder 2019].

Specimens examined. 239 ♂♂, 96 ♀♀: **CANADA, Alberta:** 2 ♂♂, 1 ♀, Albert Canyon Hot Springs, around warm stream above resort {51.138°N, 117.855°W}, 700 m, 17 June–3 July 1981, G. Pritchard [RWG]; 3 ♂♂, Cave and Basin National Historic Site and thermal pools, Banff, 51.1711°N, 115.591°W, 1400 m, 3 July 1980, G. Pritchard [RWG]; 1 ♂, same data but 1411 m, 17 June 1985, G. Pritchard [RWG]. **U. S. A., Oregon:** 1 ♂, Pond on Snow Peak, 44.5906°N, 122.593°W, 370 m, 13 July 1997, R. W. Garrison [RWG]; 2 ♀♀, Snow Peak Logging Road, 44.5728°N, 122.509°W, 370 m, 13 July 1997, R. W. Garrison [RWG]; **Idaho:** 1 ♂, Wood River, 1 mi NE of Gooding, malaise trap {42.9514°N, 114.879°W}, 1085 m, 6 July 1980 [CSCA]; 4 ♀♀, Snake River Gorge by Canyon Springs Golf course, just W of Highway 93, 42.6058°N, 114.476°W, 960 m, 10 August 1978, R. W. Garrison [RWG]; **California:** 1 ♀ (holotype of *Argia kurilis* Hagen in Selys 1865; locality in error), “Kurilische Id.” [MCZ]; 1 ♂, 8 August 1913 [CSCA]; 1 ♂, NE Corner {41.9942°N, 123.534°W}, 1441 m, 6 September 1960, T. R. Haig [CSCA]; 1 ♂, Gumboot Lake, ca. 19 km SW of Mount Shasta, 41.2114°N, 122.511°W, 1860 m, 21 July 2005, R. W. Garrison [RWG]; 1 ♂, Kneeland School, 40.7228°N, 123.944°W, 825 m, 19 June 1960, T. R. Haig [CSCA]; 3 ♂♂, 1 ♀, wooded trail and creek just S of Thermal Geyser, N of Willow Lake, 40.42°N, 121.375°W, 1740 m, 14 July 2012, R. W. Garrison & N. von Ellenrieder [HZ, RWG]; 1 ♀, Chico, Lassen National Forest, Cherry Hill campground, creek, 40.1025°N, 121.498°W, 1448 m, 26 June 2015, R. W., J. A. Garrison & N. von Ellenrieder [RWG]; 2 ♂♂, 5 mi NE of Butte Meadows, Cherry Hill campground {40.1017°N, 121.501°W}, 1448 m, 24–27 May 1974, F. G. Andrews [CSCA]; 10 ♂♂, 7 ♀♀, Chico, Lassen National Forest, Cherry Hill campground, creek and bog, 40.1017°N, 121.501°W, 1448 m, 20 June 2003, R. W. & J. A. Garrison, N. von Ellenrieder [CSCA, RMNH, RWG]; 1 ♂, Mill Pond, 1 mi E of Graniteville {39.4384°N, 120.73°W}, 1600 m, 21 July 1975, R. W. Garrison [RWG]; 1 ♂, 1 ♀, Willow Spring, 2 mi SE of Graniteville, 39.4343°N, 120.7°W, 23 June 1974, J. A. Garrison [RWG]; 1 ♂, Sagehen Creek near Hobart Mills {39.4006°N, 120.184°W}, 1766 m, 25 June 1968, R. W. Pinger [CSCA]; 2 ♂♂, Donner Camp Picnic area at Prosser Creek Reservoir, off Highway 89, 39.3872°N, 120.176°W, 1750 m, 25 July 1978, R. W. & J. A. Garrison [RWG]; 1 ♀, Keleher Picnic Area on Maybert Road, S Yuba River, E of the Town of Washington, Tahoe National Forest {39.3607°N, 120.793°W}, 805 m, 21 July 1975, R. W. Garrison [RWG]; 1 ♂, 1 ♀, Bear Rally Road, Bear creek, 39.0394°N, 122.409°W, 372 m, 20 June 2003, R. W., J. A. Garrison & N. von Ellenrieder [CSCA]; 2 ♂♂, Mendocino National Forest, Frenzel Creek, near Stoney Creek, malaise trap, 39.2897°N, 122.56°W, 430 m, 27 May–7 October 2010, M. Hauser & P. Kerr [CSCA]; 1 ♂, 1 ♀, Siegler Canyon Creek, by Siegler Canyon Road, 2 mi. SW of junction of Highway 29, 38.8939°N, 122.662°W, 490 m, 26 May 1973, J. A. Garrison [RWG]; 1 ♂, Grover Hot Springs State Park near Hoffman’s house, malaise trap #8 06LOT475, 38.6999°N, 119.846°W, 1800 m, 3–14 August 2006, P. H. Kerr & M. Hoffman [RWG]; 2 ♂♂, same data but malaise trap #8 06LOT476, 14 August–3 September 2006, P. H. Kerr & M. Hoffman [CUMZ]; 2 ♂♂, 2 ♀♀, Butts creek, 38.6997°N, 122.452°W, 234 m, 21 June 2003, R. W., J. A. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, Pope Creek, just S of Pope Canyon Road and 3.8 road mi W of junction of Berryessa-Knoxville Road, 38.6385°N, 122.348°W, 160 m, 13 May 1972, J. A. Garrison [RWG]; 1 ♀, Natoma {38.6308°N, 121.511°W}, 5 m, 10 May 1958, W. E. Simonds [CSCA]; 1 ♂, 1 ♀, Pope Creek, about 1.5 mi W of Lake Berryessa {38.6252°N, 122.325°W}, 150 m, 27 May 1978, R. W. & J. A. Garrison [RWG]; 1 ♂, cattle tank and seepage area at Samuel Springs, S of Pope Creek and W of Lake Berryessa, 38.6031°N, 122.311°W, 210 m, 27 May 1979, R. W. Garrison [RWG]; 1 ♀, Napa River by Zinfandel Lane, 4 mi SE of St. Helena, 38.4953°N, 122.426°W, 55 m, 19 June 1976, R. W. Garrison [RWG]; 1 ♀, Volcano {38.4422°N, 120.631°W}, 625 m, 29 May 1964, R. P. Allen [CSCA]; 4 ♂♂, 2 ♀♀, end of Bucktown Road, 5 mi W of Vacaville, 38.3566°N, 121.987°W, 50 m, 8 June 1974, R. W. Garrison [CSCA, RWG]; 1 ♂, same data but 10 May 1975 [RWG]; 1 ♂, Lair of the Bear, Camp Gold, 1 mi SW of Pinecrest Lake, Stanislaus National Forest, 38.1815°N, 120.007°W, 1707 m, 18 July 1996, J. Cole [RWG]; 1 ♂, 1 ♀, Lagunitas Creek at entrance to Samuel P. Taylor State Park, just W of Lagunitas, 38.0047°N, 122.708°W, 62 m, 13 May 1978, R. W. & J. A. Garrison [RWG]; 1 ♂, drainage ditch, W of San Francisco Airport, San Bruno, 37.6875°N, 122.435°W, 400 m, 11 June 1983, R. W. Garrison [RWG]; 2 ♂♂, Del Puerto Canyon at N Fork of Del Puerto Creek, about 24 km W of Patterson on Del Puerto Canyon Road, 37.4384°N, 121.337°W, 270 m, 8–9 June 1975, R. W. & J. A. Garrison [RWG]; 2 ♂♂, 1 ♀, same data but 26 September 1975, J. E. Hafernik, Jr. & R. W. Garrison [RWG]; 2 ♂♂, same data but 15 September 1976, R. W. Garrison [RWG]; 1 ♀, same data but 7 February 1977 [RWG]; 12 ♂♂, 5 ♀♀, same data but 15 May 1977, R. W. & J. A. Garrison [RWG]; 4 ♂♂, same data but 22 May 1976 [RWG]; 10 ♂♂, 3 ♀♀, same data but 19

June 2003, J. A., R. W. Garrison & N. von Ellenrieder [CSCA, RWG]; 2 ♂♂, 1 ♀, pond at gravel quarry, end of Five Bridges Road, 3 mi N of Bishop, 37.4253°N, 118.403°W, 1259 m, 28 June 1975, R. W. & J. A. Garrison [RWG]; 1 ♂, 1 ♀, same data but 29 May 1976 [RWG]; 4 ♂♂, same data but 2 September 1983 [RWG]; 3 ♂♂, same data but 24 June 2003, R. W., J. A. Garrison & N. von Ellenrieder [CSCA, RWG]; 1 ♂, 1 ♀, Owens River at Five Bridges Road, N of Bishop, 37.4111°N, 118.396°W, 1253 m, 24 June 2003, R. W., J. A. Garrison & N. von Ellenrieder [CSCA]; 1 ♂, 1 ♀, lake near Portola Road and Family Farm Road, Stanford University Campus, Palo Alto, 37.3992°N, 122.245°W, 104 m, 16 April 1972, J. A. Garrison [RWG]; 2 ♂♂, 4 ♀♀, Antelope Spring Highway 168, 37.3303°N, 118.088°W, 1680 m, 23 June 2003, R. W., J. A. Garrison & N. von Ellenrieder [CSCA, MNHN, RWG]; 14 ♂♂, 6 ♀♀, Buckhorn Springs, 37.2597°N, 118.036°W, 1507 m, 23 June 2003, R. W., J. A. Garrison & N. von Ellenrieder [CSCA, MNHN, RWG]; 2 ♂♂, 2 ♀♀, Deep Springs Valley, Batchelder Tollhouse Spring, 37.2433°N, 118.193°W, 1812 m, 23 June 2003, R. W., J. A. Garrison & N. von Ellenrieder [CSCA]; 4 ♂♂, 2 ♀♀, Batchelder Spring, by Highway 168, 37.2432°N, 118.194°W, 1820 m, 6 July 1974, R. W. & J. A. Garrison [RWG]; 1 ♂, same data but 15 July 1977, J. E. Hafernik, Jr. [RWG]; 1 ♂, 2 ♀♀, Kaweah River, by Highway 198 {36.4124°N, 118.937°W}, 200 m, 27 July 1972, R. W. Garrison [RWG]; 1 ♂, Kennedy Meadows, 3 mi N of Kennedy Meadows General Store, Sequoia National Forest {35.9861°N, 118.096°W}, 1935 m, 24 June 1994, J. Cole [RWG]; 1 ♂, Sacramento Springs {34.9°N, 114.766°W}, 375 m, 13 May 2001, T. Manolis [RWG]; 1 ♂, outlet to pond at Fraser Mountain Park, 34.82°N, 118.948°W, 1432 m, 22 June 1985, R. W. & J. A. Garrison [RWG]; 5 ♂♂, 1 ♀, canal just S of the Kern-Ventura County line, just S of Lake of the Woods, 34.8121°N, 119.01°W, 1580 m, 22 June 1985, R. W. & J. A. Garrison [RWG]; 1 ♂, 1 ♀, Atmore Meadows Campground, about 14 mi W of Lake Hughes, 34.692°N, 118.604°W, 1330 m, 15 June 1985, R. W. & J. A. Garrison [RWG]; 7 ♂♂, Lake Hughes, 34.6744°N, 118.441°W, 948 m, 28 July 2001, R. W. Garrison & N. von Ellenrieder [CSCA, ONHI, RMNH, RWG]; 2 ♂♂, Warm Springs Creek, by Lake Hughes Road, 34.6739°N, 118.443°W, 985 m, 8 June 1985, R. W. Garrison [RWG]; 1 ♂, 1 ♀, Castaic Power plant, Templin Highway near Highway 5, W of Lake Castaic, 34.5911°N, 118.662°W, 714 m, 4 September 1999, R. W. Garrison [RWG]; 3 ♂♂, just below Matilija Hot Springs, 34.4831°N, 119.304°W, 430 m, 2 September 1984, R. W. & J. A. Garrison [RWG]; 1 ♂, 1 ♀, Sespe Creek, 4 mi N of Fillmore, 34.4585°N, 118.928°W, 212 m, 5 September 1982, R. W. & J. A. Garrison [RWG]; 1 ♂, same data but 16 October 1982 [RWG]; 2 ♂♂, 2 ♀♀, Santa Paula Creek about 3 mi N of Santa Paula on Highway 150, 34.3956°N, 119.075°W, 180 m, 21 April 1984, R. W. & J. A. Garrison [FSCA, RWG]; 1 ♂, Jackson Lake and vicinity {34.3918°N, 117.726°W}, 1870 m, 21 June 1985, R. W. Garrison [RWG]; 3 ♂♂, 2 ♀♀, Santa Paula {34.3694°N, 119.066°W}, 175 m, 12–15 June 1956, W. E. Simonds [CSCA]; 1 ♂, 1 ♀, Alder Creek on Gold Creek Road, Angeles National Forest {34.3274°N, 118.299°W}, 730 m, 17 September 1986, M. L. Pearson [MHNN]; 1 ♂, Little Tujunga Canyon, Gold Creek at Little T. Creek, Angeles National Forest, 34.3189°N, 118.334°W, 540 m, 17 September 1986, M. L. Pearson [RWG]; 12 ♂♂, 8 ♀♀, Big Dalton Creek, by Big Dalton Road, N of Glendora, 34.1822°N, 117.835°W, 577 m, 4 July 2001, N. von Ellenrieder [CSCA, RWG]; 6 ♂♂, San Gabriel Mountains, Big Dalton Canyon Road, 1 mi NE of junction with Glendora Mountain Road, 34.1822°N, 117.797°W, 577 m, 4 September 1993, R. W. Garrison [RWG]; 1 ♂, Los Angeles River, at end of Oxford Road, 34.1817°N, 118.505°W, 219 m, 23 June 2001, N. von Ellenrieder [CSCA]; 1 ♂, Azusa Canyon {34.1714°N, 117.886°W}, 280 m, 20 July 1985, R. W. Garrison [RWG]; 1 ♂, Big Morongo Canyon Preserve, Morongo Valley {34.0492°N, 116.569°W}, 767 m, 13 April 1991, R. W. Garrison [RWG]; 1 ♂, 1 ♀, Riverside {33.9533°N, 117.395°W}, 256 m, 4 July 1955, W. E. Simonds [CSCA]; 2 ♂♂, Silent Valley Campground, Poppett Flat Road, SW of Highway 243, 8–10 mi SE of Banning, San Jacinto Mountains {33.8516°N, 116.853°W}, 1098 m, 26 June 1994, R. W. Garrison [RWG]; 12 ♂♂, 5 ♀♀, Santa Rosa Plateau Preserve, 2–5 mi SW of Murietta, 33.5117°N, 117.27°W, 615 m, 25–26 May 1991, R. W. & P. A. Garrison [ONHI, RWG]; 7 ♂♂, 1 ♀, Dos Palmas Nature Preserve, NE corner of Salton Sea, ca. 2 mi E of Salton Sea Recreation Area, 33.4972°N, 115.832°W, -22 m, 30 May 1999, R. W., J. A. & P. A. Garrison [RWG]; 2 ♂♂, 1 ♀, Anza Borrego State Park, Coyote Canyon, Lower Willows {33.3745°N, 116.442°W}, 400 m, 25 June 1976, Rollin Coville [RWG]; 1 ♂, Scissors crossing, 33.0961°N, 116.475°W, 700 m, 20 April 1969, M. & J. S. Wasbauer [CSCA]; 1 ♀, Jamul Creek at head of Lower Otay Lake, 32.6353°N, 116.885°W, 166 m, 7 September 1986, R. W. & J. A. Garrison [RWG]; **Nevada:** 1 ♀, Garden Creek {41.7596°N, 118.138°W}, 1456 m, 19 July 1996, M. Rahn [RWG]; 2 ♂♂, Owyhee River, N of Wild Horse Reservoir, by Highway 225, 41.6914°N, 115.843°W, 1867 m, 28 July 1978, R. W. & J. A. Garrison [DTU, RWG]; 1 ♂, 3 mi S of Wild Horse Reservoir, by Highway 43, 41.615°N, 115.801°W, 1903 m, 27 July 1978, R. W. & J. A. Garrison [RWG]; 2 ♂♂, 1 ♀, Hardscrabble Creek {39.9397°N, 119.634°W}, 1360 m, 30 August 1996, J. Simpkin [RWG]; 1 ♂, Muddy Dog Spring, 30 June 1996, J. Simpkin [RWG]; **Utah:** 1 ♂, small pond by Highway

44, 6 mi W of Red Canyon overlook, 40.844°N, 109.645°W, 2460 m, 28 July 1975, R. W. Garrison [RWG]; 2 ♂♂, 1 ♀, Horseshoe Spring, 40.6134°N, 112.71°W, 1595 m, 17 July 2016, B. D. Smith-Patten [ONHI]; 2 ♂♂, sewage pond by Highway 44, N of Vernal {40.5071°N, 109.574°W}, 1770 m, 28 July 1975, R. W. Garrison [RWG]; 1 ♂, Birch Creek, 5 mi N of Highway 4, ca. 7 mi NE of Cove Fort, Fish Lake National Forest {38.6447°N, 112.444°W}, 2106 m, 31 July 1975, R. W. Garrison [RWG]; 1 ♂, 1 ♀, Kens Lake, 38.4818°N, 109.429°W, 1537 m, 14 July 2016, B. D. Smith-Patten [ONHI]; 1 ♂, 1 ♀, Kane Springs; Kane Springs Creek, 38.3944°N, 109.453°W, 1595 m, 19 July 2016, B. D. Smith-Patten [ONHI]; 2 ♂♂, spring run and pool, Parowan {37.8354°N, 112.82°W}, 1865 m, 21–24 July 2003, R. Larsen [RWG]; **Arizona:** 3 ♂♂, Lukachukai {36.4187°N, 109.228°W}, 7 July 1972, O. Francke & M. A. Cazier [RWG]; 1 ♂, Havasu Creek at Havasupai Campground, 36.2571°N, 112.701°W, 836 m, 25 June 1979, D. Tipton [RWG]; 1 ♀, Little Colorado River at Salt Trail Canyon, 6 mi above confluence with Colorado River {36.184°N, 111.709°W}, 900 m, 4–8 July 1991, R. Timmons [RWG]; 1 ♂, Moenave {36.1389°N, 111.338°W}, 1455 m, 29 June 1967, J. W., J. M. Davidson & M. A. Cazier [RWG]. **MEXICO, Baja California:** 1 ♀, Cañón de Guadalupe, Sierra Juarez Mountains {32.1544°N, 115.789°W}, 356 m, 17 May 1986, L. Shaw [RWG]; 1 ♂, San Rafael River at Mike's Sky Rancho, Constitución de 1857 National Park {31.1106°N, 115.635°W}, 1205 m, 22 June 1988, B. Kondratieff & R. Baumann [FSCA]; 1 ♂, Catavina {29.7262°N, 114.714°W}, 530 m, 17 April 1965, D. Q. Cavagnaro, C. E. & E. S. Ross & V. L. Vesterby [FSCA]; 2 ♂♂, 1 ♀, San José de Comondú, 26.05°N, 111.817°W, 260 m, 10 October 1923, J. H. Williamson [RWG]; 2 ♂♂, Primer Agua, 7 km W of Highway 1 and 6 km S of Loreto at km 114, 26.0081°N, 111.404°W, 61 m, 2 October 1984, R. W. & J. A. Garrison [RWG]; 1 ♂, 1 ♀, arroyo 14 km W of Highway 1 on road to San Javier, SW of Loreto, 25.9756°N, 111.436°W, 165 m, 31 August 1985, R. W. & J. A. Garrison [RWG]; 4 ♂♂, Las Parras, about 18 km from Highway 1 on road to San Javier, SW of Loreto, 25.967°N, 111.489°W, 442 m, 1 September 1985, R. W. Garrison [RWG]; 1 ♂, 1 ♀, small ponds about 22 W of Highway 1 on road to San Javier, SW of Loreto, 25.9517°N, 111.482°W, 480 m, 1 September 1985, M. Pearson [RWG]; 1 ♂, 1.3 mi NW of El Triunfo {23.8051°N, 110.121°W}, 450 m, 20 January 1959, H. B. Leach [FSCA]; 1 ♂, Sierra La Laguna {23.8051°N, 110.121°W}, 1500 m, 15 August 1919, J. R. Slevin [CAS]; 1 ♂ (holotype), Cabo San Lucas {22.9333°N, 109.9°W}, 1448 m, 1860, J. Xantus [MCZ].

A medium-size species (Table 2), with vivid blue male (Figs. 162–165, 395–397, 874–876) and blue or tan female (Figs. 201, 877).

Diagnosis. Both sexes were diagnosed and illustrated by Kennedy (1915) and were redescribed by Garrison (1994) and Westfall & May (2006). *Argia vivida* is most similar to the allopatric or parapatric *A. funebris* (see Remarks under that species) and is diagnosed under *A. funebris*.

Remarks. The holotype male of *A. vivida* was collected by John Xantus de Vesey [born Xántus János], 5 October 1825–13 December 1894, who collected natural history specimens in the vicinity of Cabo San Lucas between 1859–1861 (Madden 1949; Pifkó 2019). The type is labeled as having been collected in 1860. Much of the material (presumably also the type of *A. vivida*) was sent to the Smithsonian Institution, from which Hagen most likely obtained the type for his collection currently housed in the MCZ.

All illustrations from Calvert (1902) purporting to be *A. vivida* were of other species, as noted under *A. noveloi*.

Garrison (1994) discussed color variability in this species, stating that in males from the United States the black humeral stripe can lack a posterior fork and the upper 0.25 to 0.30 can abruptly narrow to a fine line (Fig. 165), be vestigial (Fig. 162), or gradually narrow until just before the wing base, whereas in specimens from Baja California Sur (Loreto) and southern Canada it commonly has a posterior branch (as in Fig. 164). He also noted that isolated anterolateral black streaks are always present on S3–6 (Fig. 165), but some individuals have these streaks connecting to the posterior black on segment 6, and one male from Banff, Alberta (Fig. 163), has the streaks connecting with the posterior black on all abdominal segments.

The genital ligula is also variable, and we have illustrated some of these variations in Figs. 658–660. Garrison (1994) discussed this variability, and we have amended that discussion as follows. Kennedy (1919a, figs. 850, 851) illustrated a specimen from Colorado that had an elongate tip, as in our Fig. 658, that he had apparently planned to describe as *A. "melita"* but never did. Gloyd, in her locality notes, also noted two phenotypes of *A. vivida* based on morphology of the genital ligula: the typical form, occurring from Baja California north into S California through the Central Valley up to the Cascade region, with a blunt apical lobe as shown in Fig. 660, and the elongate form, as illustrated by Kennedy (1919a), occurring east of the Sierra Nevada. Subsequent examination of males from Alberta, Oregon and extreme E San Bernardino County in California (Sacramento Springs) proved that they also

have the elongate tip as in Fig. 658. Specimens from the W side of the Sierra Nevada are intermediate, with a longer blunt tip as shown in Fig. 659. Similar specimens with an even longer blunt tip (not illustrated), occur within the S Cascades (California, Siskiyou County, Gumbo Lake). The distribution of the various morphological differences as discussed here is still not resolved and will involve further sampling. Gloyd (unpublished notes) did not assume the existence of two sibling species, and we do not think that specimens east of the Sierra Nevada should be named due to evidence of intergradation in some areas of the Sierra Nevada and Cascades. Although the genital ligula of *A. vivida* differs from that of *A. funebris* as discussed under the latter species, males east of the Sierra Nevada and north of the Cascades with the elongate tip differ more from *A. funebris* than those from Baja California and S California, perhaps suggesting character displacement where both species might be sympatric.

Habitat. Individuals are numerous in populations of *A. vivida*, and those inhabiting geothermal pools in S British Colombia and Alberta have been the subject of intensive studies on behavior and population dynamics (Conrad 1992; Conrad & Pritchard 1988; Hornung & Pacas 2006; Pritchard 1971, 1980, 1982; Pritchard & Kortello 1997; Pritchard & Pelchat 1977; Leggott & Prichard 1985a, b, 1986), and the species has been featured in several field guides (e. g., Abbott 2005a; Bailowitz, *et al.* 2015; Paulson 2009, 2011).

Distribution. Like *A. funebris*, *A. vivida* is one of the more common and familiar damselflies from the W United States. It enters Mexico only in Baja California (Fig. 772) but is widespread farther north in California and other SW states. Within Mexico, it ranges in elevation from 61 to 1500 m. The most recent distributions of *A. vivida* and *A. funebris* (= *A. plana*) gleaned from Odonata Central show apparent sympatry of these two species in the far W range of *A. vivida*. Because the blue form of *A. funebris* is strikingly similar in color pattern to *A. vivida*, we suggest that some of the specimens are misidentified, especially ones that were determined from photographs alone. Abbott (2005a), followed by Paulson (2009), also showed *A. vivida* as occurring over much of New Mexico, which would encompass the known distribution of *A. funebris*. Our records show sympatry of both species only in N Nebraska as well as in parts of N New Mexico within the U. S. A.

Argia westfalli Garrison, 1996

Figs. 166, 167 (head, thorax, S1–4 ♂), 270 (head, thorax, S1–4 ♀); 398, 399 (S7–10 ♂); 490 (S1–10 ♀); 590, 591 (mesostigmal plates ♀); 753 (appendages ♂); 776 (map); 854 (field photo ♂); 885 (body scan ♂); 886 (body scan ♀).

[Key locators: ♂ G-1, couplet 9(8'); ♂ M-5, couplet 20(18'); F-6 couplet 16(14')]

Argia westfalli Garrison 1996: 42 (description ♂, ♀, figs. 3, 6, 8, 11, 16, 24–26, comparison with *A. anceps*);—Förster 2001: 11, 56 (key ♂, fig. C25);—Westfall & May 2006: 223 (♂, ♀, key, description, larva, figs. 100I–J, 101D);—González-Soriano & Novelo-Gutiérrez 2007: 128 (Mexico);—Caesar & Wenzel 2009: 101 (phylogeny within genus *Argia*);—González-Soriano & Paulson 2011: 308 (Chiapas, Mexico);—Garrison & von Ellenrieder 2017: 25 (comparison with *Argia rudolphi* sp. nov., figs. 22, 23, 46, 71, 72, 95, 117, 118, 157, 168).

Primary types. *Argia westfalli*: holotype ♂, MEXICO, Nuevo León, Municipio de Santiago, 2.5 km NW of Rancho Los Atascosos, 2 July 1987, Minter J. Westfall, Jr, Humberto Quiroz-Martinez & A. Contreras leg. [examined, in FSCA; Garrison 1996].

Specimens examined. 53 ♂♂, 10 ♀♀ (see Garrison & von Ellenrieder 2017 for additional material examined not listed here): **MEXICO, Tamaulipas:** 1 ♂, 1 ♀, ca. 7 km SE of Gómez Farías, La Florida Park, along Frío River, 22.9922°N, 99.1427°W, 94 m, 23 October 2002, R. A. Behrstock [RWG]; 1 ♀, El Salto falls near El Mico, ca. 12 km N of El Naranjo, 22.5858°N, 99.3883°W, 400 m, 24 October 2002, R. A. Behrstock [RWG]; 1 ♂, Highway 80 between km 159 and 160, 22.4853°N, 99.4169°W, 920 m, 24 October 2002, R. A. Behrstock [RWG]; **San Luis Potosí:** 4 ♂♂, 1 ♀, El Salto Falls, at top of falls {22.5857°N, 99.3843°W}, 470 m, 17 January 1963, G. & A. Beatty [RWG, UMMZ]; 2 ♂♂, 1 ♀, headwaters of Huichihuayán River, W of Huichihuayán, 21.4614°N, 98.9753°W, 104 m, 18 August 1999, R. W. & J. A. Garrison [RWG]; 1 ♂, stream in Palictla, about 9 km NW of Tamazunchale, 63x090 {21.2916°N, 98.7889°W}, 244 m, 5 September 1963, T. W. Donnelly [FSCA]; **Veracruz:** 2 ♀♀, Blanco River {18.8333°N, 97.1333°W}, 1260 m, 26 July 1956, R. R. Driesbach [UMMZ]; 2 ♂♂, 1 ♀, Ojo de Agua, large spring and outflow springs, {19.0167°N, 97.2667°W}, 1160 m, 24 August 1958, G. & A. Beatty [RWG]; **Chiapas:** 1 ♂, Montebello {16.12°N, 91.73°W}, 1475 m, 26 May 1969, R. G. Wind [RWG]; 2 ♀♀, Tziscaco Lake, Lagunas de Montebello National Park {16.0928°N, 91.6692°W}, 1371 m, 14 August 1981, D. Breedlove [CAS].

A medium-size species (Table 2) with cerulean blue males (Figs. 166, 167, 854, 885), pale tan females (Figs. 270, 886), and amber wings in both sexes.

Diagnosis. Both sexes were fully described by Garrison (1996) and by Westfall & May (2006) and illustrated by Garrison & von Ellenrieder (2017). Both sexes are diagnosed, along with *A. fissa*, under *A. anceps* and *A. rudolphi*.

Remarks. This is still a poorly known species of which no further information has come to light since its original description.

Caesar & Wenzel (2009) in their phylogenetic analysis based on molecular and morphological data, placed *A. westfalli* as sister to *A. anceps* and both as sister to *A. sabino*; we agree that the former two species are closely related by morphology as diagnosed under *A. anceps*.

Distribution. This species is known only from the E flank of Mexico from Nuevo León south to Chiapas (Fig. 776), occurring at elevations between 94 and 1475 m. It is sympatric with the closely related *A. anceps*, but whereas *A. anceps* is thus far known to extend as far north as S San Luis Potosí (21. 45°N), *A. westfalli* extends farther north into central Nuevo León (25. 42°N).

Discussion

Calvert (1902, 1907) included 48 names under the genus *Argia* for Mexico and Central America, 30 of which were new, introduced for 27 species and 3 subspecies. Two species treated by Calvert, *A. difficilis* and *A. orichalcea*, have been shown not to occur in Mexico and Central America (Garrison & von Ellenrieder 2007, 2018), reducing Calvert's total to 46. According to our present treatment, two more of Calvert's names, *A. vivida* var. *plana* and *A. wilsoni*, are considered junior synonyms of *A. funebris* and *A. calida*, respectively, thus reducing Calvert's total *bona fide* species for this area to 44. Our paper lists 71 species from the same region, a 38 % increase over Calvert's treatment.

Figure 768 shows the total number of localities sampled for *Argia* from Mexico and Central America, based on specimens we have examined and records we deemed reliable from the literature and from Odonata Central and Portal de Datos Abiertos UNAM (compare with fig. 3 in Cuevas-Yañez *et al.* 2016). Central Sinaloa and N Durango are lacking records, and there are few records from the higher xeric regions of the Central Plateau. The E regions of Honduras and Nicaragua also lack records. The N Sierra Madre Occidental in Sonora, the E flank of the Sierra Madre Oriental, central W Mexico, Guatemala and especially Costa Rica have been more thoroughly sampled. Of the 5707 records from Mexico and Central America, the mostly heavily sampled countries were Mexico (2906) and Costa Rica (1490), whereas the most sparsely sampled countries were Nicaragua (80) and El Salvador (58).

Eight species are endemic to Mexico (Table 3): *A. annae*, *A. noveloi*, *A. rudolphi* (Fig. 773), *A. deami* (Fig. 775), *A. westfalli* (Fig. 776), *A. herberti*, *A. garrisoni* (Fig. 796) and *A. mayi* (Fig. 798), three are endemic to Costa Rica (Table 3): *A. haberi*, *A. paulsoni* (Fig. 782), and *A. schorri* (Fig. 783), and no species thus far is known to be endemic to Guatemala, Belize, Honduras, El Salvador, Nicaragua or Panama, but further collecting may yield new species endemic to one or more of those countries (e. g., we know of an undescribed species, based on one male, from El Salvador).

The varied topography of Mexico has affected the distribution of several species, as noted under various species' accounts. The triangular Central Plateau (Fig. 769) is bordered by the Sierra Madre Oriental in the east, the Sierra Madre Occidental in the west, and the diagonally transverse Trans-Mexican Volcanic Belt to the south, the last terminating almost at the E coast in the form of Mexico's highest peak, Pico de Orizaba at 5,636 m. Several widespread species, including *A. extranea* (Fig. 771), *A. anceps* (Fig. 776), *A. tonto* (Fig. 777), *A. immunda* (Fig. 781), *A. oenea* (Fig. 790), *A. translata* (Fig. 793), *A. oculata* (Fig. 794) and *A. ulmeca* (Fig. 795), have a U-like distribution following the margins of the three mountain ranges mentioned above. The E portion of the Trans-Mexican Volcanic Belt separates *A. barretti* from the closely related *A. pipila* (Fig. 792). *Argia anceps* and *A. fissa* are two closely related species that appear to be allopatric, with *A. anceps* extending as far south as the Central Mountains and *A. fissa* as far north as the Talamancas Mountains in Costa Rica (Fig. 776).

Our examination of the morphology of the genital ligula suggests possible alliances within species groups. Perhaps most striking is the near confinement of those species lacking a flagellum or strap-like process to the more N parts of the region (Mexico and Guatemala), with only *A. elongata* (Fig. 771), *A. fissa*, *A. haberi* (Fig. 782), and *A. terira* (Fig. 784) extending farther southward. Possible phylogenetic affinities based on genital ligula morphology

coupled with other morphological characters are suggested under the treatments of various species. Some of our conclusions differ from the two studies based on molecular and morphological data of adults (Caesar & Wenzel 2009) and larvae (Torres-Pachón *et al.* 2017), and we believe that a more thorough phylogenetic assessment will need to include more species and a series of each from different localities.

Garrison (1994) did not examine the genital ligula in his treatment of North American species but recognized a few groups based primarily on the morphology of the male caudal appendages. For example, he considered six species, *A. agrioides* (Fig. 662d), *A. fumipennis* (Figs. 684d, 685d), *A. hinei* (Fig. 696d), *A. nahuana* (Fig. 710d) and *A. pallens* (Fig. 714d), as unique in having the “mesal margin of the cercus with a mesally or mesoventrally directed lobe [=inner branch].” We found that the morphology of the genital ligulae in all five species is also similar, as noted in Key G-2, couplet 10’, but *A. alberta* and *A. paludicola* also have a similar genital ligula morphology (Fig. 634), despite having different cercal morphology and lacking the mesoventrally directed lobe (Figs. 663, 715, 716), and their relationship was also partially supported by molecular and morphological data (Caesar & Wenzel 2009, fig. 4). Another group mentioned by Garrison (1994) and Westfall & May (2006) is the metallic red group consisting of *A. cuprea* and *A. oenea*. As shown here, this group also includes three other species, *A. calverti*, *A. cupraurea* and *A. fulgida* (and another five species in South America, see Garrison & von Ellenrieder 2018). Though the male appendages and mesostigmal plates in all are similar, they differ in the morphology of the genital ligula, which perhaps allows for sympatry of some of them. Included in this group (distal segment with a bifid flagellum and a pair of lateral multispinose branches) are five other predominantly blue species, *A. barretti*, *A. harknessi*, *A. insipida*, *A. percellulata* and *A. pipila*. The most aberrant of these five, *A. percellulata*, differs in overall coloration, morphology of the male appendages and female mesostigmal plates. We were unable to confidently distinguish among the other four species based on the morphology of the genital ligula alone, and their similarity may account for their allopatric distribution (Fig. 792); *A. percellulata* is the only species sympatric with two of them, *A. barretti* and *A. pipila*.

Garrison & von Ellenrieder (2015, 2018) previously reported color pattern within some species of *Argia* to vary geographically and within populations and advised caution when using these characters alone as a means to identify various species. We continue to place more weight on the morphology of the secondary sexual characters (male appendages, female mesostigmal plates) in defining species here, although we have found various morphological characters also to exhibit variability. The mesostigmal plates of *A. oculata* (Figs. 549–551), *A. tonto* (Figs. 579, 580), *A. talamanca* (Figs. 570–574) and *A. ulmeca* (Figs. 583–586), the genital ligula in *A. calida* (Figs. 598–600), *A. oculata* (Figs. 630, 631) and *A. vivida* (Figs. 658–660), and the male caudal appendages in *A. talamanca* (Figs. 732–735, 737) illustrate this variability.

Cuevas-Yañez *et al.* (2016) argued that the Mexican inventory of endemic odonates (presumably including *Argia*) is close to completion, as so few species have been described recently (55 species described from 1981 to 2011, but only four from 2011 to 2017). They acknowledged that an argument could be made “that some species may still be missing, which is possibly true, but such new species would be a handful at most.” We disagree with their conclusions and argue that the apparent lack of discovery of new species (including *Argia*) in Mexico is more likely due to the paucity of systematists and the difficulty in exploring more isolated areas. In this paper, we include four new species for Mexico and another from Central America, and we have a male from El Salvador and a female from Mexico that are currently undescribed but not included here pending further discoveries of more specimens of both. Two of the new species included here, *A. annae* and *A. noveloi*, have been known as undescribed for many years, but their systematics were unresolved pending a revision of the Mexican fauna, which we hope we have accomplished here. Ortega-Salas *et al.* (2022) recently described 11 new species of the poorly known genus *Paraphlebia*, some of which had been suspected as new for several years, but they too had not been described pending a full review of the genus. Other genera that will certainly yield new species include *Palaemnema* (Platystictidae) and *Heteragrion* (Megapodagrionidae *s.l.*) but these, as well as *Argia*, are speciose and require a full revisionary treatment of all species, including examination of type material supplemented by good illustrations and keys.

Garrison & von Ellenrieder (2018) acknowledged that future molecular studies may suggest more species of *Argia* than recorded presently, but we continue to advise caution when using these data alone for justifying various populations as undescribed cryptic species.

In the introduction to the section of *Argia*, Calvert (1902) stated that “Few Odonata are more difficult to identify specifically.” While this is certainly true, we hope this paper may make this task easier and ultimately yield more species than what we have thus far recorded.

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References

- Abbott, J.C. (2001) Distribution of dragonflies and damselflies (Odonata) in Texas. *Transactions of the American Entomological Society*, 127 (2), 189–228.
- Abbott, J.C. (2005a) *Dragonflies and damselflies of Texas and the South-Central United States. Texas, Louisiana, Arkansas, Oklahoma and New Mexico*. Princeton University Press, Princeton, New Jersey, viii + 344 pp.
- Abbott, J.C. (2005b) New and notable records of Odonata from Texas. *Southwestern Entomologist*, 30 (3), 169–174.
- Abbott, J.C. (2011) *Damselflies of Texas. A field guide*. University of Texas Press, Austin, Texas, xvii + 268 pp.
- Abbott, J.C., Beckemeyer, R.J., Donnelly, T.W., González-Soriano E. & Harp, G.L. (2002) Odonata collected in Nicaragua. *Notulae Odonatologicae*, 5 (10), 125–128.
- Abbott, J.C. & Stewart, K.W. (1998) Odonata of the south-central Nearctic region, including northeastern Mexico. *Entomological News*, 109 (3), 201–212.
- Alonso-Eguía, P.E., González-Soriano, E. & Gutiérrez-Yurrita, P.J. (2002) Listado y distribución de los odonatos de la Cuenca del Río Moctezuma, Centro-Occidente de México (Insecta Odonata). *Folia Entomológica Mexicana*, 41 (3), 347–357.
- Amaya-Perrilla, C. & Palacino Rodríguez, F. (2012) An updated list of the dragonflies (Odonata) of Meta Department, Colombia, with forty-six new Department records. *Bulletin of American Odonatology*, 11 (2), 29–38.
- Bailowitz, R., Behrstock R.A. & Danforth, D. (2012) Odonata of the Municipality of Metapán, Department of Santa Ana, El Salvador. *Argia*, 24 (1), 7–11.
- Bailowitz, R. & Danforth, D. (2007) *Argia harknessi* Calvert (Harkness' Dancer) new to the United States. *Argia*, 19 (2), 24–25.
- Bailowitz, R., Danforth, D. & Deviche, P. (2009) West Mexico Updated. *Argia*, 21 (4), 15–18.
- Bailowitz, R., Danforth, D., Deviche, P. & Burns, J. (2013) Seeing Red: Late Summer and Early Fall in the Muleshoe Ranch Region of Southeast Arizona. *Argia*, 25 (1), 13–15.
- Bailowitz, R., Danforth, D. & Upson, S. (2015) *A field guide to the damselflies & dragonflies of Arizona and Sonora*. Nova Granada Publications, Tucson, Arizona, 459 pp.
- Bailowitz, R. & Stevens, L. (2006) *Argia hinei* in Utah. *Argia*, 17 (4), 21.
- Baker, C.F. (1905) Invertebrata Pacifica. Neuropteroid insects. Notes on the neuropteroid insects of the Pacific Coast of North America with descriptions of new species by Nathan Banks. *Invertebrata Pacifica*, 1, 85–92.
- Behrstock, R.A. (2000) First Texas record of Amethyst dancer (*Argia pallens*) Calvert, 1902. *Argia*, 12 (2), 6–7.
- Behrstock, R.A. (2009) An updated list of the Odonata of Coahuila, Mexico, including forty-one new state records and the first Mexican occurrence of *Libellula composita* (Hagen). *Bulletin of American Odonatology*, 11 (1), 1–7.
- Behrstock, R.A., Danforth, D. & Upson, S. (2004) Yaqui Dancer (*Argia carlcooki*, Daigle 1995), New Distributional Records for Northern Mexico and the US. *Argia*, 16 (2), 11–15.
- Behrstock, R.A., Danforth, D. & Upson, S. (2007a) A list of the Odonata of Chihuahua State, Mexico, including new state records and the first Mexican record of *Argia alberta* Kennedy, 1918. *Bulletin of American Odonatology*, 10 (2/3), 52–63.
- Behrstock, R.A., Dobbs, M., Dunkle, S.D. & Overton, M. (2007b) Additional records of Odonata from Tamaulipas, San Luis Potosí, Hidalgo, and Querétaro States, Mexico. *Argia*, 19 (3), 30–33.
- Belle, J. (2002) Commented checklist of the Odonata of Suriname. *Odonatologica*, 31 (1), 1–8.
- Bick, G.H. & Bick, J.C. (1965a) Color variation and significance of color in reproduction in the damselfly, *Argia apicalis* (Say) (Odonata: Coenagrionidae). *The Canadian Entomologist*, 97 (1), 32–41.
<https://doi.org/10.4039/Ent9732-1>
- Bick, G.H. & Bick, J.C. (1965b) Demography and behavior of the damselfly, *Argia apicalis* (Say) (Odonata: Coenagrionidae). *Ecology*, 46 (4), 461–472.
<https://doi.org/10.2307/1934877>
- Bick, G.H. & Bick, J.C. (1968) Demography of the damselfly, *Argia plana* Calvert (Odonata: Coenagrionidae). *Proceedings of the Entomological Society of Washington*, 70 (3), 197–203.
- Bick, G.H. & Bick, J.C. (1971) Localization, behavior, and spacing of unpaired males of the damselfly, *Argia plana* Calvert (Coenagrionidae). *Proceedings of the Entomological Society of Washington*, 73 (2), 1467–152.
- Bick, G.H. & Bick, J.C. (1972) Substrate utilization during reproduction by *Argia plana* Calvert and *Argia moesta* (Hagen) (Odonata: Coenagrionidae). *Odonatologica*, 1 (1), 3–9.
- Bick, G.H. & Bick, J.C. (1978) The significance of wing clapping in Zygoptera. *Odonatologica*, 7 (1), 5–9.
- Bick, G.H. & Bick, J.C. (1981) Heterospecific pairing among Odonata. *Odonatologica*, 10(4), 259–270.
- Bick, J.C. & Bick, G.H. (1982) Behavior of adults of dark-winged and clear-winged subspecies of *Argia fumipennis* (Burmeister) (Zygoptera: Coenagrionidae). *Odonatologica*, 11 (2), 99–107.
- Boomsma, T. (1993) Dragonflies and damselflies of the Shipstern Nature Reserve (Odonata). *Occasional Papers of The Belize Natural History Society*, 2 (6), 54–58.
- Boomsma, T. & Dunkle, S.W. (1996) Odonata of Belize. *Odonatologica*, 25 (1), 17–29.
- Bota-Sierra, C., Sandoval-H., A., Ayala-Sánchez, D. & Novelo-Gutiérrez, R. (2019) *Libélulas de la Cordillera Occidental Colombiana, una mirada desde el Tatamá / Dragonflies of the Colombian Cordillera Occidental, a look from Tatamá*. Panamérica Formas e Impressos, Bogotá, 196 pp.
- Brooks, S.J. (1989) Odonata collected from Guanacaste National Park, Costa Rica, July 1988. *Notulae odonatologicae*, 3 (4),

- Brown, F.M. (1941) A gazetteer of entomological stations in Ecuador. *Annals of the Entomological Society of America*, 34, 809–851.
<https://doi.org/10.1093/aesa/34.4.809>
- Butt, M. (1995) Odonata collected from the Tambopata-Candamo reserved zone, southeastern Peru, August 1992–January 1993. *Notulae odonatologicae*, 4 (6), 93–97.
- Caesar, R.M. & Wenzel, J.W. (2009) A phylogenetic test of classical species groups in *Argia*. *Entomologica Americana*, 115 (2), 97–108.
<https://doi.org/10.1664/09-RA-001.1>
- Calvert, P.P. (1895) The Odonata of Baja California, Mexico. *Proceedings of the California Academy of Sciences, Second Series*, 4, 463–558.
- Calvert, P.P. (1899) Odonata from Tepic, Mexico, with supplementary notes on those of Baja, California. *Proceedings of the California Academy of Sciences. Third Series*, 1 (12), 371–418.
- Calvert, P.P. (1901) Odonata. In: Godman, F.D. & Salvin, O. (Eds.), *Biologia Centrali Americana – Insecta Neuroptera*. R.H. Porter & Dulau Co., London, pp. 17–72.
- Calvert, P.P. (1902) Odonata. In: Godman, F.D. & Salvin, O. (Eds.), *Biologia Centrali Americana – Insecta Neuroptera*. R.H. Porter & Dulau Co., London, pp. 73–128.
- Calvert, P.P. (1907) Odonata. In: Godman, F.D. & Salvin, O. (Eds.), *Biologia Centrali Americana – Insecta Neuroptera*. R.H. Porter & Dulau Co., London, pp. 309–404.
- Calvert, P.P. (1908a) Introduction to the Odonata. In: Godman, F.D. & Salvin, O. (Eds.), *Biologia Centrali Americana – Insecta Neuroptera*. R.H. Porter & Dulau Co., London, pp. i–xxx.
- Calvert, P.P. (1908b) The present state of our knowledge of the Odonata of Mexico and Central America. *Science, New Series*, 28 (724), 692–695.
<https://doi.org/10.1126/science.28.724.692>
- Calvert, P.P. (1909) Contributions to a knowledge of the Odonata of the Neotropical region, exclusive of Mexico and Central America. *Annals of the Carnegie Museum*, 6 (3), 73–280.
<https://doi.org/10.5962/p.202300>
- Calvert, P.P. (1911) [Remarks on high altitude Odonata]. *Entomological News*, 22 (8), 380–381.
- Calvert, P.P. (1919) Odonata Zygoptera from Guatemala collected by Messrs. William Schaus and John T. Barns. *Entomological News*, 30 (6), 160–165.
- Calvert, P.P. (1947) The Odonate collections of the California Academy of Sciences from Baja, California and Tepic, Mexico, of 1889–1894. *Proceedings of the California Academy of Sciences. Fourth Series*, 23 (41), 603–609.
- Calvert, P.P. (1948) Odonata (dragonflies) of Kartabo, Bartica District, British Guiana by Philip P. Calvert. *Zoologica. Scientific Contributions of the New York Zoological Society*, 33 (2), 47–87.
<https://doi.org/10.5962/p.184647>
- Calvert, P.P. & Hagen, H. (1902) Illustrations of Odonata: *Argia* by Hermann A. Hagen. With a list and bibliography of the species by Philip P. Calvert. *Bulletin of the Museum of Comparative Zoology at Harvard College*, 39 (4), 103–120.
- Campbell, W. B. & Novelo-Gutiérrez, R. (2007) Reduction in odonate phylogenetic diversity associated with dam impoundment is revealed using taxonomic distinctness. *Fundamental and Applied Limnology, Archiv für Hydrobiologie*, 168 (1), 83–92.
<https://doi.org/10.1127/1863-9135/2007/0168-0083>
- Campos Ripadeneira, F. (1922) Catálogo sistemático y sinonímico de los Odonatos regionales. *Revista del Colegio Nacional Vicente Rocafructe*, 4 (8 & 9), 1–42.
- Campos Ripadeneira, F. (1927) Las libélulas de la Provincia de El Oro. *Revista del Colegio Nacional Vicente Rocafructe*, 9 (30 & 31), 79–81.
- Carrillo-Muñoz, A.I. & García-Miranda, O. (2021) New records for the Chimalapas-Uxpanapa region, Mexico (Odonata: Calopterygidae, Heteragrionidae, Polythoridae, Thaumtoneuridae, Coenagrionidae, Gomphidae, Libellulidae). *Notulae odonatologicae*, 9 (5), 196–203.
- Cole, J. (1998) The second coming of *Argia lacrimans*. *Argia*, 9 (4), 10–11.
- Conrad, K.F. (1992) Relationships of larval phenology and imaginal size to male pairing success in *Argia vivida* Hagen (Zygoptera: Coenagrionidae). *Odonatologica*, 21 (3), 335–342.
- Conrad, K.F. & Pritchard, G. (1988) The reproductive behavior of *Argia vivida* Hagen: an example of a female-control mating system (Zygoptera: Coenagrionidae). *Odonatologica*, 17 (3), 179–185.
- Convey, P. (1989) Odonata from the Paria Peninsula, in the eastern coastal Cordillera of Venezuela. *Notulae Odonatologicae*, 3 (4), 55–59.
- Cruden, R.M. (1968) Chromosome numbers of some North American dragonflies (Odonata). *Canadian Journal of Genetics and Cytology*, 10 (1), 200–214.
<https://doi.org/10.1139/g68-029>
- Cuevas-Yañez, K. (2007) Los odonatos (Insecta: Odonata) de la Hidroeléctrica de Patla (El Pozo) y del Río Tecpatlán, Zihuateutla, Puebla, México. *Dugesiana*, 14 (2), 83–91.
- Cuevas-Yañez, K., Espinosa-Rivera, J.C., Martínez-Falcón, A.P. & Córdoba-Aguilar, A. (2016) Are all Mexican odonate species documented? An assessment of species richness. *Systematics and Biodiversity*, 15 (3), 253–258.

<https://doi.org/10.1080/14772000.2016.1249529>

- Danforth, D. (2006) Arizona Summary. *Argia*, 19 (1), 13.
- Danforth, D., Bailowitz, R. & Deviche, P. (2013) Cerulean Dancer, *Argia anceps*, a New Species for the United States. *Argia*, 25 (2), 10–11.
- Daigle, J.J. (1991) *Argia garrisoni* spec. nov. from Mexico (Zygoptera: Coenagrionidae). *Odonatologica*, 20 (3), 337–342.
- Daigle, J.J. (1995) *Argia carlcooki* spec. nov. from Mexico (Zygoptera: Coenagrionidae). *Odonatologica*, 24 (4), 467–471.
- Daigle, J.J. (1996) The rat patrol's excellent Ecuador adventure! *Argia*, 8 (3), 10–13.
- De Marmels, J. (1990) An updated checklist of the Odonata of Venezuela. *Odonatologica*, 19 (4), 333–345.
- De Marmels, J. (1992) Caballitos del Diablo (Odonata) de las Sierras de Tapirapecó y Unturán, en el extremo sur de Venezuela [Dragonflies (Odonata) from the Sierras of the Tapirapecó and Unturan, in the extreme south of Venezuela]. *Acta Biologica Venezuelica*, 14 (1), 57–78.
- De Marmels, J. (2012) Review of the “metallic group” of species of *Argia* Rambur known from Venezuela, with description of the larva of *Argia jocosa* Hagen in Selys, 1865 (Odonata: Coenagrionidae). *International Journal of Odonatology*, 15 (3), 249–262.
<https://doi.org/10.1080/13887890.2012.717906>
- De Marmels, J. (2014) Lista de los Odonata de Venezuela / Checklist of the Odonata of Venezuela. *Odonatologica*, 19 (4), 333–345.
- Dommanget, J.-L. (2000) Liste provisoire des Odonates de Guadeloupe et de Martinique. *Martinia*, 16 (3), 134–137.
- Dommanget, J.-L. & Mashaal, M. (2002) Les libellules d’Outre-mer. *Insectes*, 125 (2), 8–10.
- Dommanget, J.-L. & Papazian, M. (2000) Liste provisoire des Odonates de Guyane française. *Martinia*, 16 (3), 138–141.
- Donnelly, T.W. (1970) The Odonata of Dominica British West Indies. *Smithsonian Contributions to Zoology*, 37, 1–20.
<https://doi.org/10.5479/si.00810282.37>
- Donnelly, T.W. (1992) The Odonata of Central Panama and their position in the neotropical odonate fauna, with a checklist, and descriptions of new species. In: Quintero, D. & Aiello, A. (Eds.), *Insects of Panama and Mesoamerica: selected studies*. Oxford University Press, Oxford, pp. 52–90.
- Donnelly, T.W. (1995) Costa Rica in the spring. *Argia*, 7 (1), 17–18.
- Donnelly, T.W. (2000a) Visit to a little-known area—the Miskito Coast of Honduras. *Argia*, 12 (1), 17–18.
- Donnelly, T.W. (2000b) Clef d’identification des Odonates de Guadeloupe, Dominique et Martinique. *Martinia*, 16 (3), 111–121.
- Donnelly, T.W., von Ellenrieder, N. & Muzón, J. (1998) Nuevos registros de Odonata (Insecta) para la Argentina. *Neotropica*, 44 (111–112): 115–116.
- Dunkle, S.W. (1988) A list of the Odonata of Honduras. *Ceiba*, 29 (1), 41–49.
- Dunkle, S.W. (1990) *Damselflies of Florida, Bermuda and the Bahamas*. Scientific Publishers, Gainesville, Florida, vii + 148 pp.
- Dunkle, S.W. (1991) Additional Odonata records from Honduras. *Notulae Odonatologicae*, 3 (8), 132–133.
- Escoto-Moreno, J.A., González-Soriano, E. & Escoto-Rocha, J. (2009) Odonata from Aguascalientes state, Mexico. *Odonatologica*, 38 (2), 151–158.
- Escoto-Moreno, J.A., Márquez, J. & Asiain, J. (2020) New Records of Odonata from Central Eastern Mexico. *Proceedings of the Entomological Society of Washington*, 122 (1), 235–242.
<https://doi.org/10.4289/0013-8797.122.1.235>
- Escoto-Moreno, J.A., Márquez, J. & Novelo Gutiérrez, R. (2014) Los odonatos (Insecta: Odonata) del estado de Hidalgo, México: situación actual y perspectivas. *Revista Mexicana de Biodiversidad*, 85, 1043–1053.
<https://doi.org/10.7550/rmb.46314>
- Escoto-Moreno, J.A., Novelo Gutiérrez, Márquez, J. & Adabache-Ortiz, A. (2017) Odonata from the cloud forests of Hidalgo State, Mexico. *Notulae odonatologicae*, 8 (10), 383–390.
- Escoto-Moreno, J.A., Villalobos-Juárez, I. & Hernandez-Langford, D.G. (2021) New records of Odonata from central and Pacific Mexico. *The Pan-Pacific Entomologist*, 97 (1), 33–38.
<https://doi.org/10.3956/2021-97.1.33>
- Esquivel, C. (2005) *Libélulas de Mesoamérica y el Caribe [Dragonflies and damselflies of Middle America and the Caribbean]*. Instituto Nacional de Biodiversidad, INBio, Heredia, 319 pp.
- Flint, O.S. Jr. (1991) The Odonata collection of the National Museum of Natural History, Washington, U.S.A. *Advances in Odonatology*, 5, 49–58.
- Förster, F. (1914) Beiträge zu den Gattungen und Arten der Libellen. III. *Archiv für Naturgeschichte*, Series A, 80 (2), 59–83.
- Förster, S. (2001) *The dragonflies of Central America exclusive of Mexico and the West Indies. A guide to their identification. 2nd Edition. Odonatological monographs 2*. Gunnar Rehfeld, Braunschweig, 141 pp.
- Fraser, F.C. (1946) Notes on Amazonian Odonata in the Leeds Museum. *Transactions of the Royal Entomological Society of London*, 97 (18), 443–472.
<https://doi.org/10.1111/j.1365-2311.1946.tb00272.x>
- Fraser, F.C. (1948) The Odonata of the Argentine Republic II. *Acta Zoologica Lilloana*, 5, 47–67.
- García-Miranda, O. & Carrillo-Muñoz, A.I. (2021) New records for Puebla and Morelos, Mexico (Odonata: Aeshnidae, Coenagrionidae, Libellulidae). *Notulae odontologicae*, 9 (8), 331–340.

- Garrison, R.W. (1978) A mark-recapture study of imaginal *Enallagma cyathigerum* (Charpentier) and *Argia vivida* Hagen (Zygoptera Coenagrionidae). *Odonatologica*, 7 (3) 223–236.
- Garrison, R.W. (1982) *Archilestes neblina*, a new damselfly from Costa Rica, with comments on the variability of *A. latialatus* Donnelly. *Occasional Papers of the Museum of Zoology, University of Michigan*, 702, 1–12.
- Garrison, R.W. (1983) Odonata collected at Canaima, Venezuela, in September 1980. *Notulae odonatologicae*, 2 (2), 24–25.
- Garrison, R.W. (1994) A synopsis of the genus *Argia* of the United States with keys and descriptions of new species, *Argia sabino*, *A. leonorae*, and *A. pima* (Odonata: Coenagrionidae). *Transactions of the American Entomological Society*, 120 (4), 287–368.
- Garrison, R.W. (1996) A synopsis of the *Argia fissa* group, with descriptions of two new species, *A. anceps* sp.n. and *A. westfalli* sp.n. (Zygoptera: Coenagrionidae). *Odonatologica*, 25 (1), 31–47.
- Garrison, R.W. (2019) *Argia nataliae* n. sp. from Colombia (Odonata: Coenagrionidae). *Zootaxa*, 4590 (4), 477–486.
<https://doi.org/10.11646/zootaxa.4590.4.4>
- Garrison, R.W. (2021a) Preparation of preserved field collected dried damselfly specimens for character illustrations. *International Dragonfly Fund—Report*, 166, 1–7.
- Garrison, R.W. (2021b) Imaging preserved damselflies for scientific publications. *International Dragonfly Fund—Report*, 166, 9–20.
- Garrison, R.W. & Ramón Cabrera, G.M. (2019) *Argia mauffrayi* n. sp. from Ecuador (Odonata: Coenagrionidae). *Zootaxa*, 4545 (2): 286–292.
<https://doi.org/10.11646/zootaxa.4545.2.8>
- Garrison, R.W. & von Ellenrieder, N. (2007) The true *Argia difficilis* Selys, 1865, with the description of *Argia yungensis* sp. nov. (Odonata: Coenagrionidae). *Transactions of the American Entomological Society*, 133 (1+2), 189–204.
[https://doi.org/10.3157/0002-8320\(2007\)133\[189:TTADSW\]2.0.CO;2](https://doi.org/10.3157/0002-8320(2007)133[189:TTADSW]2.0.CO;2)
- Garrison, R.W. & von Ellenrieder, N. (2013) A contribution to the study of the biodiversity of Odonata in Costa Rica with an emphasis on the genus *Argia* (Insecta: Odonata: Coenagrionidae). *International Dragonfly Fund—Report*, 62, 1–23.
- Garrison, R.W. & von Ellenrieder, N. (2015) Damselflies of the genus *Argia* of the Guiana Shield (Odonata: Coenagrionidae). *Zootaxa*, 4042 (1), 1–134.
<https://doi.org/10.11646/zootaxa.4042.1.1>
- Garrison, R.W. & von Ellenrieder, N. (2017) New species of the damselfly genus *Argia* from Mexico, Central America and Ecuador with an emphasis on Costa Rica (Insecta: Odonata: Coenagrionidae). *Zootaxa*, 4035 (1), 1–93.
<https://doi.org/10.11646/zootaxa.4235.1.1>
- Garrison, R.W. & von Ellenrieder, N. (2018) Damselflies of the genus *Argia* (Odonata: Coenagrionidae) from Ecuador with descriptions of five new species. *Zootaxa*, 4470 (1), 1–69.
<https://doi.org/10.11646/zootaxa.4470.1.1>
- Garrison, R.W. & von Ellenrieder, N. (2019) An annotated list of the types of Odonata housed at the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, U.S.A. *International Dragonfly Fund—Report*, 134, 1–148.
- Garrison, R.W., von Ellenrieder, N. & Louton, J.A. (2010) *Damselfly genera of the New World. An Illustrated and Annotated Key to the Zygoptera*. The Johns Hopkins University Press, Baltimore, Maryland, xiv + 490 pp.
- Garrison, R.W., von Ellenrieder, N. & O'Brien, M.F. (2003) An annotated list of the name bearing types of species-group names in Odonata preserved in the University of Michigan, Museum of Zoology. *Occasional Papers of the Museum of Zoology, University of Michigan*, 736, 1–73.
- Geijskes, D.C. (1932) The dragon-fly fauna of Trinidad in the British West Indies (Odonata). Part I [Zygoptera]. *Zoologische Mededeelingen*, 14 (4), 232–262.
- Geijskes, D.C. (1943) Notes on Odonata of Surinam. Nine new or little known zygopterous nymphs from the inland waters. *Annales of the Entomological society of America*, 36 (2), 165–184.
<https://doi.org/10.1093/aesa/36.2.165>
- Geijskes, D.C. (1946) Observations on the Odonata of Tobago, B.W.I. *Transactions of the Royal Entomological Society of London*, 97 (9), 213–235.
<https://doi.org/10.1111/j.1365-2311.1946.tb00281.x>
- Geijskes, D.C. (1971) List of Odonata known from French Guyana, mainly based on a collection brought together by the mission of the “Muséum National d’Histoire Naturelle”, Paris. *Annales de la Société Entomologique de France, Nouvelle Série*, 7 (3), 655–677.
- Gloyd, L.K. (1932) Four new dragonfly records for the United States. (Odonata.). *Entomological News*, 43 (7), 189–190.
- Gloyd, L.K. (1941) The identity of three geographically misplaced species of Odonata. *Bulletin of the Chicago Academy of Sciences*, 6 (6), 130–132.
- Gloyd, L.K. (1958) The dragonfly fauna of the Big Bend region of trans-Pecos, Texas. *Occasional Papers of the Museum of Zoology, University of Michigan*, 593, 1–23.
- Gloyd, L.K. (1968a) The synonymy of *Diargia* and *Hyponeura* with the genus *Argia* (Odonata: Agrionidae: Argiinae). *The Michigan Entomologist*, 1 (8), 271–274.
- Gloyd, L.K. (1968b) The union of *Argia fumipennis* (Burmeister, 1839) with *Argia violacea* (Hagen, 1861), and the recognition of three subspecies (Odonata). *Occasional Papers of the Museum of Zoology University of Michigan*, 658, 1–6.
- Gloyd, L.K. (1981) Records of Odonata from El Salvador. *Notulae odonatologicae*, 1 (8), 133.

- Gómez-Anaya, J.A. & Novelo-Gutiérrez, R. (2010) Richness and structure of an Odonata larval assemblage from Río Pinolapa, Tepalcatepec, Michoacán, Mexico in relation to their habitat characteristics. *Odonatologica*, 39 (4), 287–303.
- González-Soriano, E. (1993) Odonata de México—Situación actual y perspectivas de estudio. *Revista de la Sociedad Mexicana de Historia Natural*, 44, 291–302.
- González-Soriano, E. (2012) *Argia mayi*, a new species from México (Zygoptera: Coenagrionidae). *Organisms Diversity & Evolution*, 12, 261–265.
<https://doi.org/10.1007/s13127-012-0078-2>
- González-Soriano, E., Noguera-Martínez, F.A., Barba-Medina, H.C.P., Zaragoza S. & Ramírez, E. (2016) Libélulas y caballitos del diablo (Odonata). In: *La Biodiversidad en Colima. Estudio de Estado*. Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (Conabio), México City, pp. 325–330.
- González-Soriano, E., Noguera, F.A. & Oñate Ocaña, L. (2011) A biodiversity hotspot for odonates in Mexico: The Huasteca Potosina, San Luis Potosí. *Odonatologica*, 40 (3), 179–190.
- González-Soriano, E., Noguera, F.A., Zaragoza-Caballero, S., Morales-Barrera, M.Á., Ayala-Barajas, R., Rodríguez-Palafox, A. & Ramírez-García, E. (2008) Odonata diversity in a tropical dry forest of Mexico, 1. Sierra de Huautla, Morelos. *Odonatologica*, 37 (4), 305–315.
- González-Soriano, E. & Novelo-Gutiérrez, R. (1991) Odonata de la Reserva de la Biosfera de la Michilia, Durango, Mexico. Parte I. Imagos. *Folia Entomológica Mexicana*, 81, 67–105.
- González-Soriano, E. & R. Novelo-Gutiérrez (1996) Odonata. In: Llorente-Bousquets, J., García Aldrete, A.N. & González-Soriano, E. (Eds.), *Biodiversidad, taxonomía y biogeografía de artrópodos de México: Hacia una síntesis de su conocimiento*. Universidad Nacional Autónoma de México, México City, pp. 147–167.
- González-Soriano, E. & Novelo-Gutiérrez, R. (2007) Odonata of Mexico revisited. In: Tyagi, B.K. (Ed.), *Odonata: Biology of Dragonflies*. Scientific Publishers, Jodhpur, pp. 105–136.
- González-Soriano, E. & Paulson, D.R. (2011) Odonata de Chiapas. In: Álvarez-Noguera, F. (Ed.), *Chiapas: estudios sobre su diversidad biológica*. Universidad Nacional Autónoma de México, México City, pp. 299–314.
- González-Soriano, E. & von Ellenrieder, N. (2009) What is *Amphipteryx agrioides* Selys 1853 (Odonata: Amphipterygidae)? *Zootaxa*, 2074 (1), 61–64.
<https://doi.org/10.11646/zootaxa.2074.1.3>
- Goyaud, C. (1994) Contribution à l'inventaire des Odonates du département de la Guadeloupe. *Martinia*, 10 (3), 49–61.
- Grand, D. (2002) Voyage en Guadeloupe. *Martinia*, 18 (1), 29–36.
- Hagen, H.A. (1861) *A synopsis of the Neuroptera of North America with a list of the South American species*. Smithsonian Institution Miscellaneous Collections, Washington, D.C., xx + 347 pp.
<https://doi.org/10.5962/bhl.title.22092>
- Hämäläinen, M. (1982) The identity of *Argia saalasi* Valle, 1942 (Zygoptera: Coenagrionidae). *Notulae odonatologicae*, 1 (10), 163.
- Hämäläinen, M. (2021) The marvelous polythorid damselfly *Euthore mirabilis* and other new Odonata species discovered by Clarence Buckley, with notes on the zoological legacy of this poorly known late 19th century collector in Ecuador and Bolivia. *Agrion*, 25 (2), 54–73.
- Hamilton, L.D. & Montgomerie, R.D. (1989) Population demography and sex ratio in a Neotropical damselfly (Odonata Coenagrionidae) in Costa Rica. *Journal of Tropical Ecology*, 5 (2), 159–171.
<https://doi.org/10.1017/S0266467400003424>
- Heckman, C.W. (2008) *Encyclopedia of South American Aquatic Insects: Odonata—Zygoptera*. Springer, Dordrecht, viii + 687 pp.
<https://doi.org/10.1007/978-1-4020-8176-7>
- Hoekstra, J.D. & Smith, R.L. (1999) Descriptions of the final instar larvae of *Argia sabino* Garrison and *Argia pima* Garrison (Odonata: Coenagrionidae). *Proceedings of the Entomological society of Washington*, 101 (4), 887–896.
- Hoekstra, J.D. & Smith, R.L. (2000) Reproductive behavior of two *Argia* spp. damselflies (Odonata: Coenagrionidae) at an Arizona stream. *International Journal of Odonatology*, 3 (1), 85–94.
<https://doi.org/10.1080/13887890.2000.9748137>
- Hoffmann, J. (2009) Summary catalogue of the Odonata of Peru. Kommentiertes Faksimile des Manuskripts von J. Cowley, Cambridge, 20.05.1933 und aktuelle Liste der Odonaten Perus mit Fundortangaben sowie Historie zu Sammlern und Odonatologen in Peru. *International Dragonfly Fund—Report*, 16, 1–115.
- Hornung, C.L.R. & Pacas, C. (2006) Investigating damselfly populations at springs in Banff National Park, Canada, with special focus on *Argia vivida*. *Aquatic Ecology*, 40, 49–58.
- Ilbert, N. & Menegaux, J. (2004) Observations d'Odonates en Guadeloupe (Antilles françaises). *Martinia*, 20 (4), 180.
- Jacquemin, G. (2000) Une petite collection d'Odonates de la Guadeloupe. *Martinia*, 16 (3), 100.
- Johnson, C. (1972a) The damselflies (Zygoptera) of Texas. *Bulletin of the Florida State Museum Biological Sciences*, 16 (2), 55–128.
- Johnson, C. (1972b) An analysis of geographical variation in the damselfly, *Argia apicalis* (Zygoptera: Coenagrionidae). *Canadian Entomologist*, 104, 1515–1527.
<https://doi.org/10.4039/Ent1041515-10>
- Johnson, C. (1973) Ovarian development and age recognition in the damselfly, *Argia moesta* (Hagen, 1961) (Zygoptera

- Coenagrionidae). *Odonatologica*, 2 (2), 69–81.
- Johnson, J. (2004) A new damselfly for Utah. *Argia*, 16 (3), 25–26.
- Johnson, J. (2016) *Argia agrioides* (California Dancer) New for Idaho. *Argia*, 28 (4), 24.
- Johnson, C. & Westfall, Jr., M.J. (1970) Diagnostic keys and notes on the damselflies (Zygoptera) of Florida. *Bulletin of the Florida State Museum, Biological Sciences*, 15 (2), 45–89.
- Justus, B.G., Trauth, S.E. & Harp, G.L. (1990) The mesostigmal complex of six *Argia* species using scanning electron microscopy (Zygoptera: Coenagrionidae). *Odonatologica*, 19 (2), 145–152.
- Kennedy, C.H. (1902). A new diagnostic character for the species of the genus *Argia*. *Proceedings of the Indiana Academy of Science*, 12, 164–169.
- Kennedy, C.H. (1915) Notes on the life history and ecology of the dragonflies (Odonata) of Washington and Oregon. *Proceedings of the United States National Museum*, 49, 259–345.
- Kennedy, C.H. (1918) New species of Odonata from the southwestern United States. Part I. Three new *Argias*. *Canadian Entomologist*, 50 (7), 256–261.
<https://doi.org/10.4039/Ent50256-8>
- Kennedy, C.H. (1919a) *The phylogeny of the Zygoptera*. PhD Thesis, Cornell University, 293 pp.
- Kennedy, C.H. (1919b) A new species of *Argia* (Odonata). *Canadian Entomologist*, 51, 17–18.
<https://doi.org/10.4039/Ent5117-1>
- Kennedy, C.H. (1920) Forty-two hitherto unrecognized genera and subgenera of Zygoptera. *Ohio Journal of Science*, 21 (2), 83–88.
- Kerst, C. (2009) Color Change in Male *Argia nahuana* (Aztec Dancer) in tandem pairs. *Argia*, 21 (4), 8–9.
- Kiauta, B. (1972) Synopsis of the main cytotaxonomic data in the order Odonata. *Odonatologica*, 1 (2), 73–102.
- Kiauta, B. (1978) Two cytotaxonomically interesting cases of irreversible autosome fusion in dragonflies *Argia moesta* (Hagen) (Zygoptera: Coenagrionidae) and *Anaciaeschna isosceles* (Müller) (Anisoptera: Aeshnidae). *Notulae odonatologicae*, 1 (1), 7–9.
- Kiauta, B. & Kiauta, M.A.J.E. (1980) Introduction to the cytotaxonomy of the odonate genus *Argia* Rambur (Zygoptera: Coenagrionidae). *Odonatologica*, 9 (1), 35–56.
- Kimmins, D.E. (1966) A list of the Odonata types described by F.C. Fraser, now in the British Museum (Natural History). *Bulletin of the British Museum (Natural History)*, 18 (6), 173–227.
- Kimmins, D.E. (1970) A list of the type-specimens of Odonata in the British Museum (Natural History) Part III. *Bulletin of the British Museum (Natural History)*, 24 (6), 171–205.
<https://doi.org/10.5962/bhl.part.1521>
- Kirby, W.F. (1890) *A Synonymic catalogue of Neuroptera Odonata, or dragonflies, with an appendix of fossil species*. Gurney and Jackson, London, ix + 202 pp.
- Kirby, W.F. (1894) On some small collections of Odonata (dragonflies) recently received from the West Indies. *Annals and Magazine of Natural History*, 6 (14), 261–269.
- Kirby, W.F. (1899) On a collection of Odonata (dragonflies) from Panama. *Annals and Magazine of Natural History*, 7 (3), 362–371.
- Kormondy, E.J. (1959) *Lestes tikalus* n. sp. and other Odonata from Guatemala. *Ohio Journal of Science*, 59 (5), 305–312.
- Koroiva, R., Neiss, U.G., Fleck, G. & Hamada, N. (2020) Checklist of dragonflies and damselflies (Insecta: Odonata) of the Amazonas state, Brazil. *Biota Neotropica*, 20 (1), 1–18.
<https://doi.org/10.1590/1676-0611-bn-2019-0877>
- Leggott, M. & Prichard, G. (1985a) The effect of temperature on rate of egg and larval development in populations of *Argia vivida* Hagen (Coenagrionidae) from habitats with different thermal regimes. *Canadian Journal of Zoology*, 63 (11), 2578–2582.
<https://doi.org/10.1139/z85-384>
- Leggott, M. & Prichard, G. (1985b) The life cycle of *Argia vivida* Hagen-developmental types, growth ratios and instar identification (Coenagrionidae). *Odonatologica*, 14 (3), 201–210.
- Leggott, M. & Prichard, G. (1986) Thermal preference and- activity thresholds in populations of *Argia vivida* (Odonata: Coenagrionidae) from habitats with different thermal regimes. *Hydrobiologia*, 140 (1), 85–92.
<https://doi.org/10.1007/BF00006730>
- Legris, M. & Pilon, J.-G. (1987) Étude morphologique des stades larvaires d’*Argia moesta* (Hagen) (Zygoptera: Coenagrionidae). *Advances in Odonatology*, 3, 61–90.
- Lencioni, F.A.A. (2006) *Damselflies of Brazil. An illustrated identification guide. 2—Coenagrionidae*. All Print Editora, São Paulo, viii + 419 pp.
- Lozano, F., del Palacio, A., Ramos, L. & Muzón, J. (2020) The Odonata of Argentina: state of knowledge and updated checklist. *International Journal of Odonatology*, 23 (2), 113–153.
<https://doi.org/10.1080/13887890.2020.1737585>
- Limongi, J. (1983 [1985]) Estudio morfo-taxonómico de náyades en algunas especies de Odonata (Insecta) en Venezuela (I). *Memorias de la Sociedad de Ciencias Naturales “La Salle”*, 43 (119), 95–117.
- Louton, J.A., Garrison, R.W. & Flint, O.S. (1996) The Odonata of Parque Nacional Manu, Madre de Dios, Peru: natural history, species richness and comparisons with other Peruvian sites. In: Wilson, D.E. & Sandoval, A. (Eds.), *Manu, the biodiversity*

- of southeastern Peru. Smithsonian Institution Press, Washington, D.C., pp. 431–449.
- Machet, P. (2004) Liste actualisée des Odonates de la Guyane Française. *Martinia*, 20 (3), 145–149.
- Machet, P. (2006) Guyane. In: Meurget, F. (Ed.), *Les Odonates des Départements et collectivités d’Outre-mer français. Bilan des activités du Groupe Odonatologique Outre-mer - 1999-2005*. Société Française d’Odonatologie, Bois d’Arcy, pp. 34–45 + 96–97.
- Madden, H.M. (1949) *Xántus Hungarian naturalist in the pioneer west*. PhD thesis, Oberösterreichischer Landesverlag, Linz, 313 pp. [https://www.zobodat.at/biografien/Xantus_Johann_hungarian_naturalist_pioneer_west_1949_SCAN_Wagner.pdf]
- Maes, J.-M. (1989) Insectos depredadores de los órdenes Odonata, Dictyoptera y Dermaptera. *Revista Nicaragüense de Entomología*, 8, 1–104.
- Maes, J.-M., Desmedt, J.-M. & Hellebuyck, V. (1988) Catálogo de los Odonata de Nicaragua. *Revista Nicaragüense de Entomología*, 4, 29–43.
- Mashaal, M. (2000) Brefs souvenirs odonatologiques de Guadeloupe, Martinique et Reunion. *Martinia*, 16 (3), 123–127.
- Maufray, W.F. & Tennessen, K.J. (2019) A catalogue and historical study of the Odonata of Ecuador. *Zootaxa*, 4628 (1), 1–265.
<https://doi.org/10.11646/zootaxa.4628.1.1>
- May, M.L. (1979) Lista preliminar de nombre y clave para identificar los Odonata (caballitos) de la Isla de Barro Colorado (I.B.C.). *Cuadernos de Ciencias*, 1, 1–52.
- Measey, G.J. (1994) Some Odonata from Belize, Central America. *Notulae odonatologicae*, 4 (3), 40–46.
- Mendoza-Trejo, R. & González-Soriano, E. (1989) Libélulas del área urbana y suburbana del Valle de México (Insecta: Odonata). In: Gio-Argáez, R., Hernández, & Sáinz, E. (Eds.), *Ecología Urbana*. Revista de la Sociedad Mexicana de Historia Natural, Publicación Especial, México City, pp. 135–140.
- Meurget, F. (2006a) Collecting trip in Guadeloupe. *Argia*, 18 (1), 19–21.
- Meurget, F. (2006b) Martinique. In: *Les Odonates des Départements et collectivités d’Outre-mer français. Bilan des activités du Groupe Odonatologique Outre-mer – 1999–2005* Societe française d’odonatologie, Paris, pp. 29–33.
- Meurget, F. (2006c) Clé de détermination actualisée des Odonates de Guadeloupe et de Martinique. In: *Les Odonates des Départements et collectivités d’Outre-mer français. Bilan des activités du Groupe Odonatologique Outre-mer – 1999–2005*. Societe française d’odonatologie, Bois d’Arcy, pp. 57–72.
- Meurget, F. (2007) The *Argia concinna* Rambur type locality mystery: Can it be solved? *Argia*, 19 (3), 13–14.
- Meurget, F. (2009) Redescription of *Argia concinna* (Rambur), with a description of *Argia telesfordi* spec. nov. from Grenada, West Indies (Zygoptera Coenagrionidae). *Zootaxa*, 2272, 54–62.
<https://doi.org/10.11646/zootaxa.2272.1.4>
- Meurget, F. (2010) 2010 Collecting trip to St. Vincent (Lesser Antilles). *Argia*, 22 (3), 10–12.
- Meurget, F. (2011) Redescription of the larva of *Argia concinna* (Rambur) and description of that of *Argia telesfordi* Meurget from the West Indies (Odonata: Coenagrionidae). *Odonatologica*, 40 (1), 45–50.
- Meurget, F. (2013) A catalogue of the West Indian dragonflies (Insecta: Odonata), *Annales de la Société entomologique de France*, New Series, 49 (3), 298–334.
<https://doi.org/10.1080/00379271.2013.848066>
- Meurget, F. & Picard, L. (2011) *Les Libellules des Antilles Françaises. Écologie, biologie, bigéographie et identification*. Biotope, Meze (Collection Parthenope); Museum national d’Histoire naturelle, Paris, 440 pp.
- Meurget, F. & Poirion, C. (2012) An updated checklist of Lesser Antillean Odonata. *International Journal of Odonatology*, 15 (4), 305–316.
<https://doi.org/10.1080/13887890.2012.738401>
- Meurget, F. & Williamson, T. (2002) Contribution a l’étude de la faune des Odonates de Guadeloupe. Observation de *Tholymis citrina* (Hagen, 1876) et *Tramea insularis* Hagen, 1861. *Martinia*, 18 (4), 157–174.
- Michalski, J. (1988) *A catalogue and guide to the Dragonflies of Trinidad (Order Odonata)*. Occasional Papers 6. University of the West Indies, St. Augustine, x + 146 pp.
- Michalski, J. (2015) *The dragonflies and damselflies of Trinidad & Tobago*. Kanduana Books, Morristown, x + 258 pp.
- Molineri, C. & Rodríguez, S. (2013) Description of the larva of *Argia jujuya* Ris (Coenagrionidae) with a key to species from the Argentinean Yungas cloud forest. *International Journal of Odonatology*, 16 (4), 301–307.
<https://doi.org/10.1080/13887890.2013.851628>
- Moulton II, S.R., Trauth, S.E. & Harp, G.L. (1987) The mesostigmal complex of *Argia* using scanning electron microscopy (Zygoptera: Coenagrionidae). *Odonatologica*, 16 (3), 285–289.
- Muzón, J. & von Ellenrieder, N. (1998). Odonata. In: Morrone, J.J. & Coscarón, S. (Eds.), *Biodiversidad de Artrópodos argentinos*. Museo de La Plata, La Plata, pp. 14–21.
- Nava-Bolaños, A., Sánchez-Guillén, R.A., Munguia Steyer, R. & Córdoba-Aguilar, A. (2016) Isolation barriers and genetic divergence in non-territorial *Argia* damselflies. *Biological Journal of the Linnean Society*, 120 (4), 804–817.
<https://doi.org/10.1111/bij.12916>
- Navás, L. (1920) Insecta nova descripsit V. series. *Memorie della Pontificia Accademia Romana dei Nuovi Lincei Serie*, 2 (5), 1–10.
- Navás, L. (1924) Odonatos nuevos o interesantes. *Memorias de la Real Academia de Ciencias y Artes, Barcelona 3 Serie*, 18

(13), 315–332.

- Navás, L. (1934a) Décadas de insectos nuevos. Década 26. Paraneuropteros (Odonatos). *Broteria, Serie de Ciencias Naturales*, Lisboa, 3 (3), 133–144.
- Navás, L. (1934b) Insectos de Méjico. *Boletín de la Sociedad Entomológica de España*, 16 (4–6), 68–75.
- Navás, L. (1935) Odonatos de Colombia. *Boletín de la Sociedad Entomológica de España*, 17, 33–38.
- Needham, J.G. (1904) New dragonfly nymphs in the United States National Museum. *Proceedings of the United States National Museum*, 27 (1371), 685–719.
- Needham, J.G. & Cockerell, T.D.A. (1902) Some hitherto unknown nymphs of Odonata from New Mexico. *Psyche*, 10 (324), 134–139.
- Novelo-Gutiérrez, R. (1991) Los odonatos de la Reserva de la Biósfera de Sian Ka'an, Quintana Roo, Mexico (Insecta: Odonata). *Folia Entomológica Mexicana*, 74, 13–68.
- Novelo-Gutiérrez, R. (1992) Biosystematics of the larvae of the genus *Argia* in Mexico (Zygoptera: Coenagrionidae). *Odonatologica*, 21 (1), 39–71.
- Novelo-Gutiérrez, R. (2008) Description of the last instar larva of *Argia barretti* Calvert (Zygoptera: Coenagrionidae). *Odonatologica*, 37 (4), 367–373.
- Novelo-Gutiérrez, R. (2013) Description of the larva of *Argia chelata* Calvert, 1902 (Odonata: Coenagrionidae). *Zootaxa*, 3745 (4), 479–485.
- Novelo-Gutiérrez, R., Canul-González, O. & Camal, J. (1988) Los Odonatos del estado de Quintana Roo, Mexico (Insecta: Odonata). *Folia Entomológica Mexicana*, 74, 13–68.
- Novelo-Gutiérrez, R. & Gómez-Anaya, J.A. (2006) A description of the larva of *Argia funcki* (Selys, 1854) (Odonata: Zygoptera: Coenagrionidae). *Proceedings of the Entomological Society of Washington*, 108 (2), 261–266.
- Novelo-Gutiérrez, R. & Gómez-Anaya, J.A. (2012) Description of the larva of *Argia percellulata* (Odonata: Coenagrionidae). *International Journal of Odonatology*, 15 (1), 45–50.
<https://doi.org/10.1080/13887890.2012.660412>
- Novelo-Gutiérrez, R. & Gómez-Anaya, J.A. (2021) Description of the larva of *Argia cuprea* (Hagen, 1861) (Odonata: Coenagrionidae). *Zootaxa*, 5057 (3), 437–445.
<https://doi.org/10.11646/zootaxa.5057.3.8>
- Novelo-Gutiérrez, R. & González-Soriano, E. (1991) Odonata de la Reserva de la Biosfera de la Michilia, Durango, Mexico. Parte II. Náyades. *Folia Entomológica Mexicana*, 81, 107–164.
- Novelo-Gutiérrez, R. & Peña-Olmedo, J. (1991) Odonata from the Northern Mountain Range of Hidalgo State. *Notulae odonatologicae*, 3 (8), 129–131.
- Ortega-Salas, H. & González-Soriano, E. (2019) Odonata of the Cuatro Ciénegas Basin. In: Álvarez, F. & Ojeda, M. (Eds.), *Animal Diversity and Biogeography of the Cuatro Ciénegas Basin, Cuatro Ciénegas Basin: An Endangered Hyperdiverse Oasis*. Springer Nature Switzerland AG, Cham, pp. 117–128.
<https://doi.org/10.1007/978-3-030-11262-29>
- Ortega-Salas, H., González-Soriano, E. & Jocque, M. (2022) Untangling the waterfall damselflies: a review of the Mesoamerican genus *Paraphlebia* Selys in Hagen, 1861 (Odonata: Thaumateuridae) with descriptions of 11 new species. *Zootaxa*, 5089 (1), 1–66.
<https://doi.org/10.11646/zootaxa.5089.1.1>
- Palacino-Rodríguez, F., Palacino-Penagos, D.A. & González-Neitha, A.A. (2020) Odonata from Bahia Solano, Colombian Pacific Region. *Check List*, (6), 1561–1573.
<https://doi.org/10.15560/16.6.1561>
- Papavero, N. (1971) *Essays on the history of Neotropical Dipterology with special reference to collectors (1750-1905)*. Vol. I. Museu de Zoologia, Universidade de São Paulo, São Paulo, vii + 216 pp.
- Papavero, N. & Ibáñez-Bernal, S. (2001) Contributions to a history of Mexican Dipterology. Part I. Entomologists and their works before the Biología Centrali-Americana. *Acta Zoológica Mexicana, Nueva Serie*, 84, 65–173.
<https://doi.org/10.21829/azm.2001.84841840>
- Paulson, D.R. (1982) Odonata. In: Hurlbert, S.H. & Villalobos-Figueroa, A. (Eds.), *Aquatic biota of Mexico, Central America and the West Indies*. San Diego State University, San Diego, California, pp. 249–277.
- Paulson, D.R. (1984) Additional records of Odonata from El Salvador. *Notulae odonatologicae*, 2 (3), 51–52.
- Paulson, D.R. (2002a) [cover photo “*Argia funckii* [sic!], Mexico. Or is it? This species—one of the largest coenagrionids in the New World - has always been thought to be solid dark gray. Has Dennis Paulson found the first red version?”]. *Argia*, 13 (4). [unknown pagination]
- Paulson, D.R. (2002b) Odonata records from Nayarit and Sinaloa, Mexico, with comments on natural history and biogeography. *Odonatologica*, 31 (4), 359–370.
- Paulson, D.R. (2009) *Dragonflies and damselflies of the West*. Princeton University Press, Princeton, New Jersey, 535 pp.
- Paulson, D.R. (2011) *Dragonflies and damselflies of the East*. Princeton University Press, Princeton, New Jersey, 538 pp.
- Paulson, D.R. (2013a) *Argia johannella*, new for Panama. *Argia*, 25 (1), 10.
- Paulson, D.R. (2013b) First record of *Argia terira* from Panama. *Argia*, 25 (1), 11.
- Paulson, D.R. & Haber, W. (2021) *Dragonflies and damselflies of Costa Rica. A field guide*. Cornell University Press, Ithaca, New York, xii + 401.

- Peña-Olmedo, J. & Novelo-Gutiérrez, R. (1993) Los odonatos del estado de Hidalgo (Insecta: Odonata). In: Villavicencio, M.A., Marmolejo, S. & Pérez-Escandón, B.E. (Eds.), *Investigaciones recientes sobre flora y fauna de Hidalgo*. Centro de Investigación Biológicas, Universidad Autónoma del Estado de Hidalgo, Pachuca, pp. 111–142.
- Pérez-Gutiérrez, L., Monroy, D. & Realpe, E. (2007) Local assemblage patterns of odonates in central Chocó, colombian pacific. In: Tyagi, B.K. (Ed.), *Odonata: biology of dragonflies*. Scientific Publishers, Jodhpur, pp. 183–199.
- Pérez-Gutiérrez, L.A. & Montes-Fontalvo, J.M. (2011) Description of the last stadium larvae of *Argia medullaris* Hagen in Selys and *A. variegata* Förster (Odonata: Coenagrionidae). *International Journal of Odonatology*, 14 (3), 217–222.
- Pérez-Gutiérrez, L.A., Montes-Fontalvo, J.M., Moreno, M.I. & Gutiérrez, L.C. (2013) *Libélulas de Colombia. Una guía de campo para su identificación*. Universidad del Atlántico, Bogotá, 206 pp.
- Pérez-Gutiérrez, L. & Palacino-Rodríguez, F. (2011) Updated checklist of the Odonata known from Colombia. *Odonatologica*, 40 (3), 203–225.
- Pifkó, D. (2019) Botanical activities of János Xántus (1825–1894) and his herbarium at the Department of Botany of the Hungarian Natural History Museum (HNHM). *Annales Museihistorico-Naturalis Hungarici*, 111, 145–177.
- Poiron, C. & Meurgey, F. (2012) Collecting trip to St Vincent – In the search for *Brechmorhogas*. *Argia*, 24 (2), 19–21.
- Pont, B. (2003) Quelques observations de Libellules en Guadeloupe. *Martinia*, 19 (4), 161–163.
- Pont, B. (2004) Contribution a la connaissance des Odonates de Guadeloupe et de Martinique. *Martinia*, 20 (4), 199–204.
- Pritchard, G. (1971) *Argia vivida* (Coenagrionidae) in hot pools at Banff. *The Canadian Field-Naturalist*, 8592, 186–188.
- Pritchard, G. (1980) The life cycle of *Argia vivida* Hagen in the northern part of its range (Zygoptera: Coenagrionidae). *Odonatologica*, 9 (1), 101–106.
- Pritchard, G. (1982) Life-history strategies in dragonflies and the colonization of North America by the genus *Argia* (Odonata Coenagrionidae). *Advances in Odonatology*, 1, 227–241.
- Pritchard, G. & Kortello, A. (2012) Roosting-perching-and habitat selection in *Argia vivida* Hagen & *Amphiagrion abbreviatum* (Selys) (Odonata: Coenagrionidae), two damselflies inhabiting geothermal springs. *The Canadian Entomologist*, 129 (4), 733–743.
<https://doi.org/10.4039/Ent129733-4>
- Pritchard, G. & Pelchat, B. (1977) Larval growth and development of *Argia vivida* (Coenagrionidae) in warm sulphur pools at Banff, Alberta. *The Canadian Entomologist*, 109 (12), 1563–1570.
<https://doi.org/10.4039/Ent1091563-12>
- Provonsha, A.V. & McCafferty, W.P. (1973) Previously unknown nymphs of western Odonata (Calopterygidae, Coenagrionidae). *Proceedings of the Entomological Society of Washington*, 75 (4), 449–454.
- Rácenis, J. (1959) Lista de los Odonata del Peru. *Acta Biologica Venezuelica*, 2 (34), 467–522.
- Rambur, P. (1842) *Histoire Naturelle des Insectes: Névroptères*. Librairie Encyclopédique de Roret, Paris, xvii + 534 pp.
- Ramírez, A., Paulson, D.R., & Esquivel, C. (2000) Odonata of Costa Rica: Diversity and checklist of species. *Revista de Biología Tropical*, 48 (1), 247–254.
- Rangel-Sánchez, L., Nava-Bolaños, A., Palacino Rodríguez, F. & Córdoba-Aguilar, A. (2018) Estimating distribution area in six *Argia* damselflies (Insecta: Odonata: Coenagrionidae) including *A. garrisoni*, a threatened species. *Revista Mexicana de Biodiversidad*, 89, 921–926.
<https://doi.org/10.22201/ib.20078706e.2018.3.2469>
- Ris, F. (1918) Libellen (Odonata) aus der Region der Amerikanischen Kordilleren von Costarica bis Catamarca. *Archiv für Naturgeschichte*, A (9), 1–197.
- Ris, F. (1921) The Odonata or dragonflies of South Africa. *Annals of the South African Museum*, 18 (3), 245–452.
- Robinson, J.V., Dickerson, J.E. & Bible, D.R. (1983) The demographics and habitat utilization of adult *Argia sedula* (Hagen) as determined by mark-recapture analysis (Zygoptera: Coenagrionidae). *Odonatologica*, 12 (2), 167–172.
- Rodriguez Capítulo, A. (1992) Los Odonata de la República Argentina (Insecta). *Fauna de Agua Dulce de la República Argentina*, 34 (1), 1–91.
- Rodriguez Capítulo, A., Mola, L.M. & Agopian, S.S. (1991) Species catalogue and chromosomal data of Odonata from Argentina. *Revista de la Sociedad Entomológica Argentina*, 49 (1–4), 59–72.
- Roble, S.M. (1994) A preliminary checklist of the damselflies of Virginia, with notes on distribution and seasonality (Odonata: Zygoptera). *Banisteria*, 4, 3–21.
- Sanchez Herrera, M., Amaya, V. & Mongui, J.P. (2020) Fishing dragons in Colombia! A collecting daydreaming during COVID-19 times. *Agrion*, 24 (2), 139–143.
- Sanmartín-Villar, I., Rivas-Torres, A., Gabela-Flores, M.V., Encalada, A.C. & Cordero-Rivera, A. (2017) Female polymorphism and colour variability in *Argia oculata* (Coenagrionidae: Zygoptera). *Neotropical Biodiversity*, 3 (1), 203–211.
<https://doi.org/10.1080/23766808.2017.1398037>
- Savart, J-P. (2010) Contribution à l'étude des Odonates de Guadeloupe. Observations sur trois sites à Pigeon (commune de Bouillante, côte-sous-le-vent, Basse-Terre). *Martinia*, 26 (3–4), 168–177.
- Say, T. (1840) Descriptions of new North American neuropterous insects, and observations on some already described. *Journal of the Academy of Natural Sciences of Philadelphia*, 8, 9–46.
- Schmidt, E. (1943) Odonata nebst Bemerkungen über die *Anomisma* und *Chalcopteryx* des Amazonas-Gebiets, In: Titschack, E. (Ed.), 1941–1942 *Beiträge zur Fauna Perus nach der Ausbeute der Hamburger Südperu Expedition 1936, anderer Sammlungen, wie auch auf Grund von Literaturangaben, herausgegeben von Professor Dr. Erich Titschack*. Vol. 2. G.

- Fischer, Jena, pp. 25–276.
- Schneeweih, C., Huber, W. & Weissenhofer, A. [Eds.] (2009) *Dragonflies of the Piedras Blancas National Park, Costa Rica*. Verein zur Förderung der Tropenstation La Gamba, Vienna, 56 pp.
- Sclater P.L. (1856) Catalogue of the birds collected by Auguste Sallé in southern Mexico, with descriptions of new species. *Proceedings of the Zoological Society of London*, 24, 283–311.
- Seemann, T.M. (1927) Dragonflies, stoneflies and mayflies of Southern California. *Journal of Entomology and Zoology*, 19 (1–4), 1–69.
- Selander, R.B. & Vaurie, P. (1962) A gazetteer to accompany the “Insecta” volumes of the “Biologia Centrali-Americana”. *American Museum Novitates*, 2099, 1–70.
- Selys, E.M. (1854) Monographie des Calopterygines. *Mémoires de la Société royale des Sciences de Liège*, 9, i–xi + 1–291.
- Selys, E.M. (1865) Synopsis des Agrionines, 5^{me} légion: *Agrion*. *Bulletin de l'Académie Royale des Sciences, des Lettres et des Beaux Arts de Belgique*, (2) 20, 375–417 (1–45 separate).
- Shelly, T.E. (1982) Comparative foraging behavior of light- versus shade-seeking adult damselflies in a lowland neotropical forest (Odonata Zygoptera). *Physiological Zoology*, 55 (4), 335–343.
<https://doi.org/10.1086/physzool.55.4.30155861>
- Sibley, F. (1999) List of dragonflies from Guadeloupe, West Indies. *Argia*, 11 (1), 21–22.
- Smith, B.D. & Patten, M.A. (2021) *Dragonflies at a biogeographical crossroads. The Odonata of Oklahoma and complexes beyond its borders*. CRC Press, Boca Raton, Florida, xiii + 726 pp.
<https://doi.org/10.1201/9781003007562>
- Smith, D.F. (2021) One Day of Odonata at Presa Tetajiosa. *Argia*, 33 (4), 17–24.
- Smith, D.F. (2022) Photographic records of *Argia mayi* (May's Dancer) from the Mexican states of Sinaloa and Oaxaca. *Argia*, 34 (2), 36–37.
- Soukup, J. (1954) Catálogo de los odonatos peruanos. *Biota, Peru*, 1 (1), 10–20.
- Stewart, D.A.B. & Vodopich, D.S. (2018) Environmental effects on wing shape and wing size of *Argia sedula* (Odonata: Coenagrionidae). *International Journal of Odonatology*, 21 (3–4), 189–203.
<https://doi.org/10.1080/13887890.2018.1523752>
- Suhling, F. (1999) Dragonfly records from El Valle, Republic of Panama. *Notulae odonatologicae*, 5 (4), 51–51.
- Tennessee, K.J. (1996) Escapade in Ecuador. Part 2. “Going looney in Yasuni.” *Argia*, 8 (2), 14–16.
- Torres-Pachón, M., Novelo-Gutiérrez, R. & Espinosa de los Monteros, A. (2017) Phylogenetic analysis of the genus *Argia* Rambur, 1842 (Odonata: Coenagrionidae), based on morphological characters of larvae and mitochondrial DNA sequences. *Organisms Diversity & Evolution*, 17, 409–420.
- Upton, S. (2000) A further *Argia lacrimans* population in southeast Arizona. *Argia*, 13 (1), 19.
- Upton, S., Danforth, D., González-Soriano, E., Behrstock, R.A. & Bailowitz, R.A. (2007) A preliminary checklist of the Odonata of Sonora, Mexico. *Bulletin of American Odonatology*, 10 (2/3), 23–51.
- Urrutia, M.X. (2005) Riqueza de especies de Odonata (Zigoptera) [sic] por unidades fisiográficas en el departamento del Valle del Cauca. *Boletín del Museo de Entomología de la Universidad del Valle*, 6 (2), 30–36.
- Ussa Cristiano, E.A. & Arango Díaz, C.J. (2009) *Libélulas de Saldaña. Una guía de campo para especies asociadas a los cultivos de arroz*. s.n., Bogotá, 85 pp.
- Valle, K.J. (1942) A small list of Odonata from U.S.A. Collected summer 1928 by Mr. Prof. U. Saalas and Mrs. Anna-Liisa Saalas. *Soumen Hyonteistieteellinen Aikakauskirja (Annales Entomologici Fennici)*, 8 (2), 163–166.
- von Ellenrieder, N. (2011) Odonata (dragonflies and damselflies) of the Kwamalasamutu region, Suriname. In: O'Shea, B.J., Alonso, L.E. & Larsen, T.H. (Eds.), *A Rapid Biological Assessment of the Kwamalasamutu region, southwestern Suriname. RAP Bulletin of biological Assessment* 63. Conservation International, Arlington, pp. 56–78.
- von Ellenrieder, N. & Garrison, R.W. (2007a) Untangling some taxonomic riddles on damselfly genera (Zygoptera) from the neotropical region. *International Dragonfly Fund—Report*, 11, 1–34.
- von Ellenrieder, N. & Garrison, R.W. (2007b) *Libélulas de las Yungas (Odonata). Una Guía de Campo para las especies de Argentina / Dragonflies of the Yungas. A Field Guide to the Species from Argentina*. Pensoft Series Faunistica 67. Pensoft Publishers, Sofia, iv + 116 pp.
- von Ellenrieder, N. & Garrison, R.W. (2007c) Dragonflies and Damselflies (Insecta: Odonata) of the Argentine Yungas: Species composition and identification. *Scientific Reports, Società Zoologica 'La Torbiera', Agrate and Conturbia*, 7, 1–95.
- von Ellenrieder, N., Garrison, R.W. & Ramón C., G.M. (2020) Odonata collected in Napo province, Ecuador, in January of 2020. *International Dragonfly Fund—Report*, 150, 3–20.
- von Ellenrieder, N., & Muzón, J. 2008. An Updated checklist of the Odonata from Argentina. *Odonatologica*, 37 (1), 55–68.
- Westfall, Jr., M.J. (1986) Additional records of Odonata from El Salvador. *Notulae odonatologicae*, 2 (7), 115–117.
- Westfall, Jr., M.J. (1990). Descriptions of larvae of *Argia munda* Calvert, *A. plana* Calvert, *A. tarascana* Calvert and *A. tonto* Calvert (Zygoptera: Coenagrionidae). *Odonatologica*, 19 (1), 61–70.
- Westfall, Jr., M.J. & May, M.L. (2006) *Damselflies of North America. Revised edition*. Scientific Publishers, Inc., Gainesville, Florida, xii + 502 pp.
- Williamson, E.B. (1912) The dragonfly *Argia moesta* and a new species (Odonata). *Entomological News*, 23 (5), 196–203.
- Woodruff, R.E., Beck, B.M., Skelley, P.E., Schotman, C.Y.L. & Thomas, M.C. (1998) *Checklist and bibliography of the insects of Grenada and the Grenadines*. The Sandhill Crane Press, Inc., Gainesville, Florida, 286 pp.

TABLE 1. Species-group names used or associated with species of *Argia* thus far known from Middle America (including Mexico, Central America and the Lesser Antilles) and current disposition of each. Number in brackets ([n]) under Reference = reprint pagination for names proposed by Hagen and Selys (1865). Names in **bold italic** = valid species-group names; names in *italic* = synonyms.

Name	Reference	Original Genus	Current status	Type Status	Location of Type
<i>adamsi</i>	Calvert 1902: 80	<i>Argia</i>	<i>Argia adamsi</i>	Holotype ♂	BMNH
<i>aenea</i>	Kirby 1890: 138	<i>Argia</i>	<i>Argia oenea</i>	Unjustified emendation	
<i>agrioides</i>	Calvert 1895: 476	<i>Argia</i>	<i>Argia agrioides</i>	Lectotype ♂	CAS
<i>alberta</i>	Kennedy 1918: 257	<i>Argia</i>	<i>Argia alberta</i>	Holotype ♂	USNM
<i>anceps</i>	Garrison 1996: 33	<i>Argia</i>	<i>Argia anceps</i>	Holotype ♂	USNM
<i>annae</i>	This paper	<i>Argia</i>	<i>Argia annae</i>	Holotype ♂	CSCA
<i>apicalis</i>	Say 1840: 40	<i>Agrion</i>	<i>Argia apicalis</i>	Holotype ♂	Lost
<i>augustana</i>	Navás 1934: 180	<i>Argia</i>	<i>Argia medullaris</i>	Holotype ♀	UMMZ
<i>barretti</i>	Calvert 1902: 87	<i>Argia</i>	<i>Argia barretti</i>	Holotype ♂	ANSP
<i>calidum</i>	Hagen 1861: 93	<i>Agrion</i>	<i>Argia calida</i>	Lectotype ♂	MCZ
<i>calverti</i>	Garrison & von Ellenrieder 2017: 6	<i>Argia</i>	<i>Argia calverti</i>	Holotype ♂	FSCA
<i>carlcooki</i>	Daigle 1995: 467	<i>Argia</i>	<i>Argia carlcooki</i>	Holotype ♂	FSCA
<i>carolus</i>	Garrison & von Ellenrieder 2017: 12	<i>Argia</i>	<i>Argia carolus</i>	Holotype ♂	FSCA
<i>charalana</i>	Navás 1924: 328	<i>Argia</i>	<i>Argia fissa</i>	Holotype ♂	?lost
<i>chelata</i>	Calvert 1902: 88	<i>Argia</i>	<i>Argia chelata</i>	Holotype ♂	BMNH
<i>columbiana</i>	Navás 1924: 327	<i>Argia</i>	<i>Argia medullaris</i>	Lectotype ♂	MNHN
<i>concinnum</i>	Rambur 1842: 270	<i>Agrion</i>	<i>Argia concinna</i>	Syntypes ♂♀	RBINS
<i>cupraurea</i>	Calvert 1902: 85	<i>Argia</i>	<i>Argia cupraurea</i>	Holotype ♂	BMNH
<i>cupreum</i>	Hagen 1861: 96	<i>Argia</i>	<i>Argia cuprea</i>	Syntype ♂	?lost
<i>dagrina</i>	Förster 1914: 62	<i>Argia</i>	<i>Argia indicatrix</i>	Lectotype ♂	UMMZ
<i>deami</i>	Calvert 1902: 90	<i>Argia</i>	<i>Argia deami</i>	Holotype ♂	ANSP
<i>eliptica</i>	Selys 1865: 393 [21]	<i>Argia</i>	<i>Argia oculata</i>	Lectotype ♂	RBINS
<i>elongata</i>	Garrison & von Ellenrieder 2017: 14	<i>Argia</i>	<i>Argia elongata</i>	Holotype ♂	CSCA
<i>espinalensis</i>	Navás 1933: 36	<i>Argia</i>	<i>Argia translata</i>	Lectotype ♂	FSCA
<i>extraneum</i>	Hagen 1861: 92	<i>Agrion</i>	<i>Argia extranea</i>	Holotype ♂	MCZ
<i>fissa</i>	Selys 1865: 401 [29]	<i>Argia</i>	<i>Argia fissa</i>	Syntypes ♂♀	MCZ, RBINS
<i>frequentula</i>	Calvert 1907: 365	<i>Argia</i>	<i>Argia frequentula</i>	Holotype ♂	UMMZ
<i>fulgida</i>	Navás 1934: 137	<i>Argia</i>	<i>Argia fulgida</i>	Lectotype ♂	MNHN
<i>funcki</i>	Selys 1854: 275	<i>Hypo-neura</i>	<i>Argia funcki</i>	Syntypes ♂♀	RBINS
<i>funebre</i>	Hagen 1861: 92	<i>Agrion</i>	<i>Argia funebris</i>	Lectotype ♂	MCZ
<i>garrisoni</i>	Daigle 1991: 337	<i>Argia</i>	<i>Argia garrisoni</i>	Holotype ♂	FSCA
<i>gaumeri</i>	Calvert 1907: 363	<i>Argia</i>	<i>Argia gaumeri</i>	Holotype ♂	FMNH
<i>gonzalezi</i>	This paper	<i>Argia</i>	<i>Argia gonzalezi</i>	Holotype ♂	CNIN
<i>haberi</i>	Garrison & von Ellenrieder 2017: 22	<i>Argia</i>	<i>Argia haberi</i>	Holotype ♂	FSCA
<i>harknessi</i>	Calvert 1899: 378	<i>Argia</i>	<i>Argia harknessi</i>	Lectotype ♂	CAS
<i>herberti</i>	Calvert 1902: 82	<i>Argia</i>	<i>Argia herberti</i>	Holotype ♂	BMNH
<i>hinei</i>	Kennedy 1918: 258	<i>Argia</i>	<i>Argia hinei</i>	Holotype ♂	UMMZ

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TABLE 1. (Continued)

Name	Reference	Original Genus	Current status	Type Status	Location of Type
<i>huallaga</i>	Fraser 1946: 450	<i>Argia</i>	<i>Argia adamsi</i>	Lectotype ♂	BMNH
<i>icterica</i>	Navás 1934: 138	<i>Argia</i>	<i>Argia oculata</i>	Holotype ♂	MHNN
<i>ierea</i>	Geijskes 1932: 244	<i>Argia</i>	<i>Argia insipida</i>	Syntypes ♂♀	RMNH
<i>immundum</i>	Hagen 1861: 93	<i>Agrion</i>	<i>Argia immunda</i>	Lectotype ♂	MCZ
<i>indicatrix</i>	Calvert 1902: 82	<i>Argia</i>	<i>Argia indicatrix</i>	Holotype ♂	BMNH
<i>insipida</i>	Hagen in Selys 1865: 389 [17]	<i>Argia</i>	<i>Argia insipida</i>	Syntypes ♂♀	MCZ
<i>intruda</i>	Williamson 1912: 200	<i>Argia</i>	<i>Argia moesta</i>	Lectotype ♂	UMMZ
<i>johannella</i>	Calvert 1907: 370	<i>Argia</i>	<i>Argia johannella</i>	Holotype ♂	BMNH
<i>kurilis</i>	Hagen in Selys 1865: 400 [28]	<i>Argia</i>	<i>Argia vivida</i>	Holotype ♀	MCZ
<i>lacrimans</i>	Hagen 1861: 95	<i>Agrion</i>	<i>Argia lacrimans</i>	Lectotype ♂	MCZ
<i>leonorae</i>	Garrison 1994: 315	<i>Argia</i>	<i>Argia leonorae</i>	Holotype ♂	FSCA
<i>lobata</i>	Navás 1924: 339	<i>Argia</i>	<i>Argia pulla</i>	Holotype ♂	?lost
<i>lugens</i>	Hagen 1861: 95	<i>Agrion</i>	<i>Argia lugens</i>	Holotype ♀	MNB
<i>mayi</i>	González-Soriano 2012: 261	<i>Argia</i>	<i>Argia mayi</i>	Holotype ♂	CNIN
<i>medullaris</i>	Hagen in Selys 1865: 412 [40]	<i>Argia</i>	<i>Argia medullaris</i>	Lectotype ♂	RBINS
<i>mista</i>	Navás 1934: 70	<i>Argia</i>	<i>Argia extranea</i>	Holotype ♂	MNHN
<i>moestum</i>	Hagen 1861: 94	<i>Agrion</i>	<i>Argia moesta</i>	Lectotype ♂	MCZ
<i>munda</i> (var. of. <i>vivida</i>)	Calvert 1902: 96	<i>Argia</i>	<i>Argia munda</i>	Lectotype ♂	MCZ
<i>nahuana</i> (var. of <i>vivida</i>)	Calvert 1902: 99	<i>Argia</i>	<i>Argia nahuana</i>	Holotype ♂	ANSP
<i>noveloi</i>	This paper	<i>Argia</i>	<i>Argia noveloi</i>	Holotype ♂	INECOL
<i>oculata</i>	Hagen in Selys 1865: 409 [37]	<i>Argia</i>	<i>Argia oculata</i>	Lectotype ♂	MCZ
<i>oenea</i>	Hagen in Selys 1865: 407 [35]	<i>Argia</i>	<i>Argia oenea</i>	?	? Lost
<i>pallens</i> (var. of <i>violacea</i>)	Calvert 1902: 98	<i>Argia</i>	<i>Argia pallens</i>	Holotype ♂	ANSP
<i>paludicola</i>	This paper	<i>Argia</i>	<i>Argia paludicola</i>	Holotype ♂	CSCA
<i>paulsoni</i>	This paper	<i>Argia</i>	<i>Argia paulsoni</i>	Holotype ♂	UCR
<i>percellulata</i>	Calvert 1902: 74	<i>Argia</i>	<i>Argia percellulata</i>	Holotype ♂	BMNH
<i>pima</i>	Garrison 1994: 323	<i>Argia</i>	<i>Argia pima</i>	Holotype ♂	USNM
<i>pipila</i>	Calvert 1907: 373	<i>Argia</i>	<i>Argia pipila</i>	Holotype ♂	UMMZ
<i>plana</i> (var. <i>vivida</i>)	Calvert 1902: 96	<i>Argia</i>	<i>Argia funebris</i>	Holotype ♂	BMNH
<i>pocomana</i>	Calvert 1907: 375	<i>Argia</i>	<i>Argia pocomana</i>	Holotype ♂	UMMZ
<i>popoluca</i>	Calvert 1902: 82	<i>Argia</i>	<i>Argia popoluca</i>	Holotype ♂	BMNH
<i>pulla</i>	Hagen in Selys 1865: 410 [38]	<i>Argia</i>	<i>Argia pulla</i>	Lectotype ♂	MCZ
<i>putridum</i>	Hagen 1861: 96	<i>Agrion</i>	<i>Argia moesta</i>	Syntypes ♂♀	MCZ
<i>rectangula</i>	Navás 1920: 1	<i>Argia</i>	<i>Argia medullaris</i>	Holotype ♀	MNHN
<i>rhoadsi</i>	Calvert 1902: 92	<i>Argia</i>	<i>Argia rhoadsi</i>	Holotype ♂	BMNH
<i>rita</i>	Kennedy 1919: 17	<i>Argia</i>	<i>Argia munda</i>	Holotype ♀	SEMC
<i>rogersi</i>	Calvert 1902: 83	<i>Argia</i>	<i>Argia rogersi</i>	Holotype ♂	BMNH
<i>rudolphi</i>	Garrison & von Ellenrieder 2017: 23	<i>Argia</i>	<i>Argia rudolphi</i>	Holotype ♂	CSCA
<i>saalasi</i>	Valle 1942: 164	<i>Argia</i>	<i>Argia nahuana</i>	Lectotype ♂	LUOMUS

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TABLE 1. (Continued)

Name	Reference	Original Genus	Current status	Type Status	Location of Type
<i>sabino</i>	Garrison 1994: 329	<i>Argia</i>	<i>Argia sabino</i>	Holotype ♂	USNM
<i>schorri</i>	Garrison & von Ellenrieder 2017: 27	<i>Argia</i>	<i>Argia schorri</i>	Holotype ♂	USNM
<i>sedulum</i>	Hagen 1861: 94	<i>Agrion</i>	<i>Argia sedula</i>	Lectotype ♂	MCZ
<i>solita</i>	Kennedy 1918: 256	<i>Argia</i>	<i>Argia pallens</i>	Holotype ♂	MCZ
<i>spgazzinii</i>	Navás 1934: 69	<i>Argia</i>	<i>Argia funebris</i>	Holotype ♂	MNHN
<i>stigmatica</i>	Navás 1934: 141	<i>Argia</i>	<i>Argia indicatrix</i>	Lectotype ♂	MNHN
<i>talamanca</i>	Calvert 1907: 371	<i>Argia</i>	<i>Argia talamanca</i>	Holotype ♂	BMNH
<i>tarascana</i>	Calvert 1902: 90	<i>Argia</i>	<i>Argia tarascana</i>	Holotype ♂	ANSP
<i>telesfordi</i>	Meurget 2009: 56	<i>Argia</i>	<i>Argia telesfordi</i>	Holotype ♂	MHNN
<i>terira</i>	Calvert 1907: 362	<i>Argia</i>	<i>Argia terira</i>	Holotype ♂	CMNH
<i>tezpi</i>	Calvert 1902: 77	<i>Argia</i>	<i>Argia tezpi</i>	Lectotype ♂	CAS
<i>tonto</i>	Calvert 1902: 89	<i>Argia</i>	<i>Argia tonto</i>	Holotype ♂	ANSP
<i>translata</i>	Hagen in Selys 1865: 410 [38]	<i>Argia</i>	<i>Argia translata</i>	Syntype ♂	MCZ
<i>trifoliata</i>	Fraser 1946: 449	<i>Argia</i>	<i>Argia variegata</i>	Lectotype ♂	BMNH
<i>ulmeca</i>	Calvert 1902: 80	<i>Argia</i>	<i>Argia ulmeca</i>	Holotype ♂	BMNH
<i>umbriaca</i>	Fraser 1946: 451	<i>Argia</i>	<i>Argia indicatrix</i>	Lectotype ♂	BMNH
<i>underwoodi</i>	Calvert 1907: 370	<i>Argia</i>	<i>Argia underwoodi</i>	Holotype ♂	BMNH
<i>variabilis</i>	Selys 1865: 406 [34]	<i>Argia</i>	<i>Argia variabilis</i>	Syntypes ♂♀	RBINS
<i>variata</i>	Navás 1934: 34	<i>Argia</i>	<i>Argia popoluca</i>	Holotype ♂	MNHN
<i>variegata</i>	Förster 1914: 65	<i>Argia</i>	<i>Argia variegata</i>	Syntypes ♂♀	UMMZ
<i>violaceum</i>	Hagen 1861: 90	<i>Agrion</i>	<i>Argia fumipennis violacea</i>	Lectotype ♂	MCZ
<i>vivida</i>	Hagen in Selys 1865: 406 [34]	<i>Argia</i>	<i>Argia vivida</i>	Holotype ♂	MCZ
<i>westfalli</i>	Garrison 1996: 33	<i>Argia</i>	<i>Argia westfalli</i>	Holotype ♂	FSCA
<i>wilsoni</i>	Calvert 1902: 75	<i>Argia</i>	<i>Argia calida</i>	Holotype ♂	MCZ

TABLE 2. Measurements for Mexican and Central American *Argia* species treated in this paper. Dimensions are given (in mm) as average $\pm$ standard deviation followed by range in square brackets and were taken from ten specimens of each sex from their entire range of distribution when available. Pt: pterostigma; px: postnodal crossveins; pq postquad-rangular cells.

<i>Argia</i> species	Pt over # cells		px Fw		px Hw		pq Fw		pq Hw	
	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀
<i>adamsi</i>	1.5-2	1-2	13-16	14-17	11-14	12-15	3-4	3-4	2-3	3-4
<i>agrioides</i>	1	1	10-14	11-14	9-11	9-12	3-4	3-4	3-4	3-4
<i>alberta</i>	1	1	9-11	10-12	8-10	8-11	3-4	3	2-3	2-3
<i>anceps</i>	1-2	1-2	13-17	14-18	11-14	12-15	4-6	4-5	3-4	4
<i>annae</i>	1-2	1-2	17-20	15-21	14-18	13-18	4-5	4-6	3-5	3-4
<i>apicalis</i>	1	1	12-16	14-17	11-15	12-16	3-4	4	3	3
<i>barretti</i>	1-1.5	1-1.5	14-17	14-17	11-14	12-14	4-5	4-6	4	3-5
<i>calida</i>	1-2	1-2	14-17	14-17	13-15	12-16	3-5	4-5	3-4	3-4
<i>calverti</i>	1-2	1-2	16-19	15-19	14-16	13-17	5	4-6	4-5	4-5
<i>carlcooki</i>	1	1	12-14	12-15	12-14	10-12	3	3	3	3
<i>carolus</i>	1-2	1-2	14-17	14-16	13-15	12-14	4	4	3-4	3-4
<i>chelata</i>	1-2	1-2	16-20	15-21	15-19	13-17	4-6	4-6	4-5	4-5
<i>concinna</i>	1-2	1-2	15-17	14-17	13-16	13-16	3-4	4	3-4	3-4
<i>cupraurea</i>	1-2	1-1.5	13-16	13-16	12-15	12-14	4-5	4-5	4-5	4
<i>cuprea</i>	1.5-2	1-1.5	14-18	14-17	13-15	12-15	4-5	4-6	4-5	3-5
<i>deami</i>	1-2	1-2	14-16	12-16	12-15	10-14	4-5	4-5	3-4	3-4
<i>elongata</i>	1-2	1-1.5	12-17	13-18	10-15	11-15	3-4	4	3	2-3
<i>extranea</i>	1-2	1-1.5	11-16	14-17	10-14	12-14	3-4	4	3-4	3-4
<i>fissa</i>	1-2	1-1.5	13-16	14-16	11-14	12-13	3-5	4-5	3-4	3-4
<i>frequentula</i>	1	1	13-15	13-16	12-14	11-14	3-4	3-4	2-3	2-3
<i>fulgida</i>	1_1.5	1-2	13-18	11-18	11-16	10-14	5	4-5	4-5	4
<i>fumipennis</i>	1	1	13-15	12-15	11-13	11-13	3-4	3-4	3	3
<i>funcki</i>	1.5-3	2-3	16-20	16-19	14-18	13-16	6-7	6-7	5-6	5-6
<i>funebriis</i>	1-1.5	1-1.5	13-17	13-19	11-16	11-17	3-4	3-4	3-4	3
<i>garrisoni</i>	1-1.5	1-2	14-17	14-16	12-15	13-14	3-4	3-4	3-4	3-4
<i>gaumeri</i>	1	1	11-15	12-16	10-12	10-13	3-4	3-4	3-4	3

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TABLE 2. (Continued)

Argia species	Pt over # cells		px Fw		px Hw		pq Fw		pq Hw	
	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀
<i>gonzalezi</i>	1-1.5	1-2	14-18	15-20	12-17	13-17	3.5-4	4	3	3
<i>haberi</i>	1-2		15-16		13-14		4		3-4	
<i>harknessi</i>	1-1.5	1	13-17	15-17	11-14	12-14	4-5	5	4-5	4-5
<i>herberti</i>	1-2	1-1.5	16-20	15-19	14-18	15-16	4-5	3-4	3-4	3-4
<i>hinei</i>	1	1	13-15	13-15	11-13	11-13	3-4	3-4	3	2-3
<i>immunda</i>	1	1	11-15	12-15	10-12	10-12	3	3-4	2-3	3
<i>indicatrix</i>	1-2	1-2	13-16	13-16	12-14	11-14	4	3-4	3	3
<i>insipida</i>	1-2	1-2	15-16	14-18	12-14	12-16	4-5	4-5	4	3-4
<i>johannella</i>	1	1	14-17	14-19	12-14	12-15	3	3-4	2-3	3
<i>lacrimans</i>	1-2	1-2	16-19	16-22	15-18	13-18	4-4	4-6	4	3-5
<i>leonorae</i>	1	1	10-12	10-13	8-10	8-10	3	3	2-3	2-3
<i>lugens</i>	1.5-3	1.5-2.5	14-19	14-18	11-18	13-14	5-6	5-7	4-5	4-6
<i>mayi</i>	1-1.5	1-1.5	12-15	13-15	11-14	11-13	3-4	3-4	3	2-3
<i>medullaris</i>	1-1.5	1-1.5	15-19	14-18	12-16	12-15	4	3-4	3	3
<i>moesta</i>	1-2	1-2	13-18	13-19	11-15	11-17	4-5	3-6	3-4	3-5
<i>munda</i>	1-2	1-2	15-18	14-18	13-17	13-16	4-5	4-6	3-5	4-5
<i>nahuana</i>	1	1	11-14	11-14	10-13	10-12	3-4	3-4	3	3-4
<i>noveloi</i>	1-2	1-2	15-18	14-18	13-16	12-16	4	4-5	3	3-4
<i>oculata</i>	1	1	13-18	13-18	12-16	11-16	3-4	3-4	3	3-4
<i>oenea</i>	1	1	13-16	12-16	12-14	11-14	4-6	4-5	4-6	3-4
<i>pallens</i>	1	1	12-15	12-15	10-13	11-12	3-4	3-5	3	3-4
<i>paludicola</i>	0.5-1	1	9-14	10-12	7-12	10	3-4	3-4	3-4	3
<i>paulsoni</i>	1		12-14		11-12		3		3	
<i>percellulata</i>	1-2	1.5-2	16-19	17-19	14-17	15-17	5-6	5-6	4-5	5
<i>pima</i>	1-2	1-2	15-18	14-18	14-16	12-18	4-5	4-6	4-5	3-5
<i>pipila</i>	1-1.5	1-1.5	13-18	14-18	12-15	12-15	4-5	5-6	4	4
<i>pocomana</i>	1-1.5	1-1.5	13-16	13-15	11-13	11-13	3	3	2-3	3

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TABLE 2. (Continued)

Argia species	Pt over # cells		px Fw		px Hw		pq Fw		pq Hw	
	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀
<i>popoluca</i>	1-1.5	1-1.5	13-16	13-15	12-14	11-13	3-4	3-4	3	3
<i>pulla</i>	1	1	12-17	13-17	10-14	11-16	2-3	3	2-3	2-3
<i>rhoadsi</i>	1	1	12-16	13-16	11-13	12-14	3-4	3-4	3-4	3
<i>rogersi</i>	1-1.5	1-1.5	14-17	13-17	11-16	11-15	3-4	3-5	3	3-4
<i>rudolphi</i>	1-2	1-2	16-20	16-20	12-18	15-17	3-5	4	3-4	3
<i>sabino</i>	1-2.5	1-2	13-17	14-16	12-16	12-15	4-5	4-5	3-5	3-4
<i>schorri</i>	1	1	12-14	13	10-11	10	3-4	3	3	3
<i>sedula</i>	1	1	11-15	12-15	10-12	9-12	3-5	4	3-4	3
<i>talamanca</i>	1	1-1.5	12-17	12-16	10-13	10-13	3-4	3-4	2-3	3
<i>tarascana</i>	1-2	1-2	14-17	14-17	11-15	11-14	3-4	4	3-4	3-4
<i>telesfordi</i>	1-2	1-2	14-17	15-17	13-15	13-15	4	3-4	3-4	3-4
<i>terira</i>	1-2	1-1.5	16-19	16-17	13-17	14	4-5	4-5	3-4	4
<i>tezpi</i>	1-1.5	1-2	15-18	13-18	13-16	10-16	5-6	4-6	3-5	3-5
<i>tonto</i>	1-2	1-2.5	15-21	17-23	14-18	15-20	4-6	5-6	3-5	4-5
<i>translata</i>	1	1	13-18	14-17	11-14	11-14	4-5	4-5	3-4	3-4
<i>ulmeca</i>	1.5-2	1.5-2	15-19	15-19	14-17	13-17	4-5	4-5	3-5	4
<i>underwoodi</i>	1-2	1-2	14-19	14-18	12-15	11-16	3-4	3-4	3	3-4
<i>variabilis</i>	1-2	1-2	14-15	12-16	11-13	11-14	3-4	4	3	3
<i>vivida</i>	1-2	1-2	13-18	13-18	11-15	11-15	3-4	3-5	3	3-4
<i>wesfalli</i>	1-2	1-1.5	14-19	15-16	13-16	12-14	3-5	4-5	3-5	3-4

TABLE 2. (Continued)

Argia species	RP ₂ at Fw		RP2 at Hw		Hw length		Abdomen length		Total length	
	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀
<i>adamsi</i>	7-8	7-8	6-7	5-7	18.5-21.9	19.4-22.6	25.6-31.1	25.8-29.8	32.8-39.5	32.7-38.2
<i>agrioides</i>	6-7	6-7	5-7	5-7	18-19.6	16.0-20.5	22.9-25.3	21.1-25.4	30.1-32.7	27.2-33.2
<i>albertya</i>	5-7	5-7	5-6	5-6	16.4-17.7	14.7-20.2	21.6-23.7	18.9-24.9	28.1-30.8	24.8-32.5
<i>anceps</i>	6-9	6-9	6-7	6-7	19.5-25.4	22.8-26.4	25.5-33.5	26-31.5	32.8-43	34-40.7
<i>annae</i>	7-8	7-9	5-7	6-7	21.5-24.6	23.8-27.2	27.8-32.1	27.2-31.6	35.3-40.7	35.2-40.8
<i>apicalis</i>	6-9	7-9	6-8	6-8	19.8-22.3	20.9-24.8	26.7-29.8	26.7-29.7	33.7-37.7	34.3-37.8
<i>barretti</i>	7-8	7-8	6-7	6-7	22.3-24.5	23.2-25.8	30.7-34.8	29.6-32.9	39.8-46.7	38.5-41.7
<i>calida</i>	7-9	7-8	6-8	6-7	19.1-22.1	19.7-23.5	26.4-29.3	24.3-29.3	33-37.2	31.7-37.6
<i>calverti</i>	7-9	7-8	6-8	6-7	23.8-27.6	23.5-28.2	31.2-36.1	29-34	40.7-47	38.2-44.5
<i>carlcooki</i>	6-7	6-8	5-7	5-6	17.8-21.3	19.5-20.7	24.1-27.6	24.7-25.8	31-35.4	31.3-32.5
<i>carolus</i>	7-8	7-8	6-7	6-7	20.8-23.0	18.5-24.7	27.6-32.1	23.3-29.3	35.8-41.5	30.5-38.5
<i>chelata</i>	8-9	7-9	7-8	6-8	25-29	25.2-29.8	30.4-36.8	27.7-34.5	39.1-46.7	36.5-44.8
<i>concinna</i>	7-9	7-9	6-8	6-7	18.7-20.9	19.2-22.8	27.2-30.1	23.3-29.8	34.5-38	30-36.4
<i>cupraurea</i>	6-7	6-8	6	6-7	20.2-22.5	19.8-23.5	28-30.7	25.4-28.4	36.1-40	33.4-37.3
<i>cuprea</i>	6-8	7-8	6-8	6-7	18.8-23.9	19.1-24.7	26.7-32	26.3-30	34.2-42	30.6-39
<i>deami</i>	6-8	6-8	5-7	5-7	20.4-22.8	19.8-25.3	24.7-28	22.6-30.3	32.1-36	30.1-38.3
<i>elongata</i>	6-8	6-8	5-7	5-7	18.8-23.4	20-23.9	24.5-30.4	23.7-29.1	32.2-38.6	31.2-37.88
<i>extranea</i>	5-8	6-8	5-6	5-7	19.9-22.4	21-26	25.8-29.2	25-29.8	33.6-37.2	32.8-38.8
<i>fissa</i>	7-8	7-8	6-7	6-7	21-23.2	21.3-24.5	27-30.7	24-28	34.8-39	31.7-36.7
<i>frequentula</i>	7-8	7-8	6-7	6-7	16.5-18.9	17.5-19.8	21.6-28.1	23.2-28.4	28.5-35.2	29.7-35.9
<i>fulgida</i>	6-8	6-8	6-8	5-7	18.4-23.4	20.5-24	28.5-32.5	25.1-29	36.5-43	33.3-37.7
<i>fumipennis</i>	6-8	6-7	5-7	5-6	17.6-20.7	19.3-22.1	23.3-26.4	22.3-26	30.5-34.3	29-33.9
<i>funcki</i>	6-9	7-9	6-8	6-8	31.3-36.1	34.1-38.9	38.8-46.4	39.7-44.7	50.4-58.9	51.2-58.3
<i>funnebris</i>	6-8	6-9	5-7	5-7	18.5-24.5	20.5-26.2	26.4-31.5	24.2-29.6	33.3-40.3	31.5-37.7
<i>garrisoni</i>	7-8	7-8	6-8	6-7	19.3-24.5	21-24.2	28.4-32.7	27.8-31.2	36.1-41.2	35.7-39.5
<i>gaumeri</i>	6-8	6-8	5-7	5-6	15.8-20.2	17.2-20.2	21.7-28.2	23.1-27.3	27.7-35.2	29.7-34.8
<i>gonzalezi</i>	7-9	8-9	6-8	6-8	20.5-24.9	23.6-28.1	26.5-31.5	27.4-31.9	33.6-40	35.5-40.4

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TABLE 2. (Continued)

Argia species	RP ₂ at Fw		RP2 at Hw		Hw length		Abdomen length		Total length	
	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀
<i>haberi</i>	7-8		6-7		22.5-23.3		28.3-30.2		36.8-38.4	
<i>harknessi</i>	7-8	7-8	6	6	20.7-24.5	23.7-26.4	27.5-33.7	28.8-31.3	35.7-43.4	37.7-41
<i>herberti</i>	8-10	8-9	6-8	7-8	21.7-25.6	22.5-25.3	27.3-32.7	26-29.5	35.2-41.7	33.7-38.4
<i>hinei</i>	6-8	6-8	5-6	5-7	17.8-20.7	18.9-20.9	23.3-26.7	22.1-26.5	29.9-34.5	28.2-33.7
<i>immunda</i>	6-7	6-7	5-6	5-6	18.2-21.7	21.3-23.5	23.6-29.2	25.5-29.2	30.2-35.8	33.3-37.7
<i>indicatrix</i>	6-8	6-7	5-6	5-6	14.8-18.9	16.3-19.7	21.8-25.6	20.1-24.1	28.2-32.8	26.3-31.3
<i>insipida</i>	7-8	7-9	6-7	6-8	18.9-22.3	19.3-22.9	26.3-30.3	24.4-29.8	33.4-39.2	31.9-38.3
<i>johannella</i>	7-9	7-9	6-7	6-8	17.2-20.2	18.1-20.8	24-27.8	24.4-27.6	30.7-35.5	30.9-35.2
<i>lacrimans</i>	7-9	7-11	6-7	6-7	23.6-28.9	26.7-31.8	31.3-36.4	30.1-36.4	40-46.8	39.1-43.8
<i>leonorae</i>	6-7	5-7	4-6	5-6	15.7-17.3	16.9-20	20.9-23.7	22-25.7	27.3-31.5	28.5-33.3
<i>lugens</i>	5-7	5-7	4-6	4-5	27.3-31.1	29.1-32.5	32.4-38.4	34.8-37.3	42.3-49.5	45.5-48.3
<i>mayi</i>	6-8	6-7	4-6	5-6	17.8-21.5	17.8-20.9	23.1-29.5	22-25.2	30.3-37.5	28.7-32.5
<i>medullaris</i>	6-9	7-8	5-7	5-7	22-27.7	24-28.5	28-31.8	25.6-31.7	35.3-40	34.1-40.5
<i>moesta</i>	6-9	6-8	5-7	5-7	21.3-26.8	24-28.7	29.3-34.9	29.5-35.2	37.4-44.2	37.5-44.5
<i>munda</i>	7-9	7-10	7-8	6-8	23.7-26.7	24-26.4	28.3-33.3	28-30.4	36-42	36-39.2
<i>nahuana</i>	5-7	6-7	5-6	5-7	17.7-20.7	18.4-22.5	23-26	23.1-27.2	30.4-33.4	29.7-35.7
<i>noveloi</i>	8-9	7-8	6-7	6-7	23.2-25.3	24.5-27.1	29.3-31.6	27.8-29.6	37.7-40.3	36.5-38.6
<i>oculata</i>	6-9	7-9	5-7	5-8	18.8-25.7	19-26.8	26.1-32.3	25.1-31.8	31.1-40.6	32-40.7
<i>oenea</i>	6-8	6-8	5-7	6-7	18.5-22.6	18.8-23.8	26.1-30.7	20-29.3	33.8-39.7	28.5-38.5
<i>pallens</i>	6-8	6-7	5-8	5-7	18-21.6	19-22.1	23.3-27.7	22.5-26	30.2-35.6	29.7-33.7
<i>paludicola</i>	5-7	5-6	4-6	5-6	12.7-14.7	13.8-14.8	16-17.4	16.4-17	21-23.1	21.6-22.4
<i>paulsoni</i>	5-6		4-5		19.6-20.7		25.9-27.6		32.8-35.3	
<i>percellulata</i>	7-10	8-9	7-8	7	26.2-30.1	28.8-29.7	36-41	34.7-35.5	45.8-52.1	44.8-46.1
<i>pima</i>	7-8	7-8	6-7	6-8	22.4-27.1	23.8-28	29.5-34.1	27.8-33.8	37.7-43.6	36-43.4
<i>pipila</i>	7-8	6-8	5-7	5-6	20.7-24.3	22.5-24.8	28.8-32.4	26.7-30.8	36.5-42.1	34.8-40.1
<i>pocomana</i>	6-7	6-7	4-7	5-6	20-23.7	18.1-24.3	26.4-31.1	24.4-29.6	33.9-39.5	31.8-38.5
<i>popoluca</i>	6-8	7-8	5-7	5-6	17.1-20.8	17.2-22.1	24-29.5	21.6-28.1	29.6-37.5	28-35.8

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TABLE 2. (Continued)

Argia species	RP ₂ at Fw		RP2 at Hw		Hw length		Abdomen length		Total length	
	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀
<i>pulla</i>	6-8	6-9	5-7	5-8	13.2-18.4	17.2-21.5	20-26.3	23.4-28.8	25.5-32.1	30.1-35.9
<i>rhoadsi</i>	6-8	6-8	5-6	5-6	18.6-22	20.2-22.5	26.1-29.6	26.2-29.5	33.3-37.5	33.7-37.6
<i>rogersi</i>	6-8	6-8	5-7	5-7	20.8-23.2	22-25.1	28.7-31.6	27.3-30.9	36.3-40	35.2-38.8
<i>rudolphi</i>	7-8	7-8	6-7	6-7	20-24	22.3-26.5	27.6-33.1	28.6-31.3	35.4-41.9	33.5-40.1
<i>sabino</i>	6-8	7-8	6-7	6-7	20.8-24.7	22-25.5	26.1-31.6	27.2-29.8	33.2-40.5	35.3-38.4
<i>schorri</i>	6-8	6-7	5	4	17.6-20.3	20.1	24-27	25.3	31.1-34.4	32.8
<i>sedula</i>	6-7	6-8	4-6	4-6	17-19.9	17.8-20.7	22.8-27.1	22.4-26.3	29.7-34.9	29.2-33.7
<i>talamanca</i>	6-7	6-7	4-6	4-6	18.4-21.8	20-24.2	23.8-29.6	24.3-28.1	30.9-37.7	31.7-36.2
<i>tarascana</i>	6-8	6-8	6-8	6-8	19.3-24.8	22.9-26.3	24.7-32.5	26.7-29.6	32.8-41.3	34.8-38.7
<i>telesfordi</i>	7-8	7-8	6-8	6-7	17-20.5	19.5-22.4	25.7-28.9	25.2-29.3	32.7-36.5	32.3-37.3
<i>terira</i>	7-9	8	6-8	6-7	24.4-27.8	26-27.5	28.7-34.9	28.1-30.9	37.2-44.5	36.7-40.4
<i>tezpi</i>	7-9	7-9	6-8	6-8	22-26.1	22-27.5	29.1-34.4	27.5-34.4	36.9-43.5	35.8-44.1
<i>tonto</i>	7-9	7-10	6-8	6-8	25.3-29.1	28.5-31.8	30.7-37.3	31.3-36.1	39.5-48.1	40.5-46.8
<i>translata</i>	7-9	7-8	6-8	6-8	20-23.4	18.6-26	28.4-34.6	23.4-32.7	35.7-43.8	30.5-41.8
<i>ulmeca</i>	7-9	6-9	6-8	6-8	19.5-26.4	21.4-29	26.6-35.6	26.9-33.6	34-45.5	34.9-43.6
<i>underwoodi</i>	6-8	6-8	5-6	5-7	21.3-26.1	20.9-24.4	28.1-32.8	24.9-29.1	35.5-47.7	32.9-37.5
<i>variabilis</i>	6-7	6-8	5-6	5-6	20.2-23.5	20.4-24	24.9-31.3	24.8-28.2	32.1-39.6	31.8-36.5
<i>vivida</i>	6-9	5-8	5-8	5-7	18.7-24	21.8-25.2	25.6-30.9	26.4-29.2	32.5-39.5	34.2-37.7
<i>westfalli</i>	7-10	7-9	7-9	6-9	22.8-24.4	23.4-26.2	29.2-31.5	27.8-30.8	38-40.5	36.4-40.5

TABLE 3. Presence of *Argia* species from Mexico and Central America by country. AR: Argentina, BE: Belize; BO: Bolivia; BR: Brazil; CA: Canada; CO: Colombia; CR: Costa Rica; EC: Ecuador; ES: El Salvador; FG: French Guiana; GU: Guatemala; GY: Guyana; HO: Honduras; LA: Lesser Antilles; MX: Mexico; NI: Nicaragua; PA: Panama; PE: Peru; SU: Suriname; TR: Trinidad and Tobago; US: United States of America; VE: Venezuela.

<i>Argia</i> species	CA	US	MX	BE	GU	HO	ES	NI	CR	PA	LA	TR	VE	CO	GY	SU	FG	BR	EC	PE	BO	AR
<i>adamsi</i>						x		x	x	x			x	x				x	x	x		x
<i>agrioides</i>		x	x																			
<i>alberta</i>		x	x																			
<i>anceps</i>		x	x	x	x	x	x	x	x													
<i>annae</i>			x																			
<i>apicalis</i>	x	x	x																			
<i>barretti</i>		x	x																			
<i>calida</i>			x	x	x																	
<i>calverti</i>									x	x												
<i>carlcooki</i>		x	x																			
<i>carolus</i>									x													
<i>chelata</i>			x	x		x		x	x	x												
<i>concinna</i>											x											
<i>cupraurea</i>					x	x		x	x	x			x	x								
<i>cuprea</i>		x	x	x	x	x																
<i>deami</i>			x																			
<i>elongata</i>			x	x	x	x	x	x	x	x												
<i>extranea</i>		x	x																			
<i>fissa</i>									x	x				x								
<i>frequentula</i>			x	x	x	x		x	x	x												
<i>fulgida</i>														x								
<i>fumipennis</i>	x	x	x																			
<i>funcki</i>		x	x				x															
<i>funbris</i>		x	x		x	x																
<i>garrisoni</i>			x																			
<i>gaumeri</i>			x	x	x	x																
<i>gonzalezi</i>			x	x	x				x													

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TABLE 3. (Continued)

<i>Argia</i> species	CA	US	MX	BE	GU	HO	ES	NI	CR	PA	LA	TR	VE	CO	GY	SU	FG	BR	EC	PE	BO	AR
<i>haberi</i>									x													
<i>harknessi</i>		x	x																			
<i>herberti</i>			x		x																	
<i>hinei</i>		x	x																			
<i>immunda</i>		x	x	x																		
<i>indicatrix</i>			x														x	x	x		x	
<i>insipida</i>								x	x	x		x	x	x	x	x	x	x				
<i>johannella</i>						x		x	x	x												
<i>lacrimans</i>		x	x																			
<i>leonorae</i>		x	x																			
<i>lugens</i>		x	x																			
<i>mayi</i>			x																			
<i>medullaris</i>					x	x	x	x	x	x		x	x	x					x			
<i>moesta</i>	x	x	x																			
<i>munda</i>		x	x																			
<i>nahuana</i>		x	x																			
<i>noveloi</i>			x																			
<i>oculata</i>		x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x		
<i>oenea</i>		x	x	x	x	x	x	x	x	x												
<i>pallens</i>		x	x							x												
<i>paludicola</i>		x	x																			
<i>paulsoni</i>									x													
<i>percellulata</i>			x		x																	
<i>pima</i>		x	x																			
<i>pipila</i>			x	x	x	x		x														
<i>pocomana</i>			x		x	x	x		x	x												
<i>popoluca</i>			x			x			x	x				x					x			
<i>pulla</i>			x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x		

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TABLE 3. (Continued)

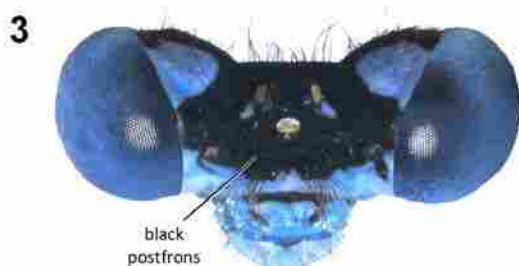
<i>Argia</i> species	CA	US	MX	BE	GU	HO	ES	NI	CR	PA	LA	TR	VE	CO	GY	SU	FG	BR	EC	PE	BO	AR
<i>rhoadsi</i>		x	x																			
<i>rogersi</i>									x	x												
<i>rudolphi</i>			x																			
<i>sabino</i>		x	x																			
<i>schorri</i>									x													
<i>sedula</i>	x	x	x																			
<i>talamanca</i>									x	x				x								
<i>tarascana</i>		x	x																			
<i>telesfordi</i>											x											
<i>terira</i>									x	x												
<i>tezpi</i>		x	x		x	x	x	x														
<i>tonto</i>		x	x																			
<i>translata</i>	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x
<i>ulmeca</i>		x	x	x	x	x	x	x	x	x				x								
<i>underwoodi</i>									x	x												
<i>variabilis</i>			x		x																	
<i>vivida</i>	x	x	x																			
<i>westfalli</i>			x																			
TOTAL	6	34	55	15	21	20	11	16	29	22	2	4	7	12	5	4	5	6	7	4	4	1



A. adamsi – male
ECUADOR, 12 km N of Loreto



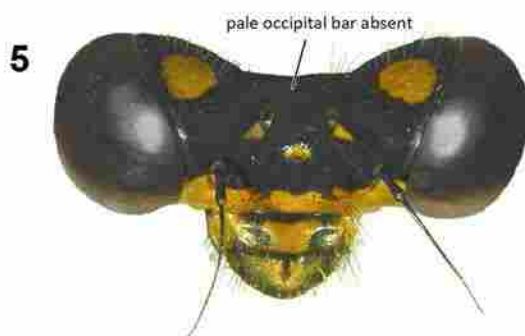
A. adamsi – female
PANAMA, NW of Gamboa



A. annae – male PARATYPE
MEXICO, Puente Teocelo



A. calida – male
MEXICO, Puente Palictla



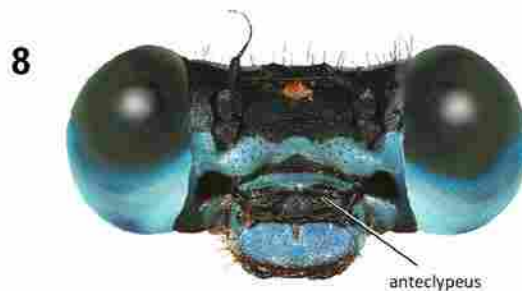
A. calida – female
MEXICO, Ruinas del Tajin



A. calverti – male
COSTA RICA, Braulio Carrillo N.P.



A. carolus – male PARATYPE
COSTA RICA, Cataratas River



A. concinna – male
GUADELOUPE, 12 mi N of Roseau

9



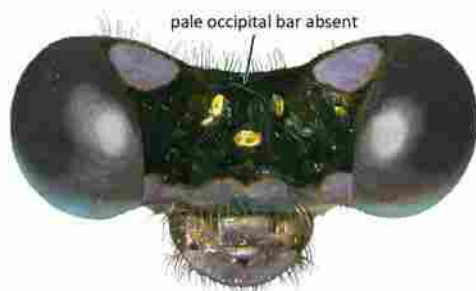
A. fulgida – male
COSTA RICA, La Selva

10



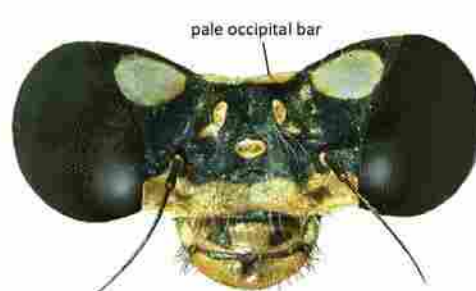
A. fulgida – male
ECUADOR, Playones

11



A. garrisoni – male
MEXICO, Huichihuayan River

12



A. garrisoni – female
MEXICO, Cascada de Micos

13



A. insipida – female
NICARAGUA, Refugio Bartola

14



A. oculata – female
PANAMA, Barro Colorado Island

15



A. oculata – female
BELIZE, Ontario Village

16



A. oculata – female
MEXICO, Sontecomapan

17



A. oculata – female
MEXICO, Parque Javier Clavijero

18



A. oenea – male
MEXICO, Máquinas River

19



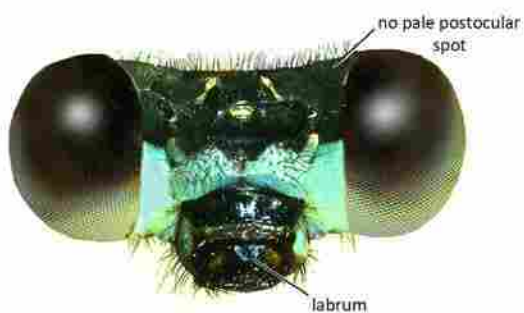
A. oenea – female
MEXICO, Máquinas River

20



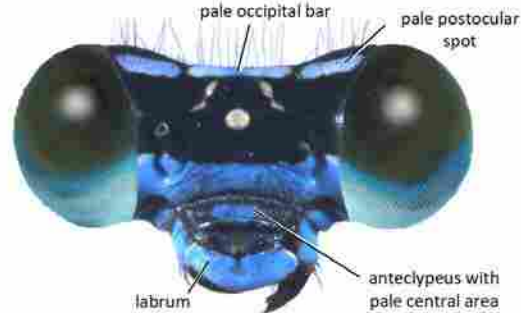
A. pulla – male
MEXICO, Agua Caliente

21



A. rogersi – male
COSTA RICA, Finca Mauricio Ramírez

22



A. telesfordi – male
SAINT VINCENT, South Rivers

23



A. calverti – female PARATYPE
COSTA RICA, La Selva

24



A. fulgida – female
COSTA RICA, La Selva

25



A. fulgida – male
PANAMA, Sierra Llorona Lodge

26



A. oenea – female
COSTA RICA, near La Union

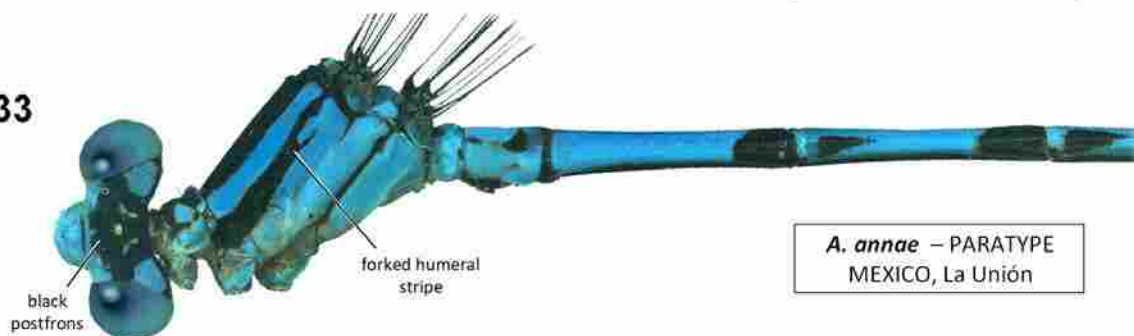


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A. annae – PARATYPE
MEXICO, Teocelo

33



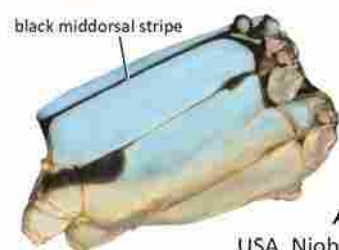
A. annae – PARATYPE
MEXICO, La Unión

34



A. apicalis
USA, Niobrara Valley Reserve

35



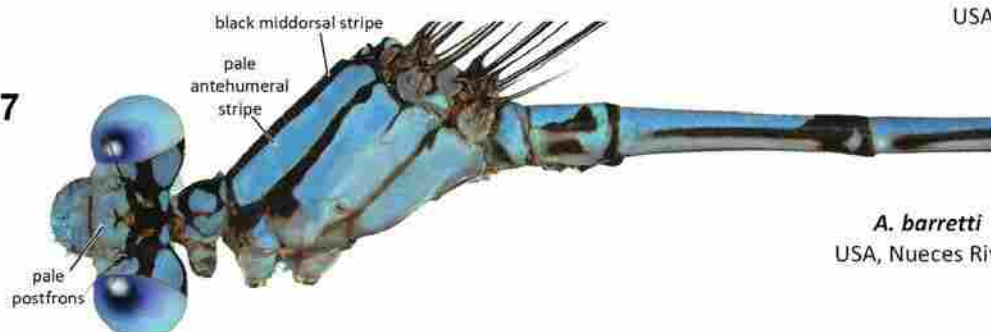
A. apicalis
USA, Niobrara Valley Reserve

36



A. barretti
USA, Nueces River

37



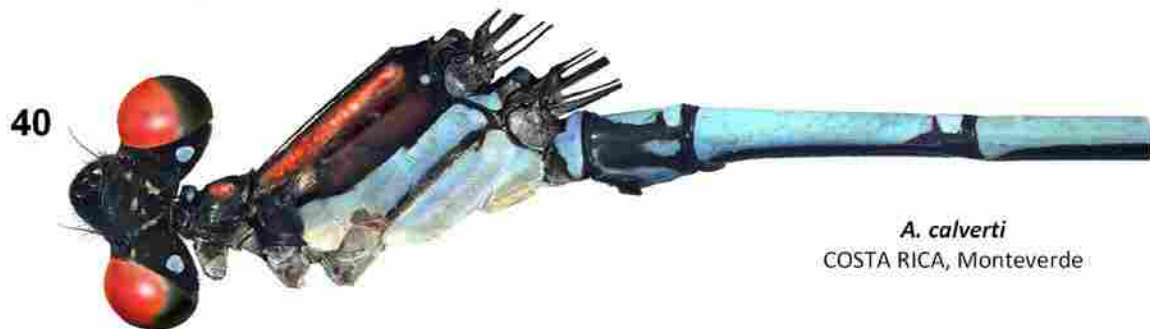
A. barretti
USA, Nueces River



A. calida
MEXICO, Cascada Misol-Ha



A. calida
MEXICO, Puente Palictla



A. calverti
COSTA RICA, Monteverde

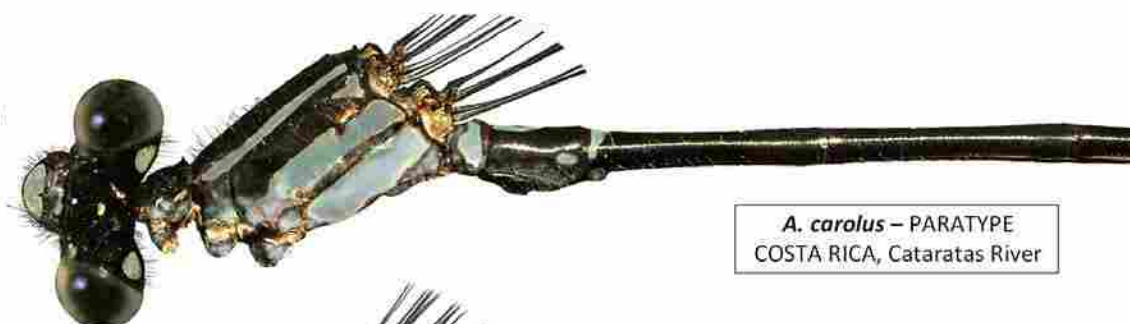


A. carlcooki
MEXICO, Balneario La Palma



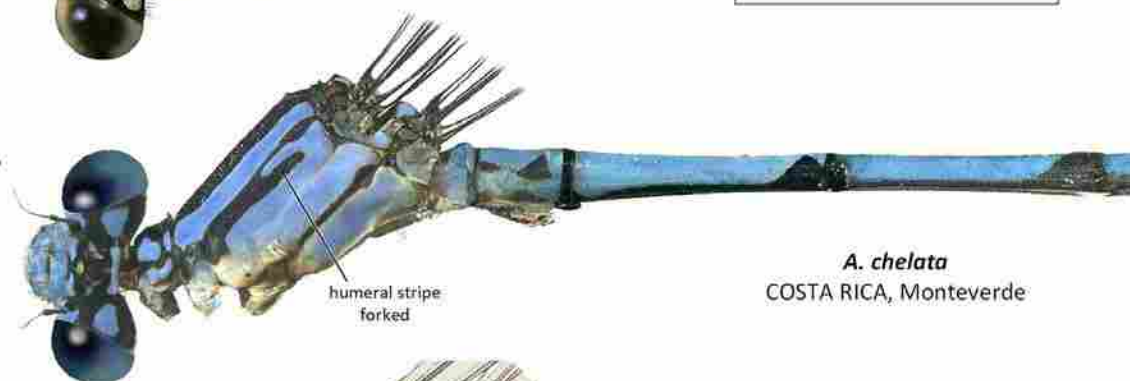
A. carlcooki
MEXICO, Balneario La Palma

43



A. carolus – PARATYPE
COSTA RICA, Cataratas River

44



A. chelata
COSTA RICA, Monteverde

45



A. concinna
GUADELOUPE, Grand Etang

46



A. cupraurea
COSTA RICA, near La Unión

47



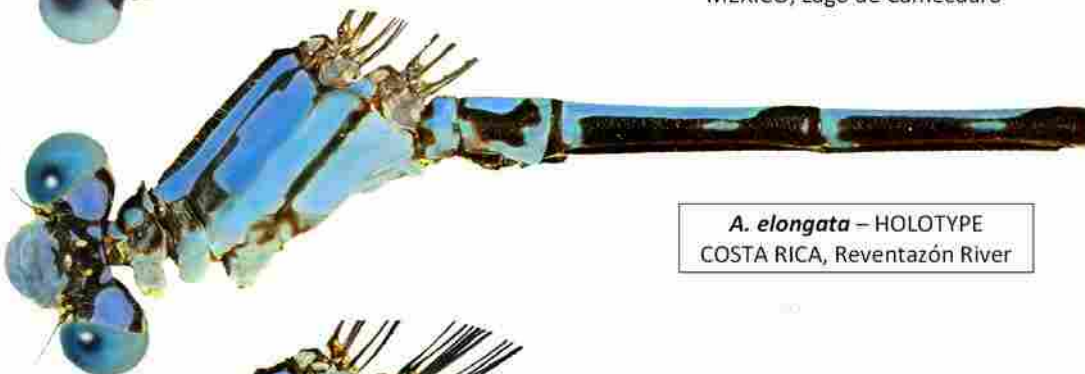
A. cuprea
MEXICO, Las Pozas de Xilitla

48



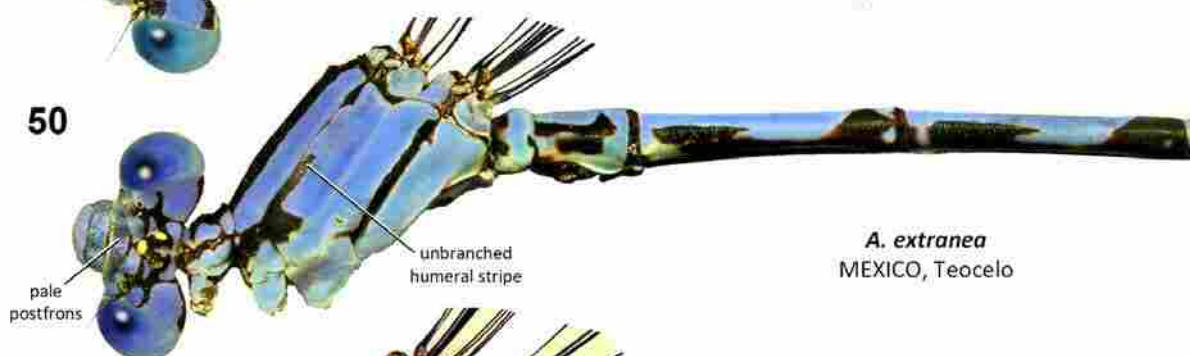
A. deami
MEXICO, Lago de Camécuaro

49



A. elongata – HOLOTYPE
COSTA RICA, Reventazón River

50



A. extranea
MEXICO, Teocelo

51



A. fissa
PANAMA, Cerro Campana

52



A. frequentula
MEXICO, Otapa River

53



A. frequentula
COSTA RICA, Puntarenas

54



A. frequentula – PARATYPE
HONDURAS, San Pedro Sula

55



A. fulgida
COSTA RICA, La Selva

56



A. fulgida
ECUADOR, E of Caluma

57



A. fumipennis violacea
MEXICO, La Michilia

58



A. fumipennis violacea
USA, Bottomless Lake

59



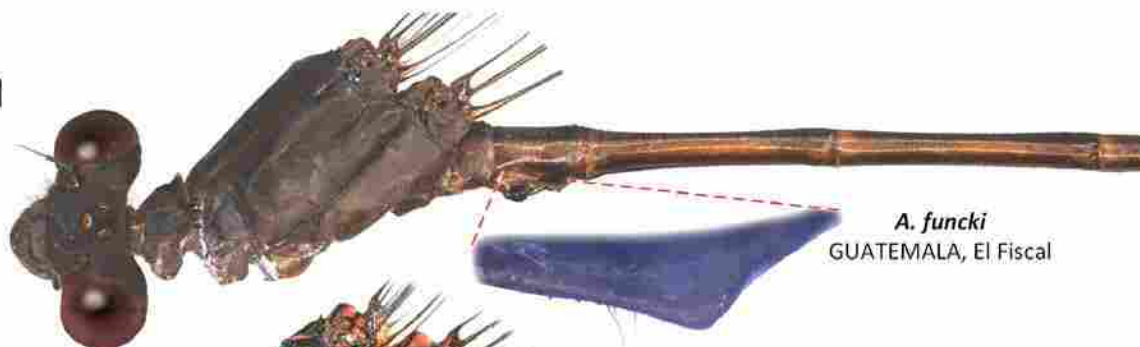
A. fumipennis violacea
USA, Bottomless Lake

60



A. fumipennis violacea
USA, Butler Creek

61



A. funcki
GUATEMALA, El Fiscal

62



A. funcki
MEXICO, Taxco

63

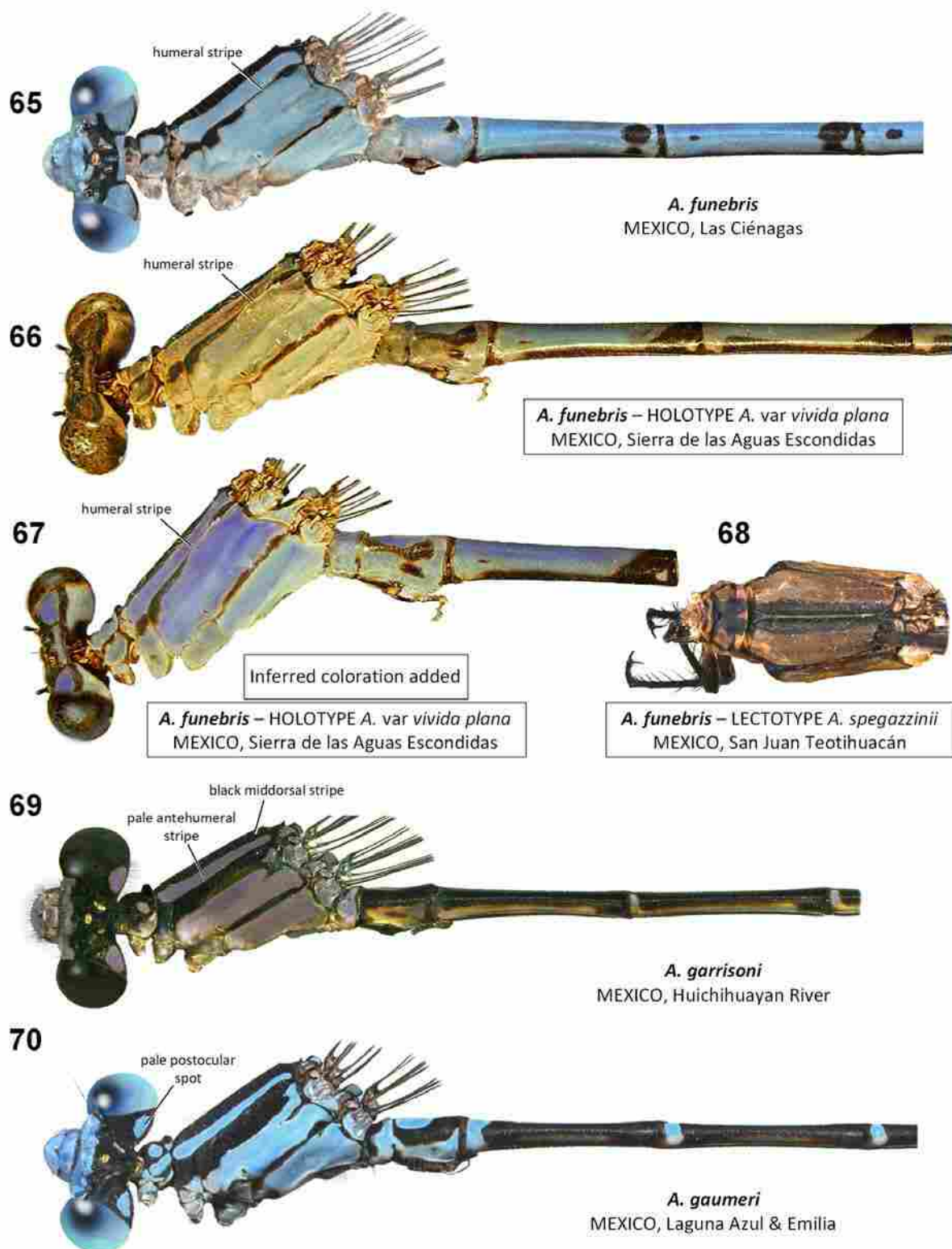


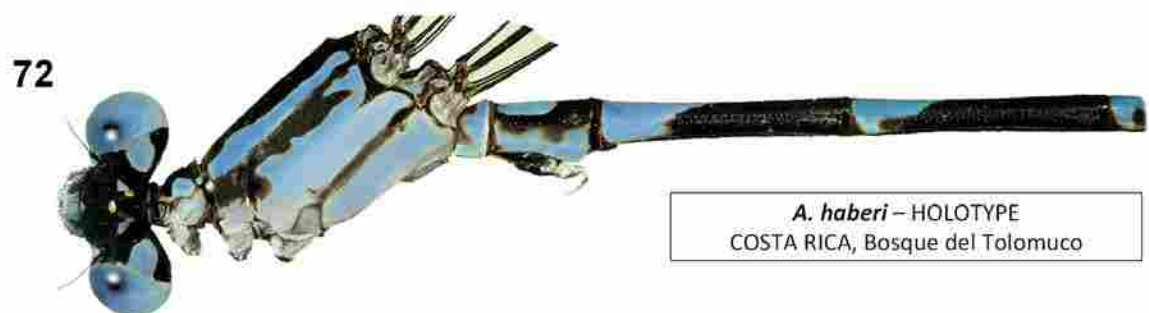
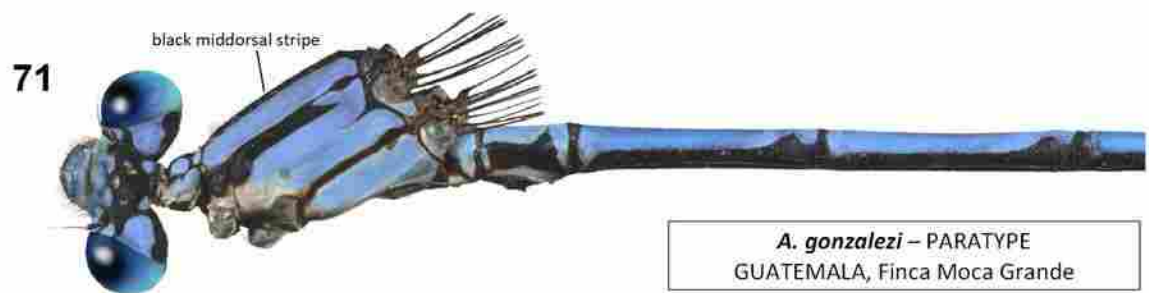
A. funcki
MEXICO, Maycoba River

64



A. funebris
MEXICO, San Cristobal de las Casas



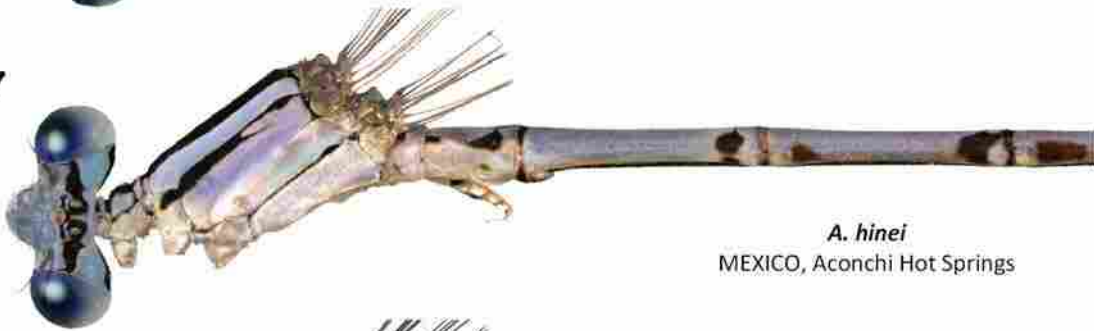


76



A. herberti
MEXICO, E of El Camarón

77



A. hinei
MEXICO, Aconchi Hot Springs

78



A. immunda
MEXICO, Agua Caliente

79



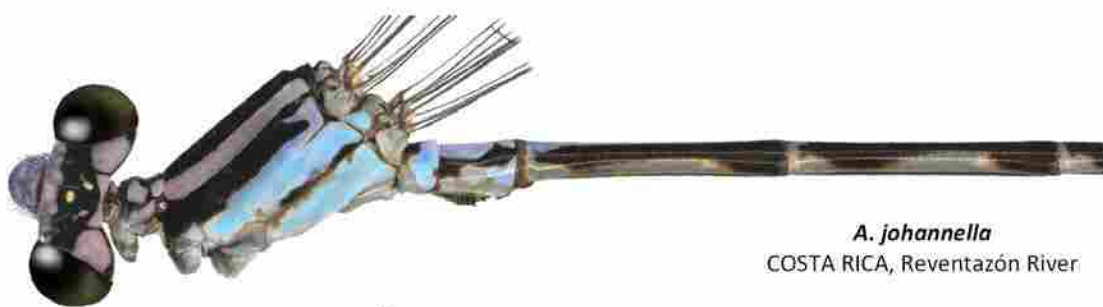
A. indicatrix
MEXICO, Agua Caliente

80



A. insipida
COSTA RICA, Parismina River

81



A. johannella
COSTA RICA, Reventazón River

82



A. lacrimans
MEXICO, La Fuente

83



A. leonora
USA, Culberson W of junction 2185

84



A. lugens
USA, Gila Webber Creek

85



A. lugens
MEXICO, Piedras River near Pacheco

86



A. lugens
USA, Bidwell City Park

87



A. lugens
USA, Grant Sapillo Creek

88



A. lugens
USA, Grant Sapillo Creek

89



A. mayi
MEXICO, La Palma

90



A. medullaris
COSTA RICA, Monteverde

91



A. moesta
USA, Gila River

92



A. moesta
MEXICO, Lago de Chapala

93



A. munda

USA, Upper Sabino Canyon

94



A. nahuana

USA, San Bernardino Ranch

95



A. nahuana

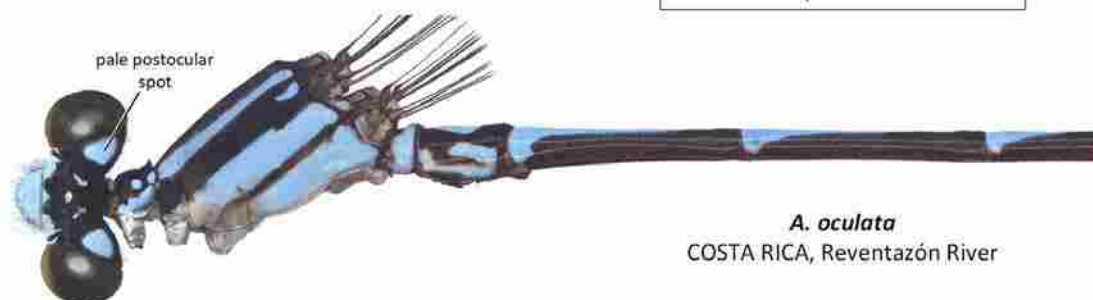
MEXICO, Lago de Camécuaro

96



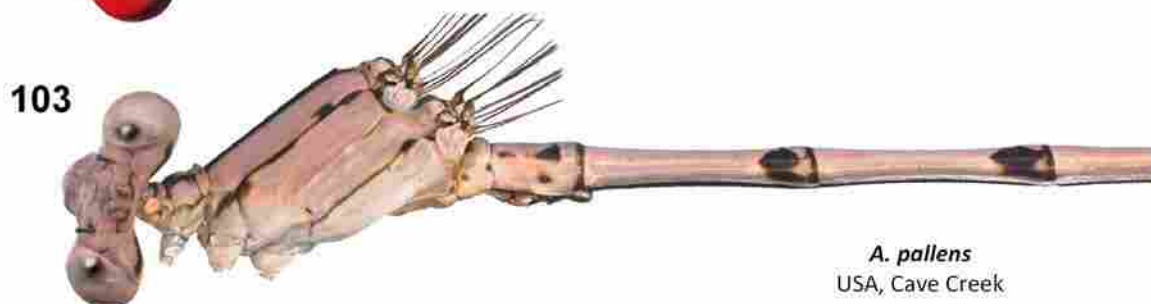
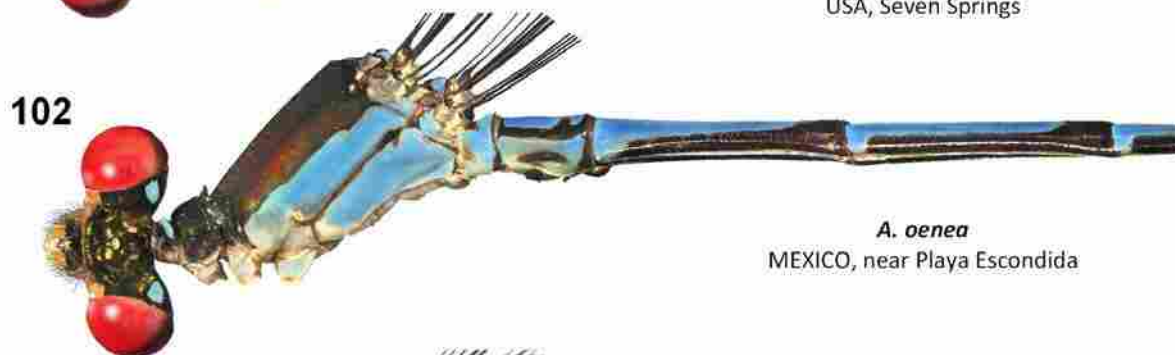
A. noveloi – PARATYPE
MEXICO, Puente Texolo

97



A. oculata

COSTA RICA, Reventazón River



104



A. pallens
MEXICO, San José de Pimas River

105



A. pallens
MEXICO, Encarnación River

106



A. paludicola – PARATYPE
USA, Bog Tank

107



A. paulsoni – PARATYPE
COSTA RICA, NE of Londres

108

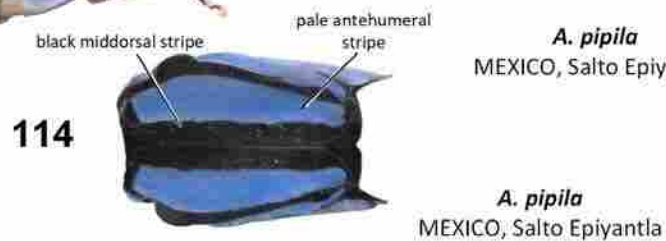
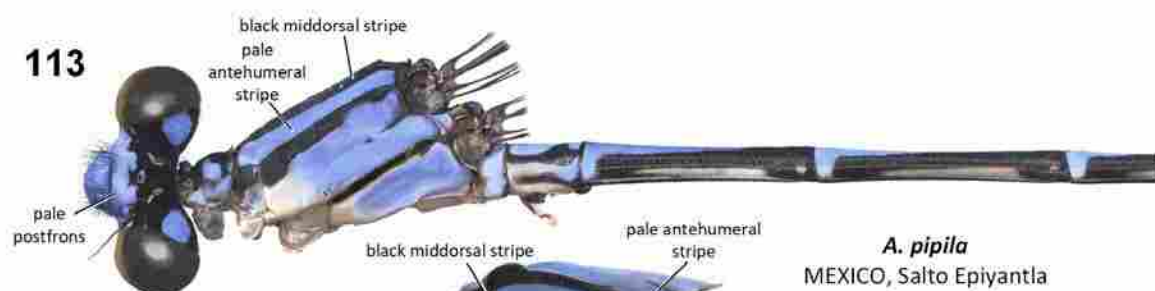


A. percellulata
MEXICO, Puente Teocelo

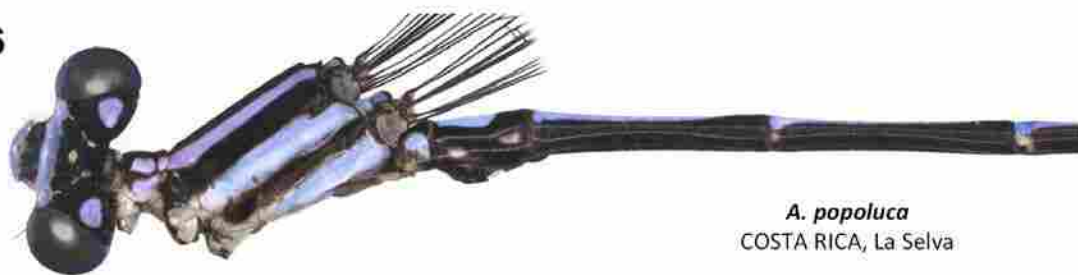
109



A. percellulata
MEXICO, San Marcos River



116



A. popoluca
COSTA RICA, La Selva

117



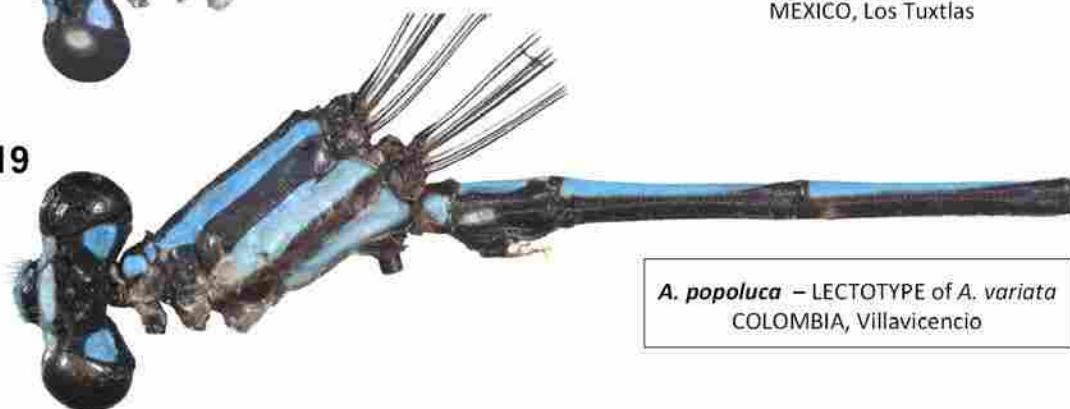
A. popoluca
MEXICO, Los Tuxtlas

118



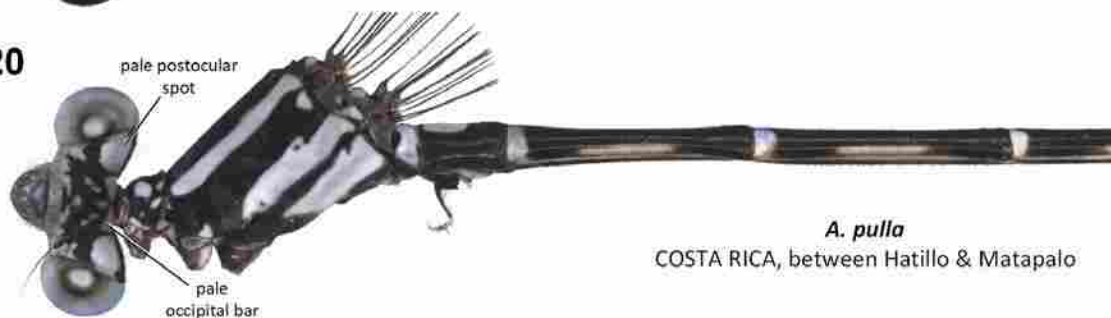
A. popoluca
MEXICO, Los Tuxtlas

119



A. popoluca – LECTOTYPE of *A. variata*
COLOMBIA, Villavicencio

120



A. pulla
COSTA RICA, between Hatillo & Matapalo

121



A. pulla
COSTA RICA, 3 mi E of Golfito

122



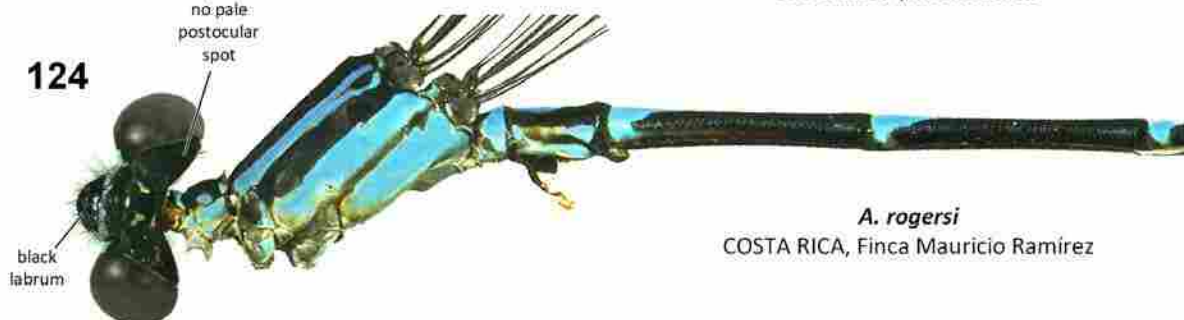
A. rhoadsi
USA, Las Moras Creek

123



A. rogersi
COSTA RICA, Monteverde

124



A. rogersi
COSTA RICA, Finca Mauricio Ramírez

125



A. rudolphi – HOLOTYPE
MEXICO, La Unión

126



A. sabino
USA, Molino Basin Forest Camp

127



A. sabino
USA, Upper Sabino Canyon

128



A. sabino
USA, Upper Sabino Canyon

129



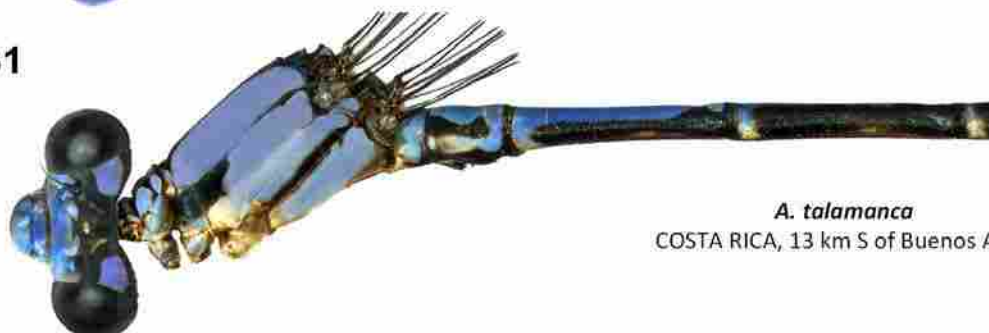
A. schorri – PARATYPE
COSTA RICA, 2 mi N of Uvita

130



A. sedula
MEXICO, Coy River head

131



A. talamanca
COSTA RICA, 13 km S of Buenos Aires

132



A. talamanca
COSTA RICA, Juan Vinas

133



A. talamanca
PANAMA, Chagres National Park

134



A. talamanca
COSTA RICA, 13 mi SE of Buenos Aires

135



A. talamanca
PANAMA, Chagres National Park

136



A. tarascana
USA, Hot Springs Canyon

137



A. tarascana
MEXICO, La Fuente

138



A. tarascana
USA, Muleshoe Ranch

139

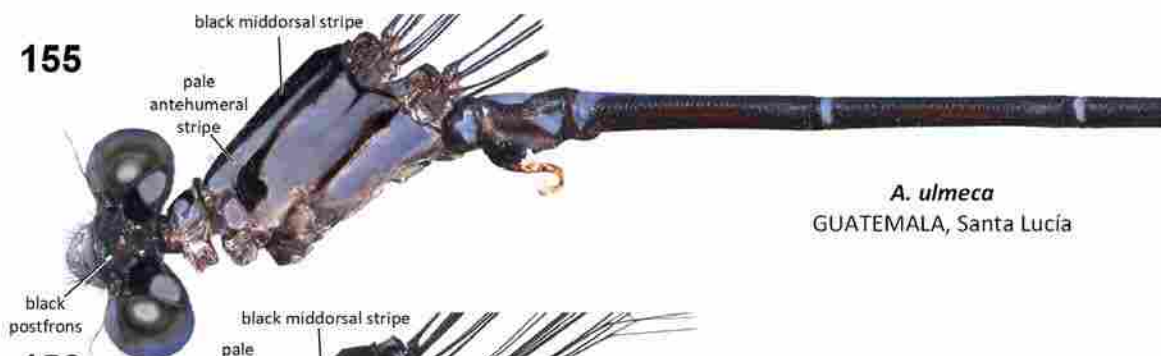


A. tarascana
MEXICO, Cajón Bonito at Rancho Los Ojos



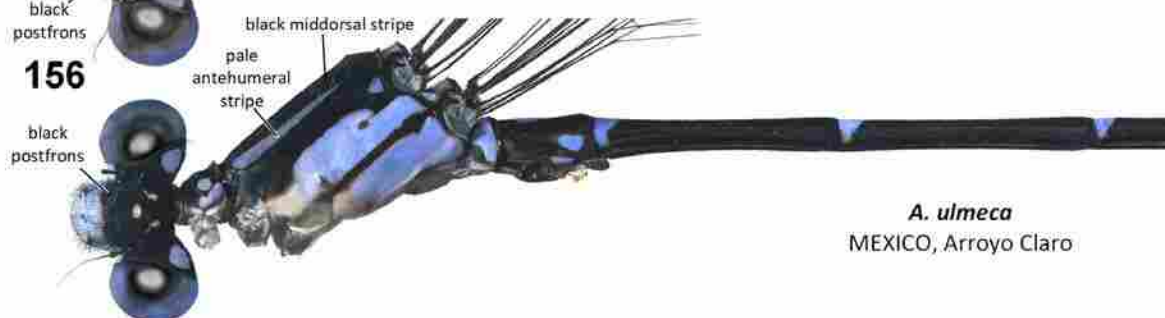


155



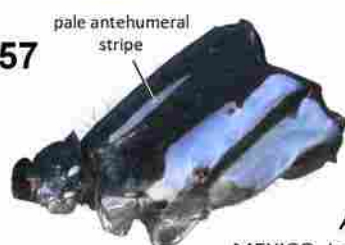
A. ulmeca
GUATEMALA, Santa Lucía

156



A. ulmeca
MEXICO, Arroyo Claro

157



A. ulmeca
MEXICO, Lagunas Azul & Emilia

158



A. underwoodi
COSTA RICA, Sarapiquí River

159



A. underwoodi
COSTA RICA, Monteverde

160



A. variabilis
MEXICO, 2 km E of Coyame

161



unbranched
humeral stripe

A. variabilis

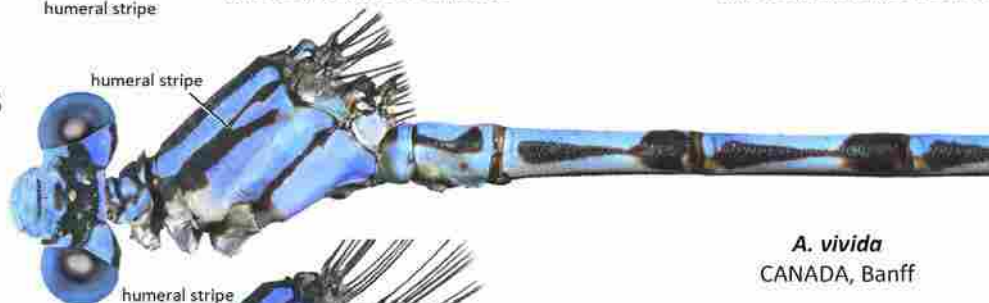
MEXICO, 2 km E of Coyame

162

*A. vivida*

MEXICO, stream on road to San Javier

163

*A. vivida*

CANADA, Banff

164

*A. vivida*

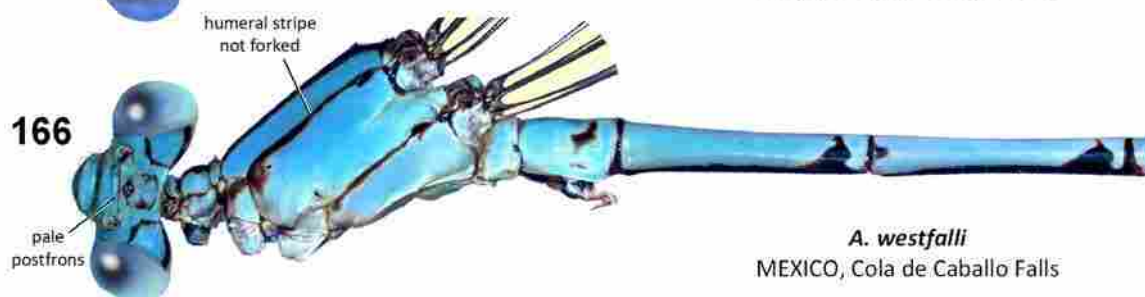
MEXICO, Primer Agua

165

*A. vivida*

USA, end of Five Bridges Road

166

*A. westfalli*

MEXICO, Cola de Caballo Falls

167

*A. westfalli* – PARATYPE

MEXICO, Lagunas de Montebello

168



A. adamsi
PANAMA, SE of Gamboa

169



A. adamsi
VENEZUELA, Táchira

170



A. agrioides
MEXICO, Rancho San Enrique

171

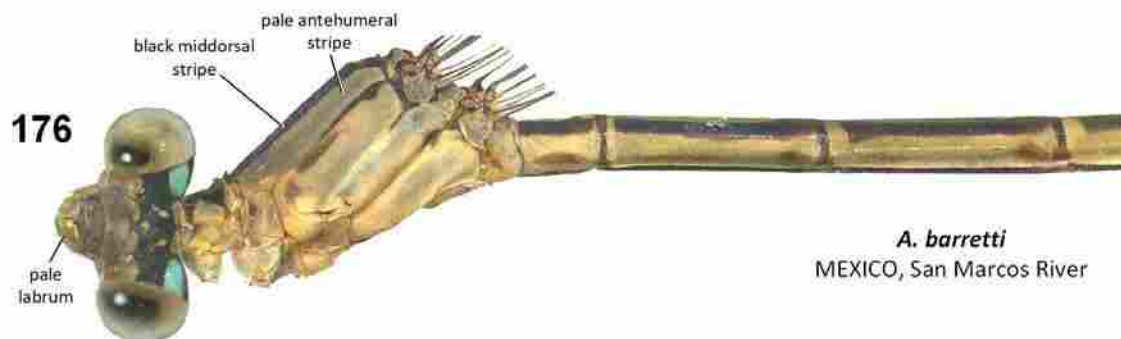
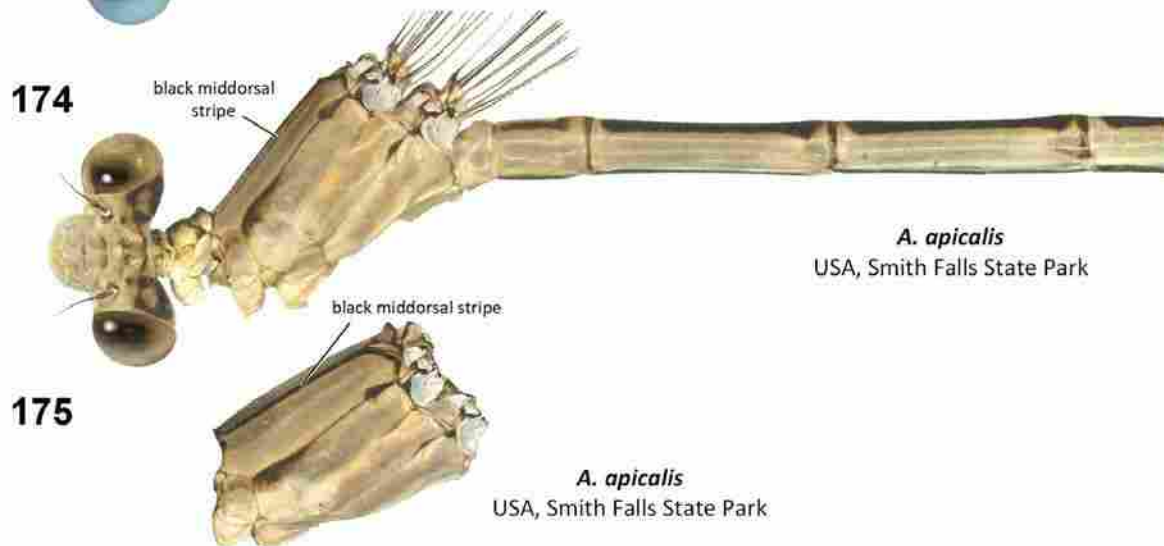


A. alberta
USA, Double Springs

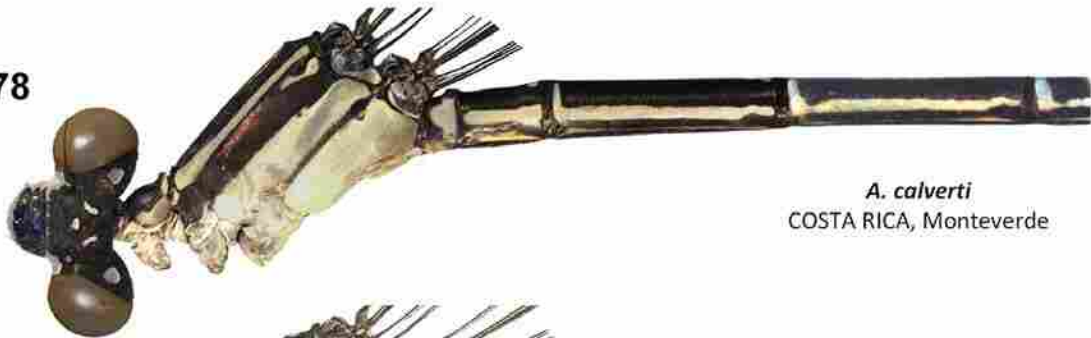
172



A. anceps
MEXICO, La Chichilua

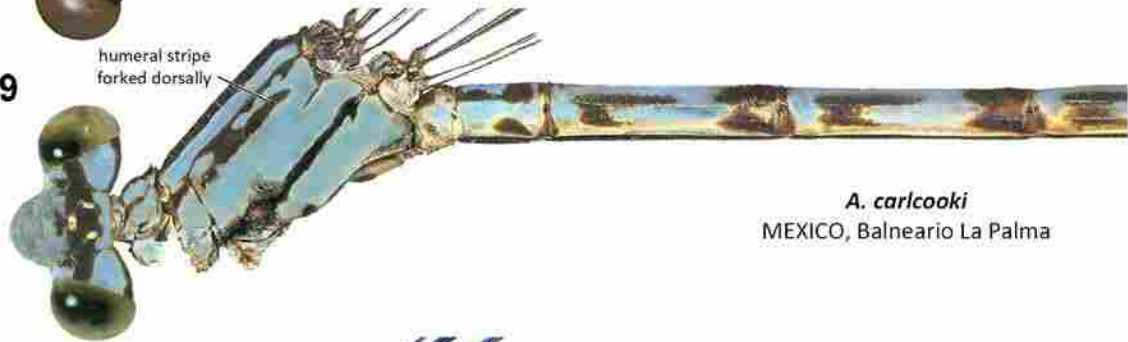


178



A. calverti
COSTA RICA, Monteverde

179



A. carlcooki
MEXICO, Balneario La Palma

180

mostly
dark
labrum



A. carolus – PARATYPE
COSTA RICA, El Rodeo

181

labrum
pale



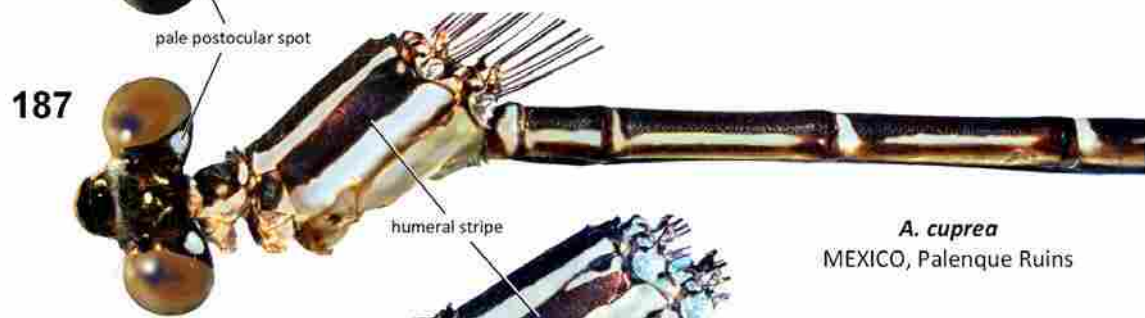
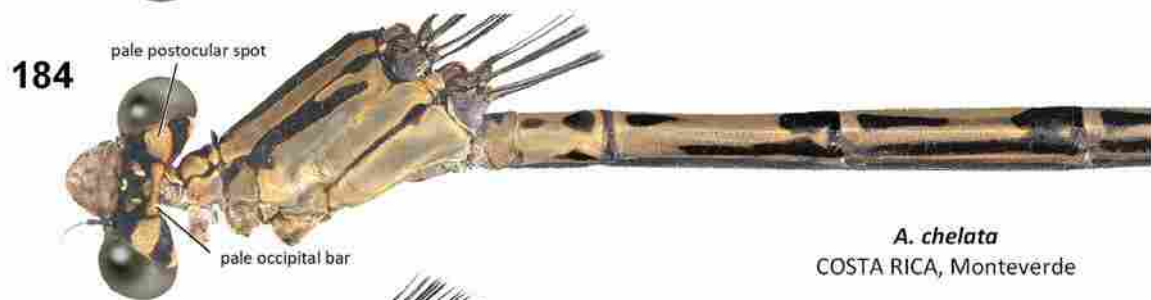
A. carolus – PARATYPE
COSTA RICA, Diamantes River

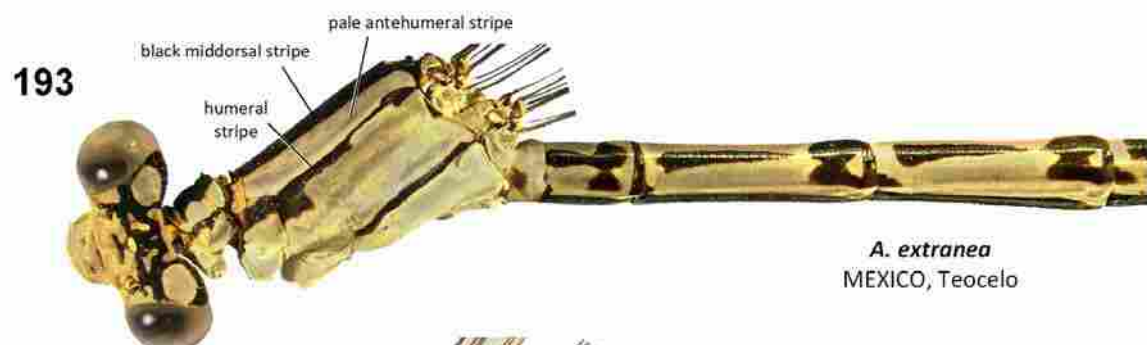
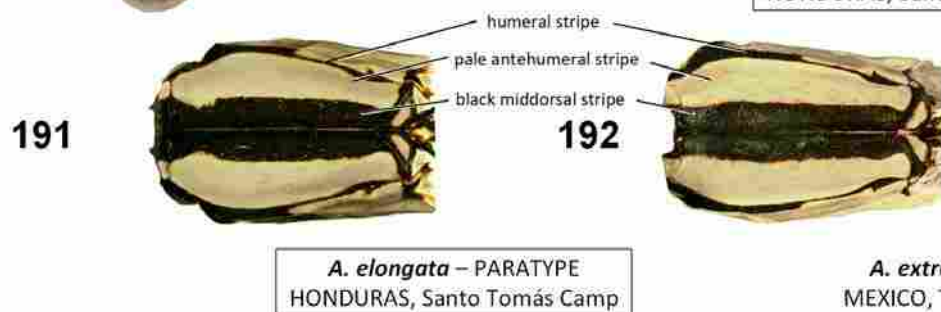
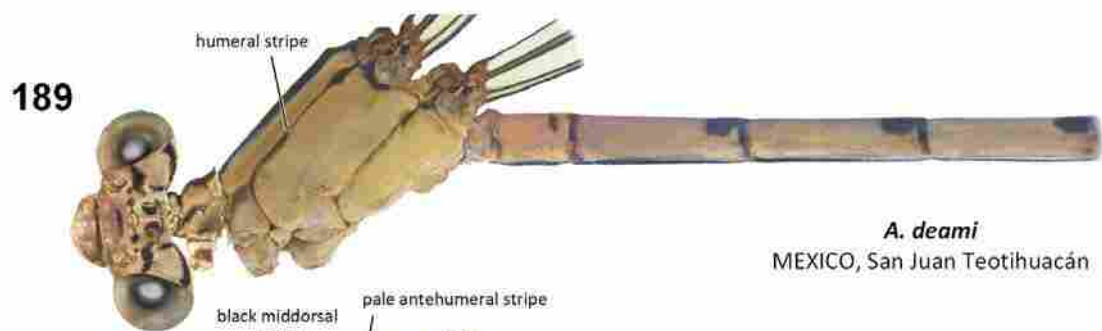
182

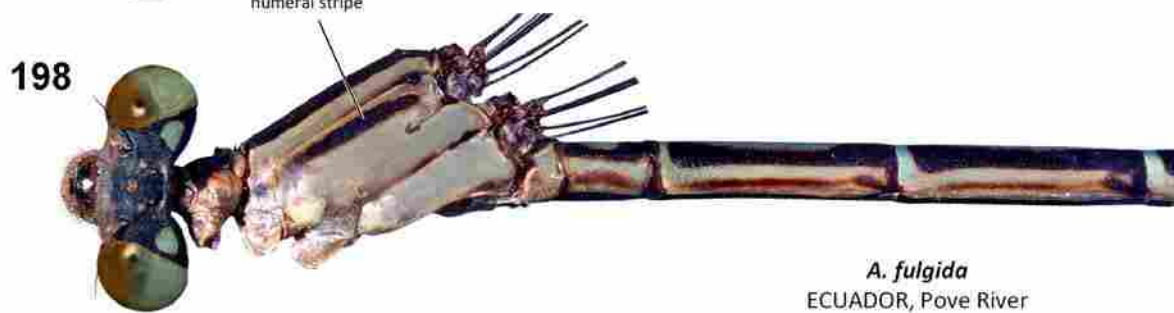
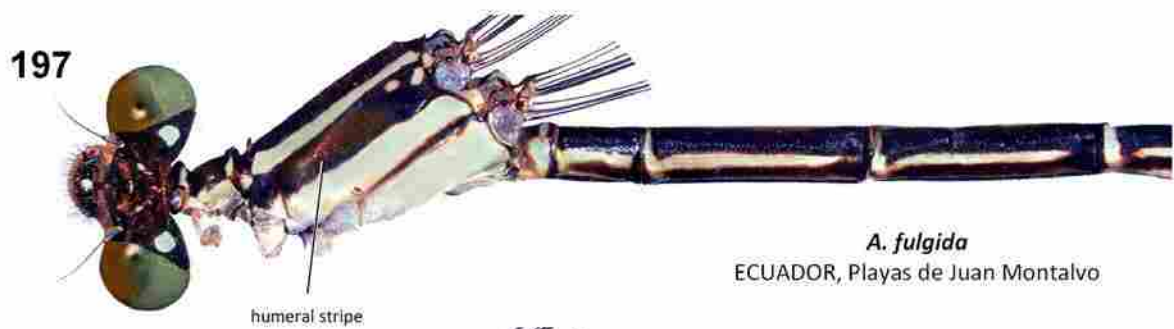
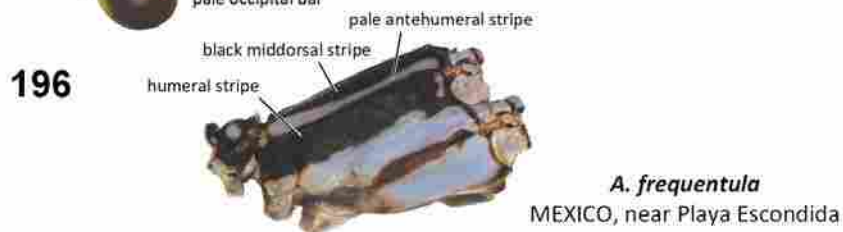
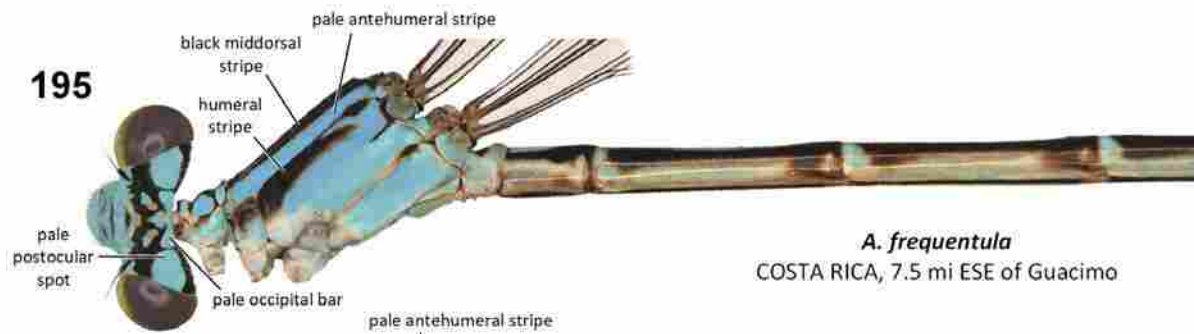
mostly
dark
labrum



A. carolus – PARATYPE
COSTA RICA, El Rodeo









205



A. gonzalezi – PARATYPE
GUATEMALA, Finca Moca Grande

206



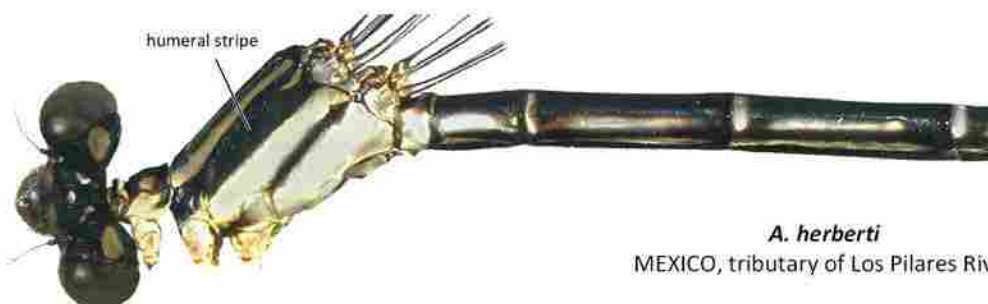
A. harknessi
MEXICO, Balneario Las Palmas

207



A. harknessi
MEXICO, Tepic

208



A. herberti
MEXICO, tributary of Los Pilares River

209

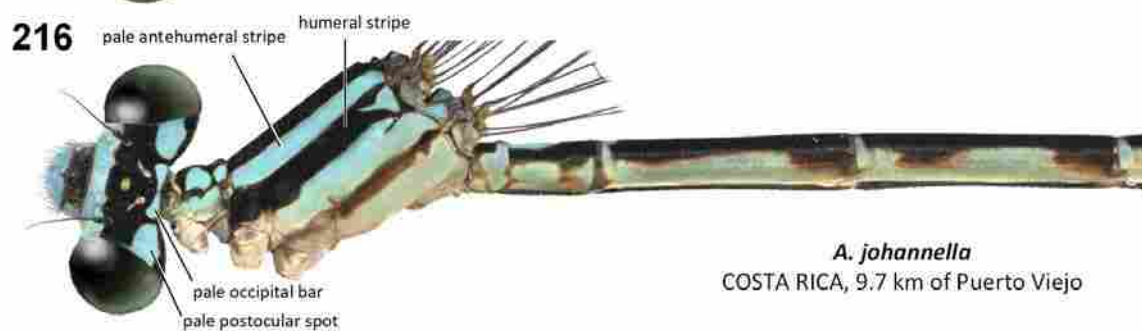


A. hinei
USA, Upper Sabino Canyon





A. insipida
GUYANA, GGMC



A. johannella
COSTA RICA, 9.7 km of Puerto Viejo



A. lacrimans
MEXICO, La Fuente



A. lacrimans
MEXICO, La Fuente



A. lacrimans – LECTOTYPE
MEXICO, Córdoba

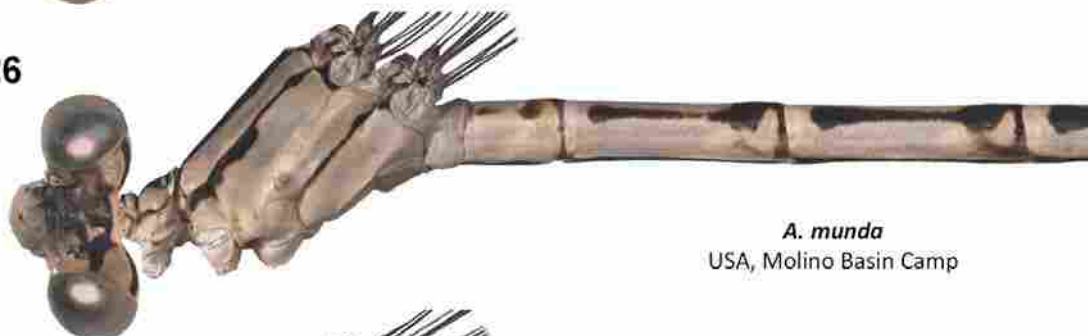


225



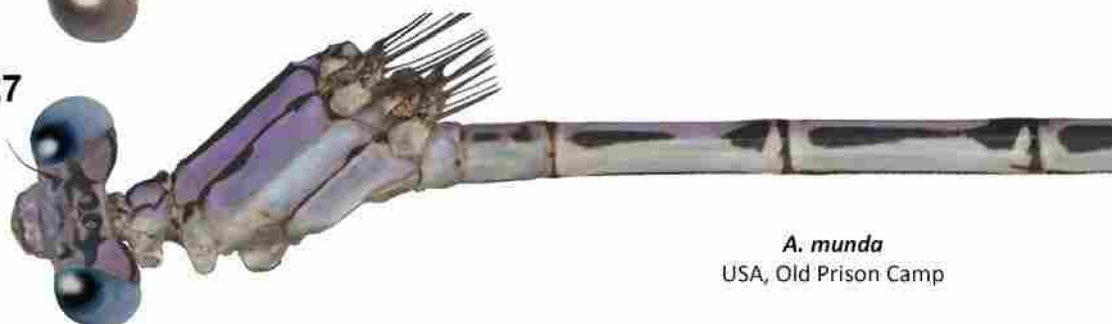
A. moesta
USA, Mustang Creek

226



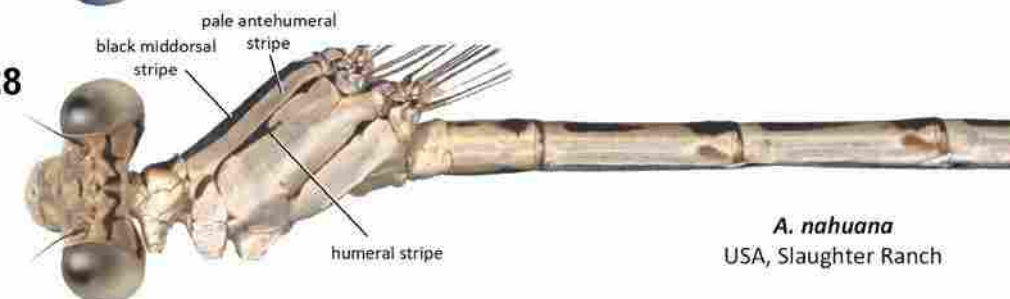
A. munda
USA, Molino Basin Camp

227



A. munda
USA, Old Prison Camp

228



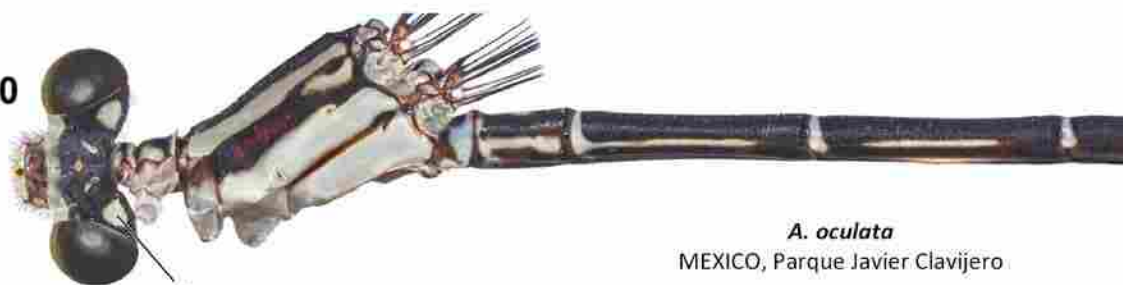
A. nahuana
USA, Slaughter Ranch

229



A. noveloi – PARATYPE
MEXICO, Puente Texolo

230



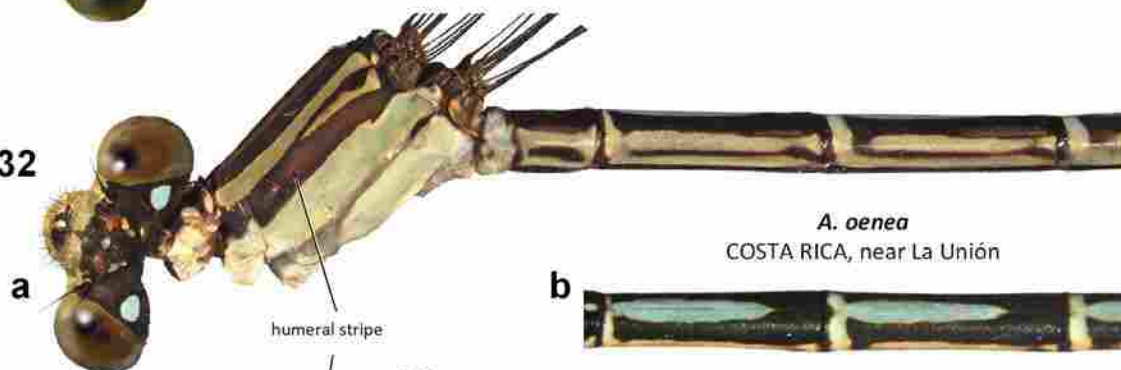
A. oculata
MEXICO, Parque Javier Clavijero

231



A. oculata
GUYANA, Kaieteur to Tukait

232



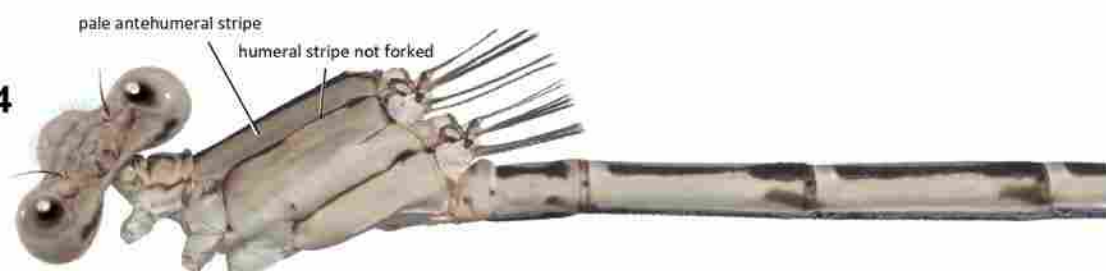
A. oenea
COSTA RICA, near La Unión

233



A. oenea
PANAMA, SW of Los Algarrobos

234



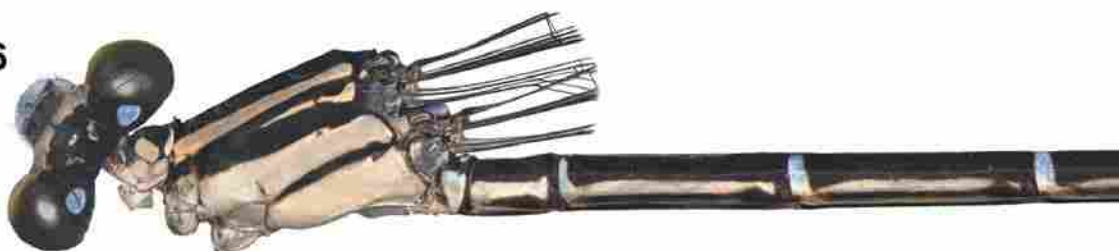
A. pallens
USA, Cave Creek

235



A. paludicola – PARATYPE
USA, Bog Tank

236



A. percellulata
MEXICO, San Marcos River

237



A. pima
USA, Hot Springs Canyon

238



A. pipila
MEXICO, Salto Epiyantla

239



A. pipila
MEXICO, Reserva Monte Azules

240



A. pipila
GUATEMALA, Gualán

241



A. pocomana
COSTA RICA, Grande de Tárcoles River

242



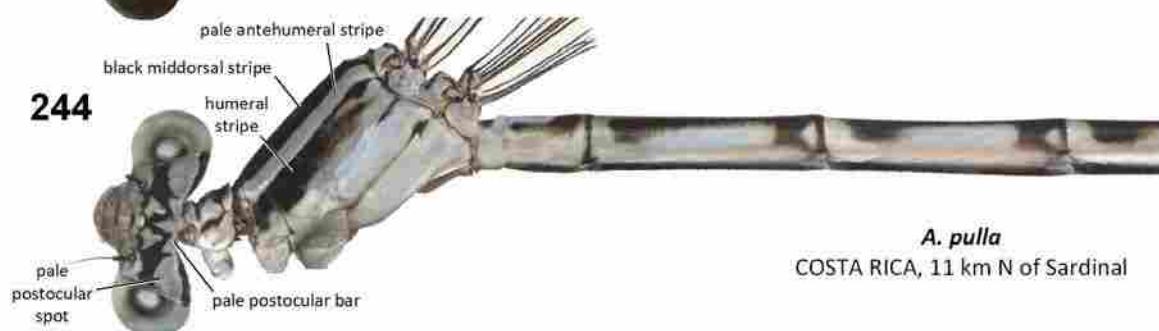
A. popoluca
PANAMA, near Santa Fé

243



A. popoluca
PANAMA, near Santa Fé

244



A. pulla
COSTA RICA, 11 km N of Sardinal

245



A. rhoadsi
MEXICO, Ojitipa River

246



A. rogersi
COSTA RICA, Monteverde

247



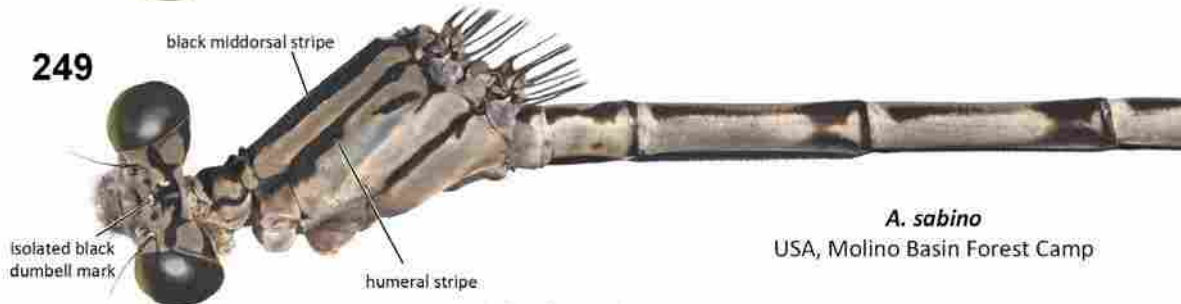
A. rogersi
COSTA RICA, below Monteverde

248



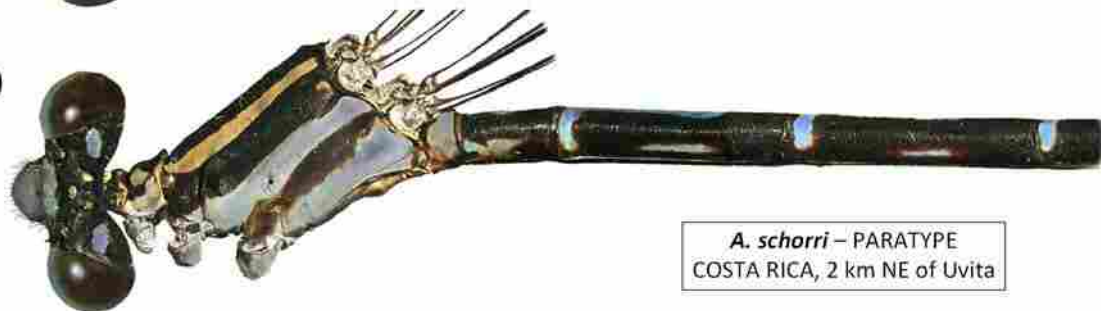
A. rudolphi
MEXICO, El Muro

249



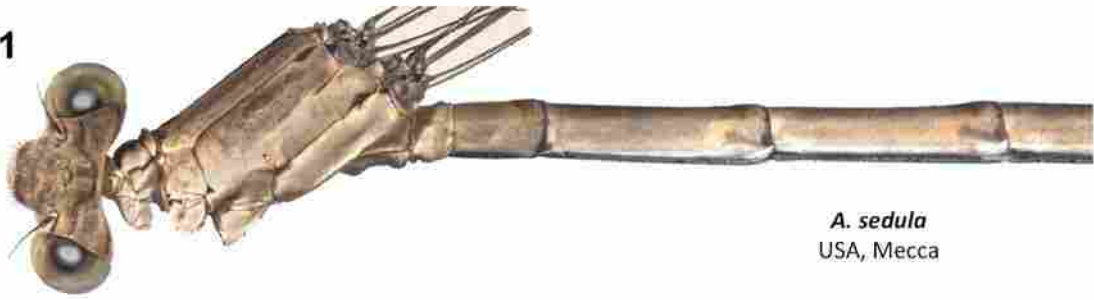
A. sabino
USA, Molino Basin Forest Camp

250



A. schorri – PARATYPE
COSTA RICA, 2 km NE of Uvita

251



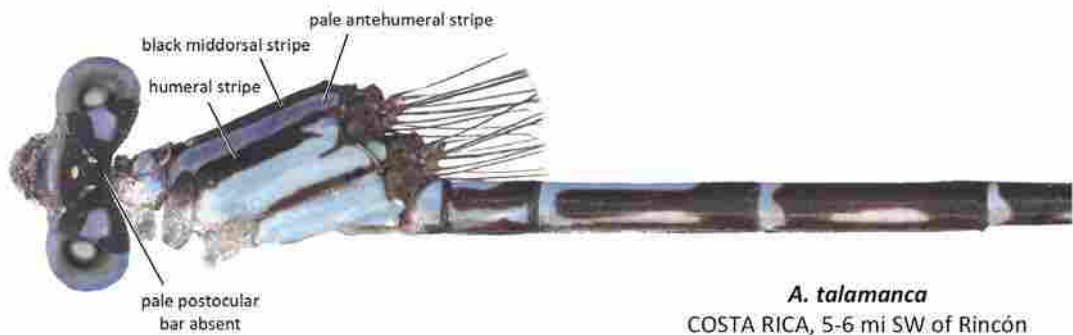
A. sedula
USA, Mecca

252



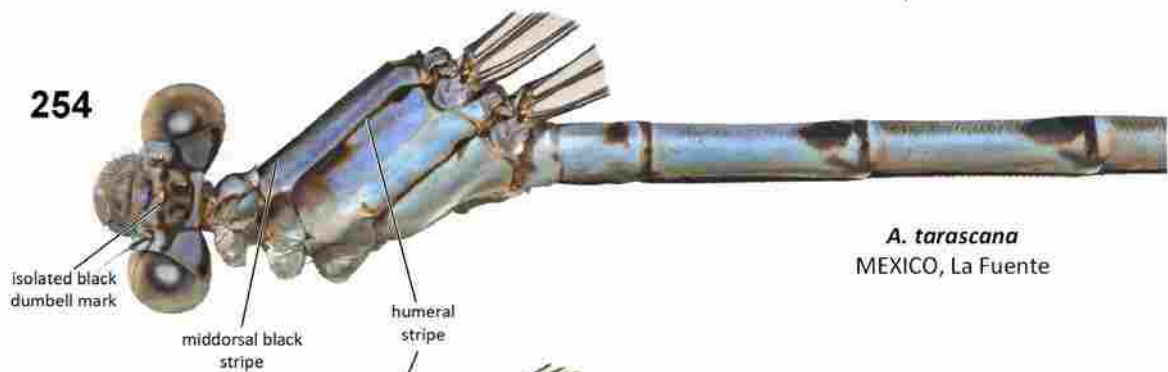
A. sedula
USA, Mecca

253



A. talamanca
COSTA RICA, 5-6 mi SW of Rincón

254

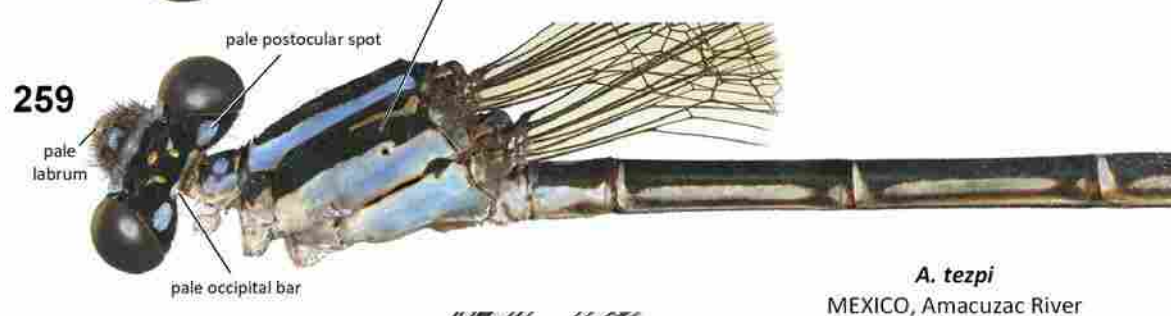
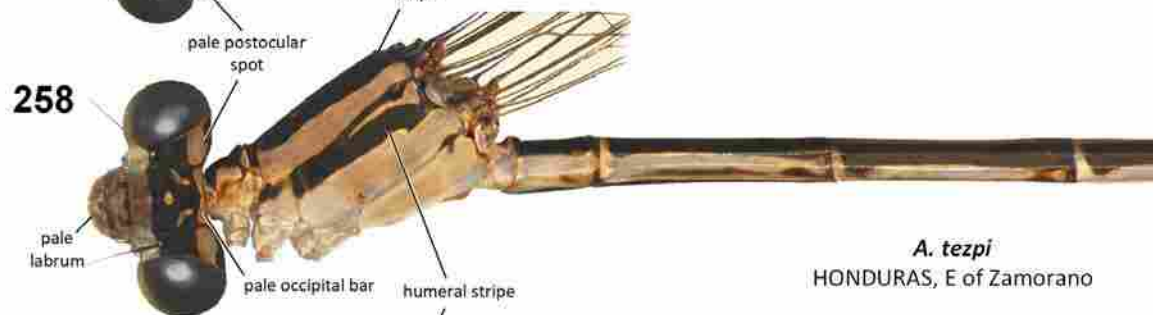
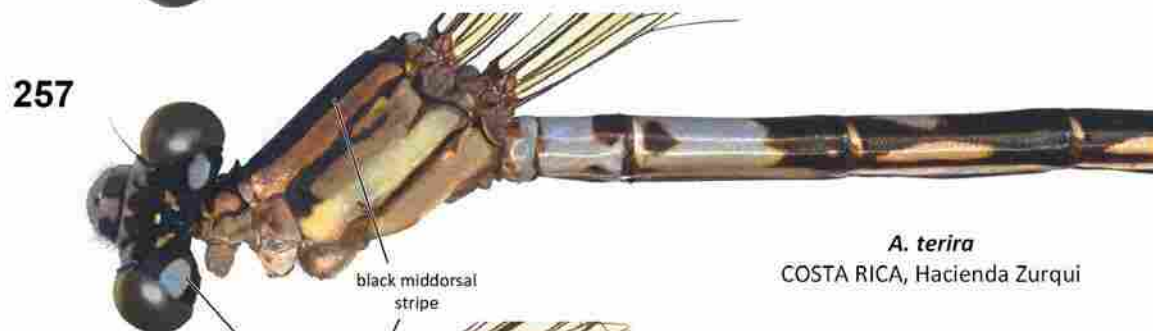


A. tarascana
MEXICO, La Fuente

255



A. tarascana
MEXICO, La Fuente



261



A. translata
MEXICO, Epiyantla Falls

262



A. translata
COSTA RICA, between La Unión & Flores

263



A. translata
FRENCH GUIANA, Lawa River

264



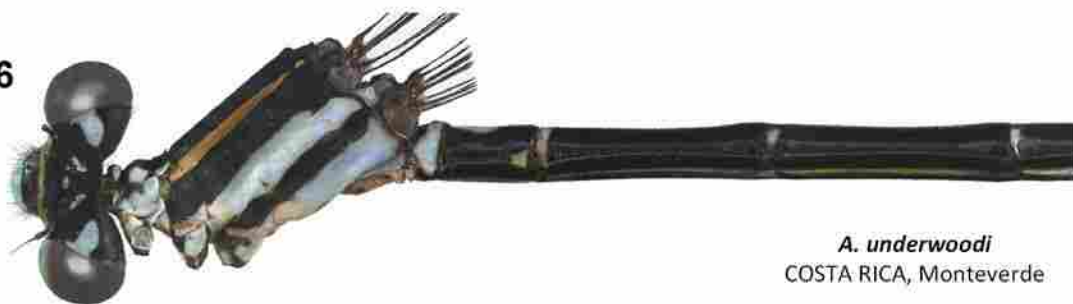
A. ulmeca
MEXICO, Arroyo Claro

265



A. ulmeca
GUATEMALA, El Fiscal

266



A. underwoodi
COSTA RICA, Monteverde

267



A. variabilis
MEXICO, 2 km E of Coyame

268



black middorsal stripe

A. variabilis
MEXICO, 2 km E of Coyame

269



A. vivida
MEXICO, stream on road to San Javier

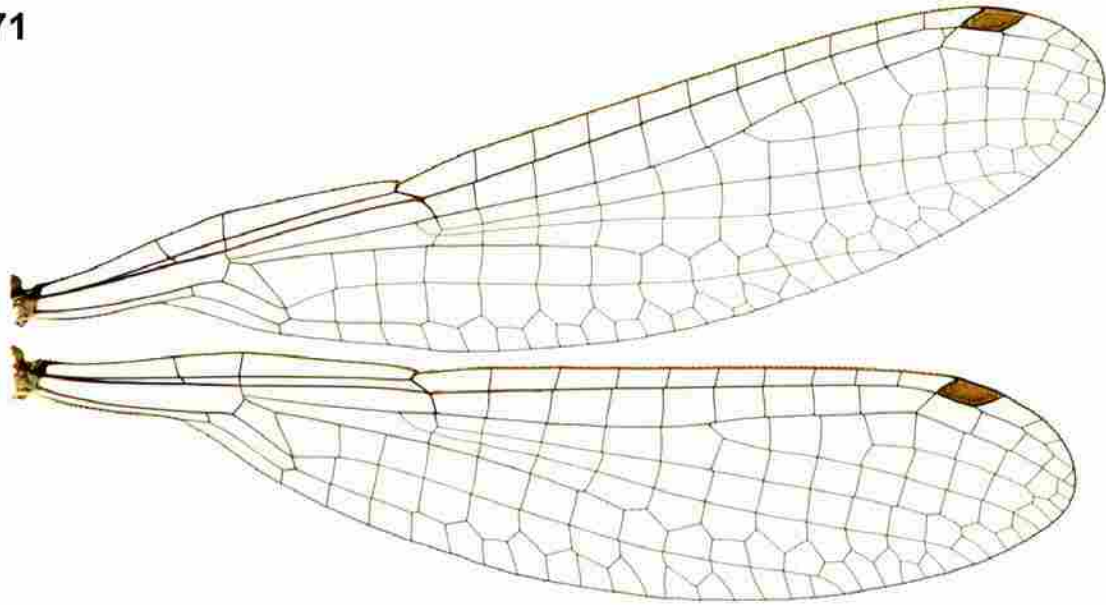
270



humeral stripe
unbranched

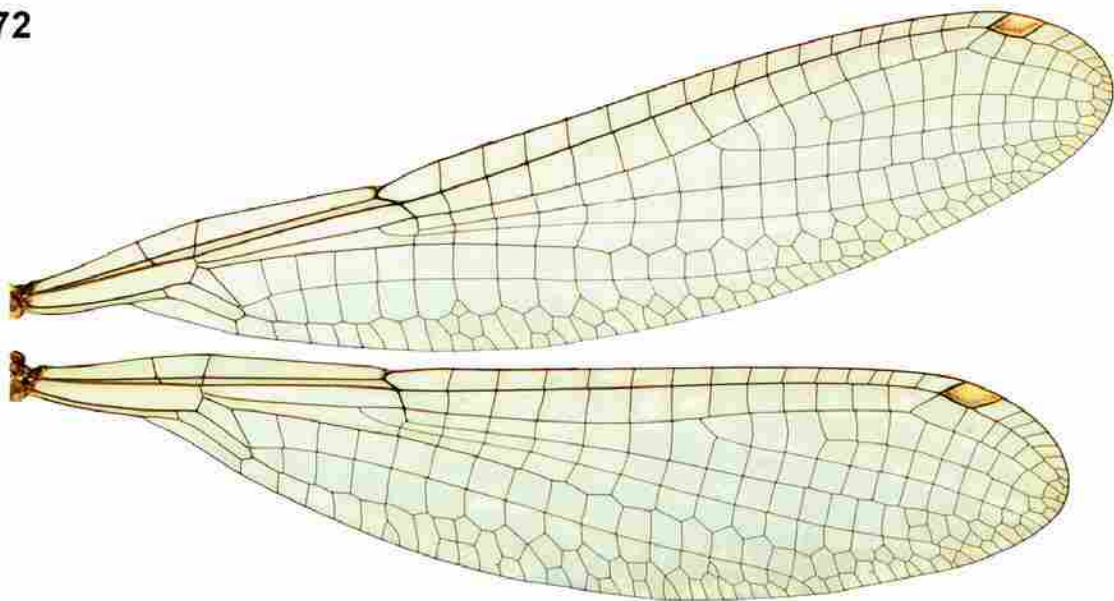
A. westfalli
MEXICO, Lagunas de Montebello

271



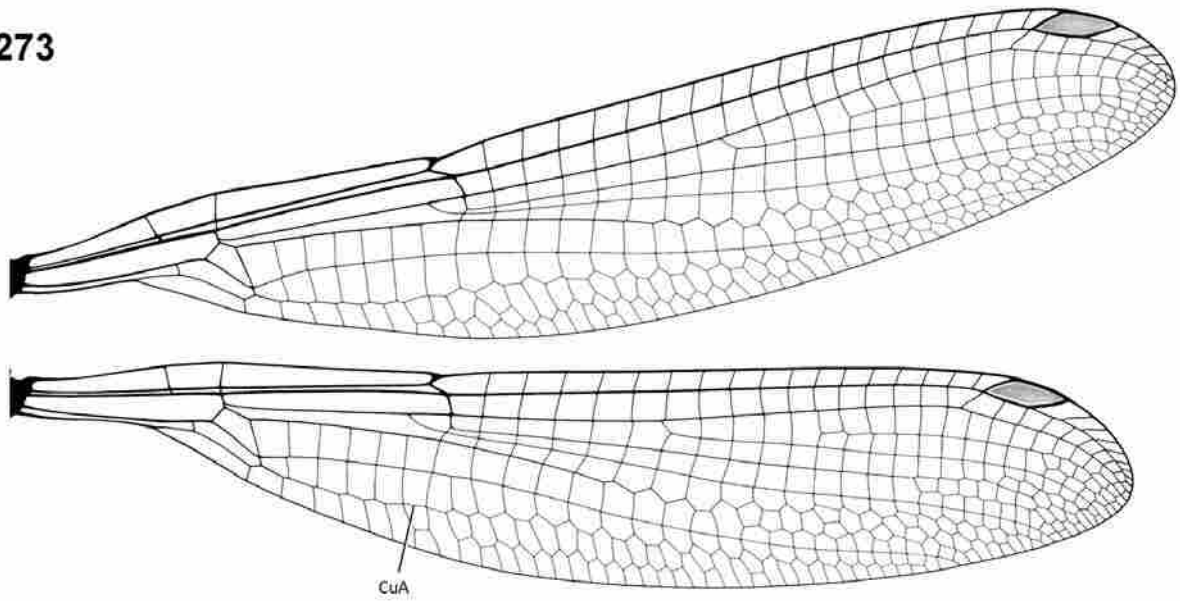
A. alberta – male
USA, Five Bridges road

272



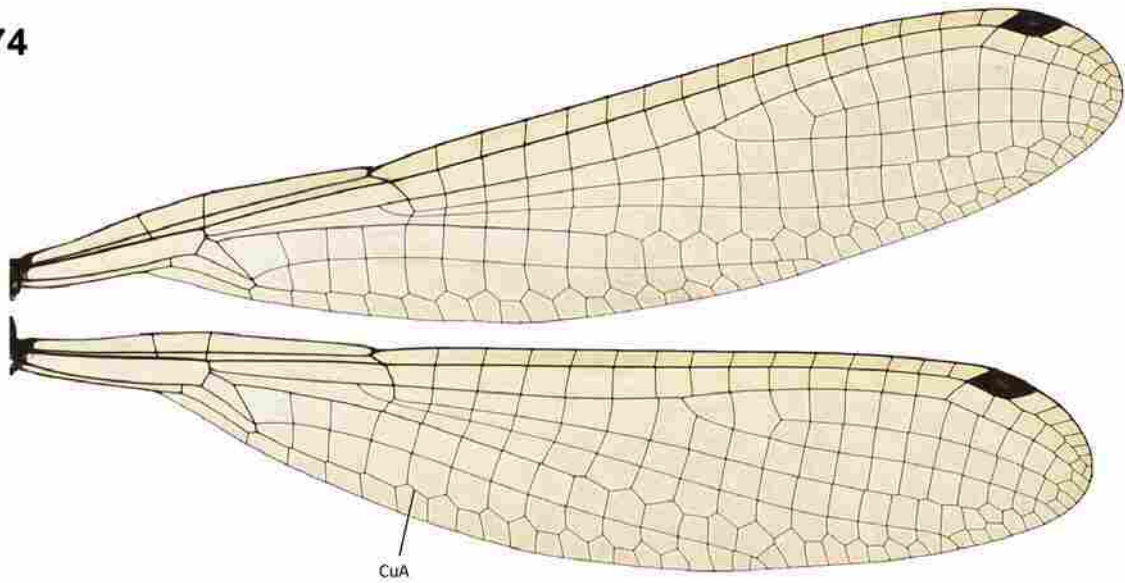
A. anceps – female PARATYPE
MEXICO, La Fuente

273



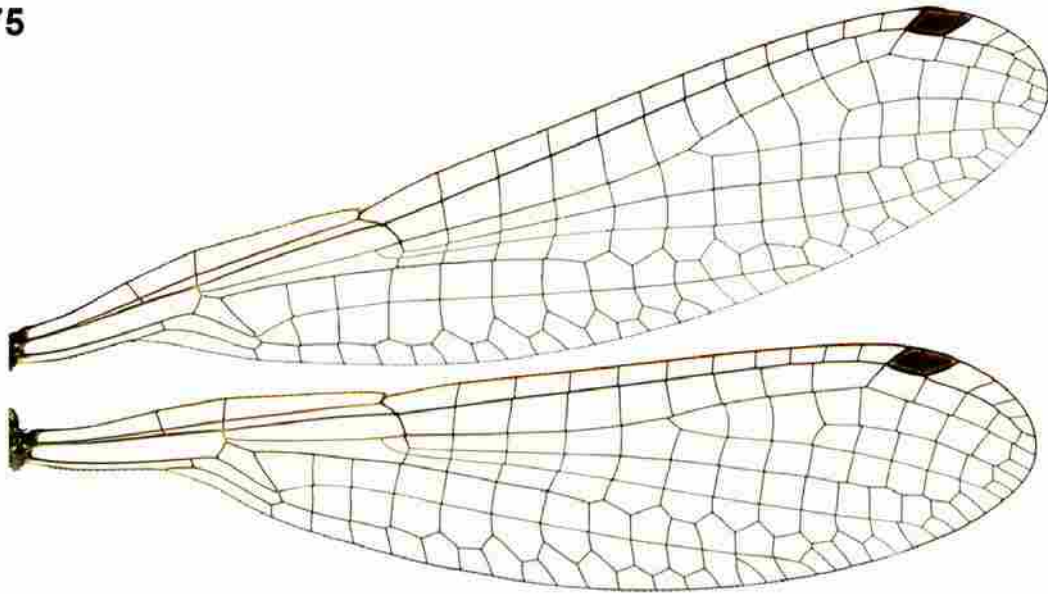
A. funcki – male
MEXICO, El Sabino

274



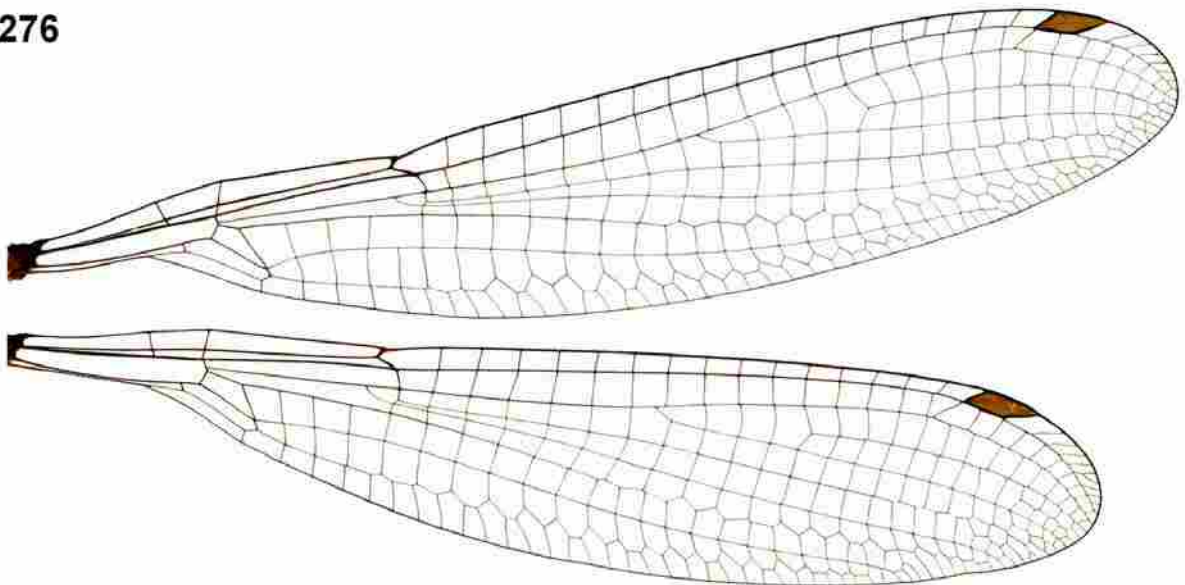
A. haberi – male PARATYPE
COSTA RICA, Bosque del Tolomuco

275



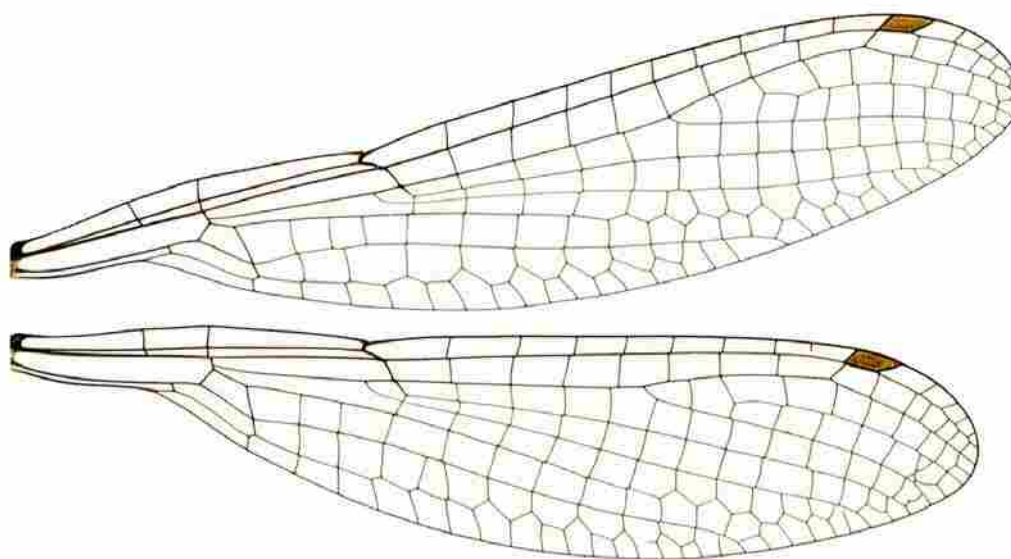
A. leonora – male
USA, Mustang Creek

276



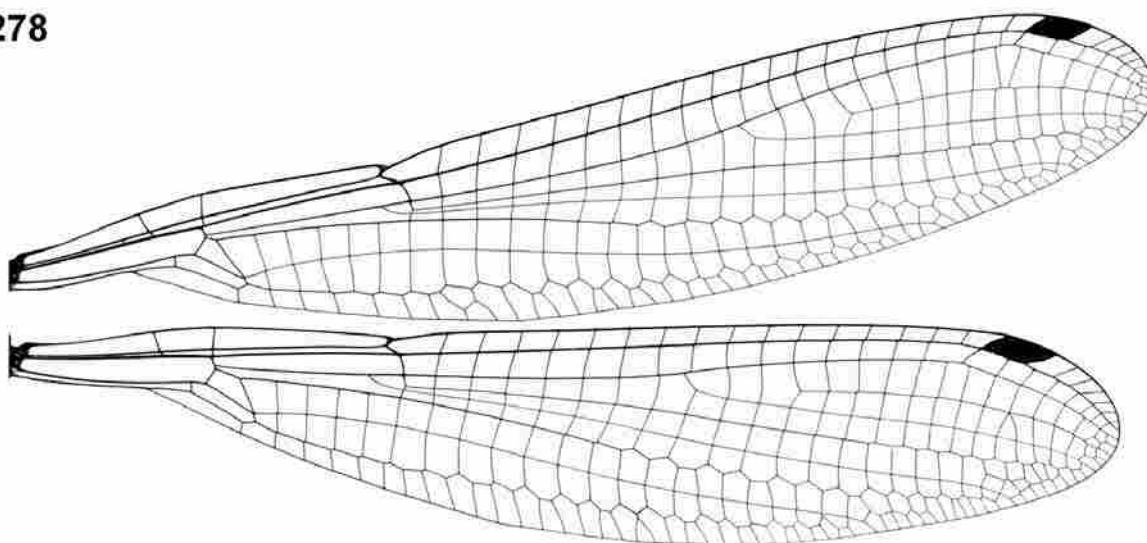
A. moesta – female
MEXICO, Michoacán

277



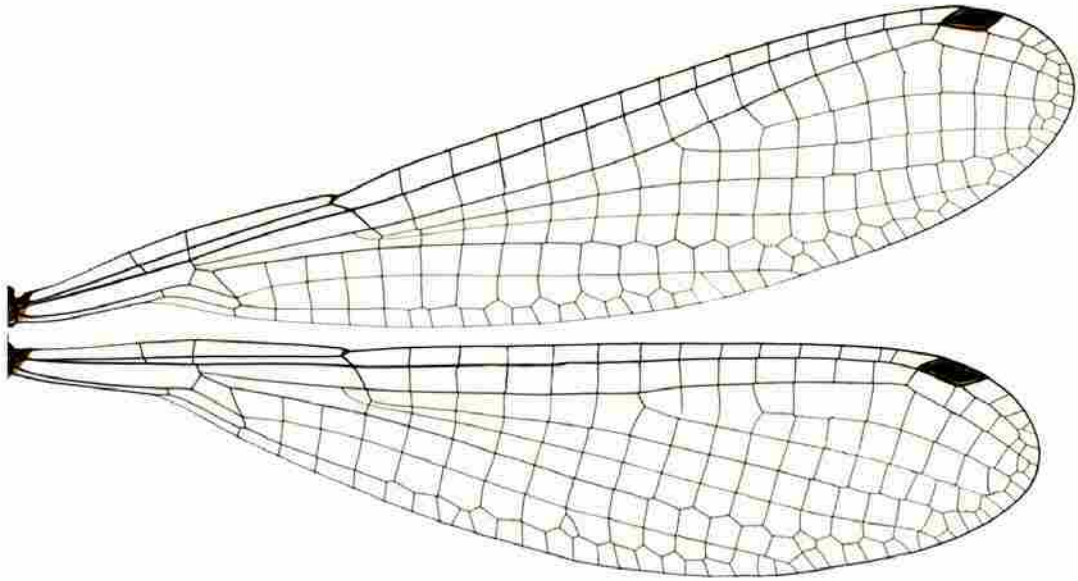
A. paludicola – male PARATYPE
USA, Bog Tank

278



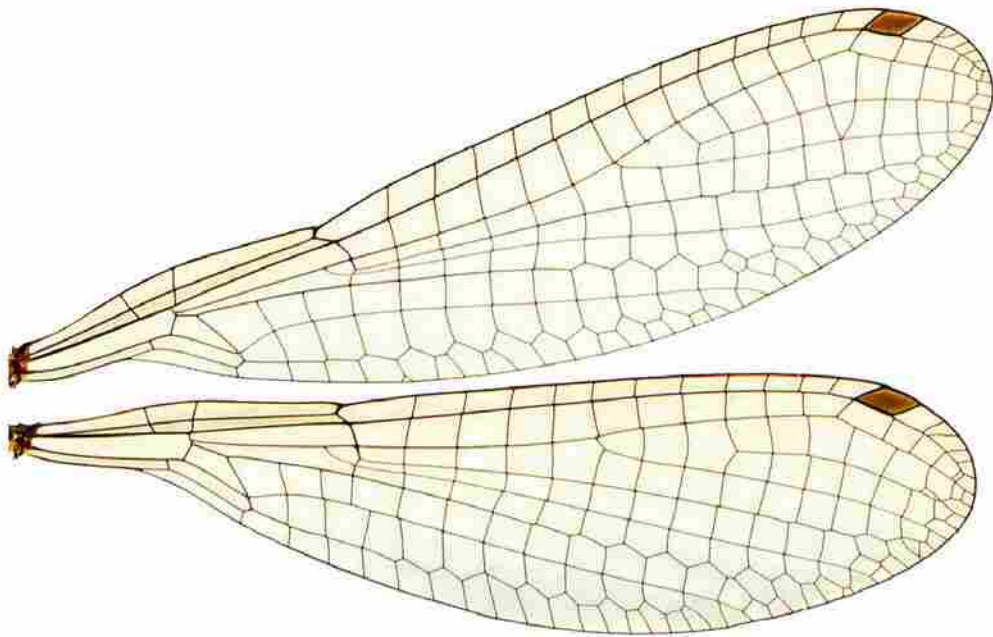
A. percellulata – male
MEXICO, Sierra Juarez

279



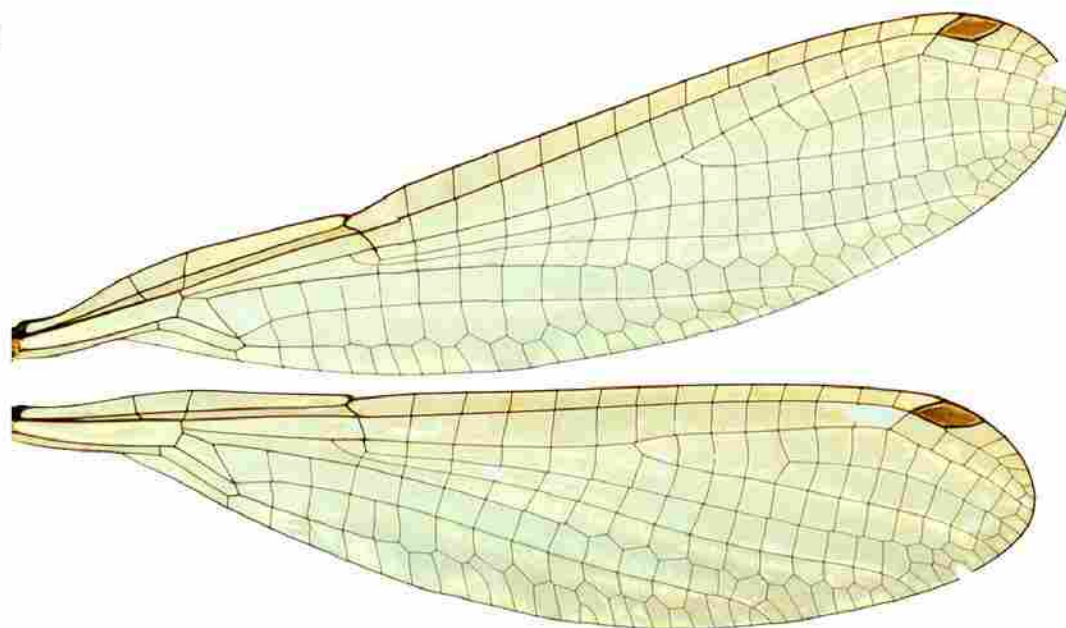
A. popoluca – male
MEXICO, Laguna Zacatal

280



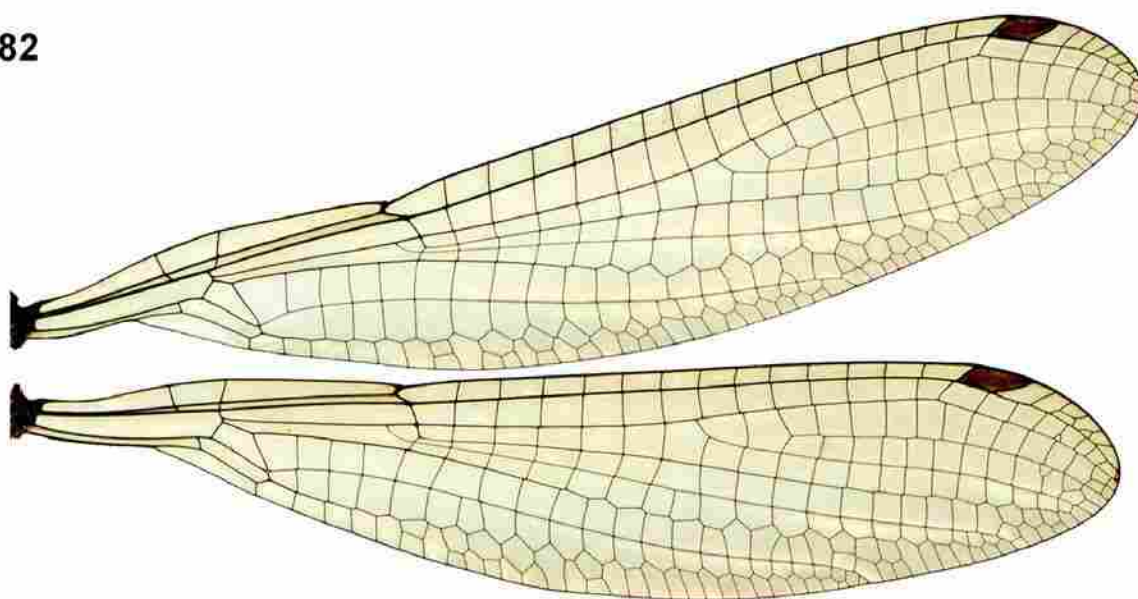
A. pulla – female
MEXICO, Otapa River

281



A. rhoadsi – female
MEXICO, near Sabinas

282



A. tezpi – male
NICARAGUA, Chala River

283



A. adamsi
COSTA RICA, 9 mi SW of Pandora

290



A. anceps
MEXICO, La Chichilua

284



A. adamsi
COSTA RICA, La Selva

291



285



A. adamsi
COSTA RICA, 5 km NW of El Sardinal



A. annae – PARATYPE
MEXICO, Teocelo

286



A. adamsi
ECUADOR, 12 km N of Loreto

292



A. annae – PARATYPE
MEXICO, Teocelo

287



A. adamsi
PERU, Hotel Amazonia

293



A. apicalis
USA, Niobrara Valley Reserve

288



A. agrioides
MEXICO, Primer Agua

294



A. barretti
USA, Nueces River

289



A. alberta
USA, Afton Canyon

295



A. calida
MEXICO, Puente Palictla

296



A. calverti
COSTA RICA, Monteverde

297



A. carlcooki
MEXICO, Balneario La Palma

298



A. carolus – PARATYPE
COSTA RICA, Cataratas River

299



A. chelata
COSTA RICA, Monteverde

300



A. concinna
GUADELOUPE, Grand Etang

301



A. cupraurea
COSTA RICA, near La Unión

302



A. cupraurea
PANAMA, SE of Boquete

303



A. cupraurea
PANAMA, Canal Zone

304



A. cuprea
MEXICO, Las Pozas de Xilitla

305



A. deami
MEXICO, Lago de Camécuaro

306



A. elongata – HOLOTYPE
COSTA RICA, Reventazón River

307



A. elongata – PARATYPE
MEXICO, Arroyo Claro

308



A. elongata – PARATYPE
PANAMA, Bambito

309



A. extranea
MEXICO, Teocelo

310



A. fissa
PANAMA, Cerro Campana

317



A. funcki
MEXICO, Taxco

311



A. frequentula
MEXICO, Otapa River

318



A. funcki
MEXICO, Maycoba River

312



A. fulgida
COSTA RICA, La Selva

319



A. funebris – HOLOTYPE *A. var vivida plana*
MEXICO, Sierra de las Aguas Escondidas

313



A. fulgida
ECUADOR, E of Caluma

320



Inferred coloration added

A. funebris – HOLOTYPE *A. var vivida plana*
MEXICO, Sierra de las Aguas Escondidas

314



A. fumipennis violacea
MEXICO, La Michilia

321



A. funebris
MEXICO, San Cristobal de las Casas

315



A. fumipennis violacea
USA, Bottomless Lake

322



A. funebris
MEXICO, W of Las Ciénagas

316



A. funcki
GUATEMALA, El Fiscal

323



A. garrisoni
MEXICO, Huichihuayan River

324



A. gaumeri

MEXICO, Laguna Azul & Emilia

331



A. herberti

MEXICO, E of El Camarón

325



A. gaumeri

BELIZE, N of Agustine

332



A. hinei

MEXICO, Aconchi Hot Springs

326



A. gonzalezi – PARATYPE

GUATEMALA, Finca Moca Grande

333



A. immunda

MEXICO, Agua Caliente

327



A. haberi – HOLOTYPE

COSTA RICA, Bosque del Tolomuco

334



A. indicatrix

MEXICO, Agua Caliente

328



A. harknessi

MEXICO, San Rafael Vicente Aranda

335



A. indicatrix

HONDURAS, Campamento

329



A. herberti

MEXICO, Los Pilares River

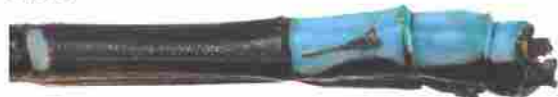
336



A. insipida

COSTA RICA, Parismina River

330



A. herberti

MEXICO, Las Estacas

337



A. johannella

COSTA RICA, Reventazón River

338



A. lacrimans
MEXICO, La Fuente

345



A. moesta
MEXICO, Lago de Chapala

339



A. leonora
USA, Culberson W of junction 2185

346



A. munda
USA, Upper Sabino Canyon

340



A. lugens
USA, Gila Webber Creek

347



A. nahuana
USA, San Bernardino Ranch

341



A. lugens
MEXICO, Piedras River near Pacheco

348



A. nahuana
MEXICO, Lago de Camécuaro

342



A. mayi
MEXICO, La Palma

349



A. noveloi – PARATYPE
MEXICO, Puente Texolo

343



A. medullaris
COSTA RICA, Monteverde

350



A. oculata
COSTA RICA, El Rodeo

344



A. moesta
USA, Gila River

351



A. oculata
COSTA RICA, Reventazón River

352



A. oculata
MEXICO, Guiracoba River

359



A. percellulata
MEXICO, Puente Teocelo

353



A. oenea
USA, Seven Springs

360



A. pima
USA, Hot Springs Canyon

354



A. oenea
MEXICO, near Playa Escondida

361



A. pipila
MEXICO, Salto Epiyantla

355



A. pallens
USA, Cave Creek

362



A. pipila
MEXICO, Salto Epiyantla

356



A. paludicola – PARATYPE
USA, Bog Tank

363



A. pocomana
COSTA RICA, Potrero River

357



A. paulsoni – PARATYPE
COSTA RICA, NE of Londres

358



A. percellulata
MEXICO, San Marcos River

364



A. popoluca
MEXICO, Los Tuxtlas

365



Fig. 1 *Argia variata* ♂ Nav.

A. popoluca – LECTOTYPE of *A. variata*
COLOMBIA, Villavicencio

371



A. rogersi
COSTA RICA, Finca Mauricio Ramírez

366



A. popoluca
COSTA RICA, Corcovado National Park

372



A. rogersi
COSTA RICA, Monteverde

367



A. popoluca
COSTA RICA, La Selva

373



A. rudolphi – HOLOTYPE
MEXICO, La Unión

374



A. sabino
USA, Molino Basin Forest Camp

368



A. pulla
COSTA RICA, between Hatillo & Matapalo

375



A. schorri – PARATYPE
COSTA RICA, 2 mi N of Uvita

369



A. pulla
PANAMA, Madden Dam

376



A. sedula
MEXICO, Coy River head

370



A. rhoadsi
USA, Las Moras Creek

377



A. talamanca
COSTA RICA, 13 km S of Buenos Aires

378



A. talamanca

COSTA RICA, 13 mi SE of Buenos Aires

379



A. talamanca

PANAMA, Chagres National Park

380



A. tarascana

USA, Hot Springs Canyon

381



A. tarascana

MEXICO, La Fuente

382



A. telesfordi

SAINT VINCENT, South Rivers

383



A. terira

COSTA RICA, Monteverde

384



A. terira

PANAMA, 1 km S of Alto del María

385



A. tezpi

MEXICO, road to San Javier

386



A. tezpi

MEXICO, road to San Javier

387



A. tonto
USA, Garden Canyon

388



A. translata
EL SALVADOR, Apuzunga

389



A. translata
MEXICO, Micos Waterfall

390



A. ulmeca
PANAMA, Quebrada Piedra de Moler

391



A. ulmeca
GUATEMALA, Santa Lucia

392



A. ulmeca
MEXICO, Arroyo Claro

393



A. underwoodi
COSTA RICA, Monteverde

394



A. variabilis
MEXICO, 2 km E of Coyame

395



A. vivida
CANADA, Banff

396



A. vivida
USA, end of Five Bridges Road

397



A. vivida
MEXICO, Primer Agua

398



A. westfalli
MEXICO, Cola de Caballo Falls

399



A. westfalli – PARATYPE
MEXICO, Lagunas de Montebello

400



A. adamsi
COSTA RICA, Santa Clara River

401



A. adamsi
PANAMA, SE of Gamboa

402



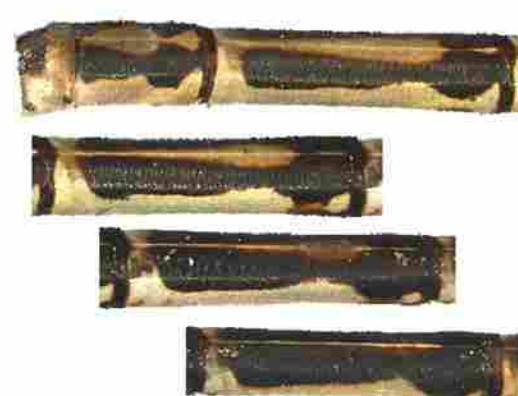
A. adamsi
VENEZUELA, Táchira

403



A. agrioides
MEXICO, Rancho San Enrique

404



A. agrioides
MEXICO, Rancho San Enrique

405



406

A. alberta
USA, Double Springs



407

A. alberta
USA, Double Springs



A. anceps
MEXICO, La Chichilua

408



A. annae – PARATYPE
MEXICO, Teziutlán

409



A. apicalis
USA, Smith Falls State Park

410



A. barretti
MEXICO, San Marcos River

411



A. calida
MEXICO, Ruinas del Tajín

412



A. calverti
COSTA RICA, Monteverde

413



A. carlcooki
MEXICO, Balneario La Palma

414



A. carolus – PARATYPE
COSTA RICA, El Rodeo

415



A. carolus – PARATYPE
COSTA RICA, Diamantes River

416



A. chelata
COSTA RICA, Monteverde

417



A. chelata
MEXICO, Banderillas

418



A. concinna
DOMINICA, 12 km N of Roseau

419



A. cupraurea
COSTA RICA, near La Unión

420



A. cuprea
MEXICO, Palenque Ruins

421



A. cuprea
MEXICO, Palenque Ruins

422



A. deami
MEXICO, San Juan Teotihuacán

423



A. elongata – PARATYPE
HONDURAS, Santo Tomás Camp

424



A. extranea
MEXICO, Teocelo

425



A. extranea
MEXICO, Aconchi Hot Springs

426



A. fissa
PANAMA, Chiriquí Mountains

427



A. frequentula
COSTA RICA, 7.5 mi ESE of Guacimo

428



A. fulgida
ECUADOR, Playas de Juan Montalvo

429



A. fulgida
ECUADOR, Pove River

430



A. fumipennis violacea
USA, Bottomless Lake

431



A. funcki
GUATEMALA, El Fiscal

432



A. funebris
MEXICO, 5 km SE Jitolol

433



A. garrisoni
MEXICO, Cascada de Micos

434



A. gaumeri
BELIZE, S of Blanden River

435



A. gaumeri
BELIZE, N of Augustine

436



A. gonzalezi – PARATYPE
GUATEMALA, Finca Moca Grande

437



A. harknessi
MEXICO, Balneario Las Palmas

438



A. harknessi
MEXICO, Tepic

439



A. herberti
MEXICO, tributary of Los Pilares River

440



A. hinei
USA, Upper Sabino Canyon

441



A. immunda
MEXICO, Agua Caliente

442



A. indicatrix
MEXICO, Agua Caliente

443



A. indicatrix
HONDURAS, Nance River

444



A. insipida
NICARAGUA, Refugio Bartola

445



A. insipida
NICARAGUA, Refugio Bartola

446



A. johannella
COSTA RICA, 9.7 km of Puerto Viejo

447



A. lacrimans
MEXICO, La Fuente

448



A. leonora
MEXICO, 5.6 mi W of Cuatro Ciénagas

449



A. lugens
USA, Gila Webber Creek

450



A. mayi
MEXICO, La Palma

451



A. medullaris
COSTA RICA, Monteverde

452



A. moesta
USA, Gila River

453



A. moesta
USA, Mustang Creek

454



A. munda
USA, Molino Basin Camp

455



A. munda
USA, Old Prison Camp

456



A. nahuana
USA, Slaughter Ranch

457



A. noveloi – PARATYPE
MEXICO, Puente Texolo

458



A. oculata
MEXICO, Parque Javier Clavijero

459



A. oculata
GUYANA, Kaieteur to Tukait

460



A. oenea
COSTA RICA, near La Unión

461



A. pallens
USA, Cave Creek

462



A. paludicola – PARATYPE
USA, Bog Tank

463



A. percellulata
MEXICO, San Marcos River

464



A. pima

USA, Hot Springs Canyon

471



A. rogersi

COSTA RICA, below Monteverde

465



A. pipila

MEXICO, Salto Epiyantla

472



A. rogersi

COSTA RICA, below Monteverde

466



A. pocomana

COSTA RICA, Grande de Tárcoles River

473



A. rudolphi

MEXICO, El Muro

467



A. popoluca

PANAMA, near Santa Fé

474



A. sabino

USA, Molino Basin Forest Camp

468



A. pulla

COSTA RICA, 11 km N of Sardinal

475



A. schorri – PARATYPE

COSTA RICA, 2 km NE of Uvita

469



A. rhoadsi

MEXICO, Ojitipa River

470



A. rogersi

COSTA RICA, Monteverde

476



A. schorri – PARATYPE

COSTA RICA, 2 km NE of Uvita

477



A. sedula
USA, Mecca

478



A. talamanca
COSTA RICA, 5-6 mi SW of Rincón

479



A. tarascana
MEXICO, La Fuente

480



A. telesfordi
SAINT VINCENT, South Rivers

481



A. terira
COSTA RICA, Hacienda Zurqui

482



A. tezpi
HONDURAS, E of Zamorano

483



A. tezpi
MEXICO, Amacuzac River

484



A. tonto
USA, Garden Canyon

485



A. translata
MEXICO, Epiyantla Falls

486



A. ulmeca
MEXICO, Arroyo Claro

487



A. underwoodi
COSTA RICA, Monteverde

488



A. variabilis
MEXICO, 2 km E of Coyame

489



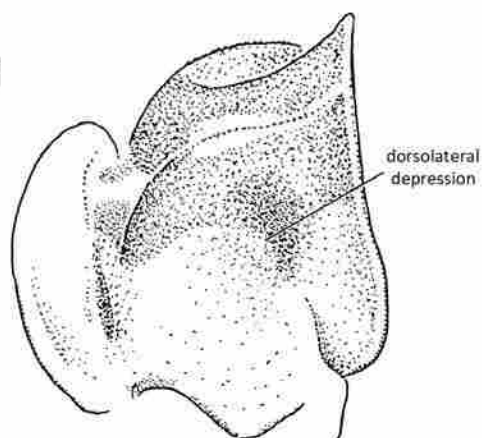
A. vivida
MEXICO, stream on road to San Javier

490



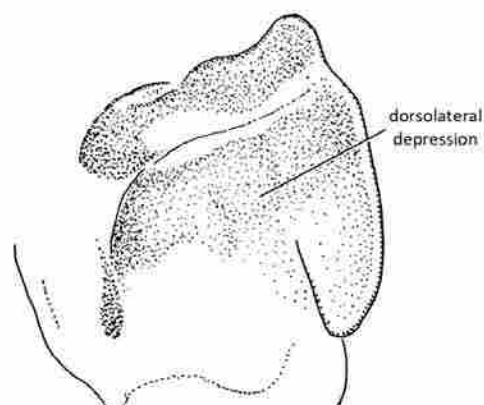
A. westfalli
MEXICO, Lagos de Montebello

491



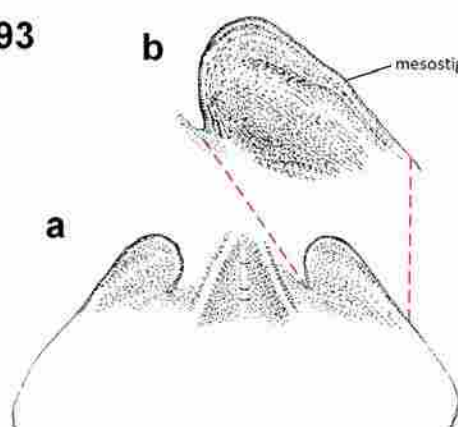
A. funebris
USA, Jeff Davis County

492



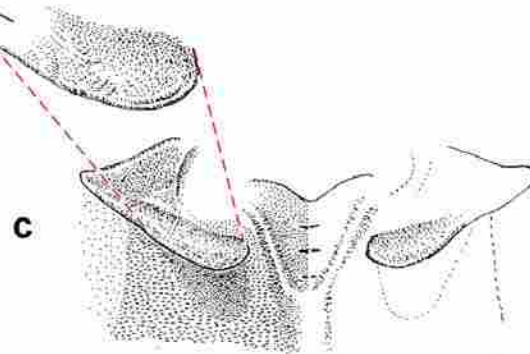
A. vivida
USA, Riverside County

493



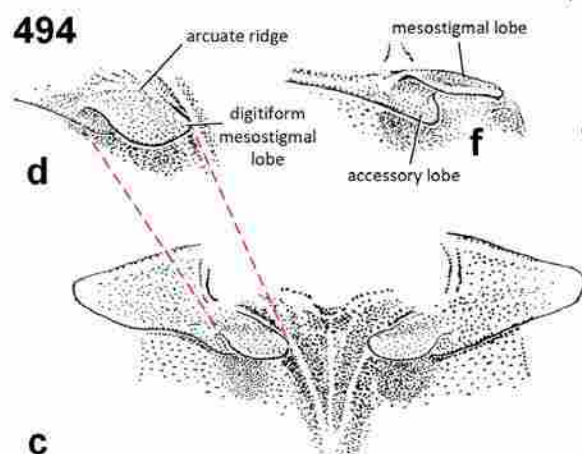
b mesostigmal lobe

d



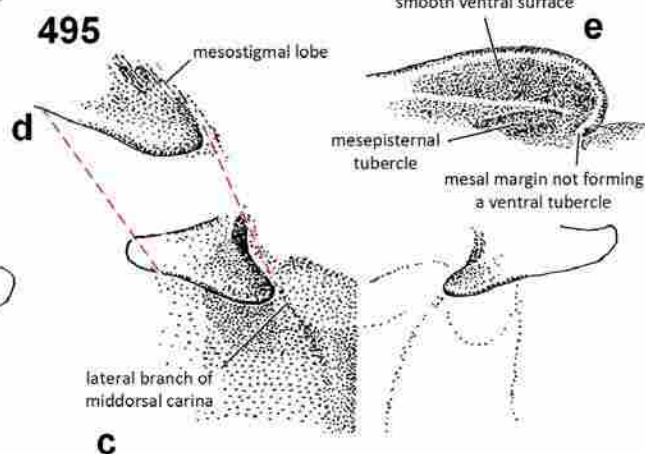
A. adamsi
PANAMA, Darien National Park

494

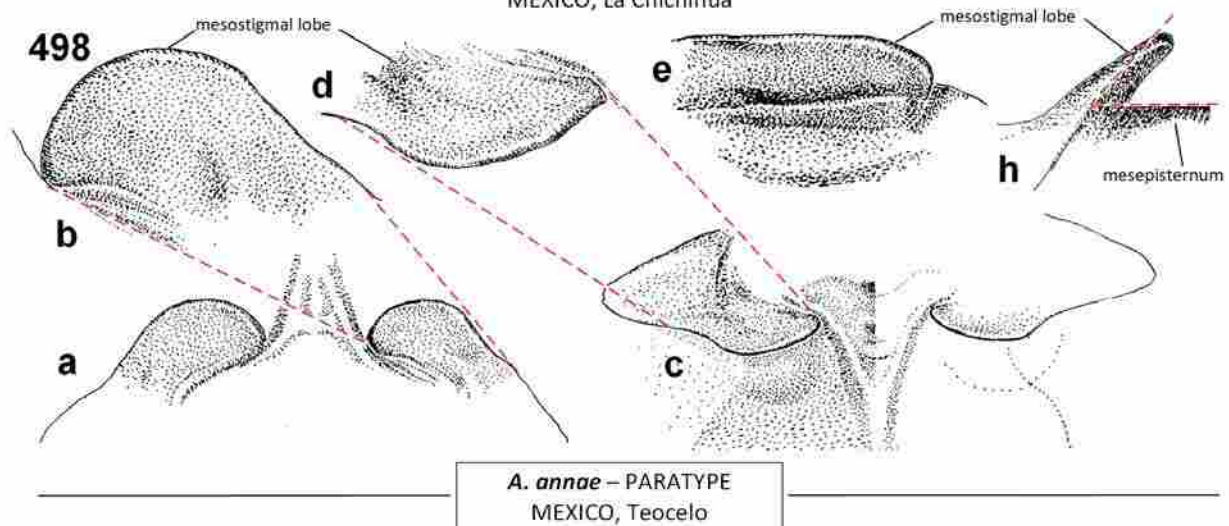
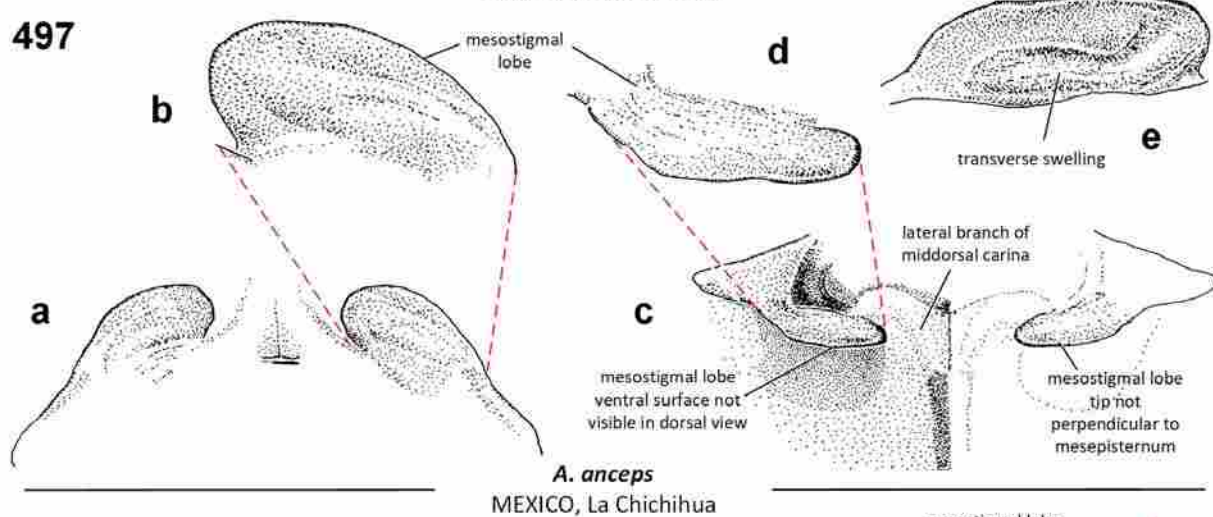
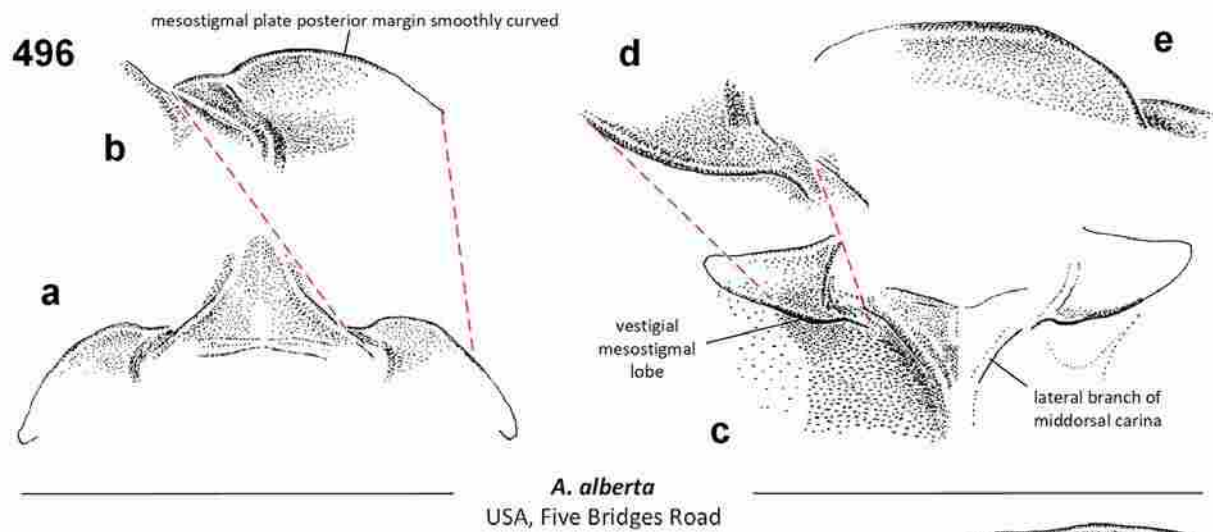


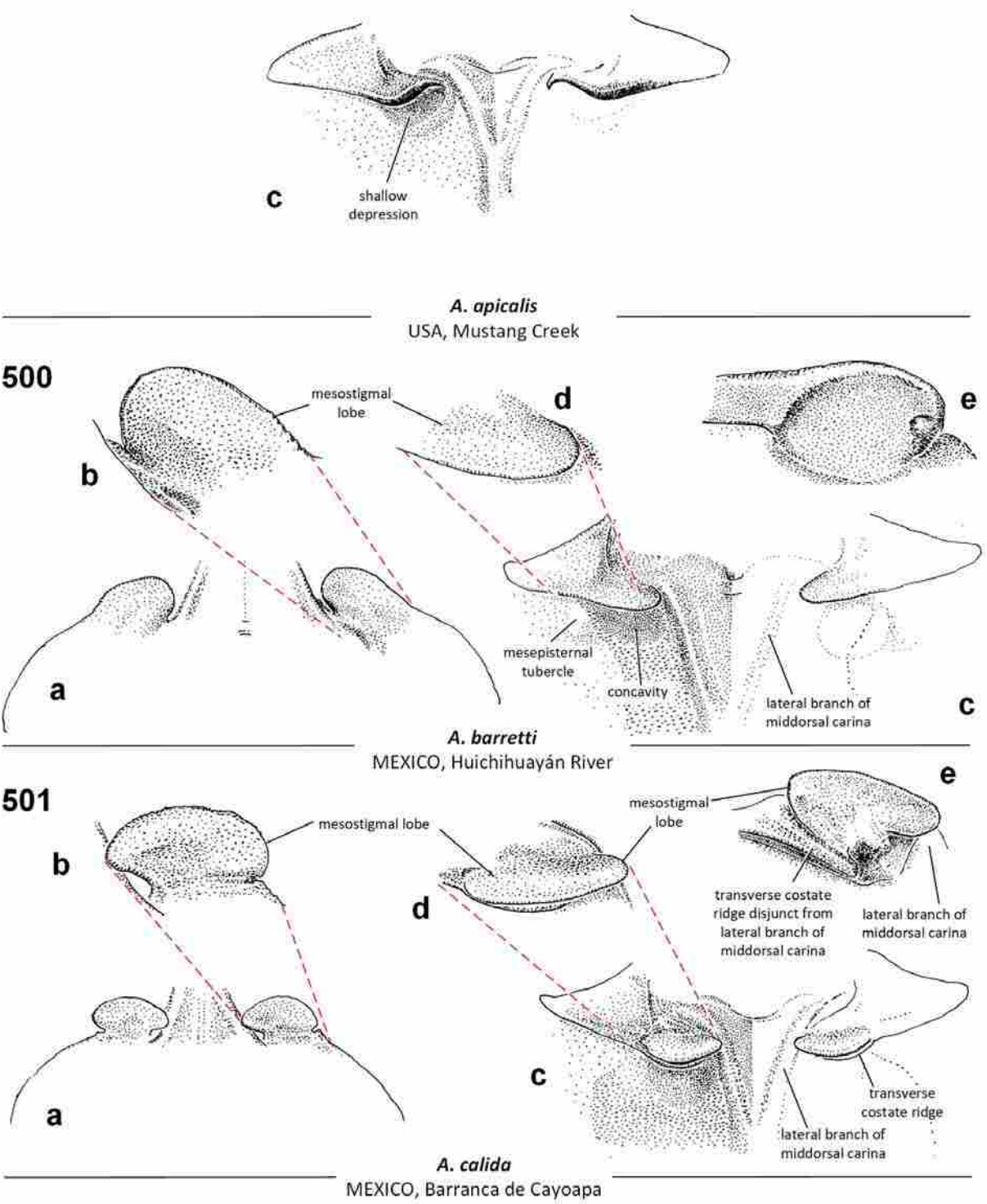
A. adamsi
PANAMA, NW of Gamboa

495

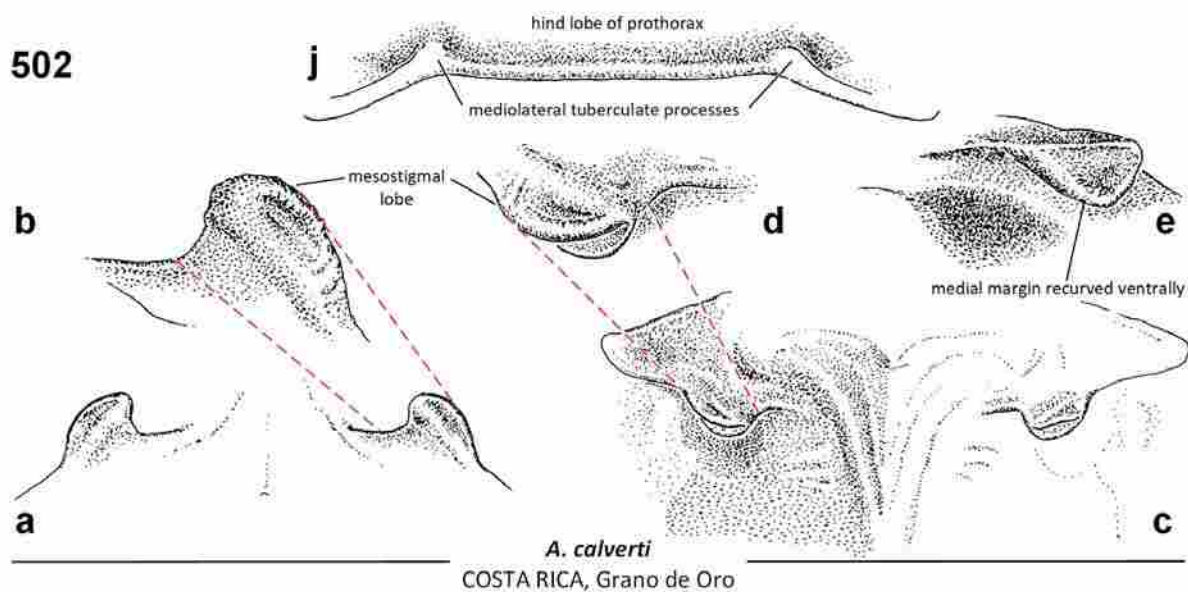


A. agrioides
MEXICO, Rancho San Enrique

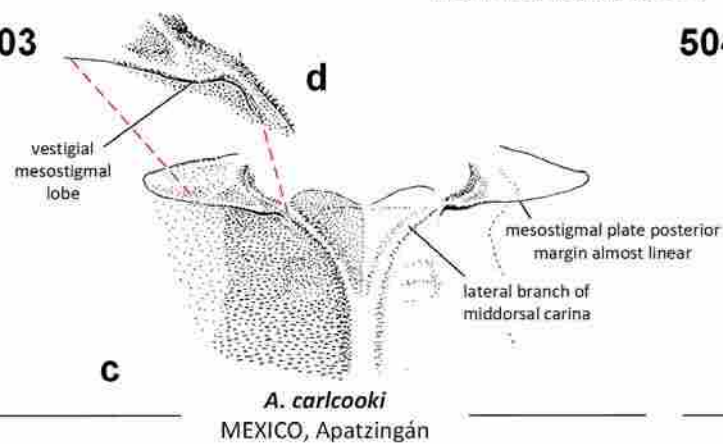




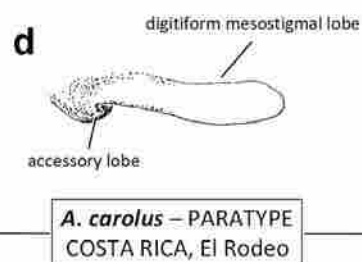
502



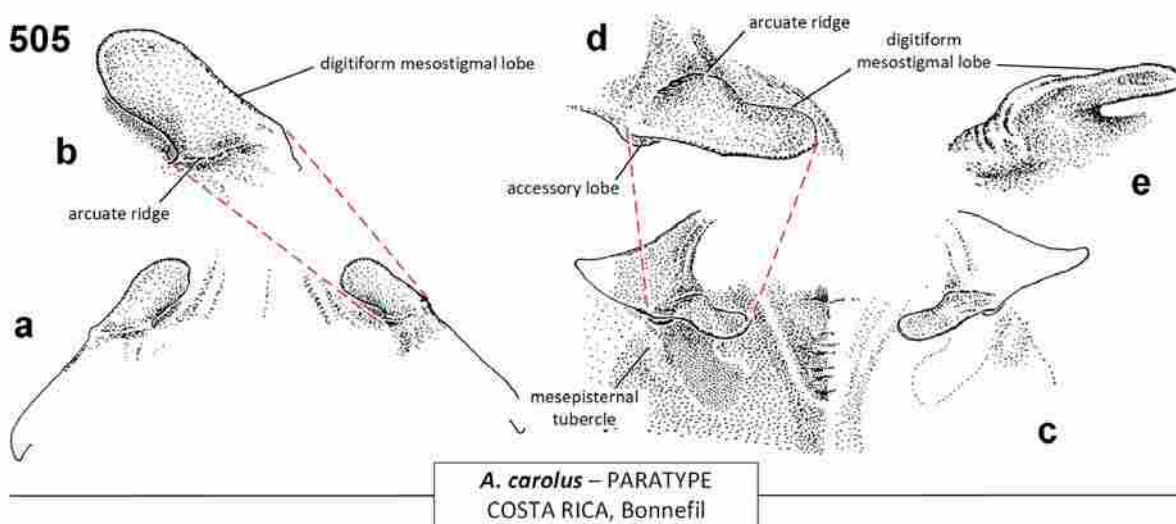
503

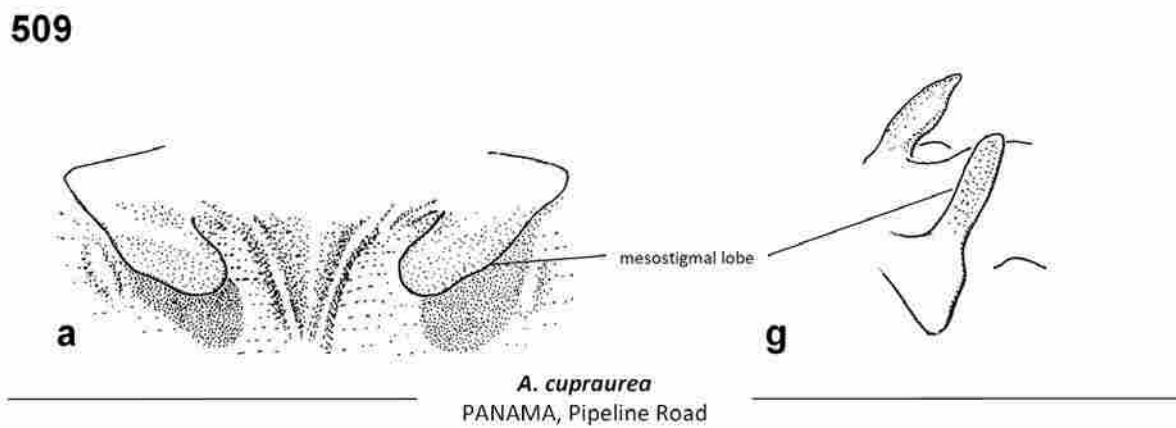
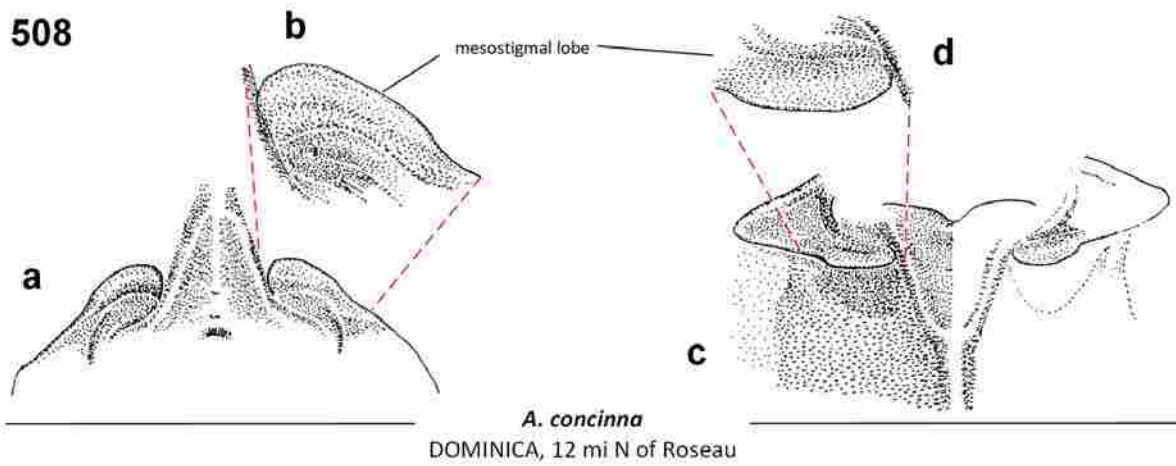
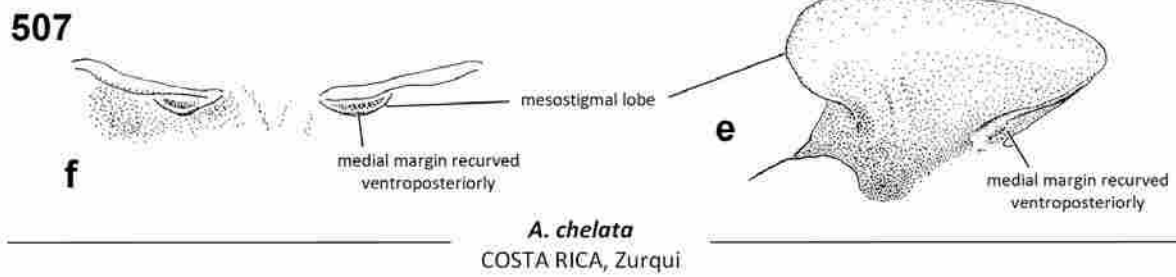
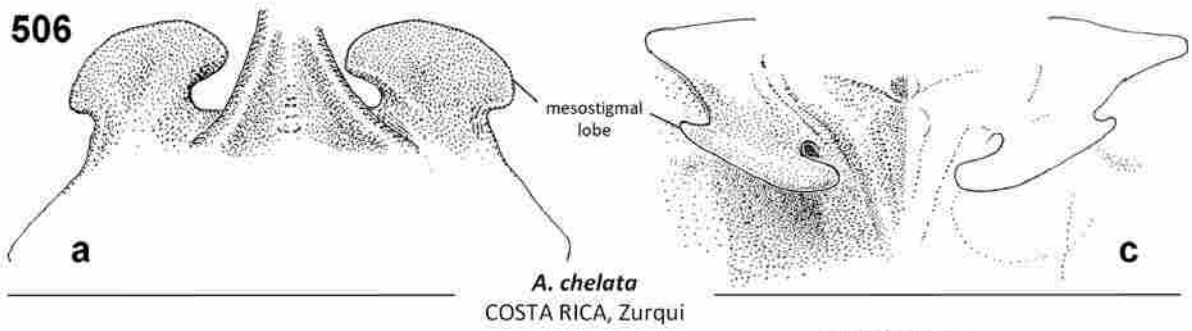


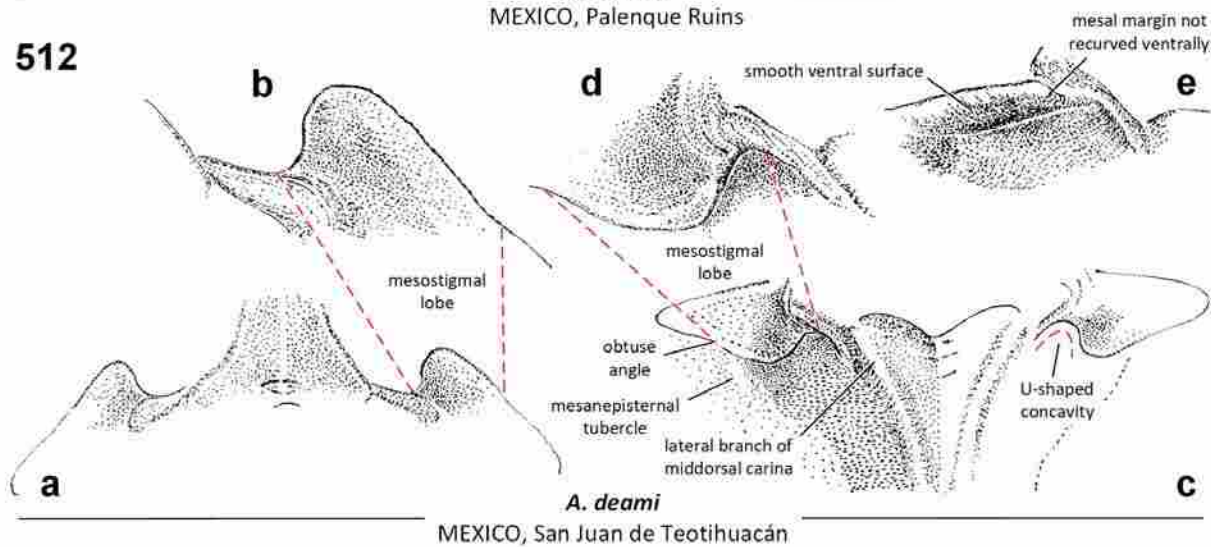
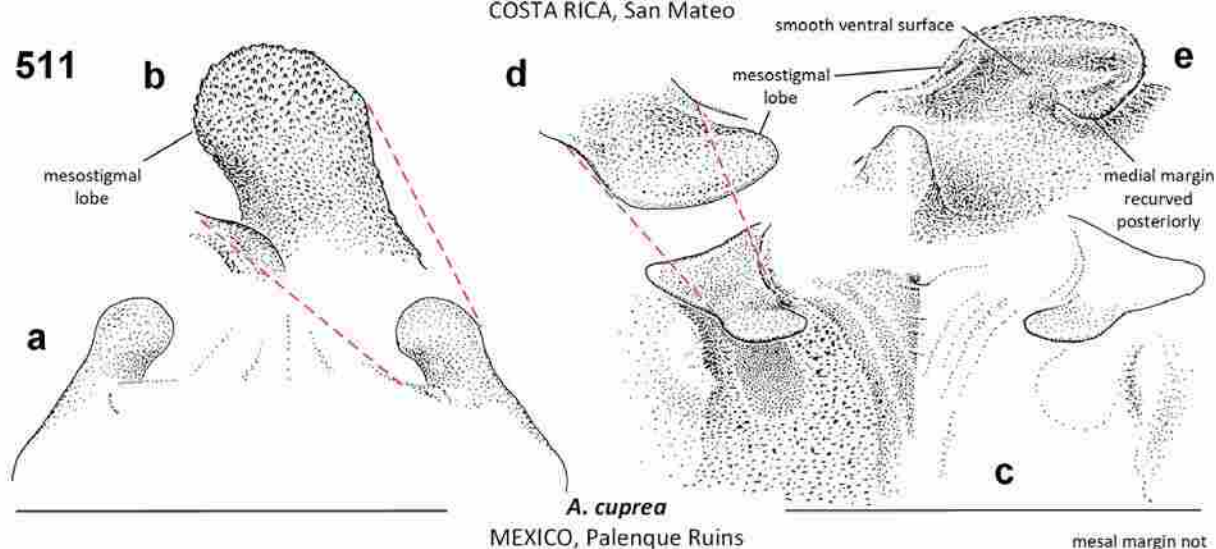
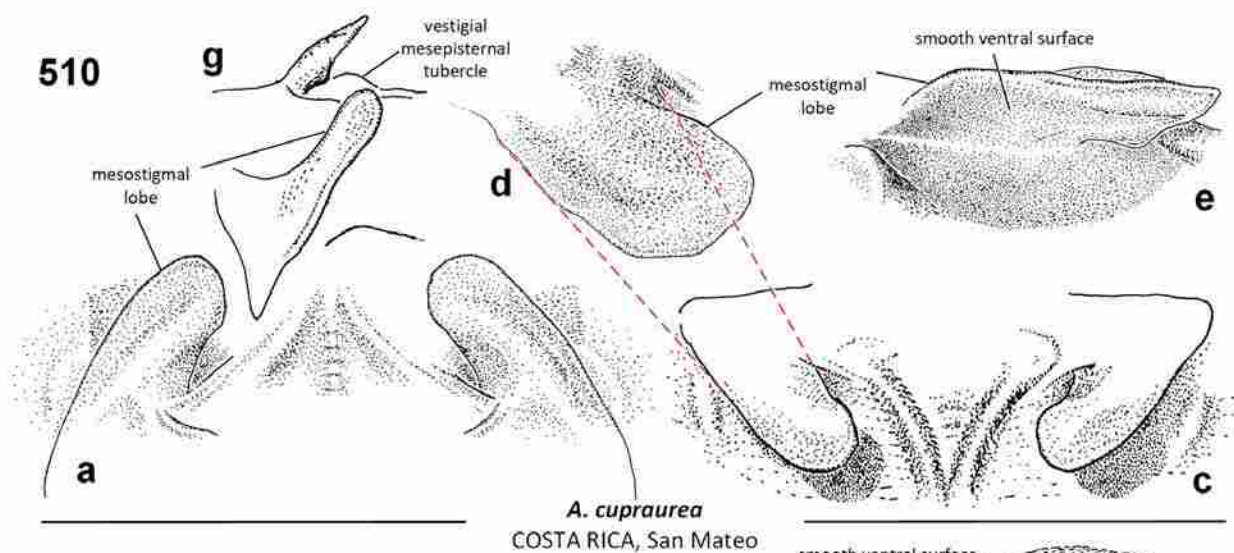
504

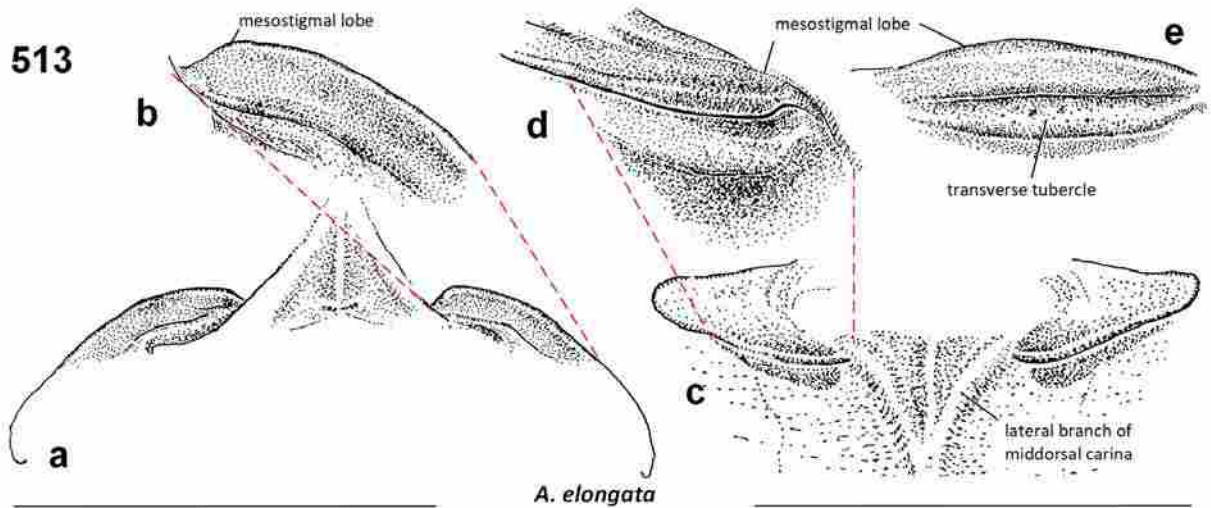


505

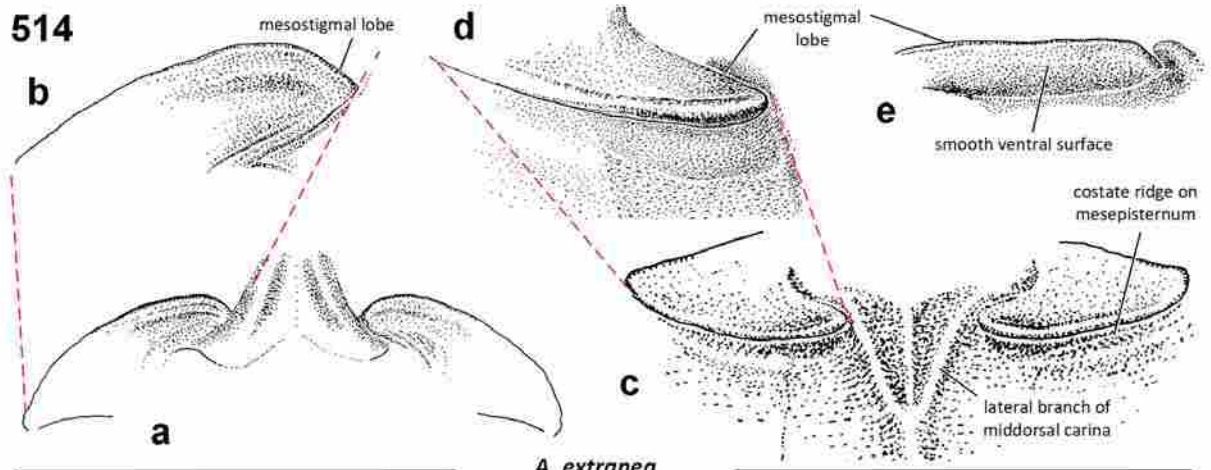




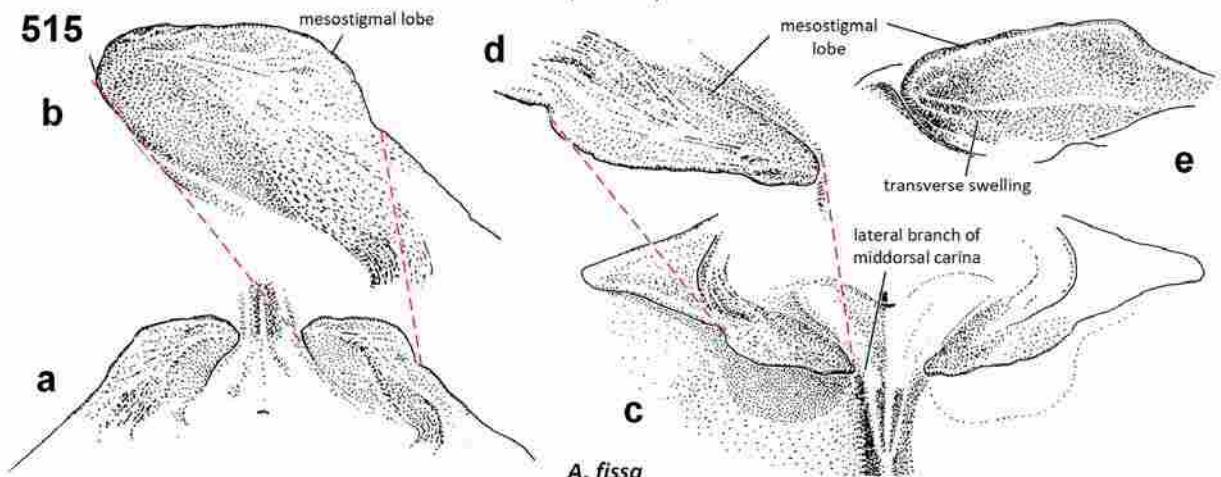




A. elongata
COSTA RICA, Holanda Hotel

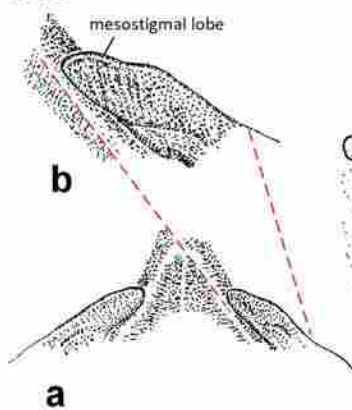


A. extranea
MEXICO, La Guayanera



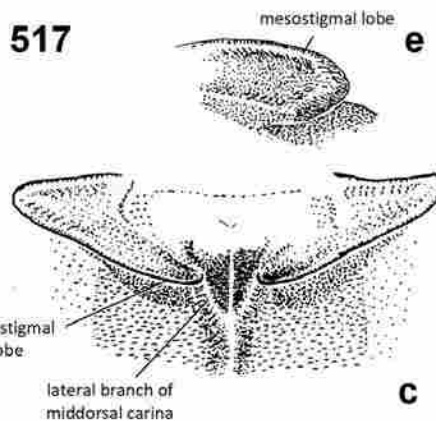
A. fissa
PANAMA, Potrerillos

516



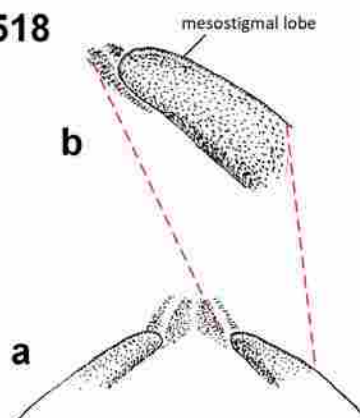
A. frequentula
COSTA RICA, Guapiles

517



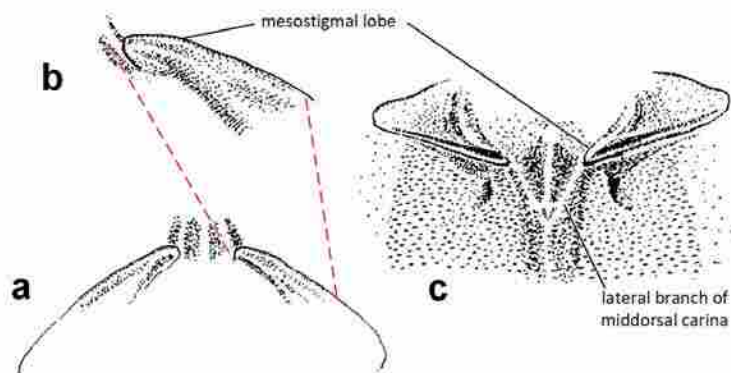
A. frequentula – PARATYPE
HONDURAS, San Pedro Sula

518



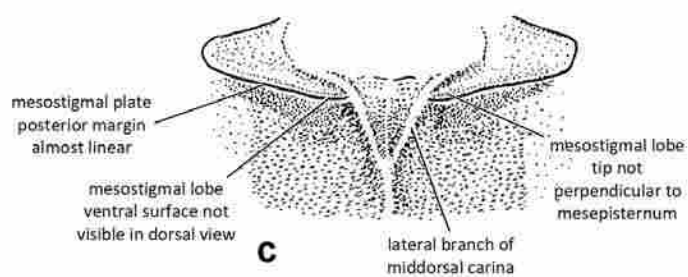
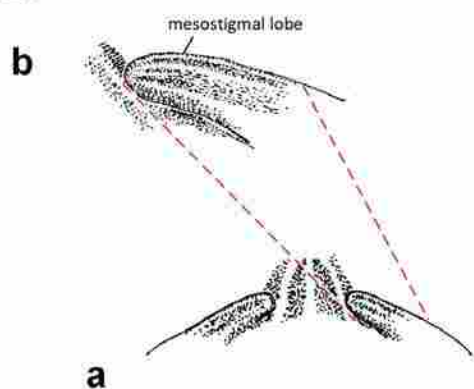
A. frequentula
MEXICO, below Palenque Ruins

519

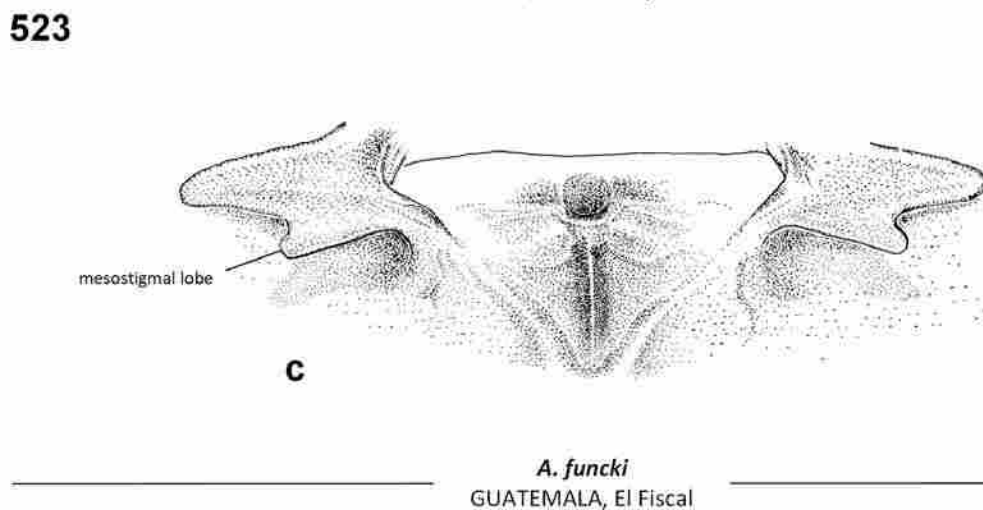
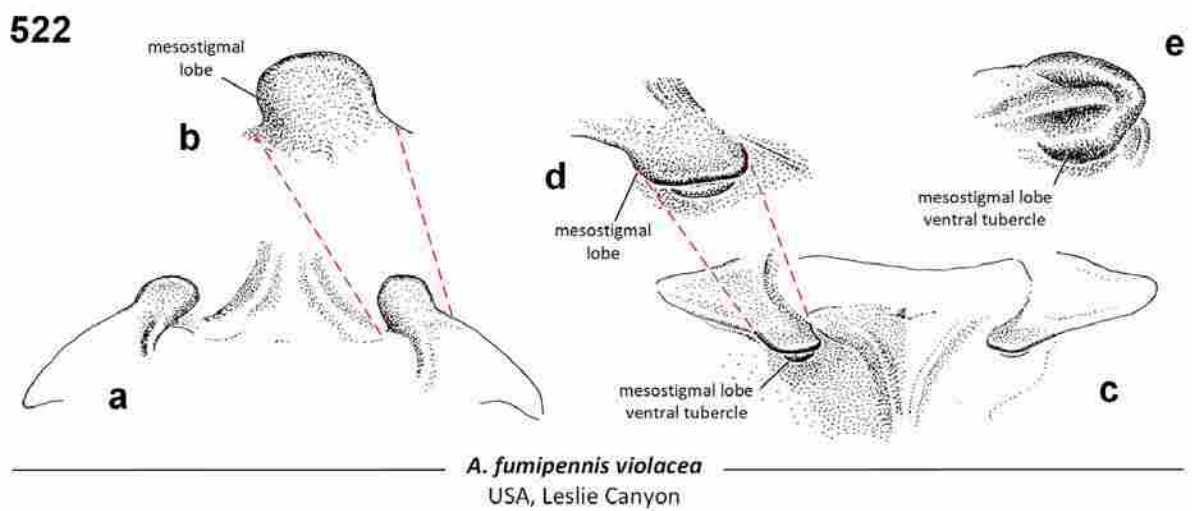
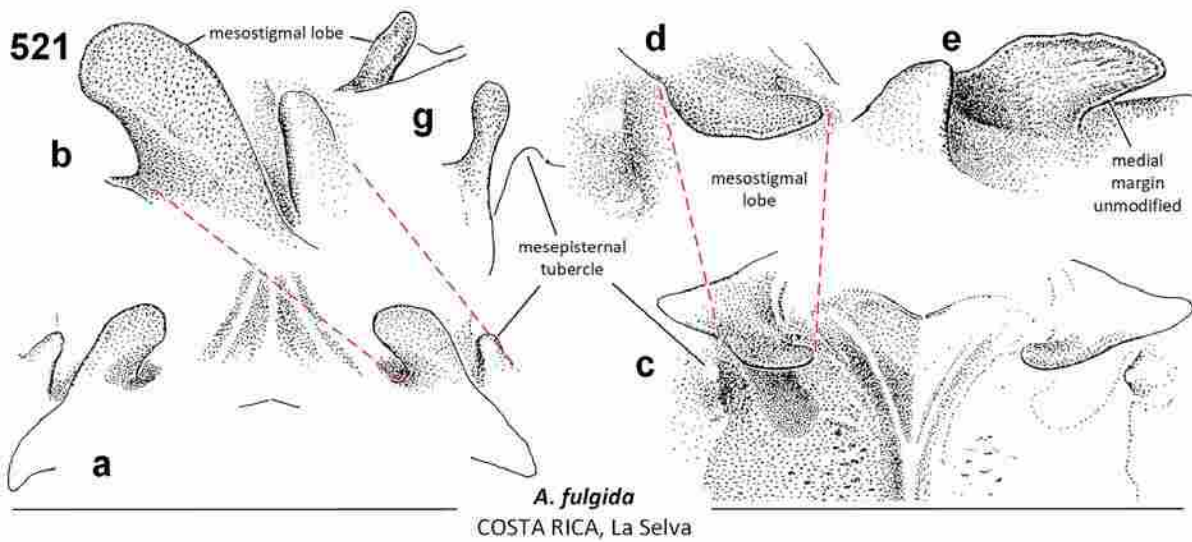


A. frequentula
MEXICO, Agua Caliente

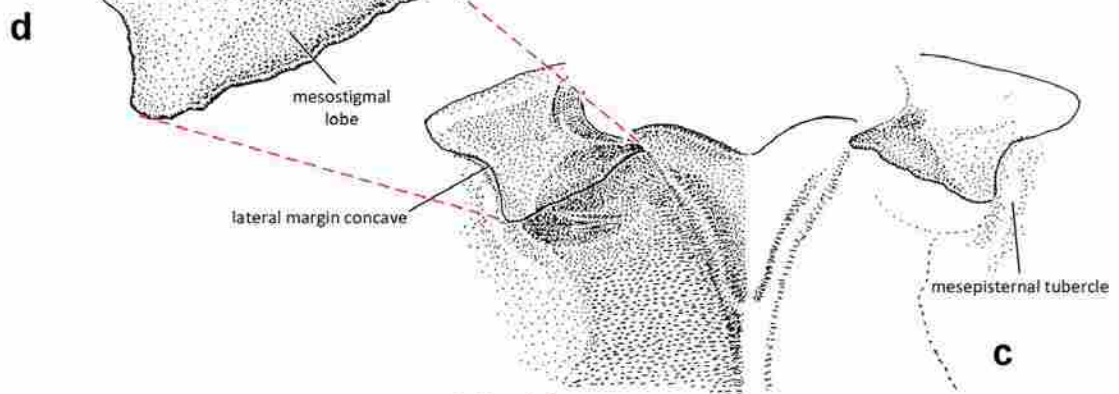
520



A. frequentula
BELIZE, Gallon Jug



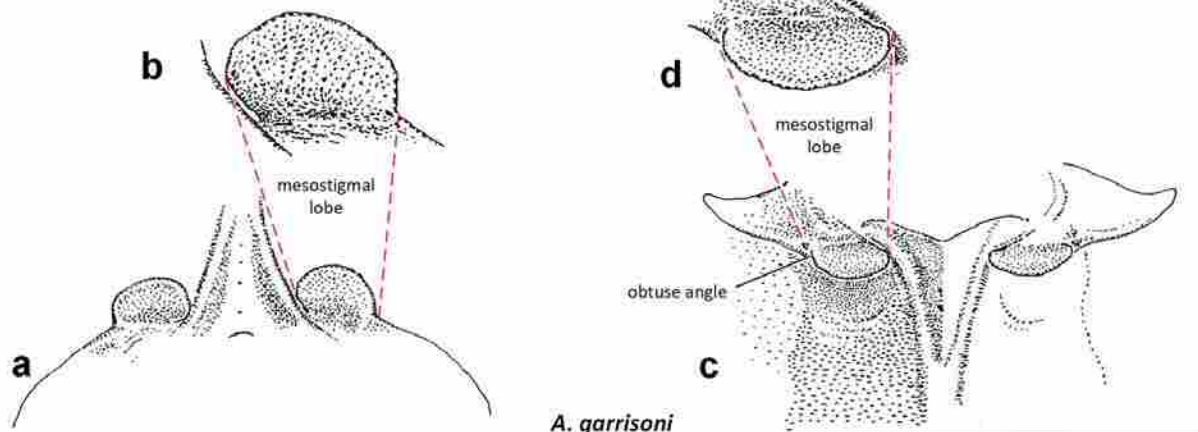
524



A. funebris

MEXICO, San Cristobal de las Casas

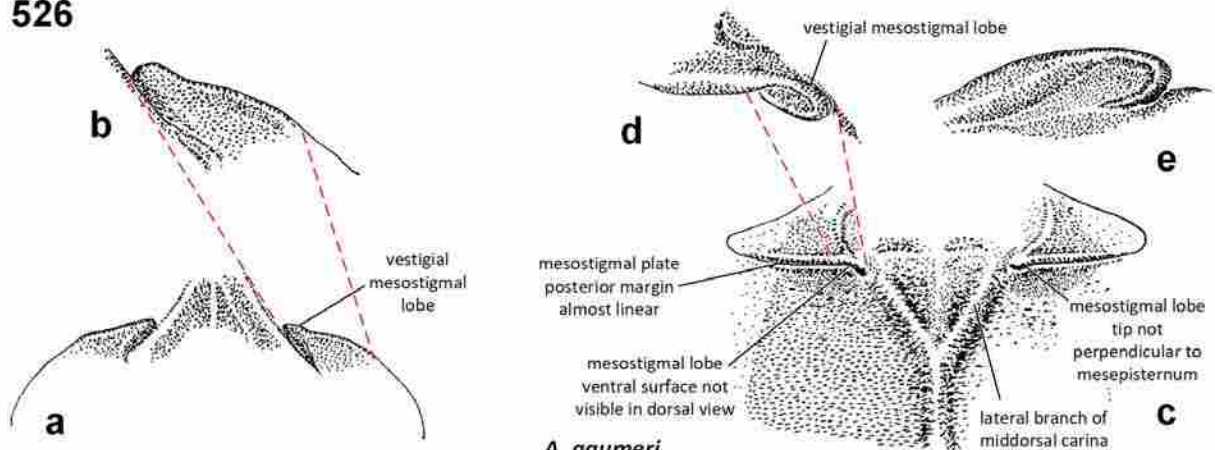
525



A. garrisoni

MEXICO, Cascada de Micos

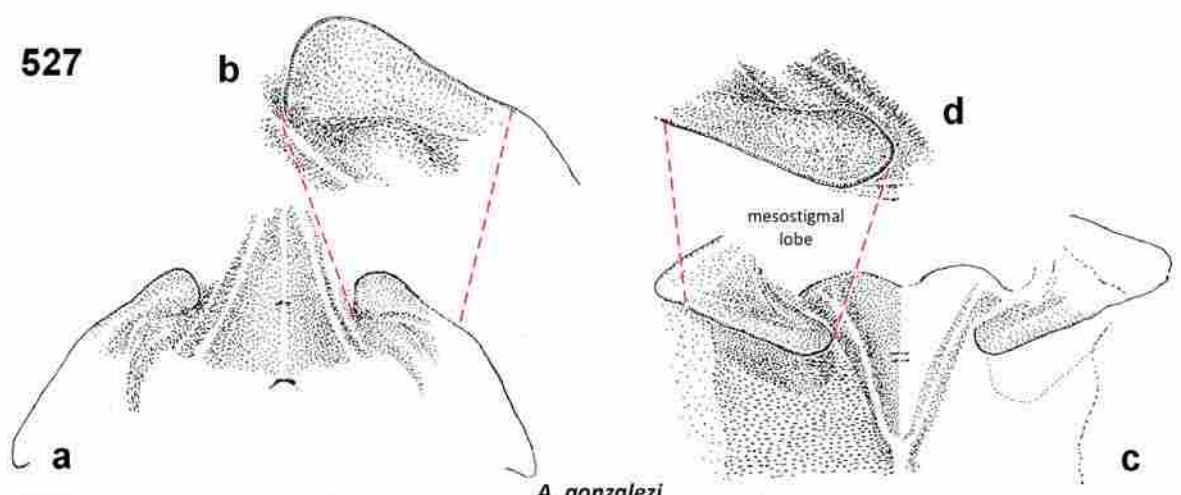
526



A. gaumeri

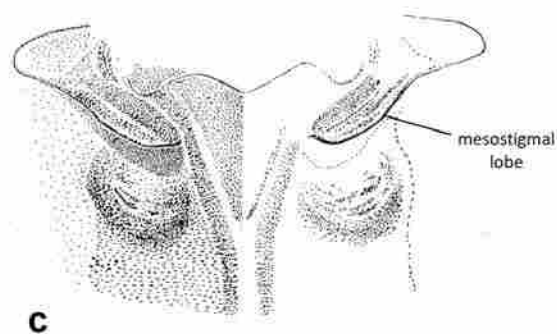
MEXICO, Azul & Emilia Ponds

527



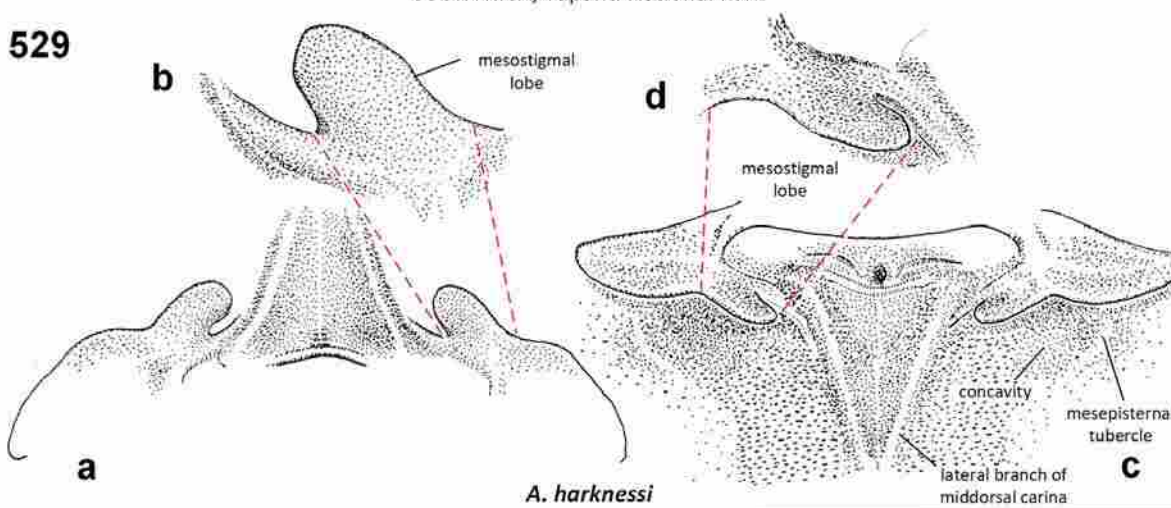
A. gonzalezi
MEXICO, 3.5 km E of Rayón

528



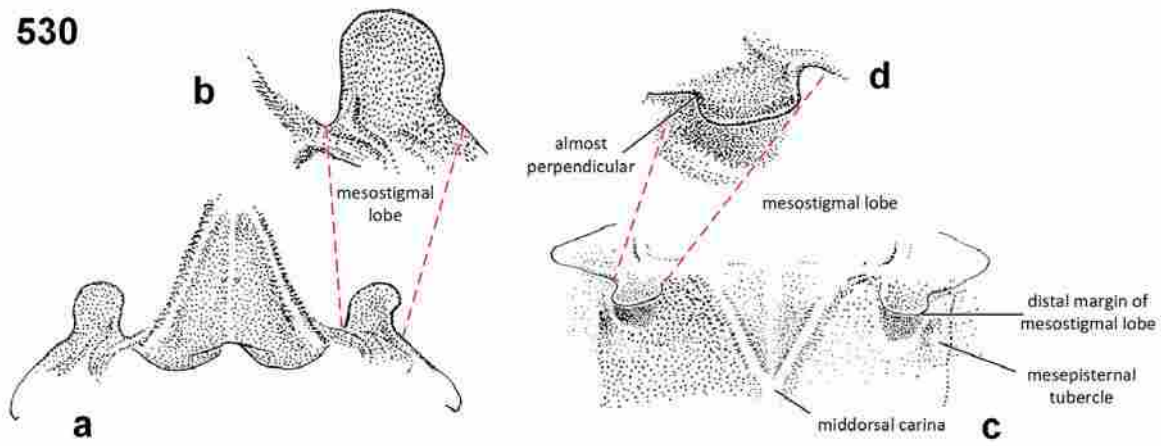
A. ? gonzalezi
COSTA RICA, Tapantí National Park

529



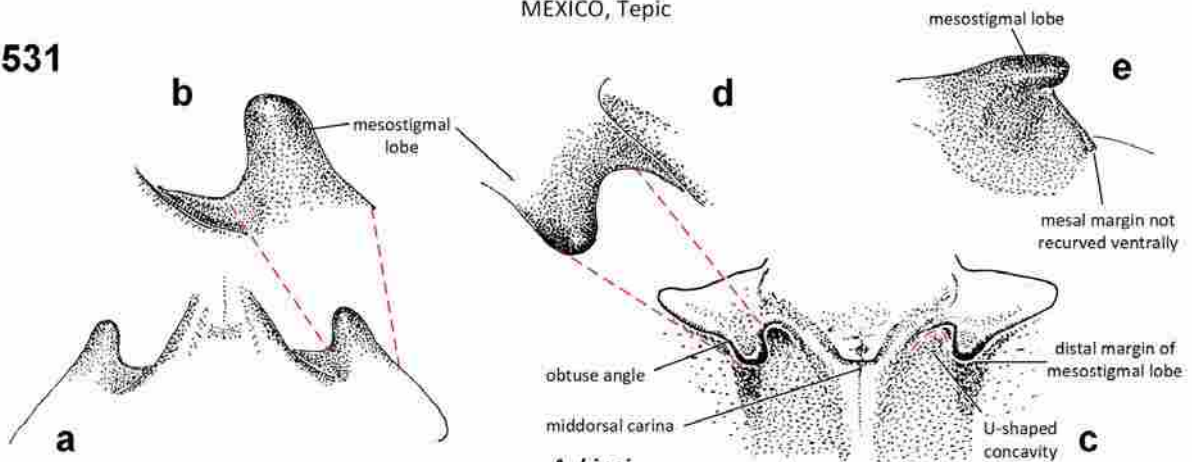
A. harknessi
MEXICO, Cascada de Micos

530



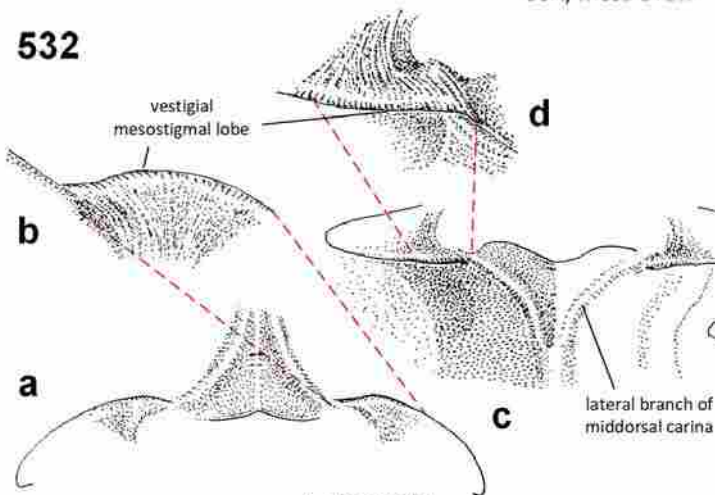
A. herberti
MEXICO, Tepic

531



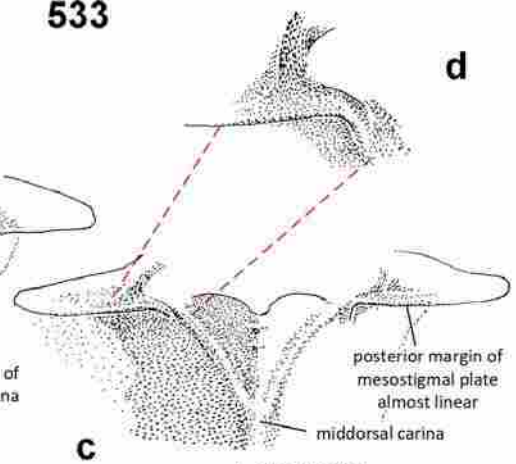
A. hinei
USA, Mesa Draw

532



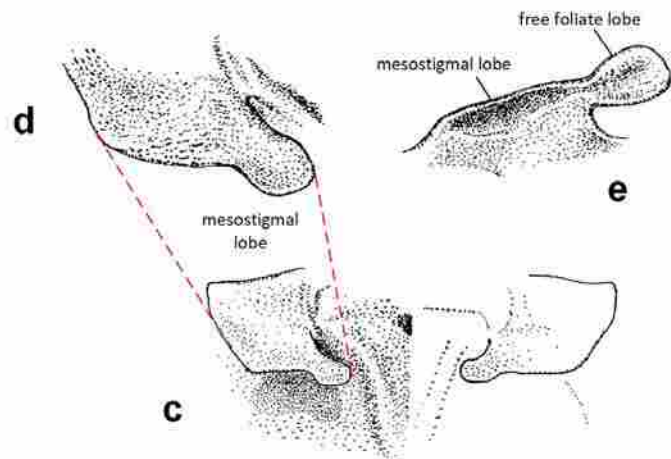
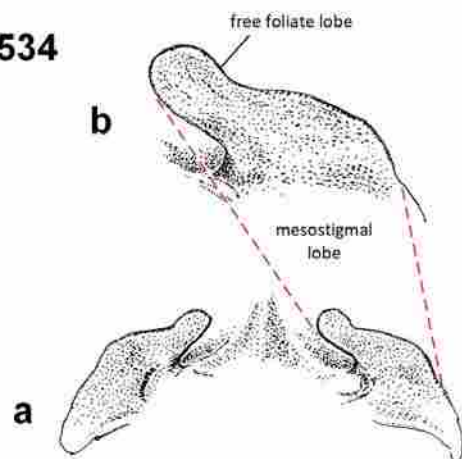
A. immunda
GUATEMALA, Semuc Champey

533



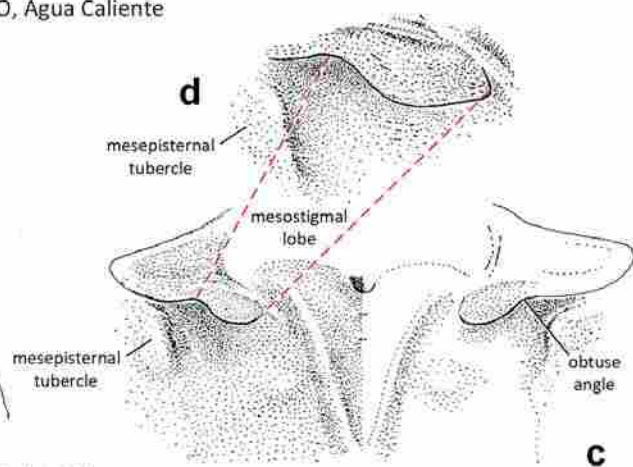
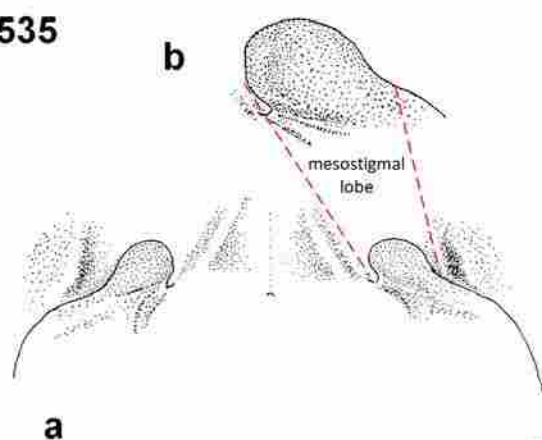
A. immunda
USA, Mustang Creek

534



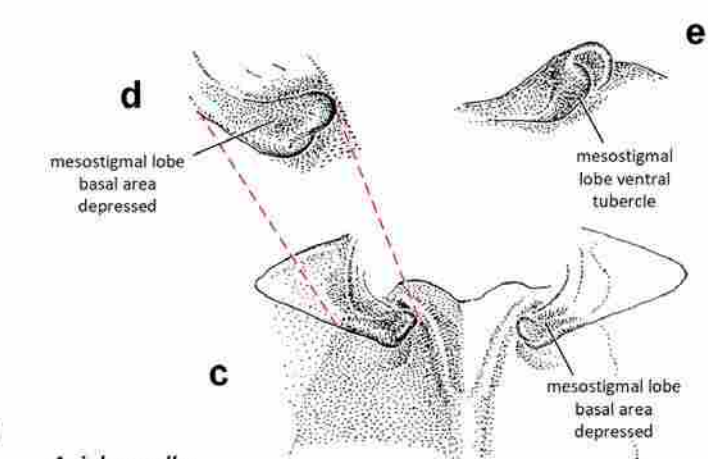
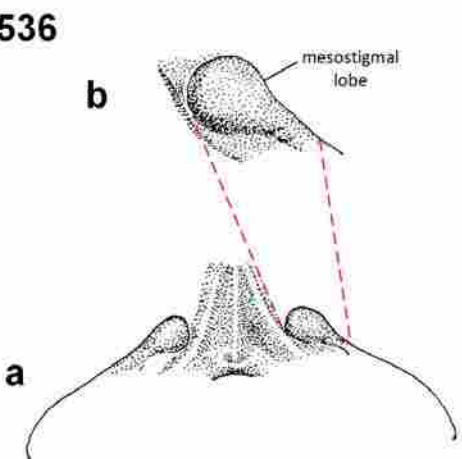
A. indicatrix
MEXICO, Agua Caliente

535

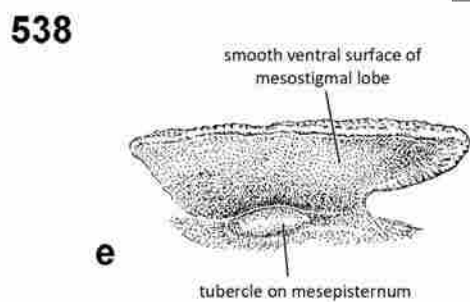
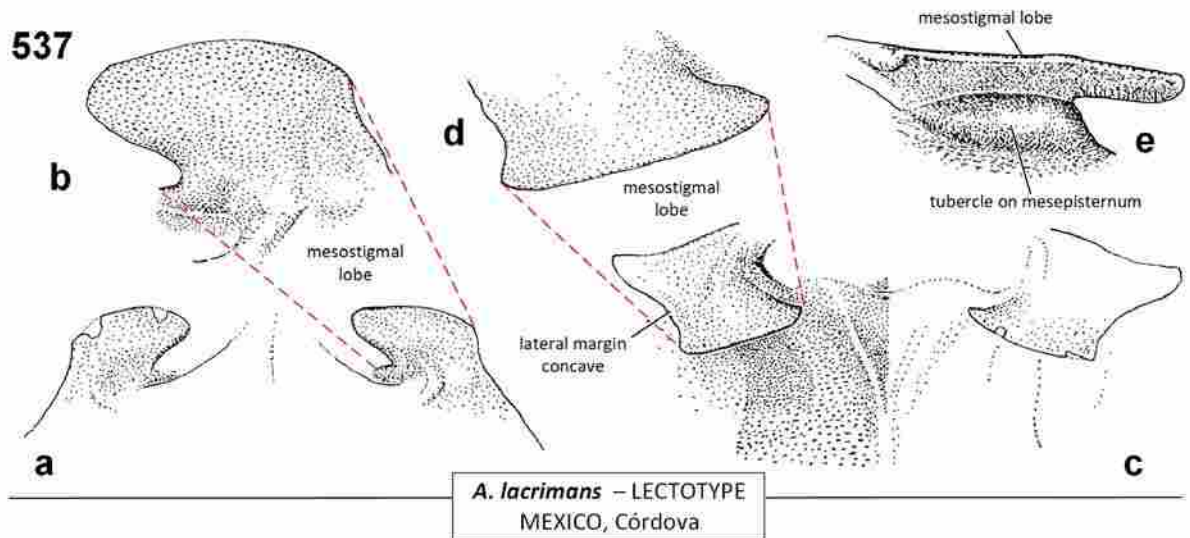


A. insipida
SURINAM, Kutari River

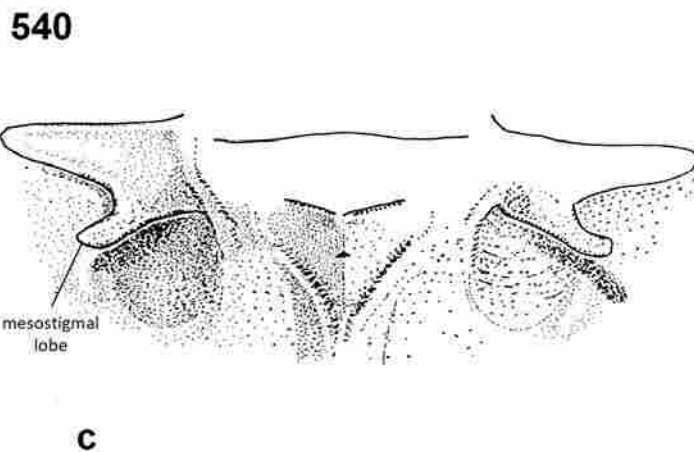
536



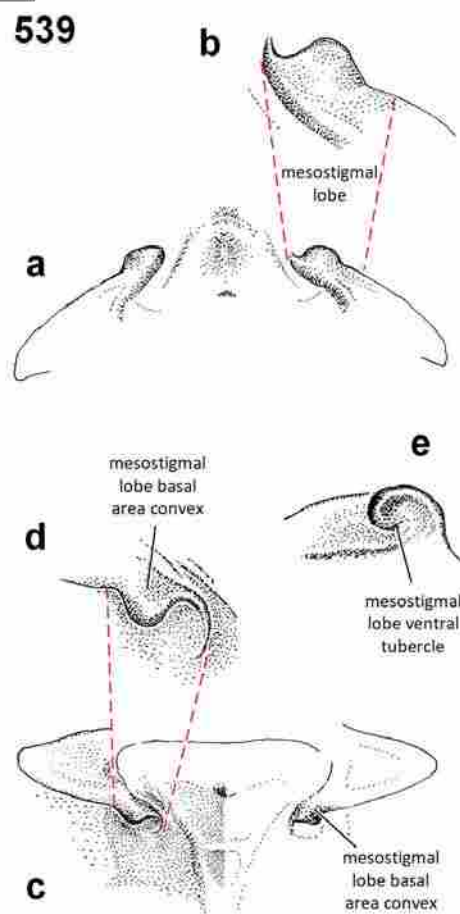
A. johannella
PANAMA, Canal Zone



A. lacrimans
MEXICO, Ojo Zarco

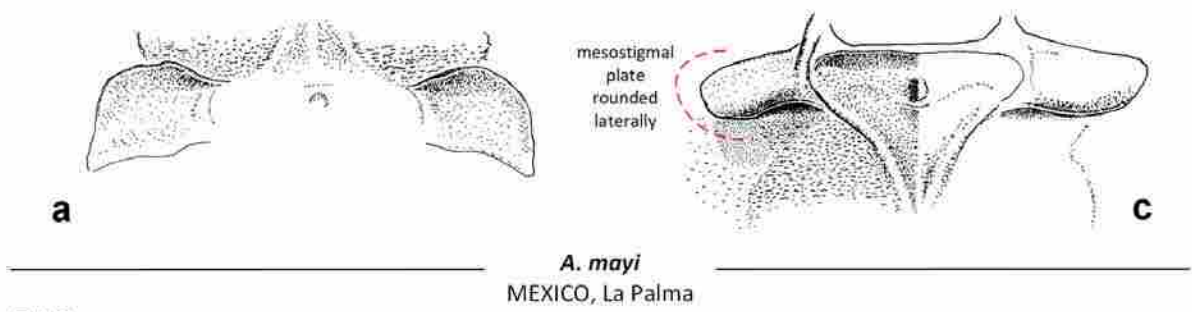


A. lugens
USA, Seven Springs

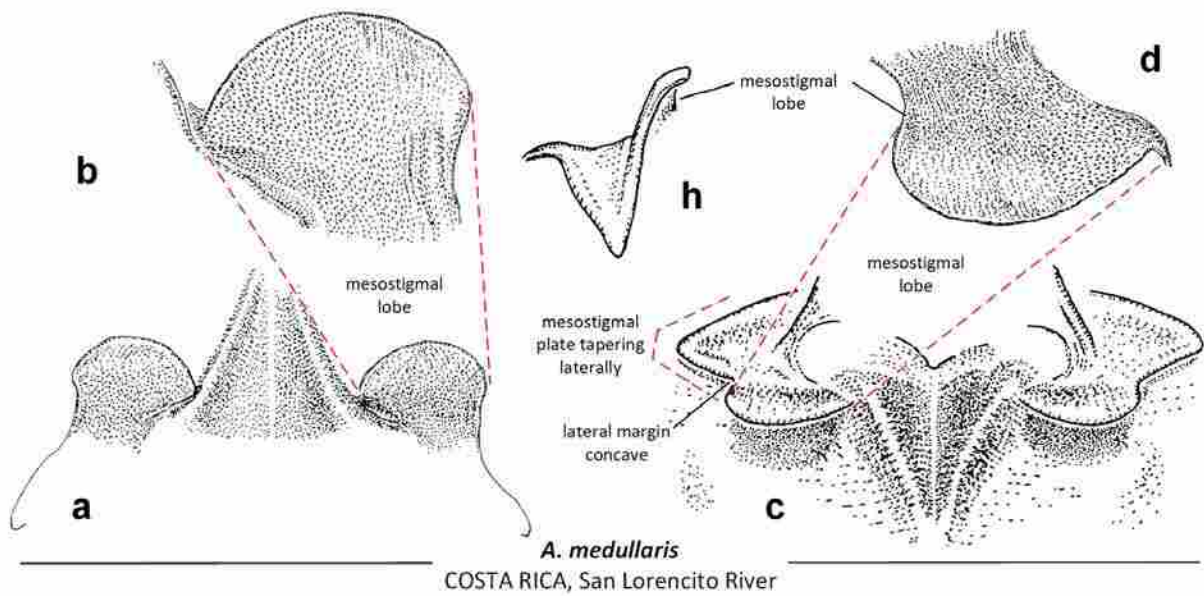


A. leonorae
USA, Oasis Ranch

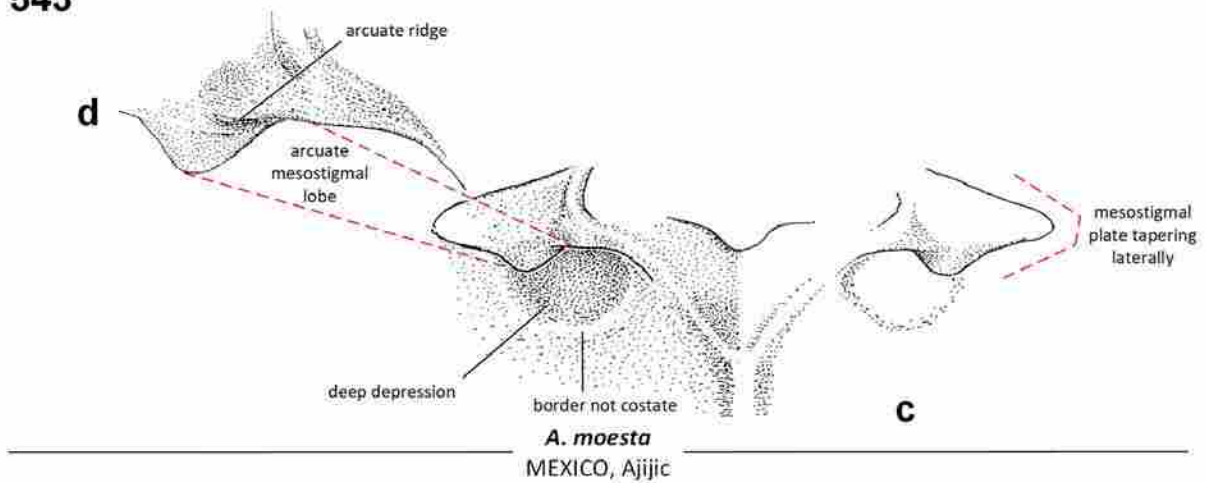
541



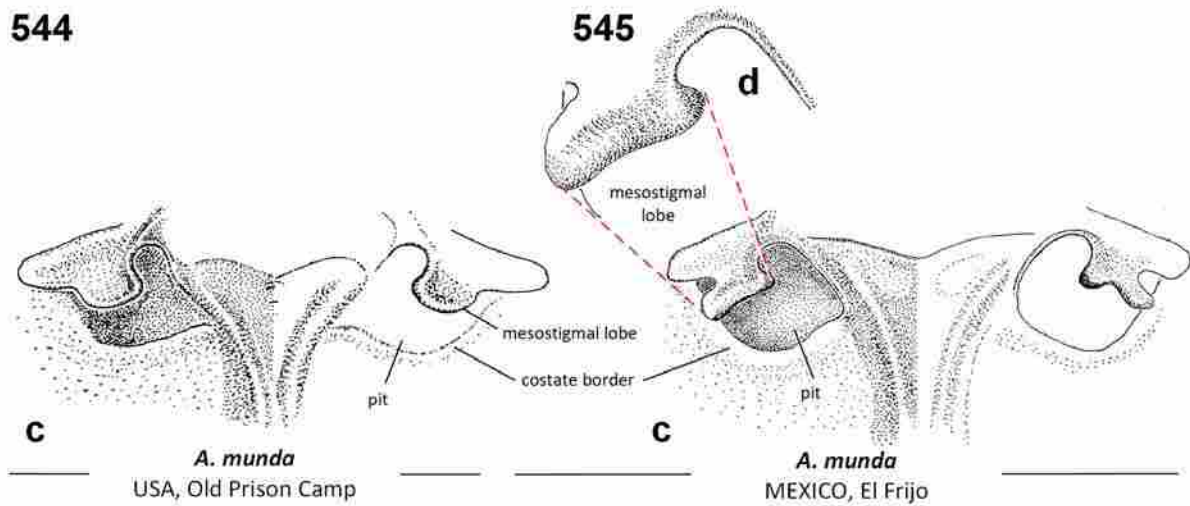
542



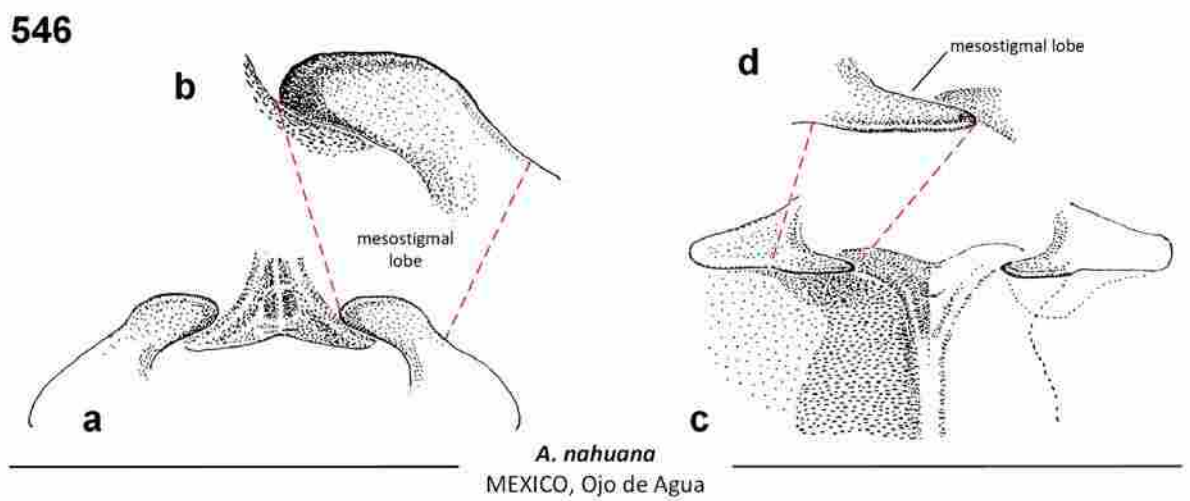
543



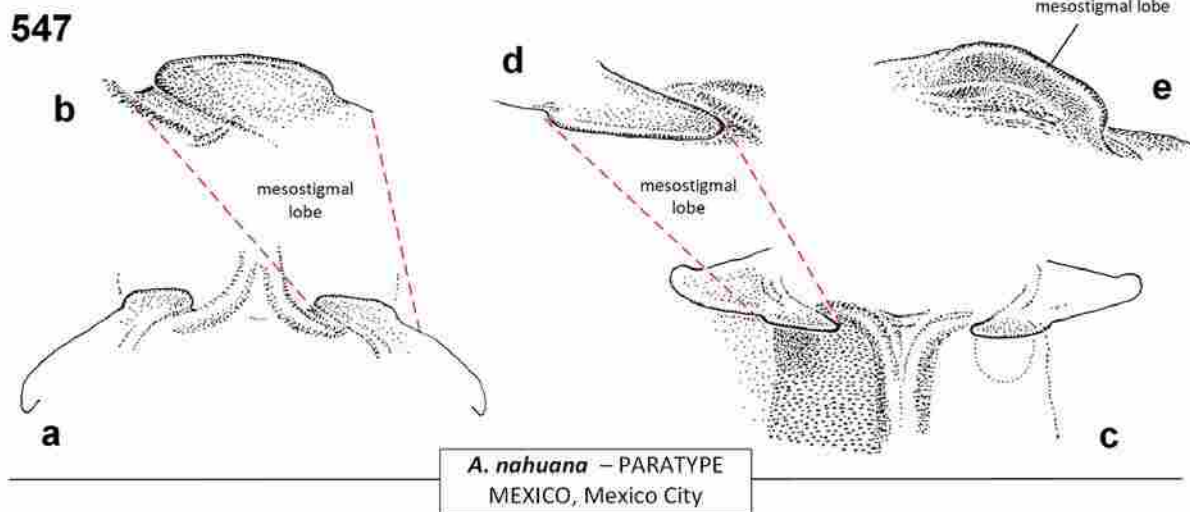
544

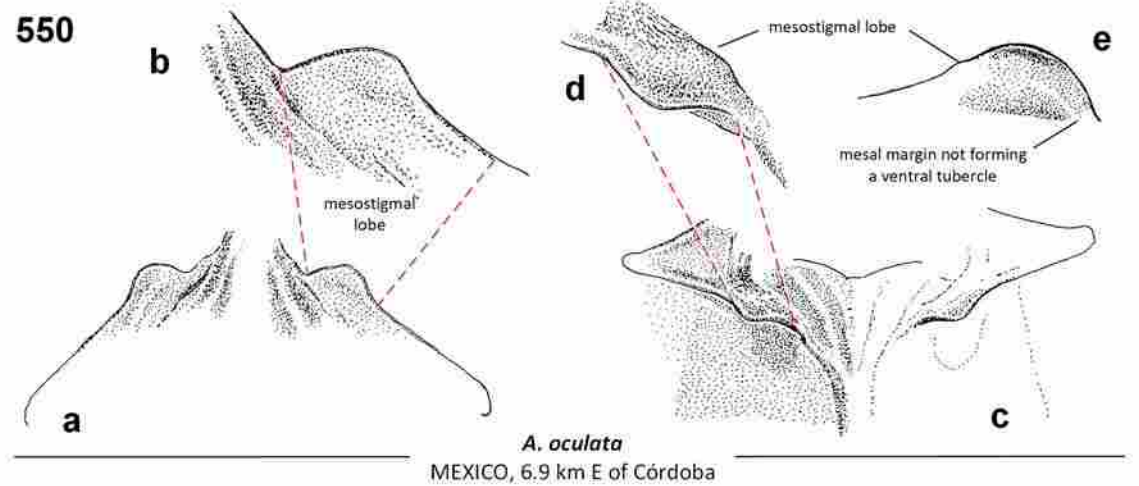
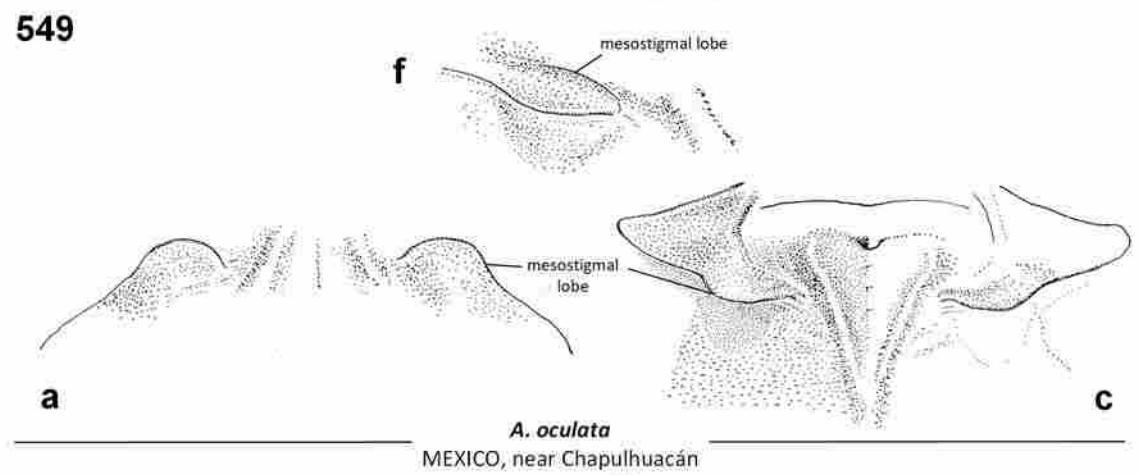
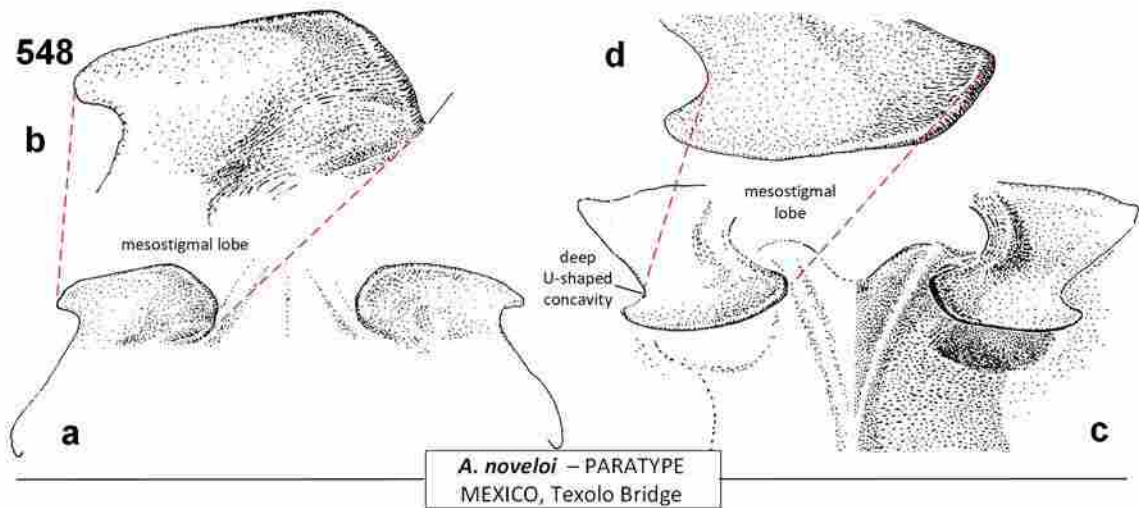


546



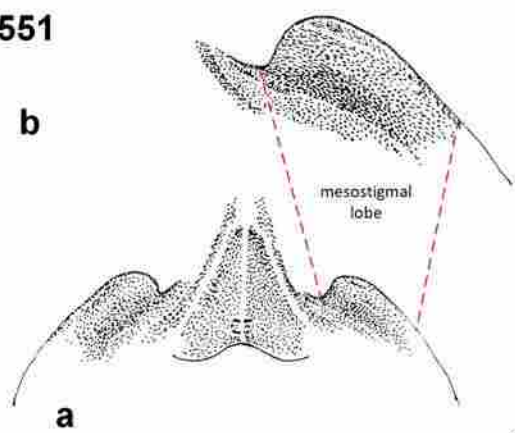
547





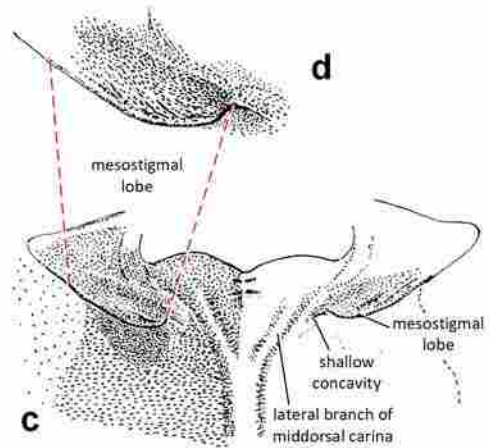
551

b

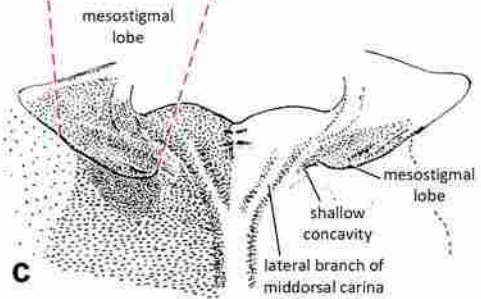


a

A. oculata
MEXICO, Tenosique



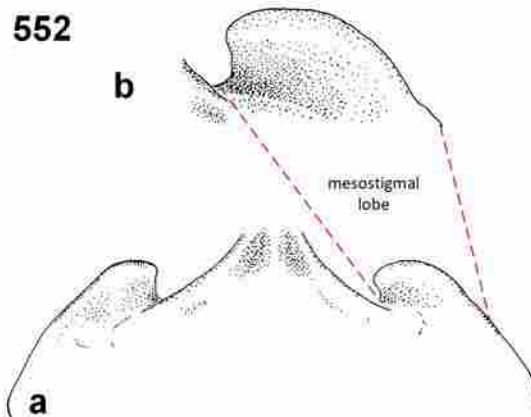
d



c

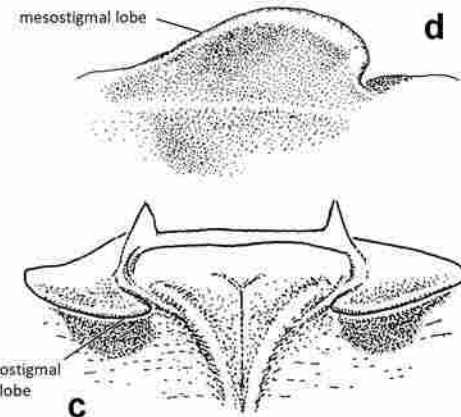
552

b



a

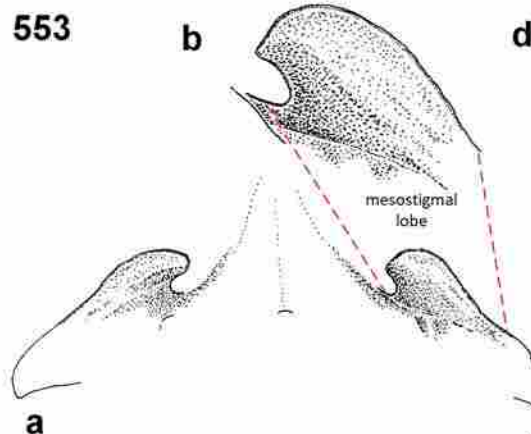
A. oenea
USA, Seven Springs



c

553

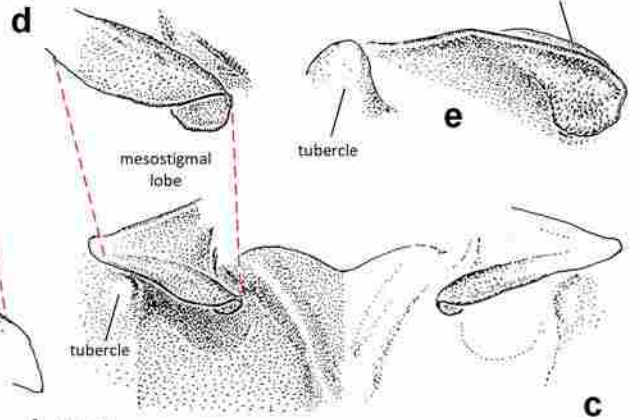
b



a

A. oenea
MEXICO, Máquinas River

d



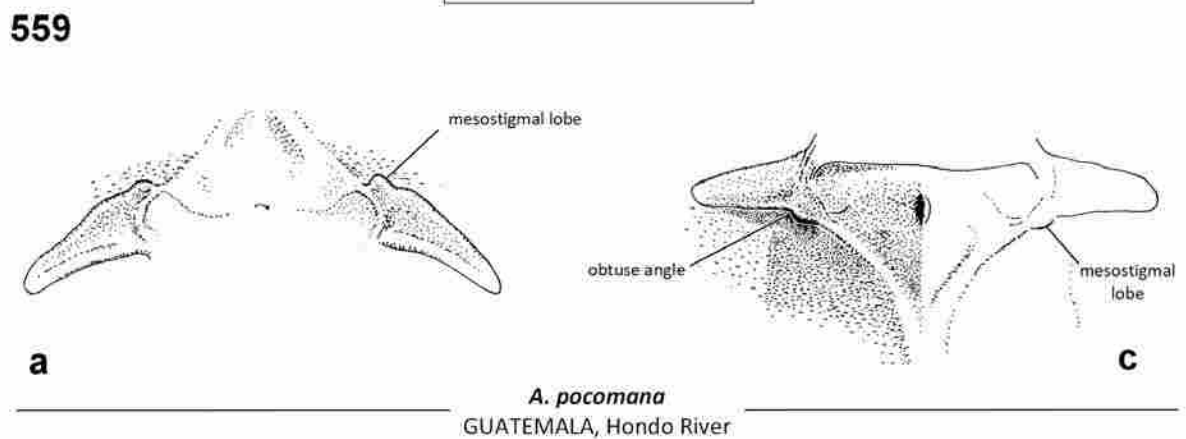
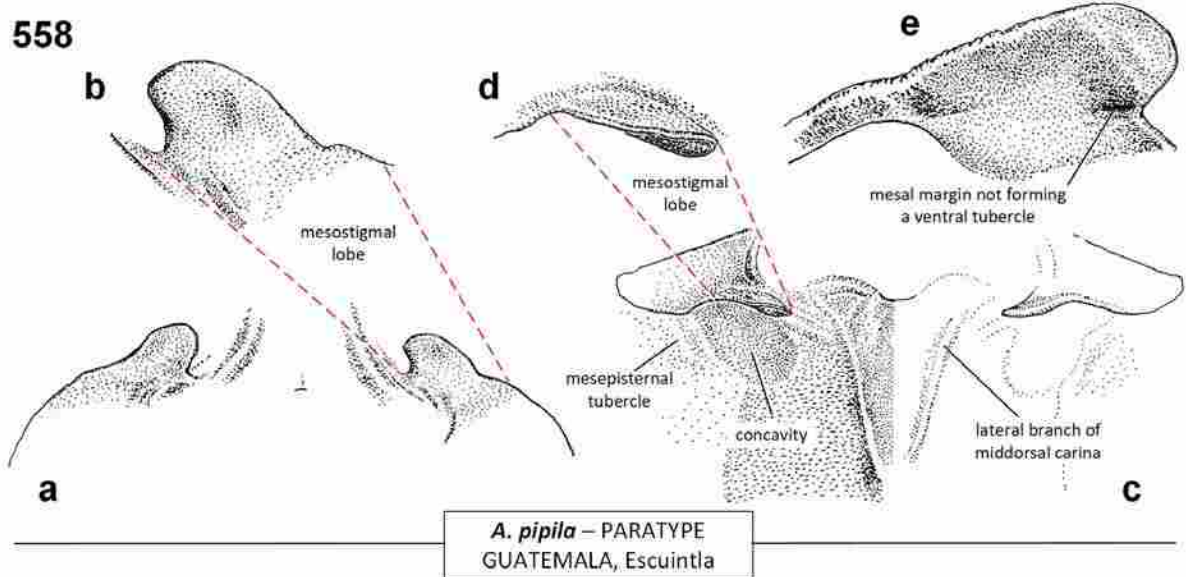
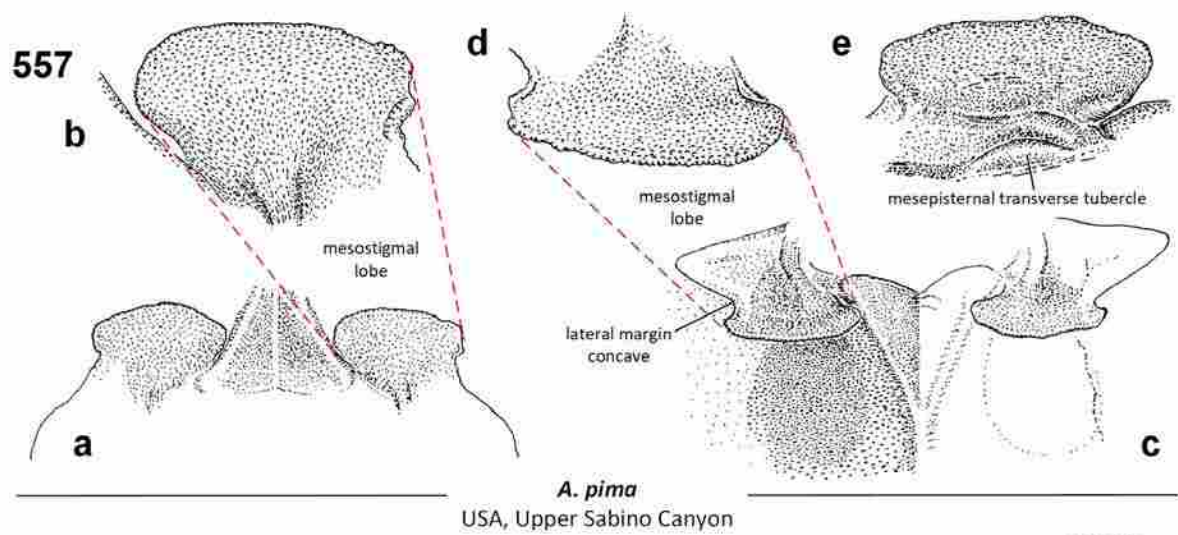
c

mesostigmal lobe

tubercle

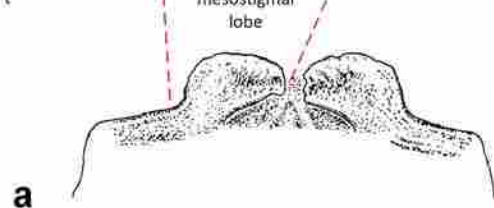
mesostigmal lobe

tubercle



560

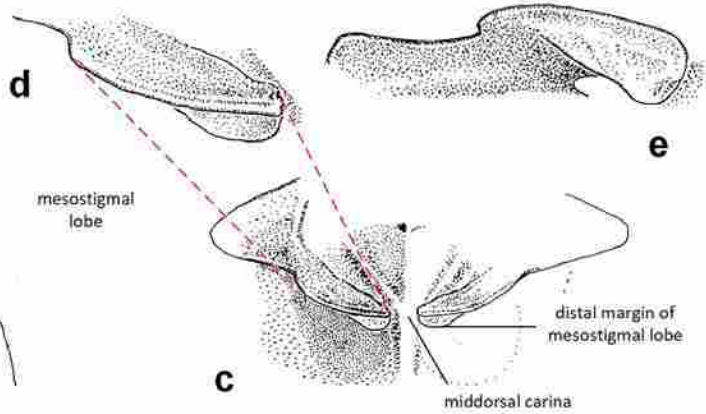
b



a

d

mesostigmal lobe



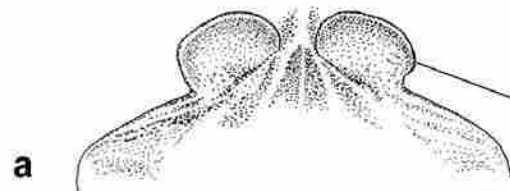
c

e

A. popoluca
COSTA RICA, Braulio Carrillo N.P.

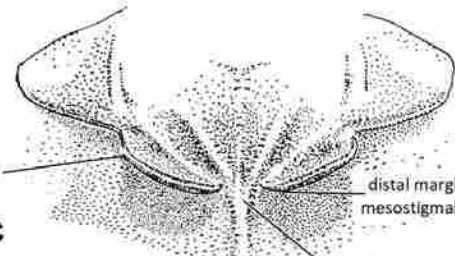
561

e



a

mesostigmal lobe



c

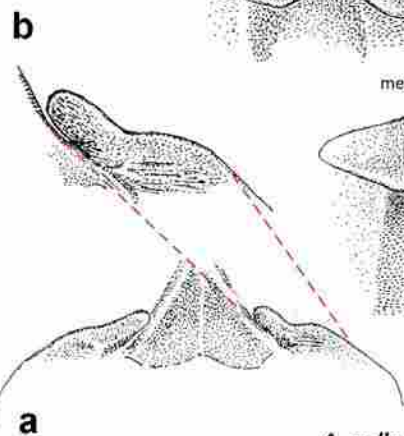
middorsal carina

A. popoluca
Mexico, Los Tuxtlas

562

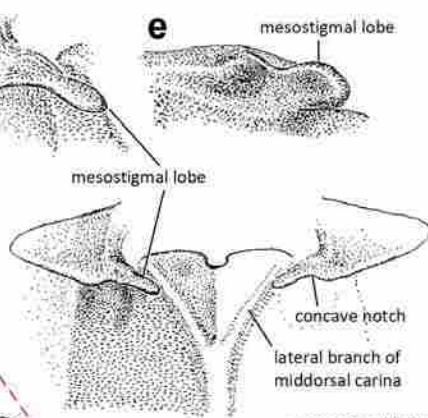
d

e



a

mesostigmal lobe

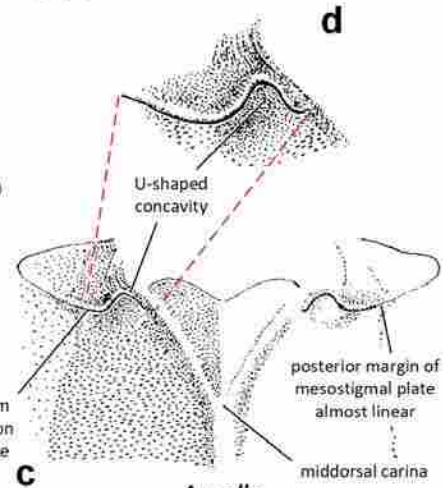


c

A. pulla
MEXICO, 23 mi N of Manzanillo

563

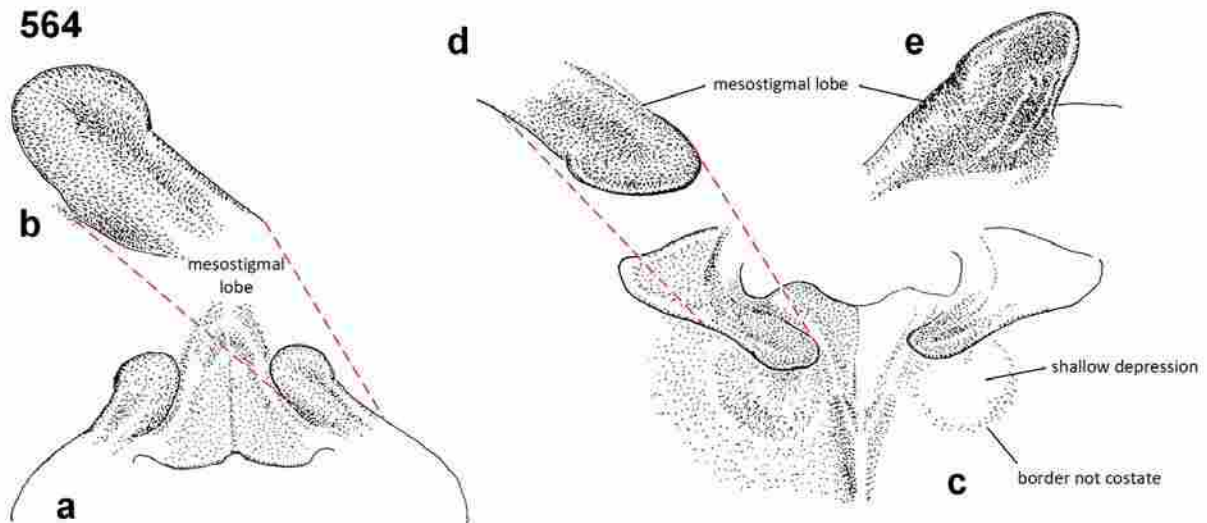
d



c

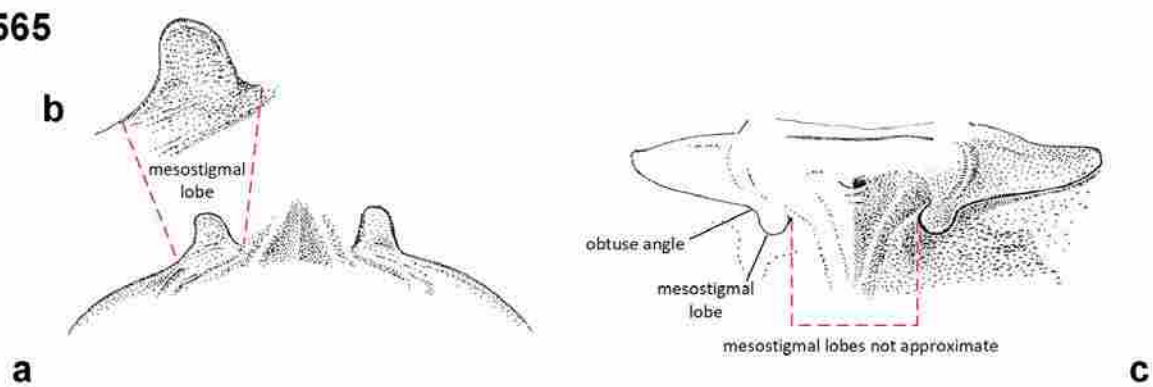
A. pulla
MEXICO, Otapa River

564



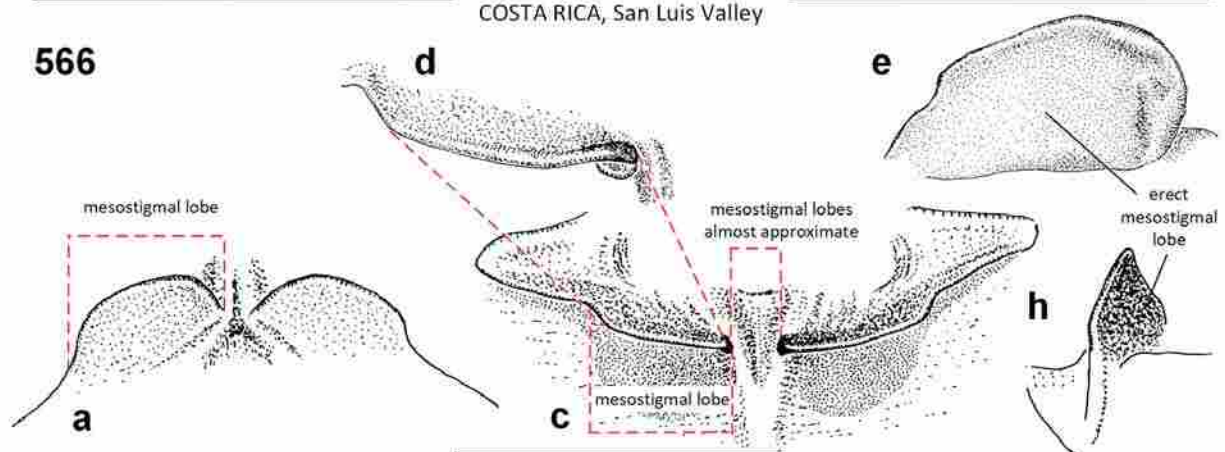
A. rhoadsi
MEXICO, near Sabinas

565

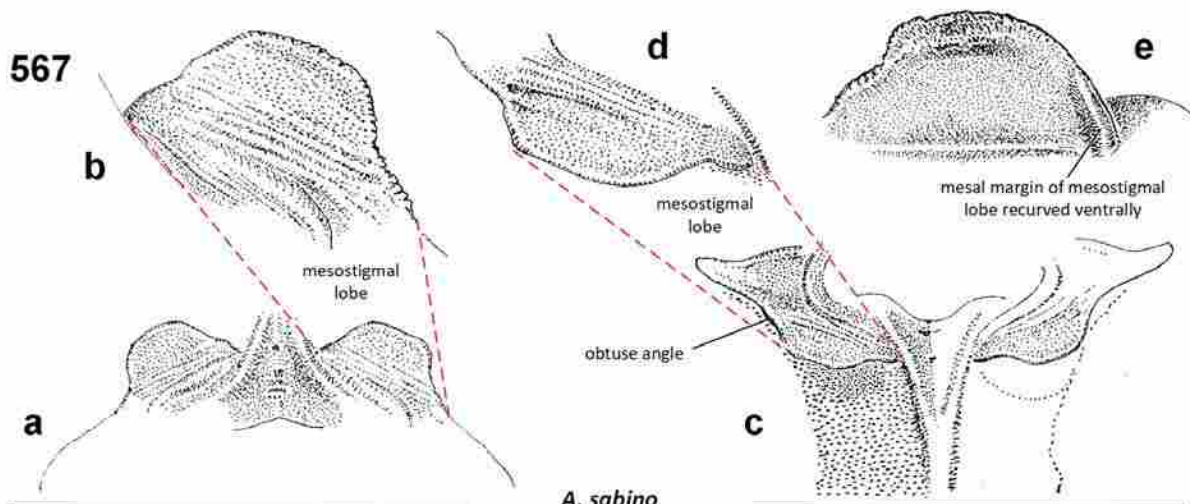


A. rogersi
COSTA RICA, San Luis Valley

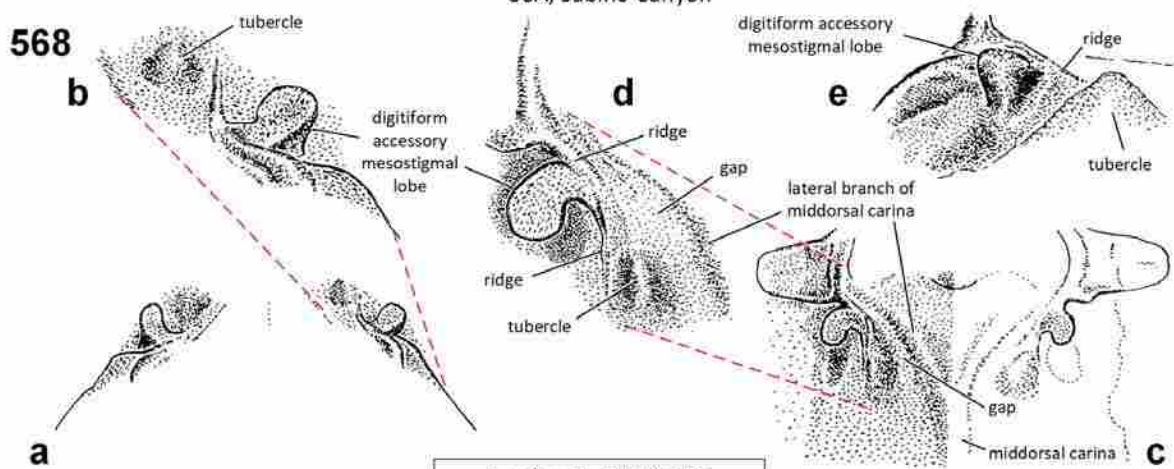
566



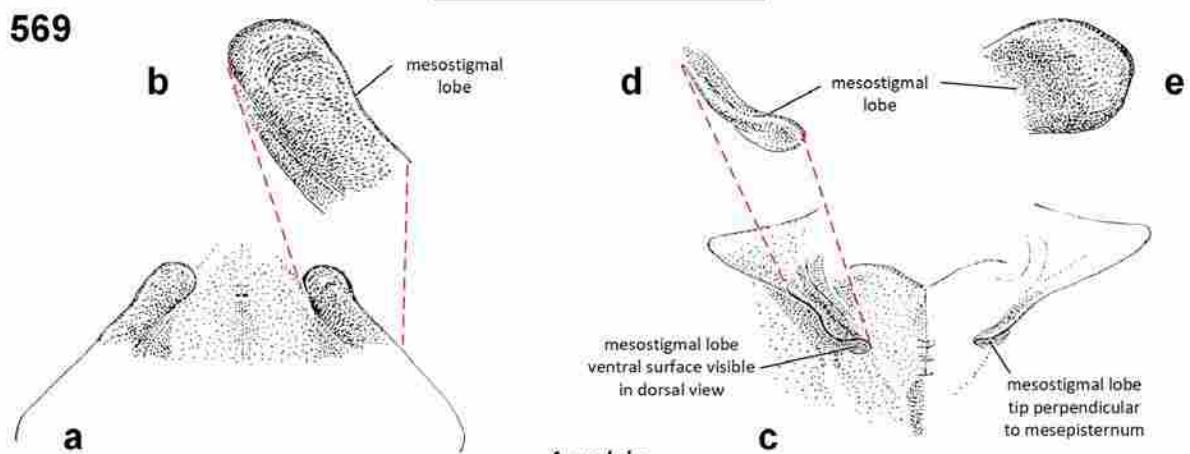
A. rudolphi – PARATYPE
MEXICO, 7 km N of Tlanchinol



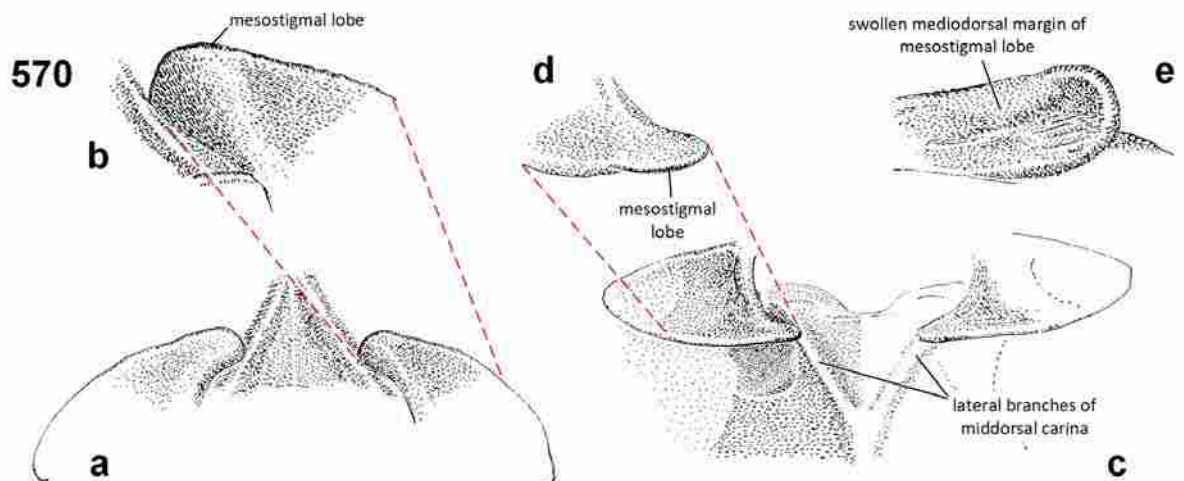
A. sabino
USA, Sabino Canyon



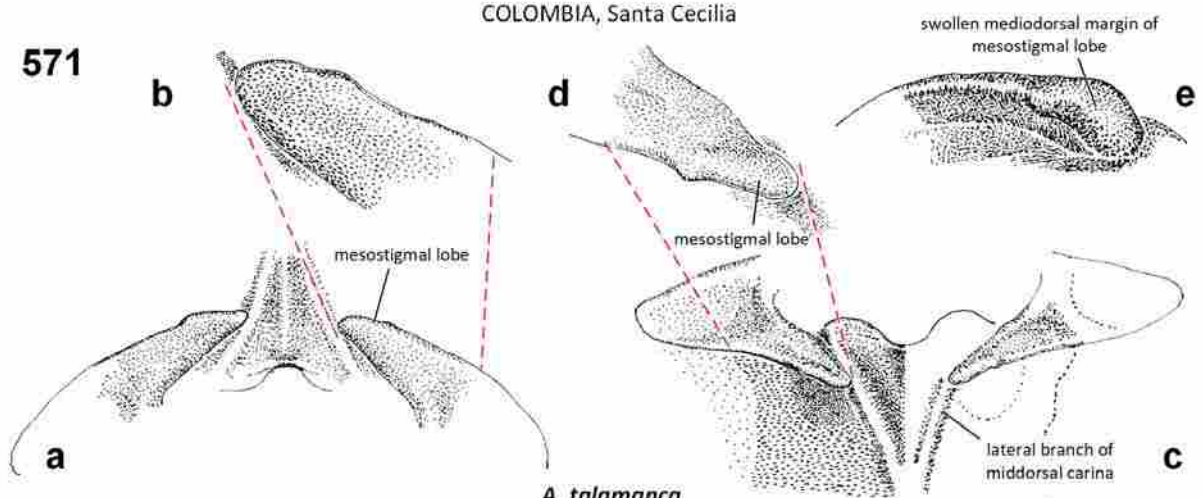
A. schorri – PARATYPE
COSTA RICA, 2 km NE of Uvita



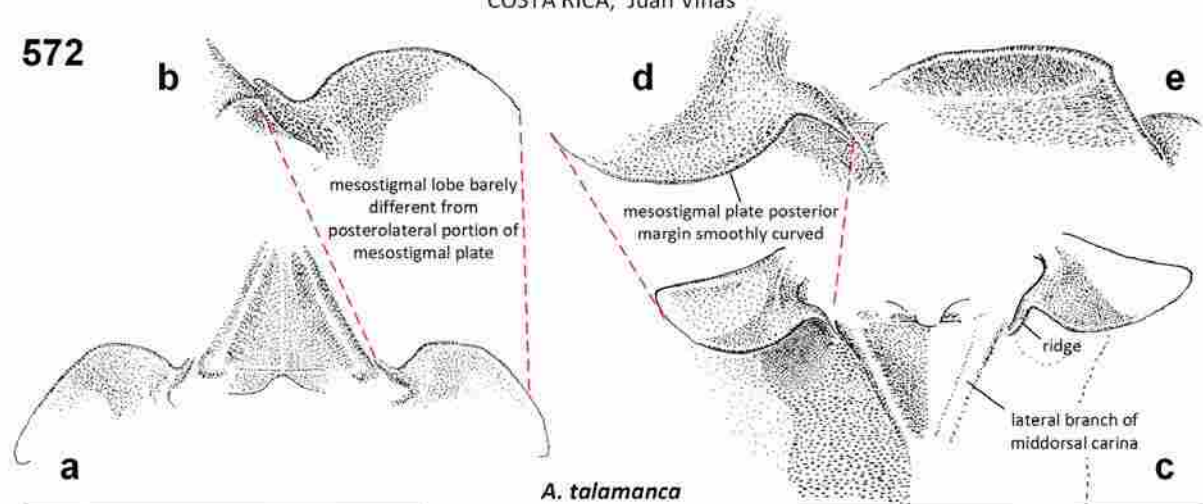
A. sedula
MEXICO, Coy River Headwater



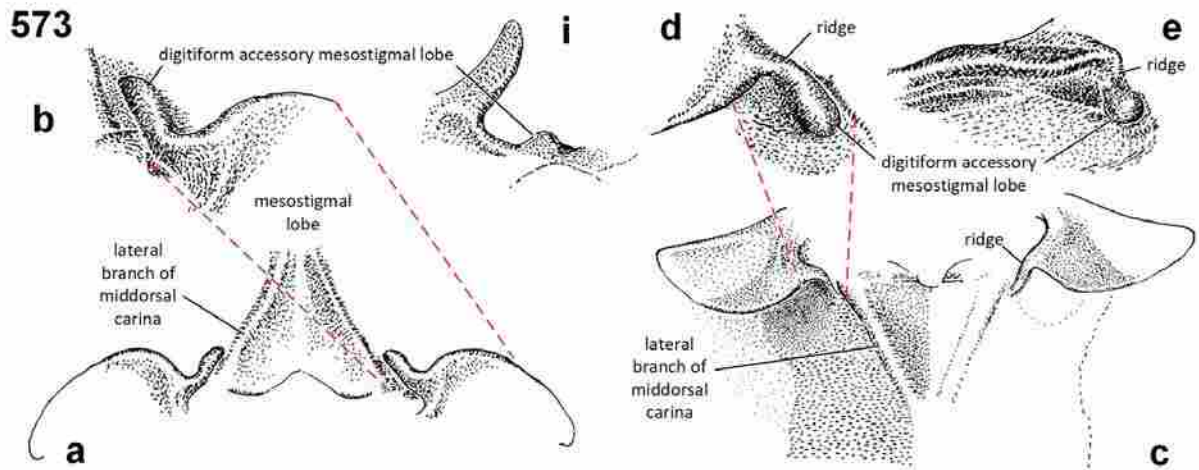
A. talamanca
COLOMBIA, Santa Cecilia



A. talamanca
COSTA RICA, Juan Viñas

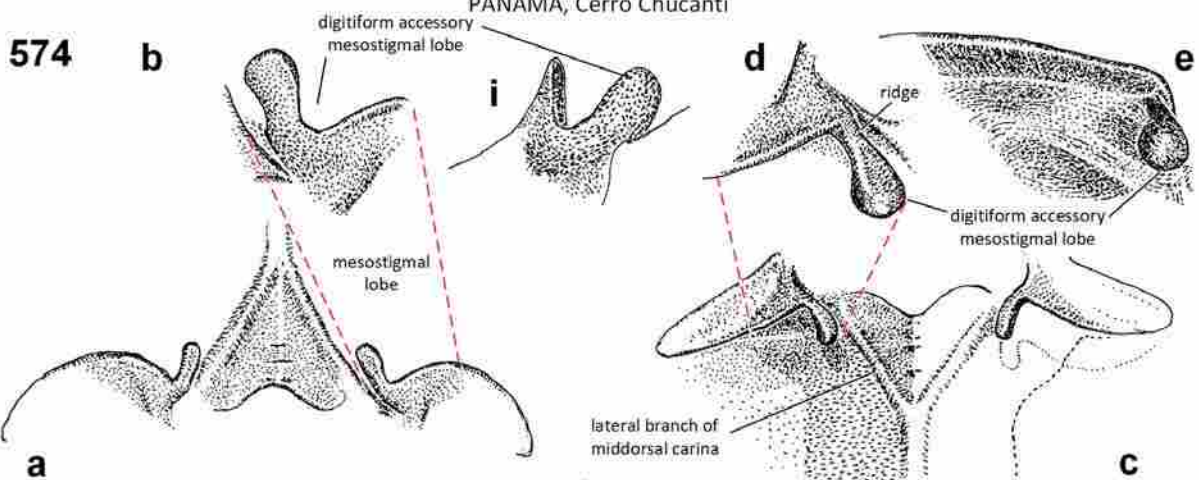


A. talamanca
PANAMA, Madden Dam



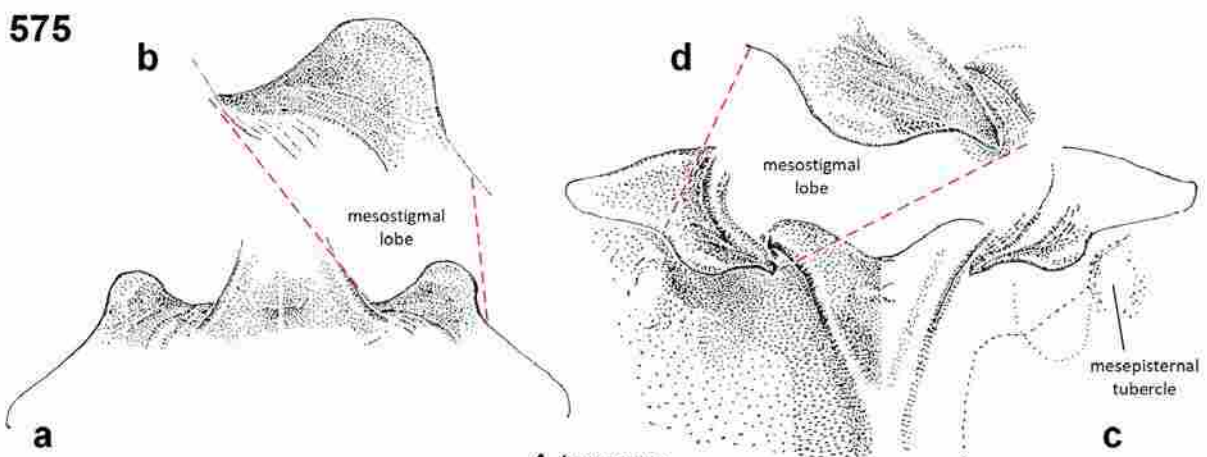
A. talamanca

PANAMA, Cerro Chucanti



A. talamanca

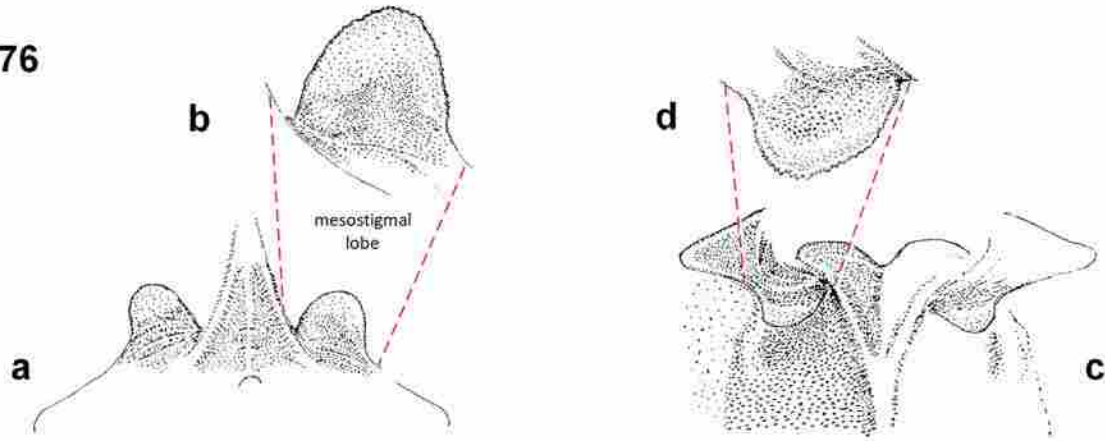
COSTA RICA, near Rincón de Osa



A. tarascana

MEXICO, 10 km W of Cuernavaca

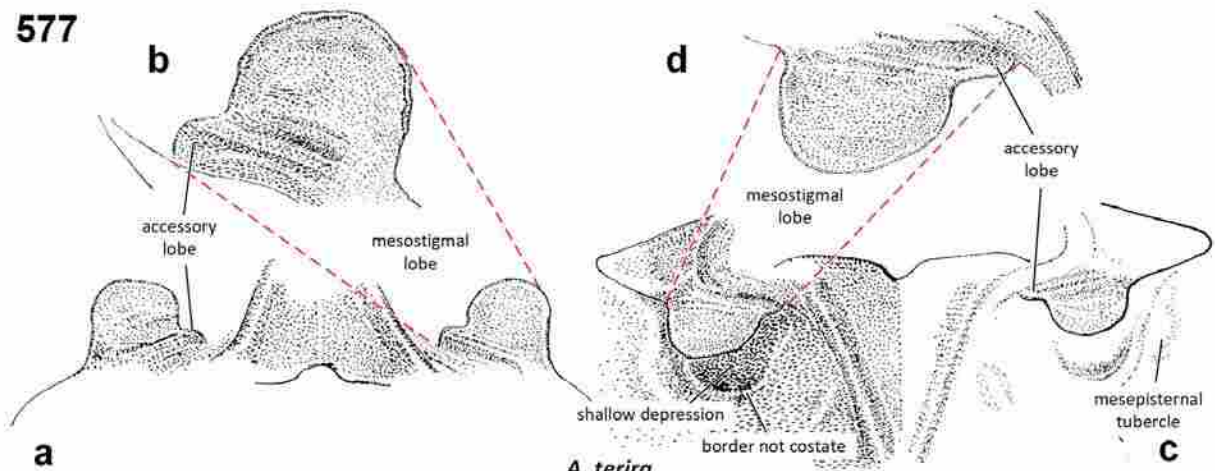
576



A. telesfordi

GRENADA, Saint Margarets Falls

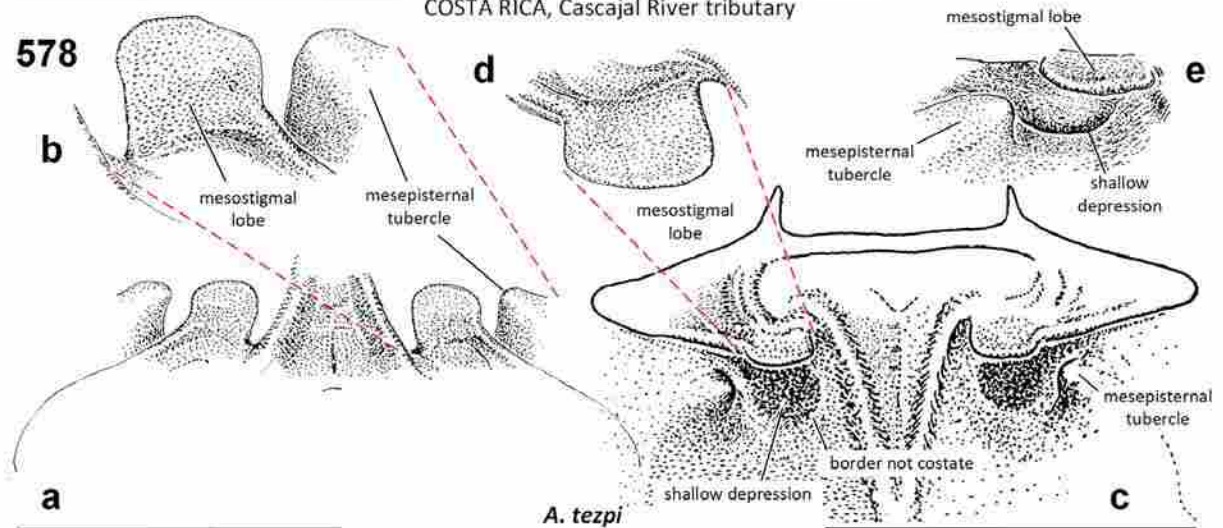
577



A. terira

COSTA RICA, Cascajal River tributary

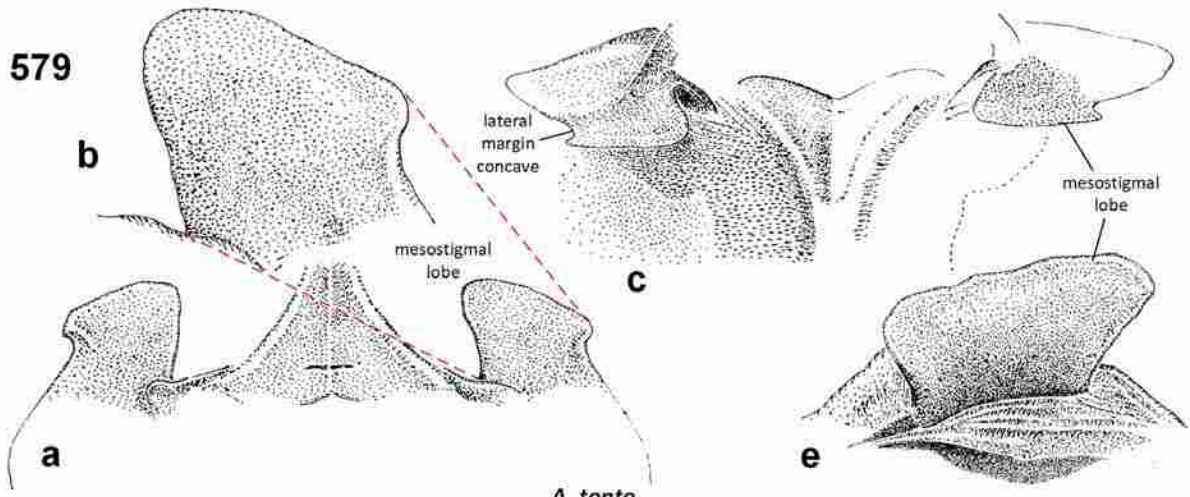
578



A. tezpi

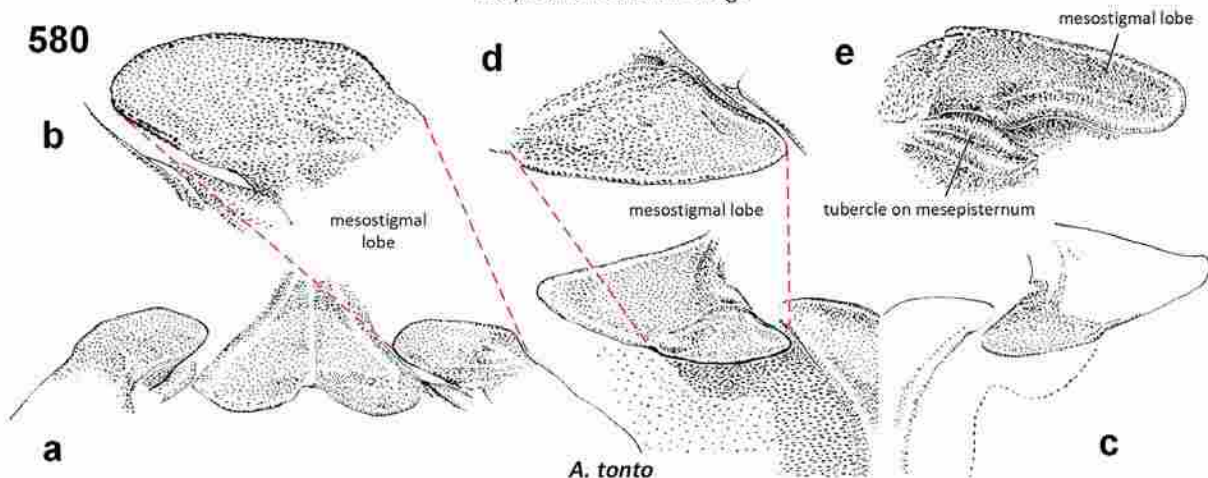
MEXICO, 14 km W of Baja California Sur

579



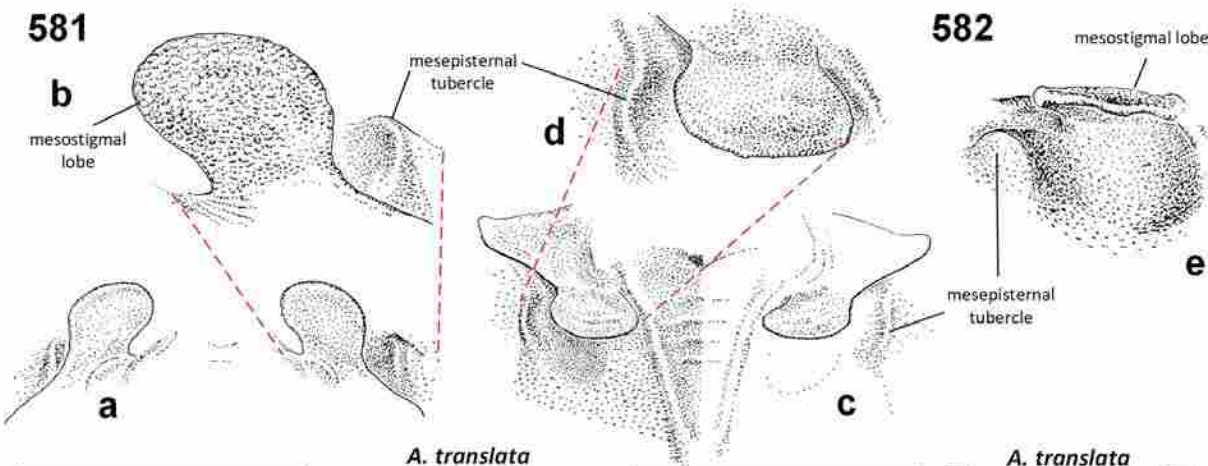
A. tonto
USA, Tonto National Bridge

580



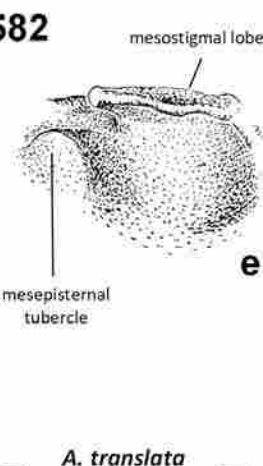
A. tonto
MEXICO, Los Remedios N.P.

581



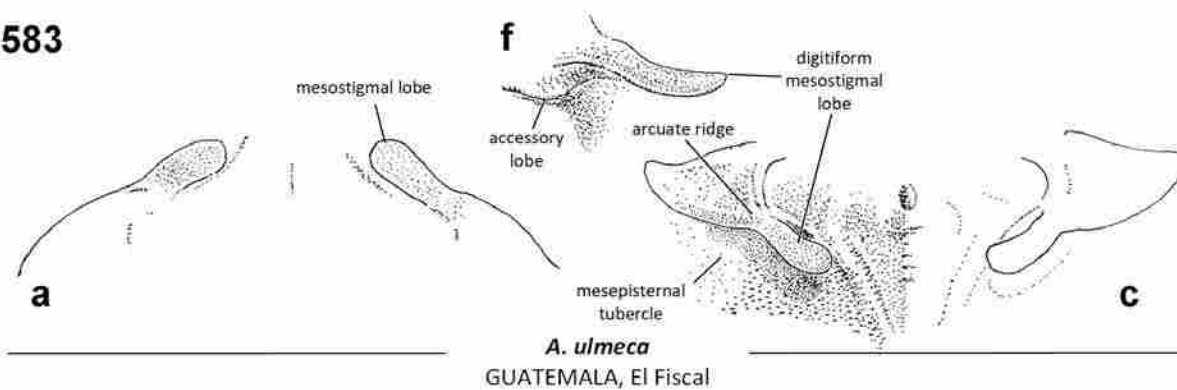
A. translata
FRENCH GUIANA, Maripasoula

582

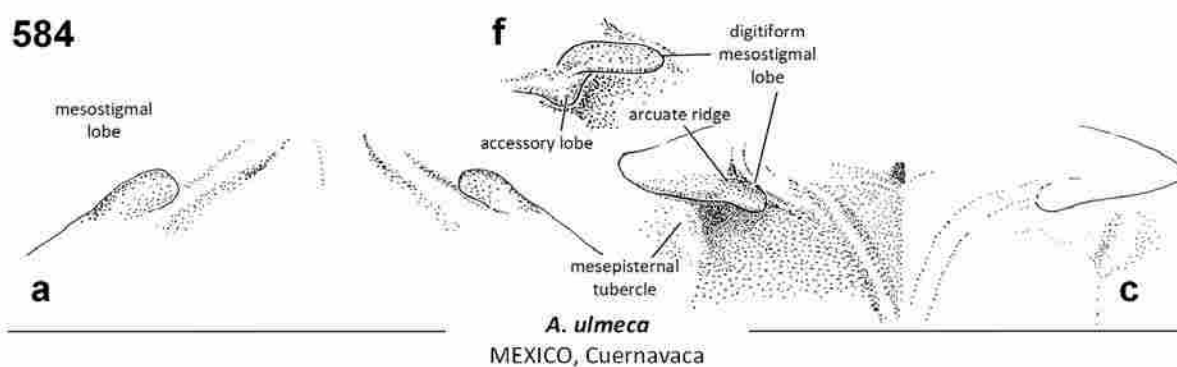


A. translata
USA, Cave Creek

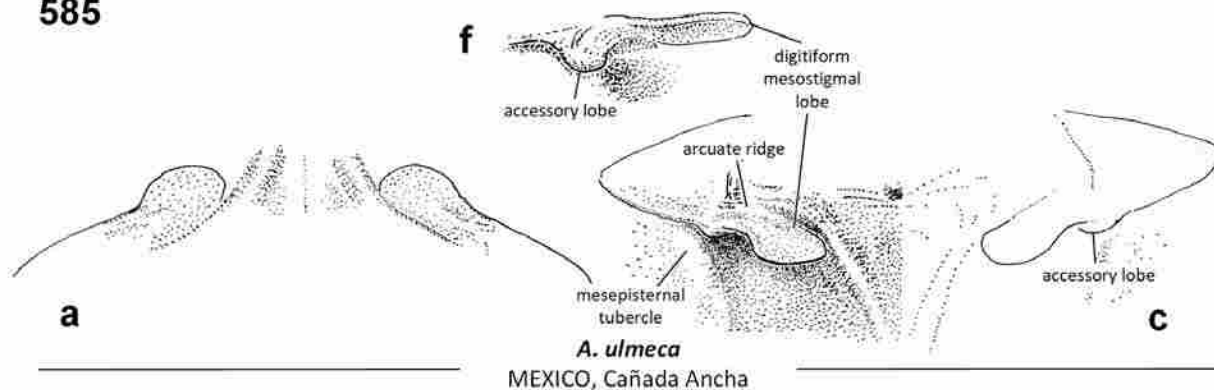
583



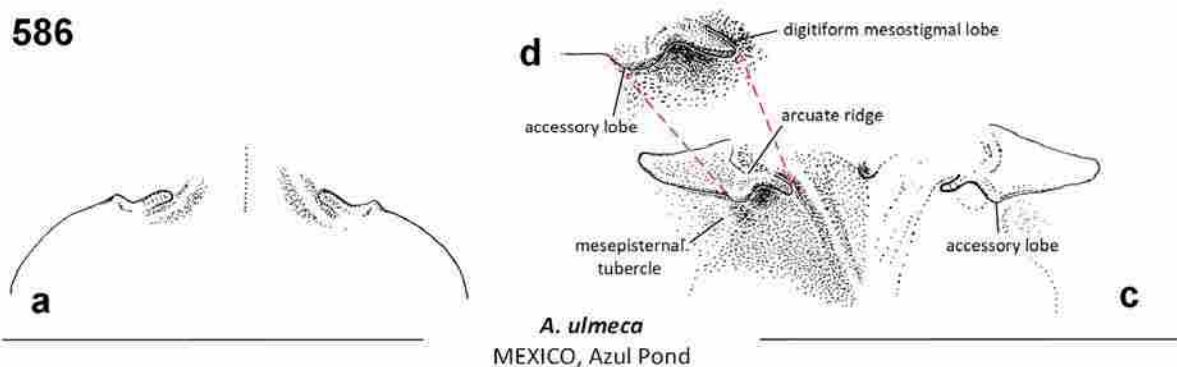
584



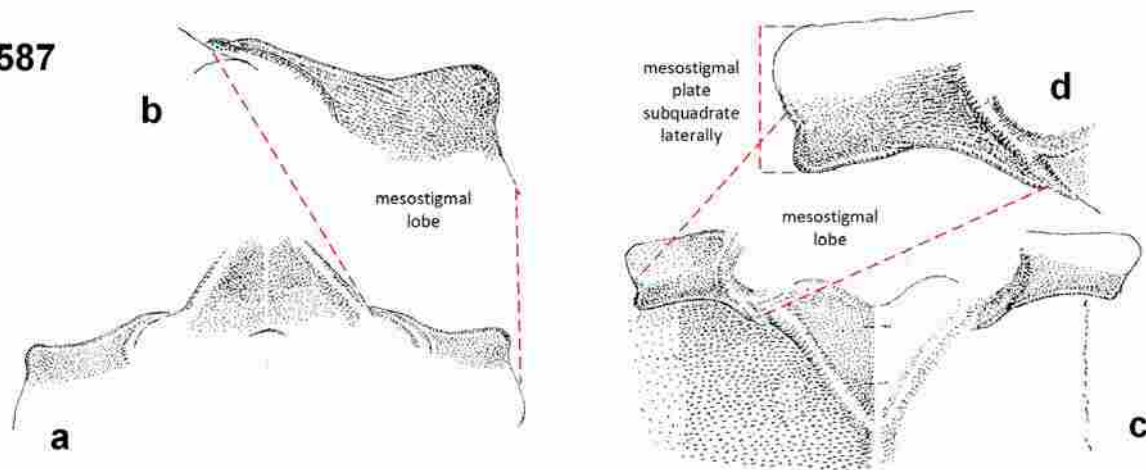
585



586

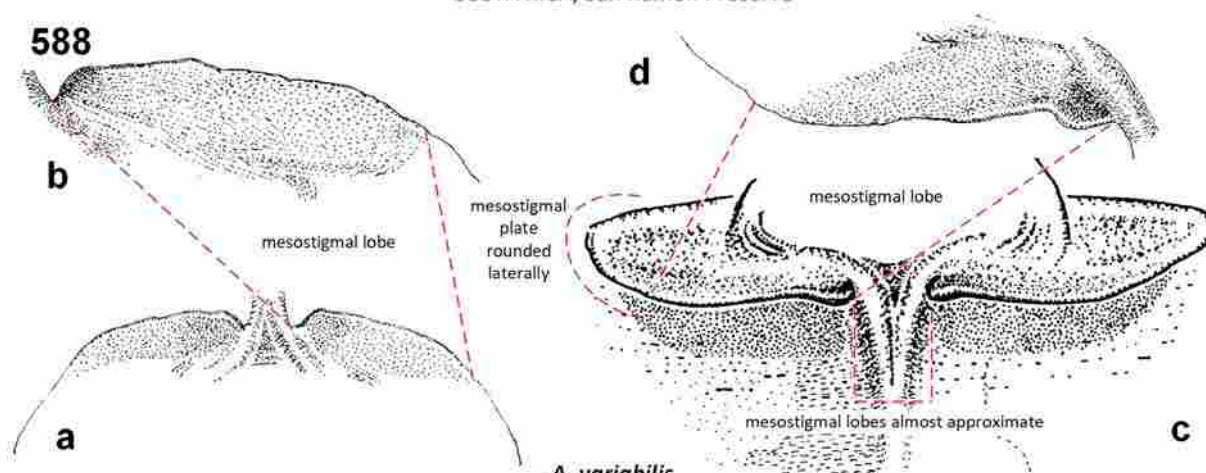


587



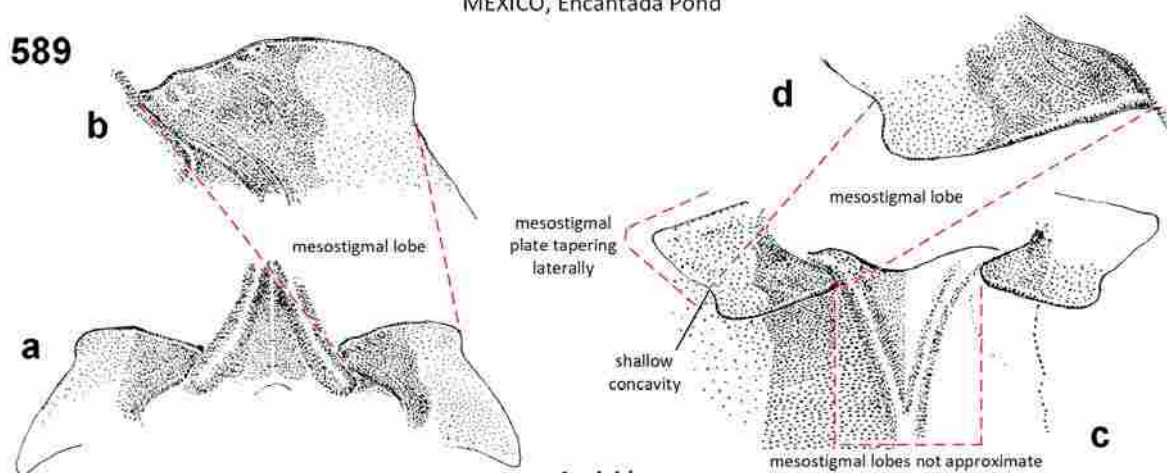
A. underwoodi
COSTA RICA, San Ramon Preserve

588



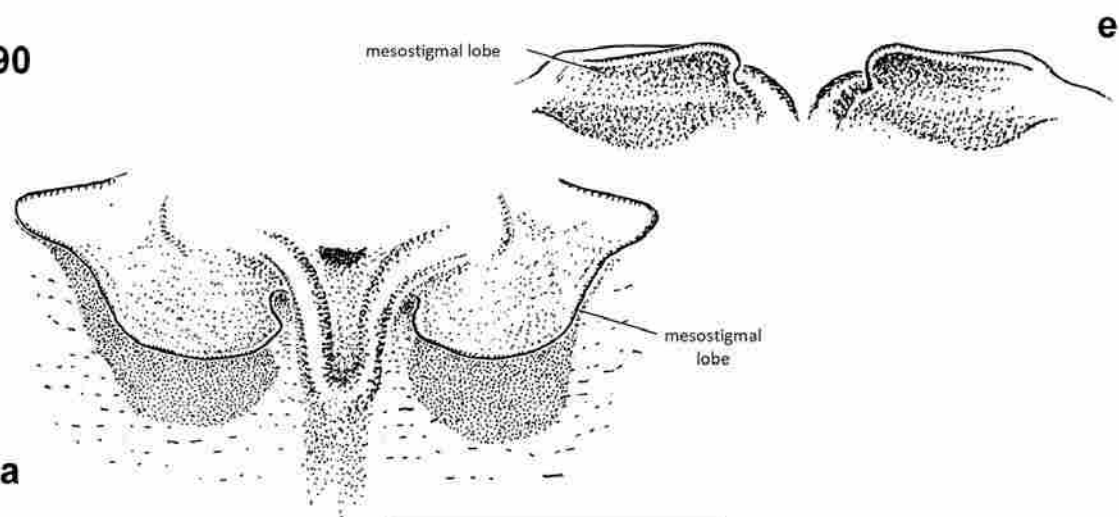
A. variabilis
MEXICO, Encantada Pond

589



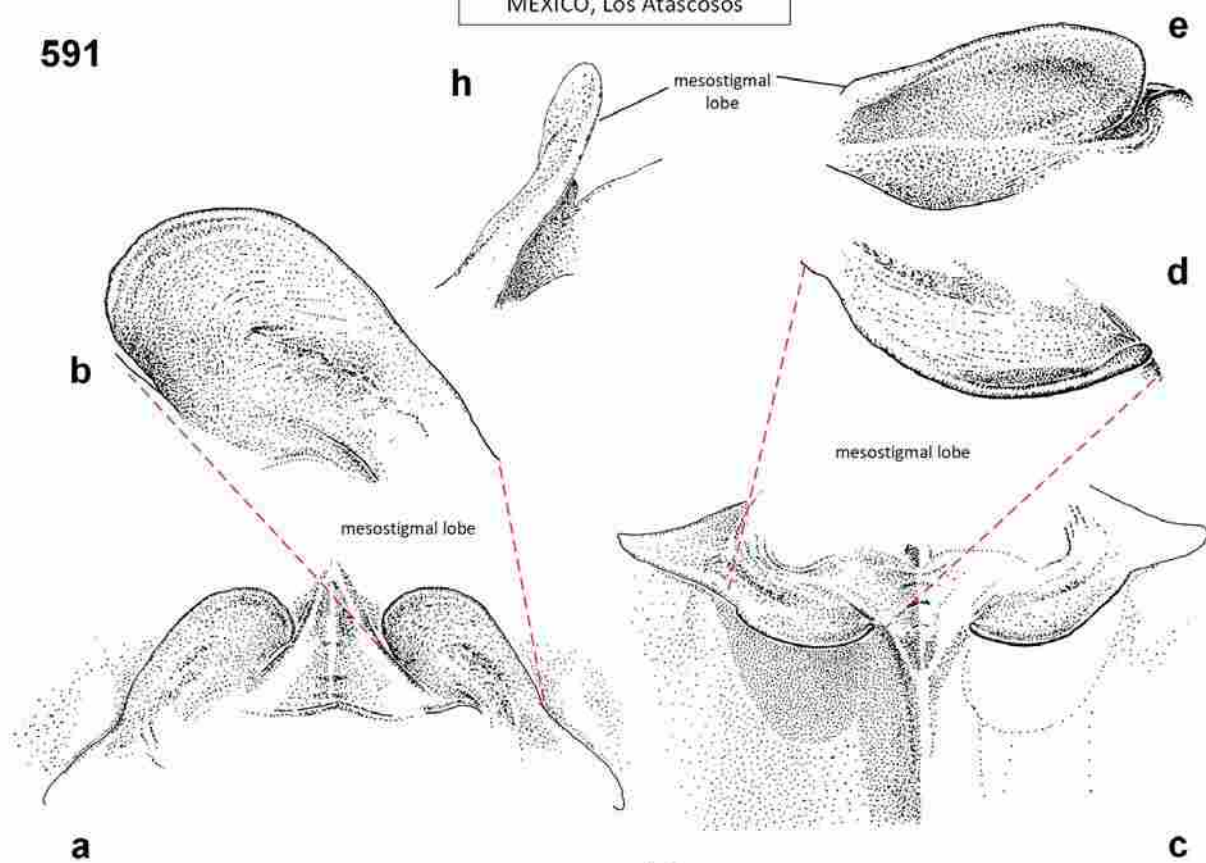
A. vivida
MEXICO, 22 mi W of Baja California Sur

590



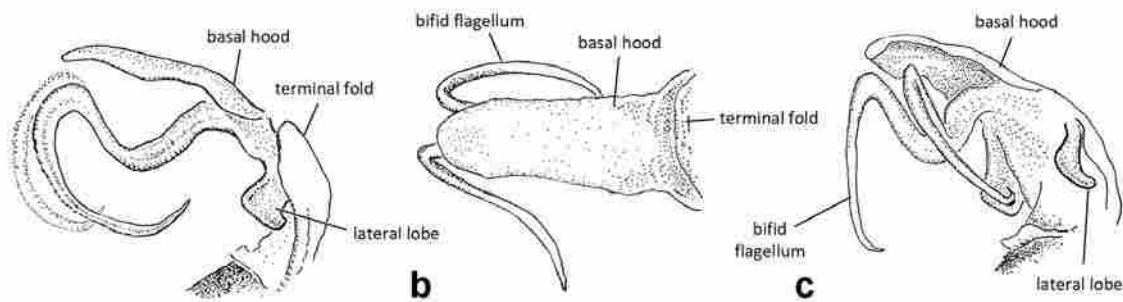
A. westfalli – ALLOTYPE
MEXICO, Los Atascosos

591



A. westfalli
MEXICO, Montebello Ponds

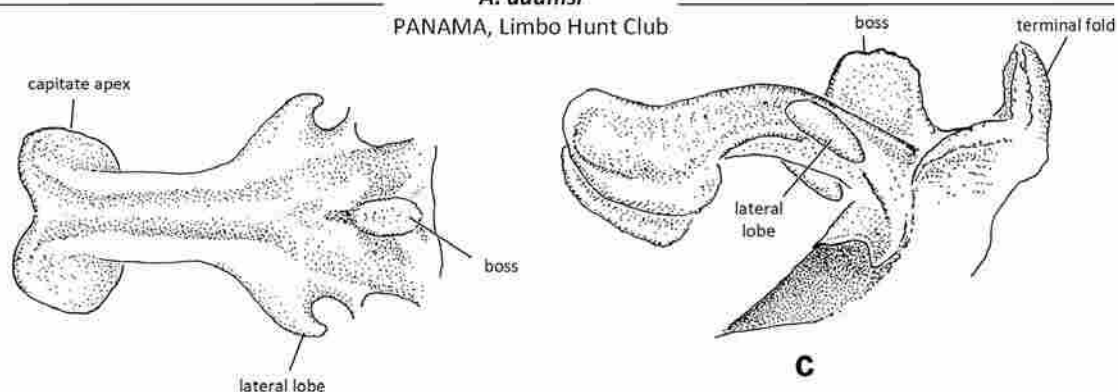
592



A. adamsi

PANAMA, Limbo Hunt Club

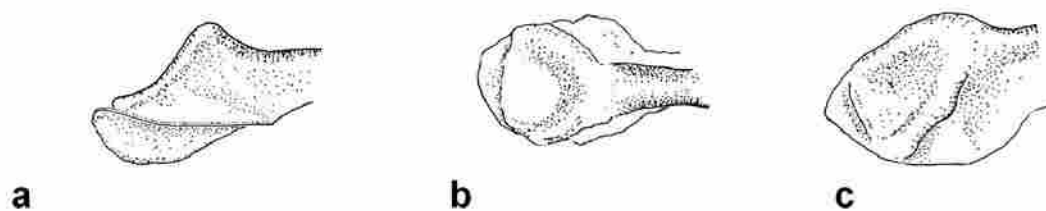
593



A. anceps

COSTA RICA, Hacienda El Rodeo

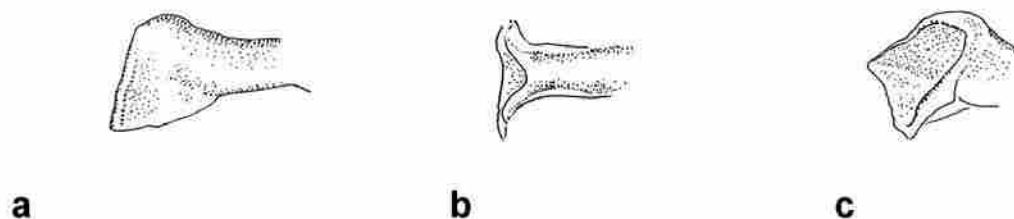
594



A. anceps

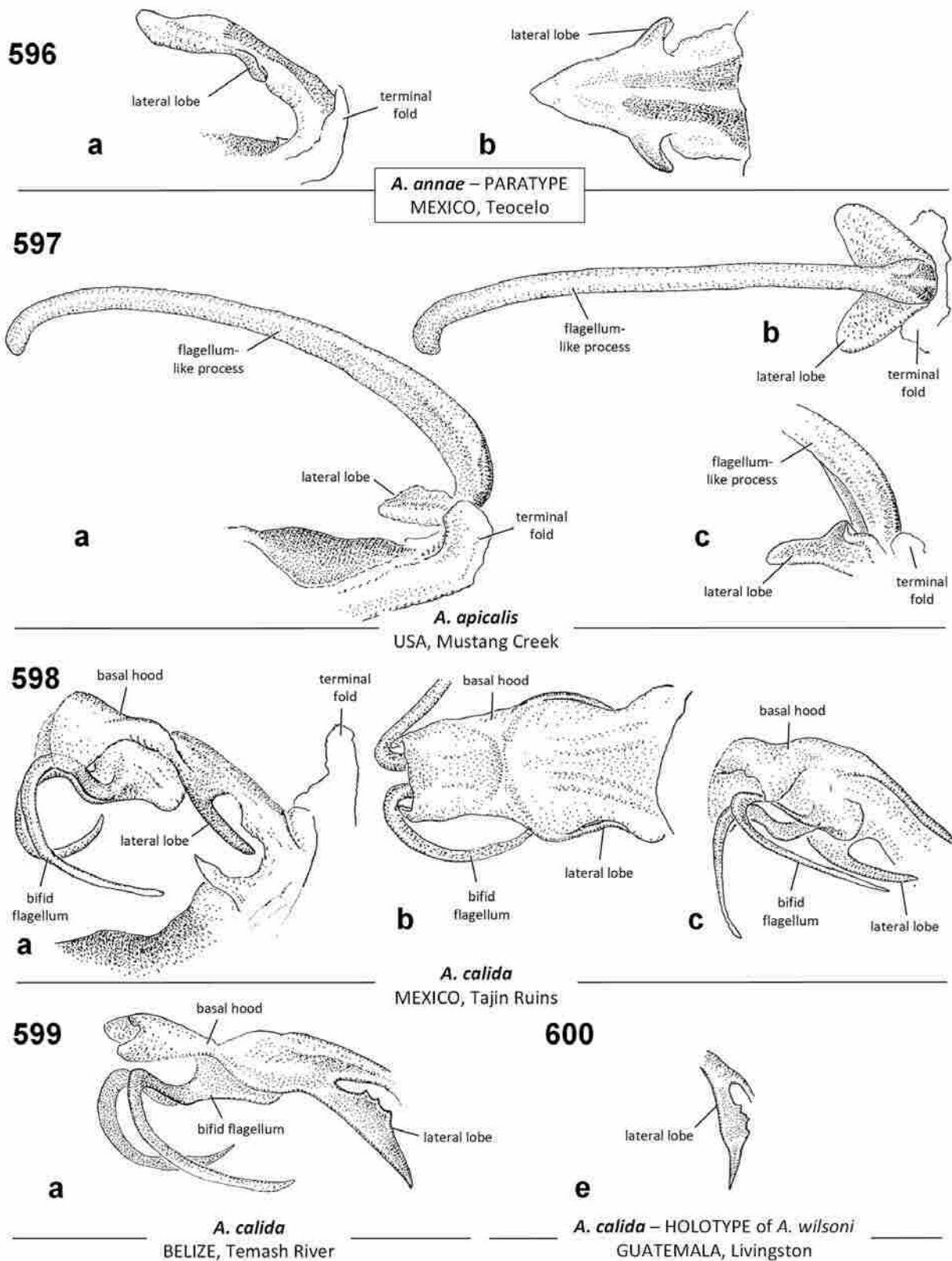
COSTA RICA, Reventazón River

595

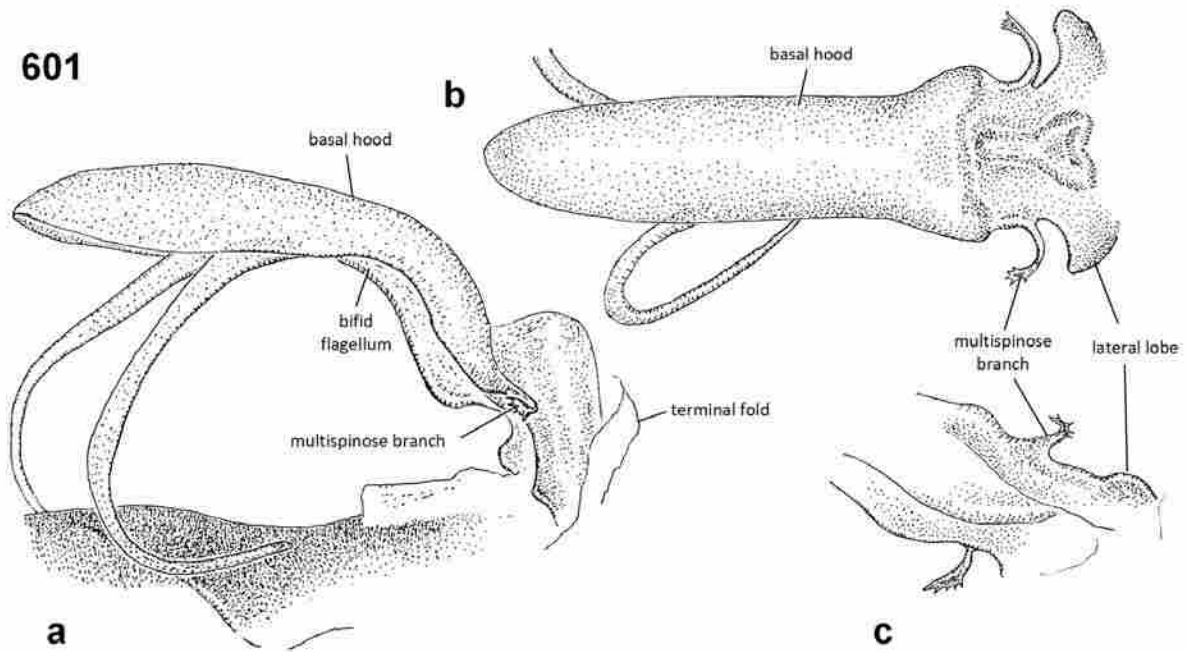


A. anceps

MEXICO, Sierra de Autlán

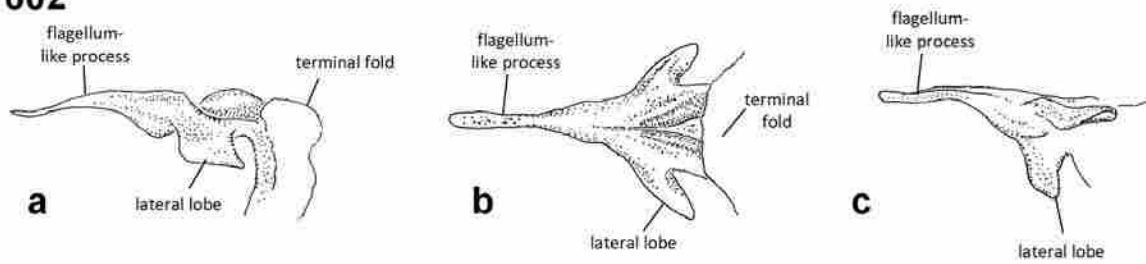


601



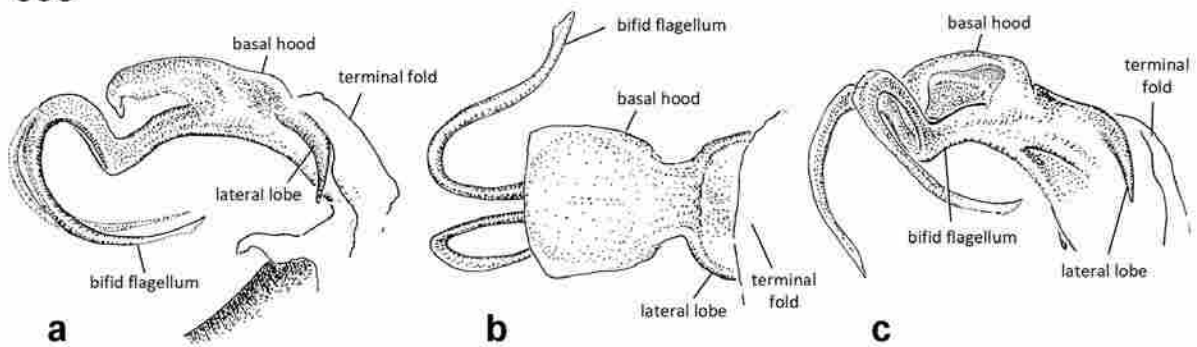
A. calverti – PARATYPE
COSTA RICA, Tapandi Preserve

602

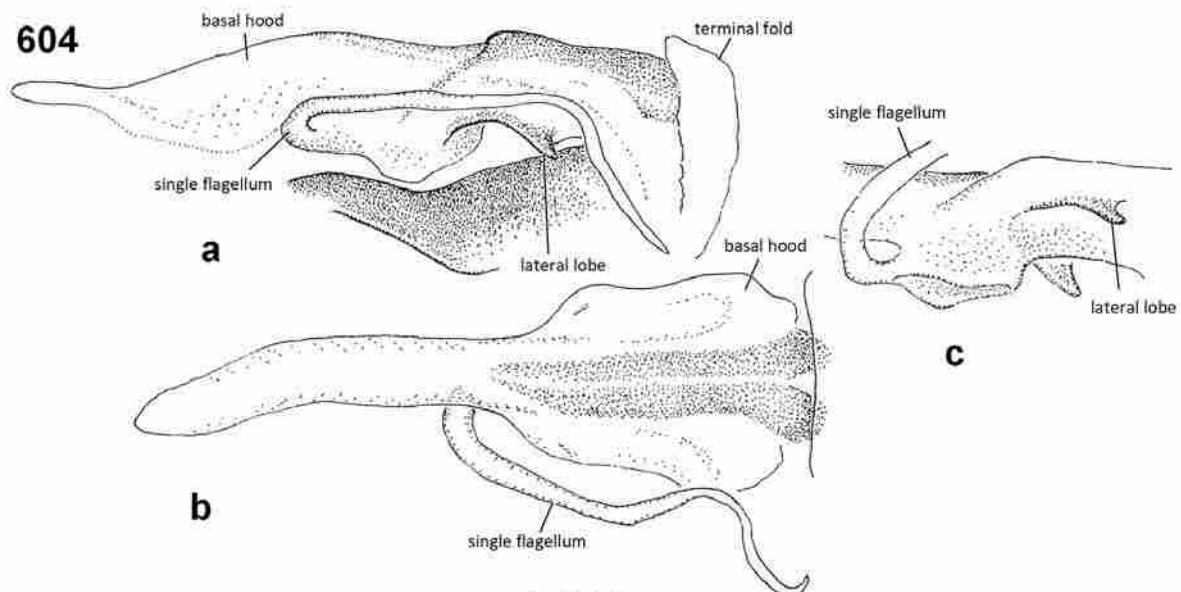


A. carlcooki – PARATYPE
MEXICO, Las Palomas

603

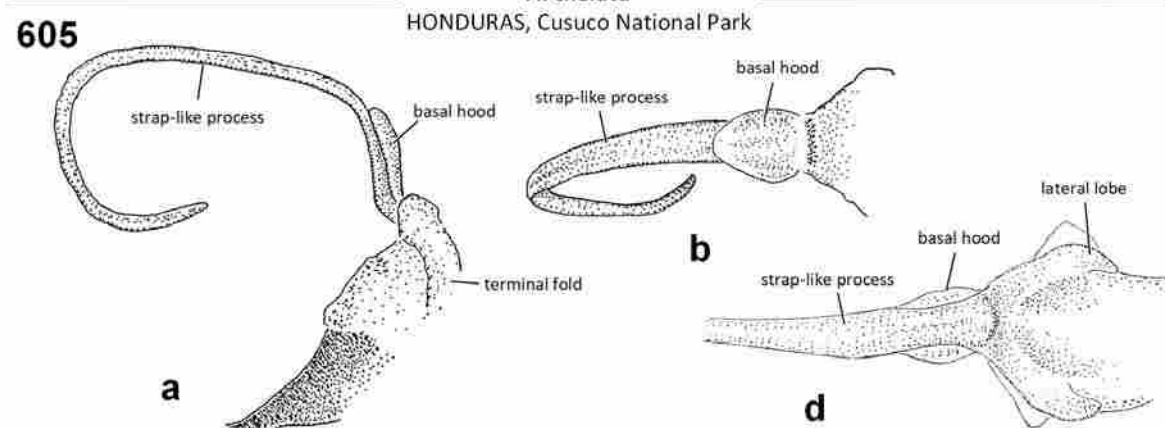


A. carolus – HOLOTYPE
COSTA RICA, El Rodeo



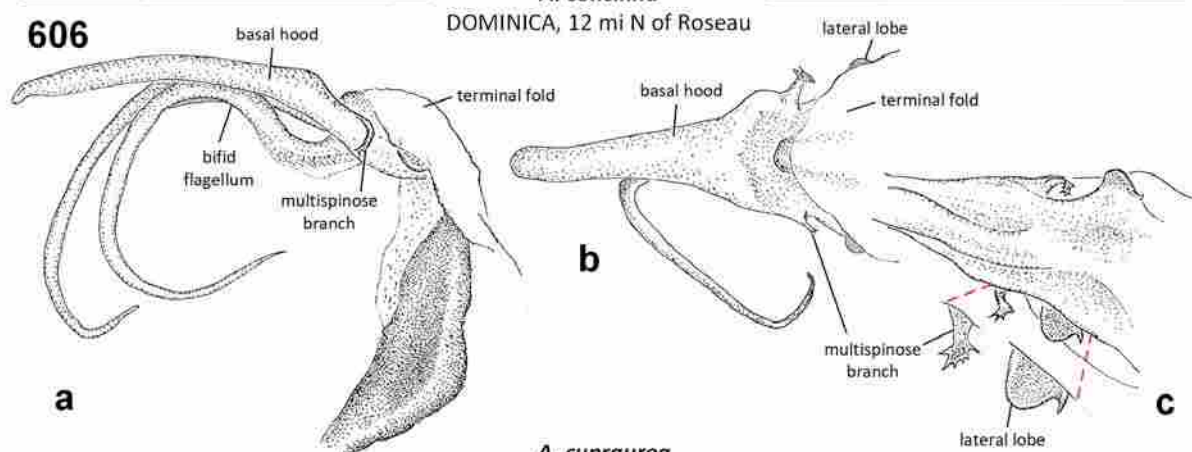
A. chelata

HONDURAS, Cusuco National Park



A. concinna

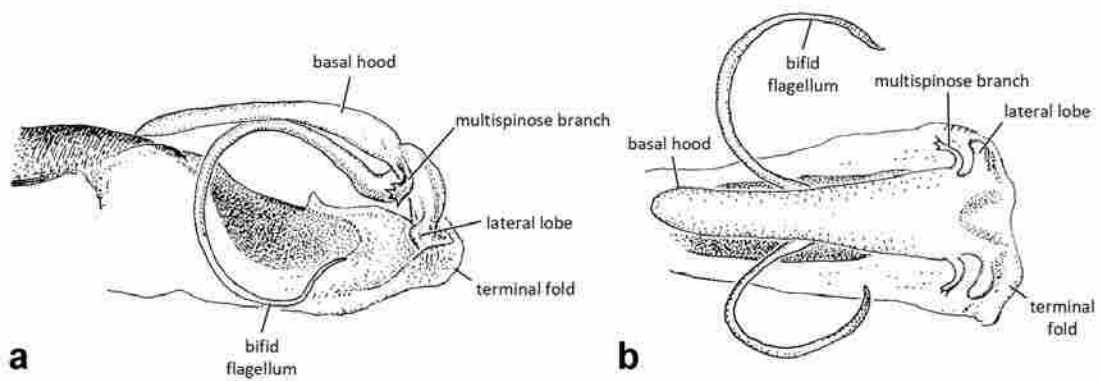
DOMINICA, 12 mi N of Roseau



A. cupraurea

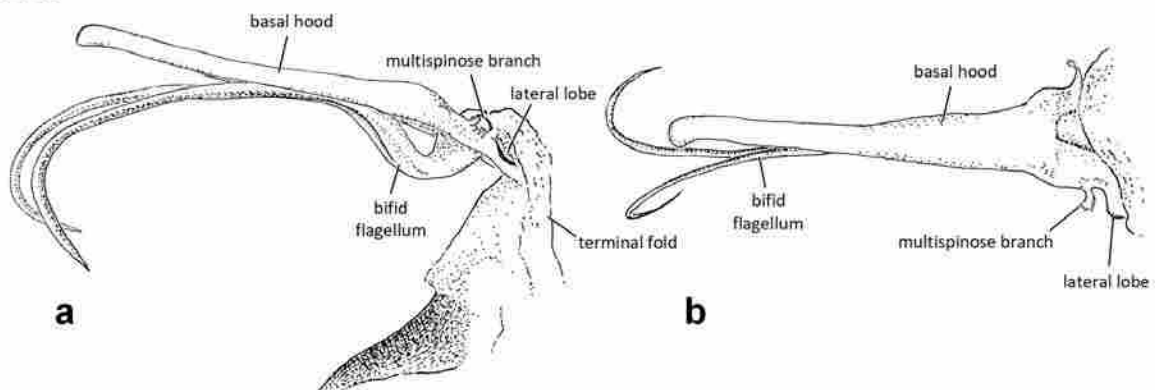
COSTA RICA, between La Unión and Flores

607



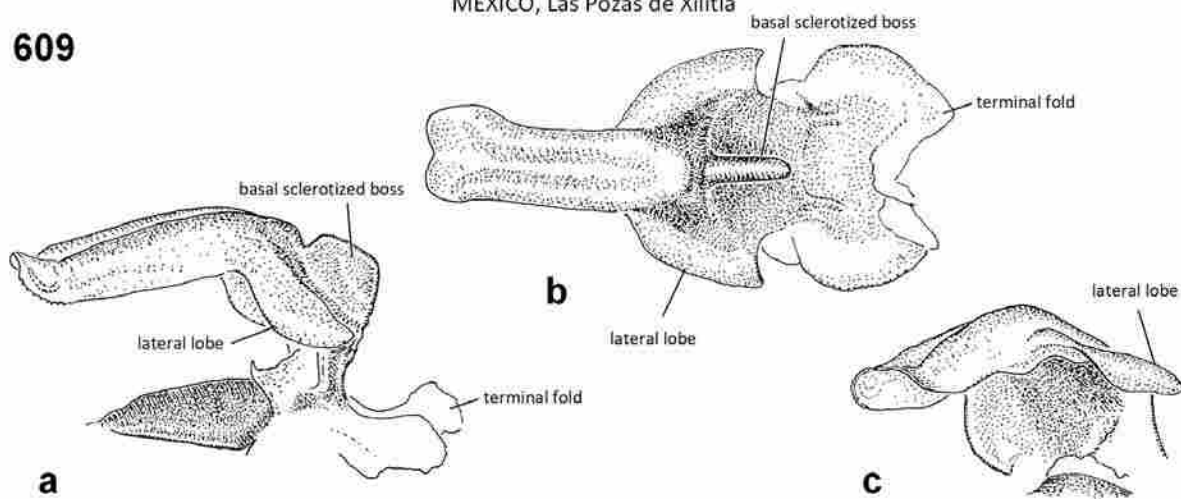
A. cuprea
MEXICO, Azul Pond

608



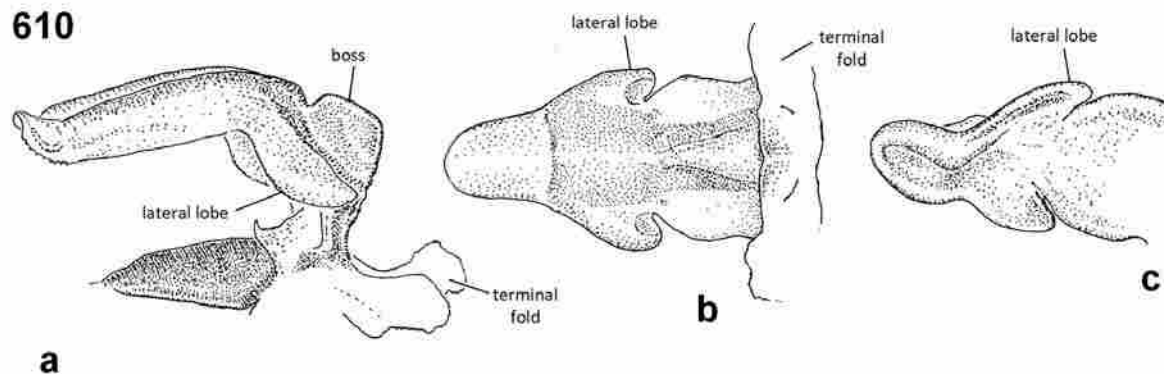
A. cuprea
MEXICO, Las Pozas de Xilitla

609



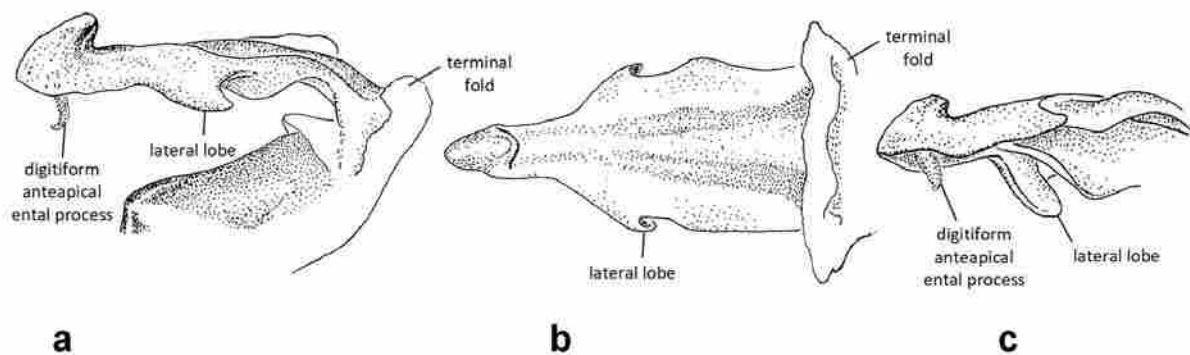
A. deami
MEXICO, Ojo de Agua

610



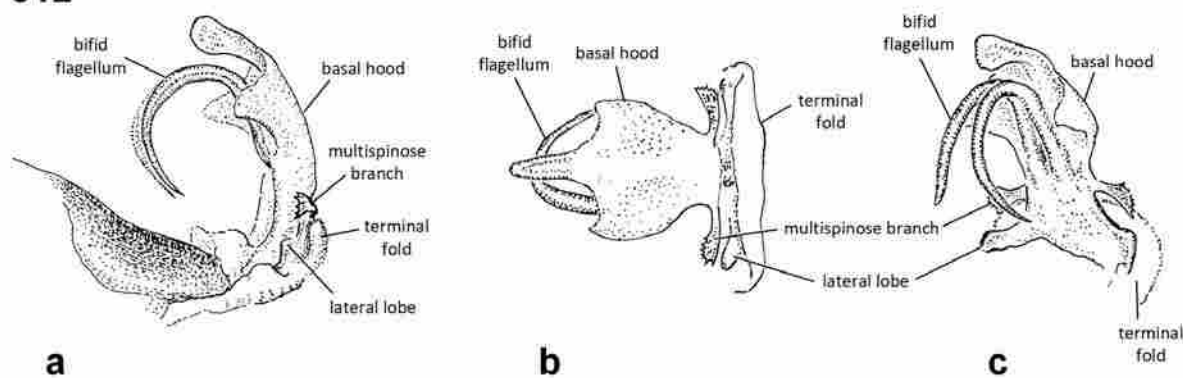
A. elongata – PARATYPE
GUATEMALA, Tamahu

611



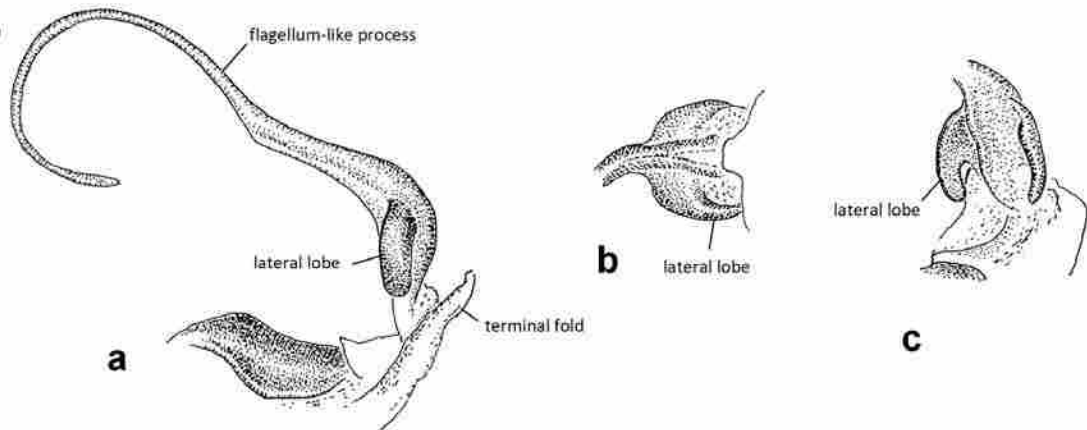
A. extranea – HOLOTYPE of *A. mista*
MEXICO, San Juan Teotihuacán

612



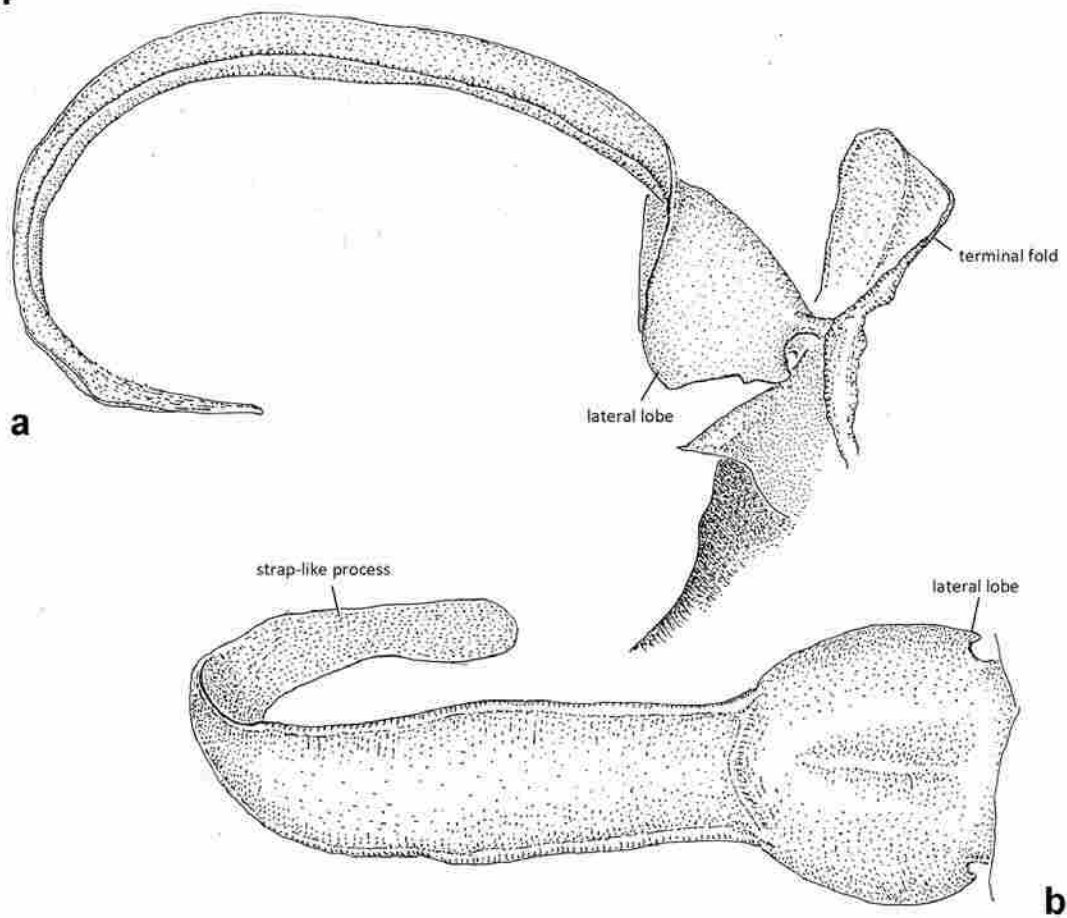
A. fulgida
PANAMA, Santa Fe

613



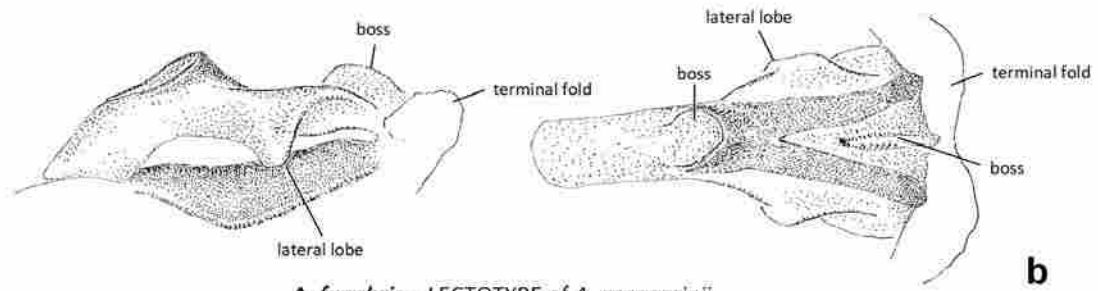
A. fumipennis violacea
USA, Scotia Canyon

614



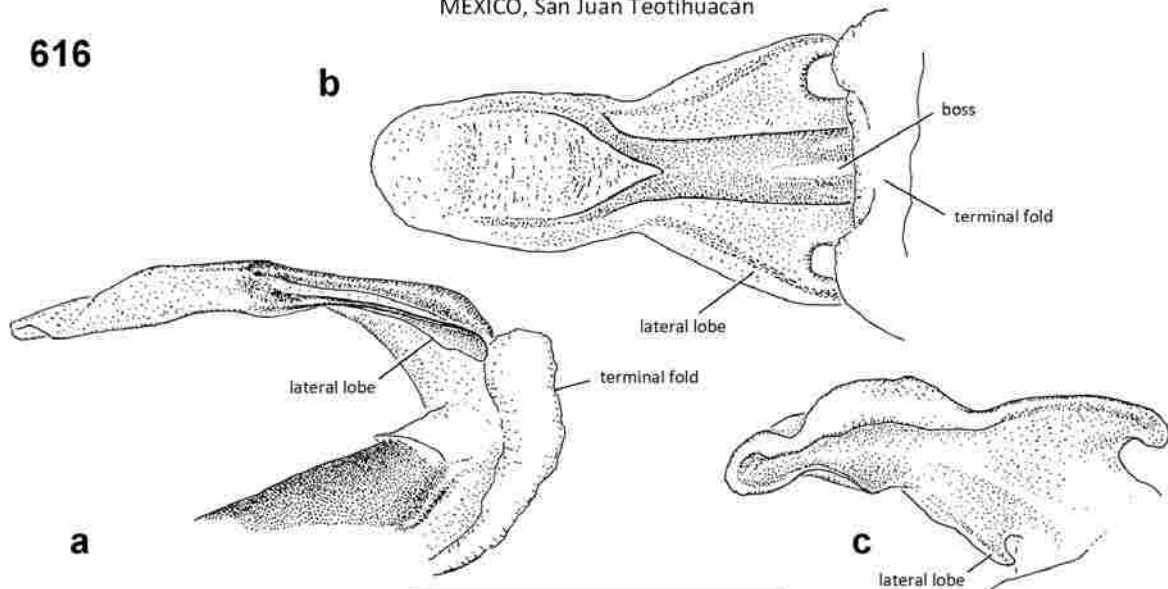
A. funcki
GUATEMALA, El Fiscal

615



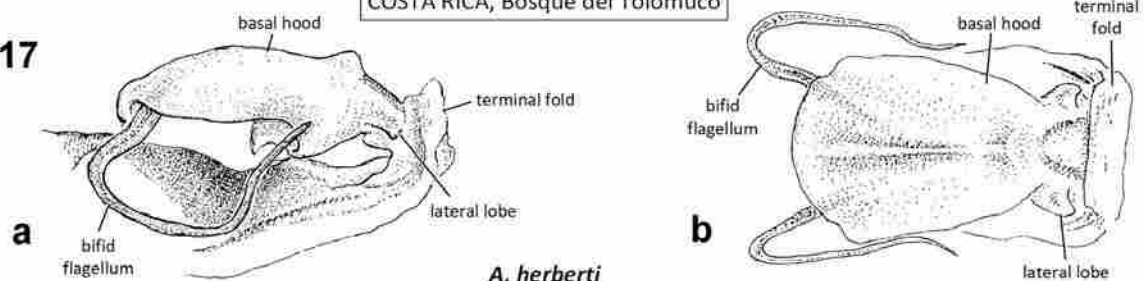
A. funebris – LECTOTYPE of *A. spegazzinii*
MEXICO, San Juan Teotihuacán

616



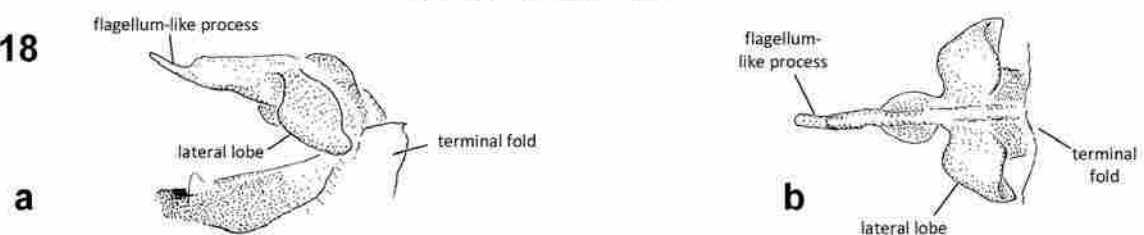
A. haberi – HOLOTYPE
COSTA RICA, Bosque del Tolomuco

617



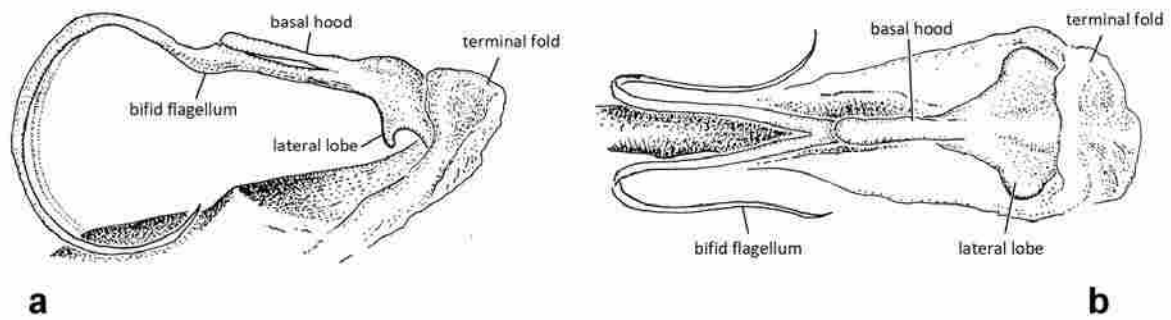
A. herberti
MEXICO, Los Pílares River

618



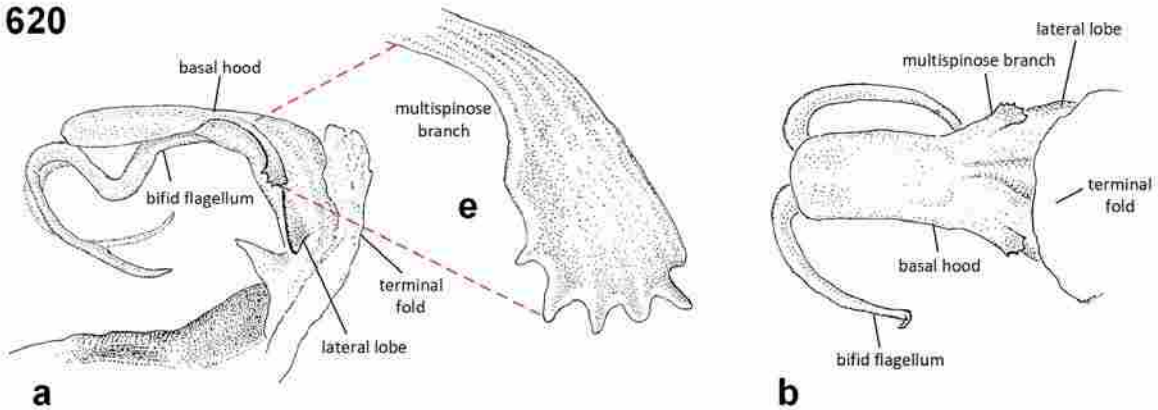
A. immunda
GUATEMALA, Sumue Champey

619



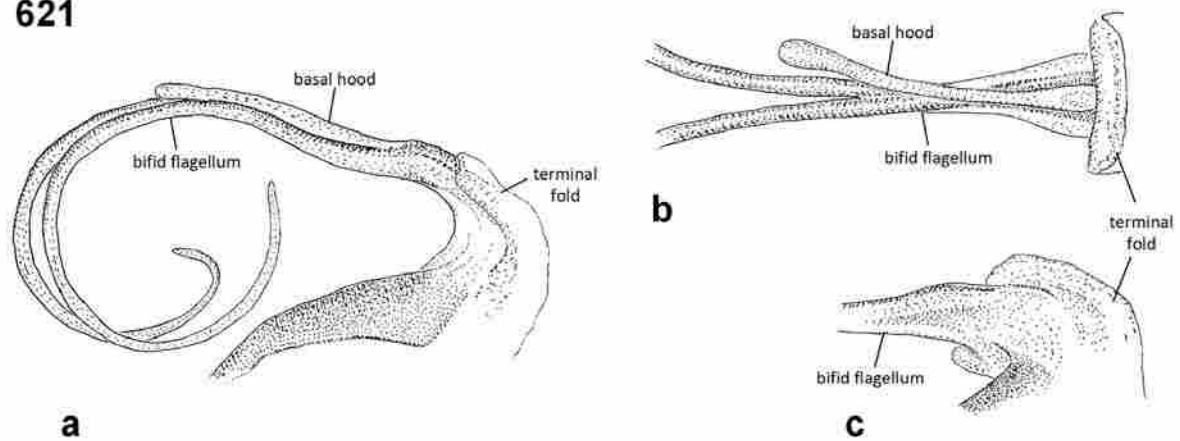
A. indicatrix
MEXICO, Agua Caliente

620

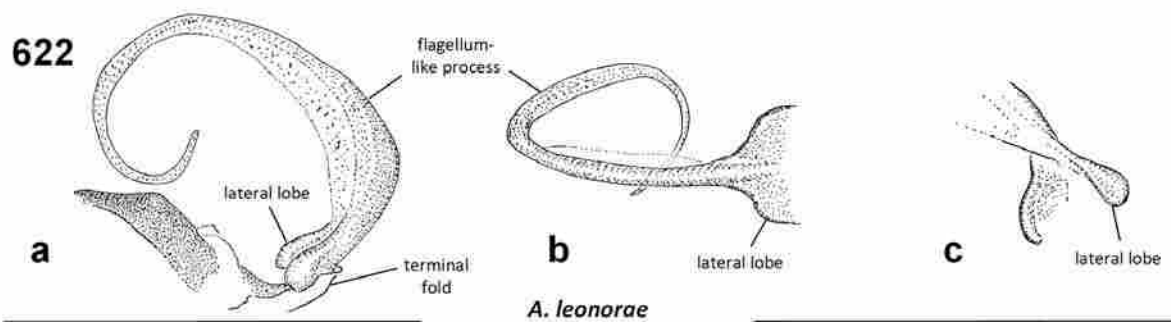


A. insipida
SURINAM, Kutari River

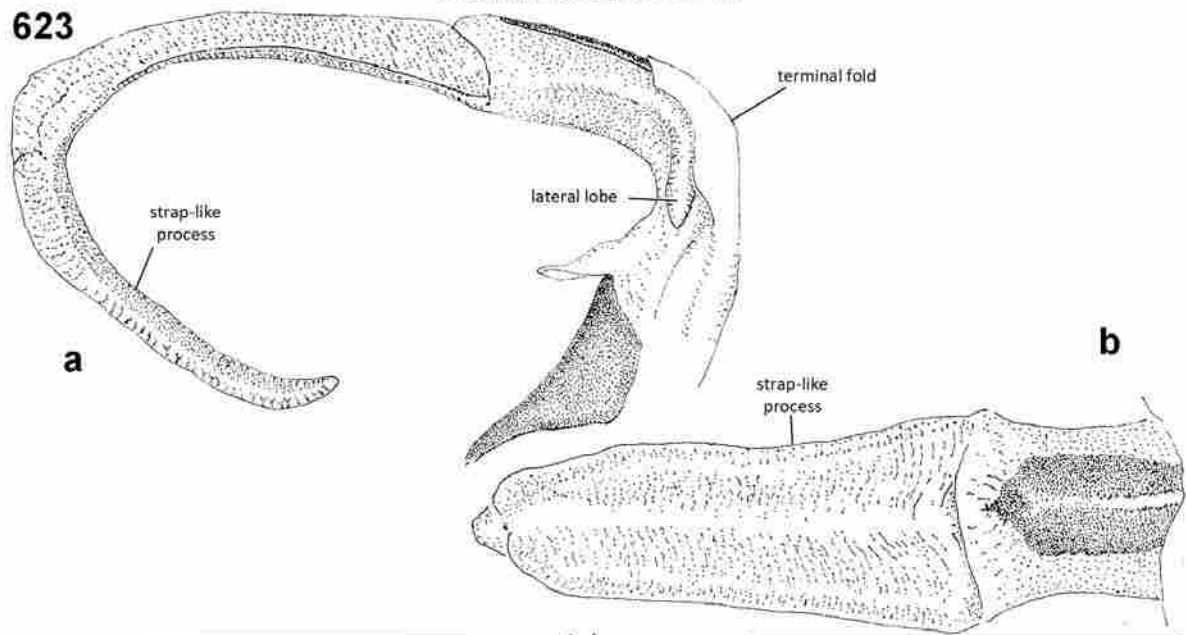
621



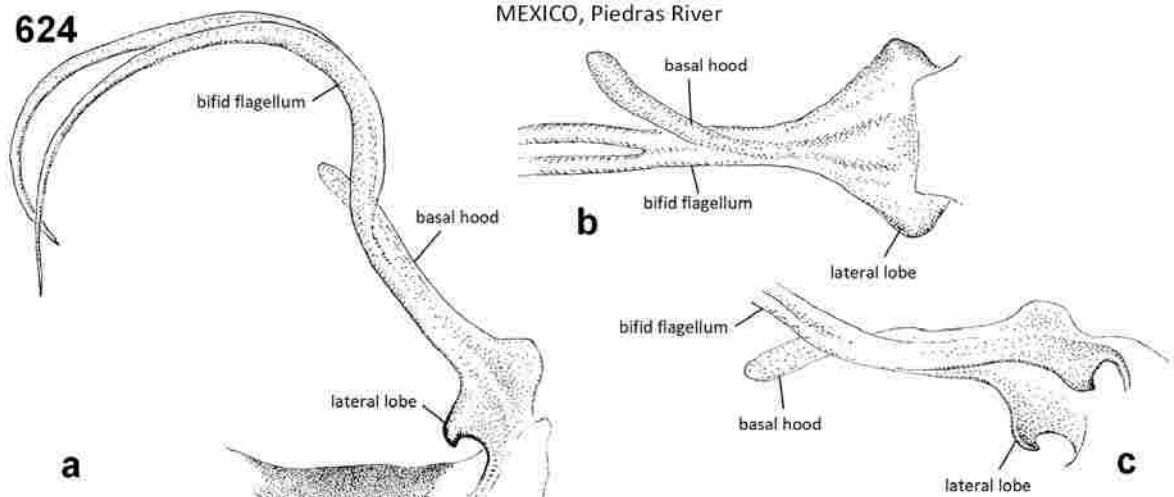
A. johannella
COSTA RICA, La Selva



MEXICO, Nacataz Tourist Park

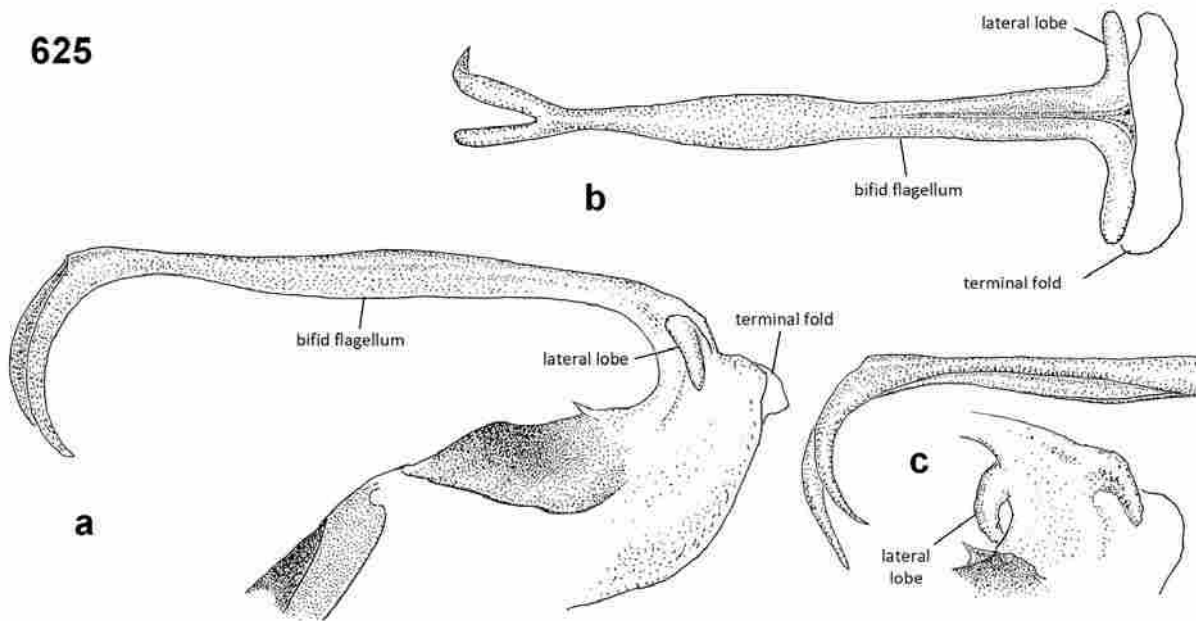


MEXICO, Piedras River



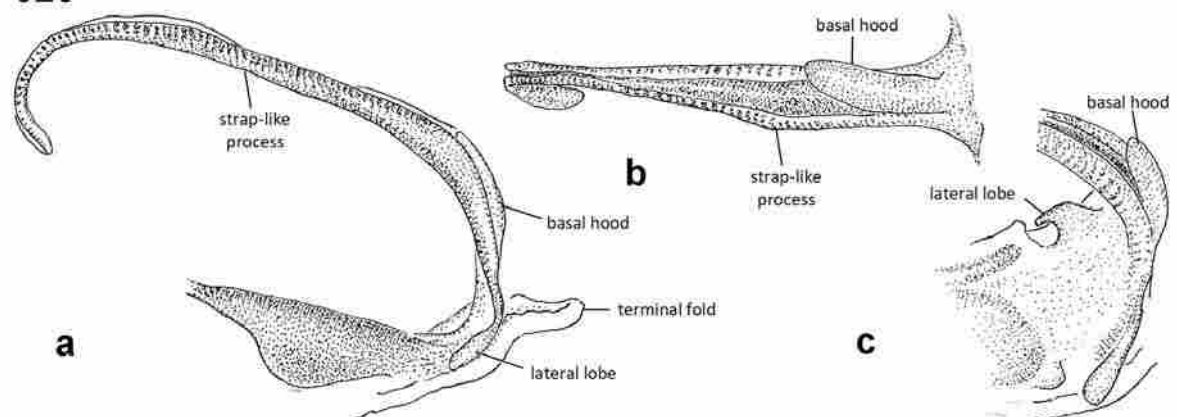
MEXICO, Apotla

625



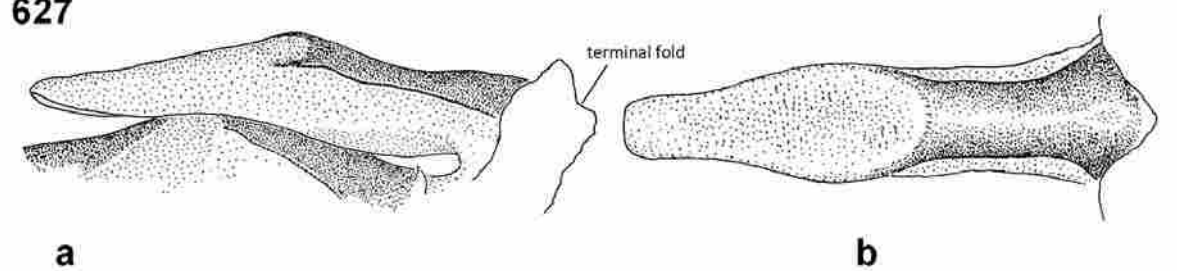
A. medullaris
HONDURAS, El Danto

626



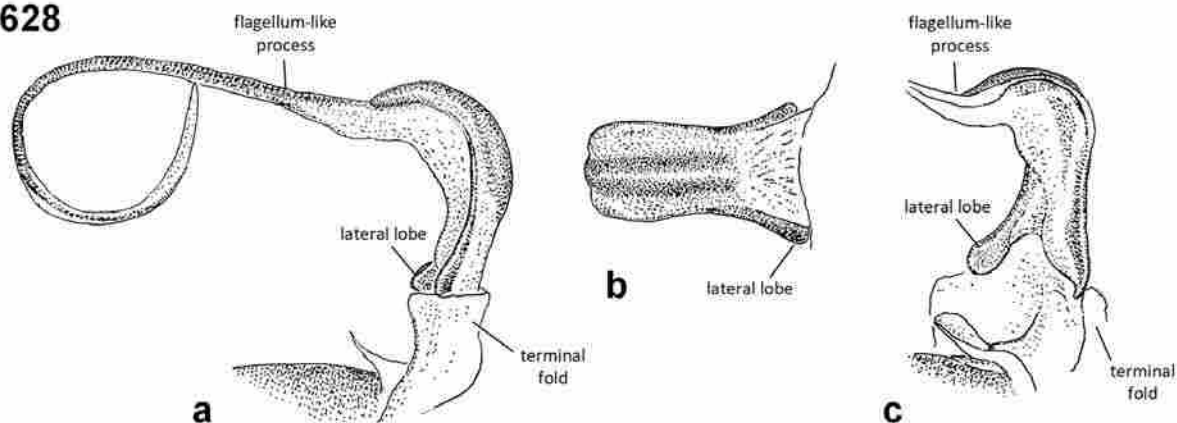
A. moesta
MEXICO, Chalapa Lake

627



A. munda
USA, Old Prison Camp

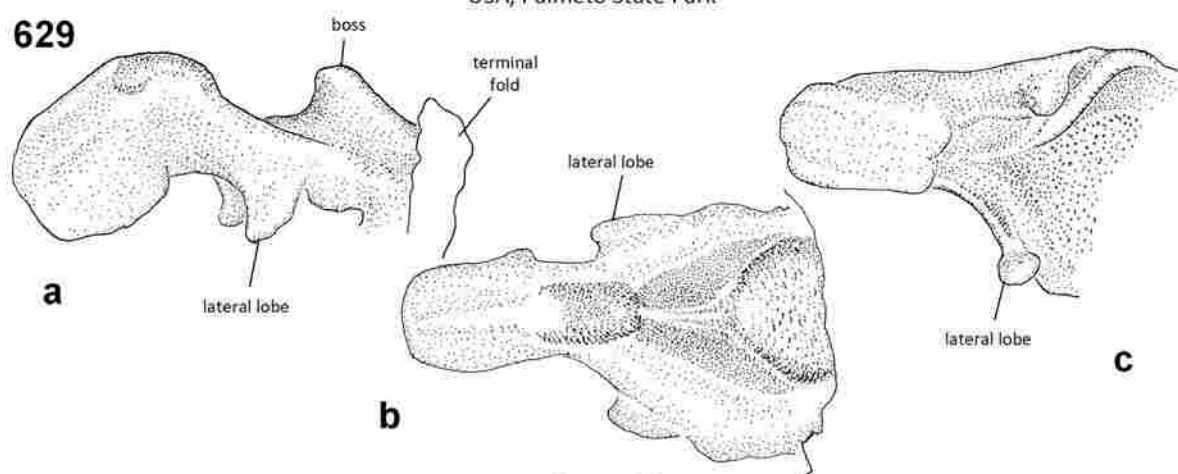
628



A. nahuana

USA, Palmeto State Park

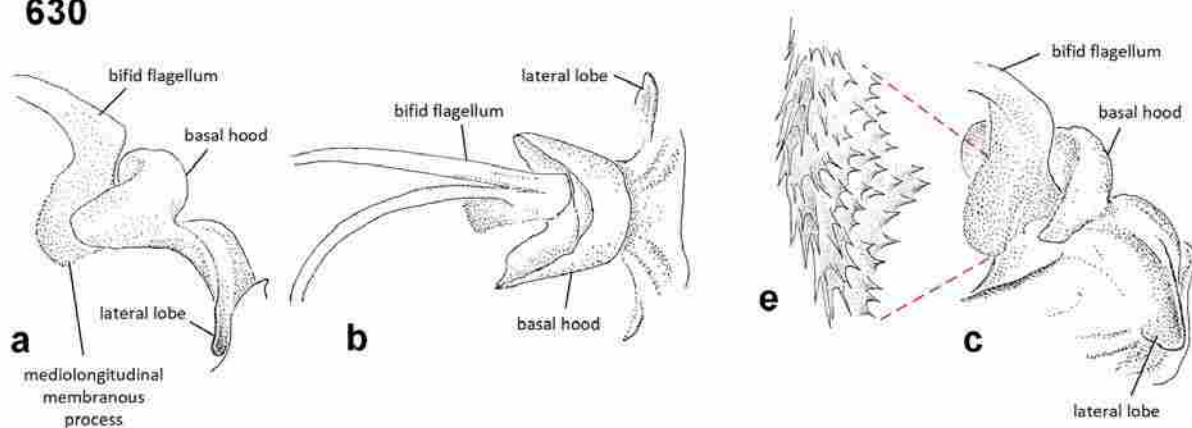
629



A. noveloi

MEXICO, Las Banderillas Preserve

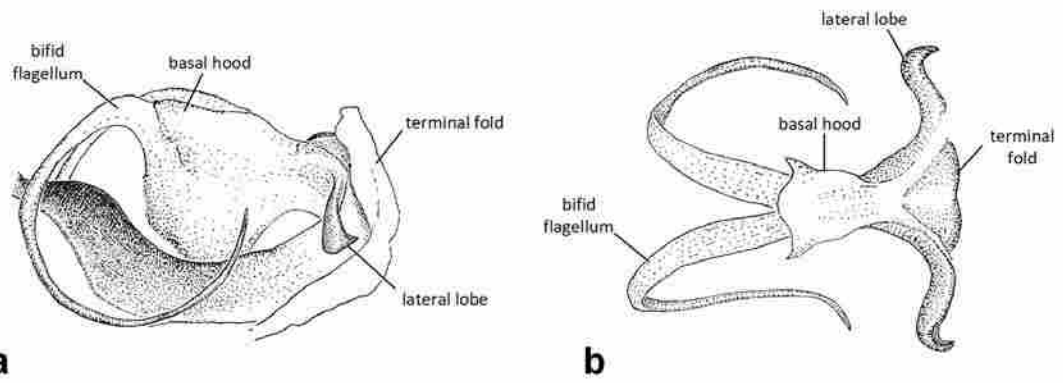
630



A. oculata

MEXICO, Guiracoba River

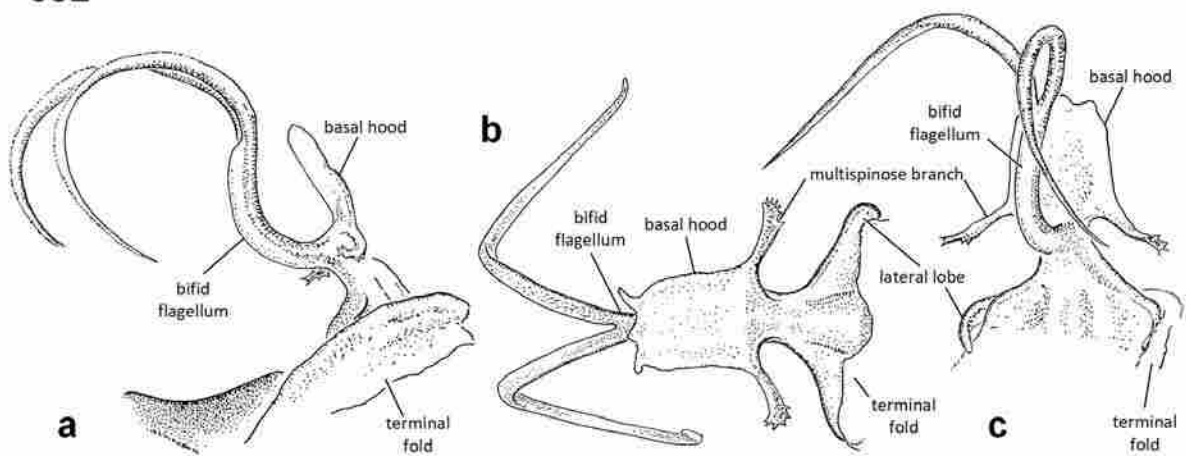
631



A. oculata

MEXICO, Huchueyapan River

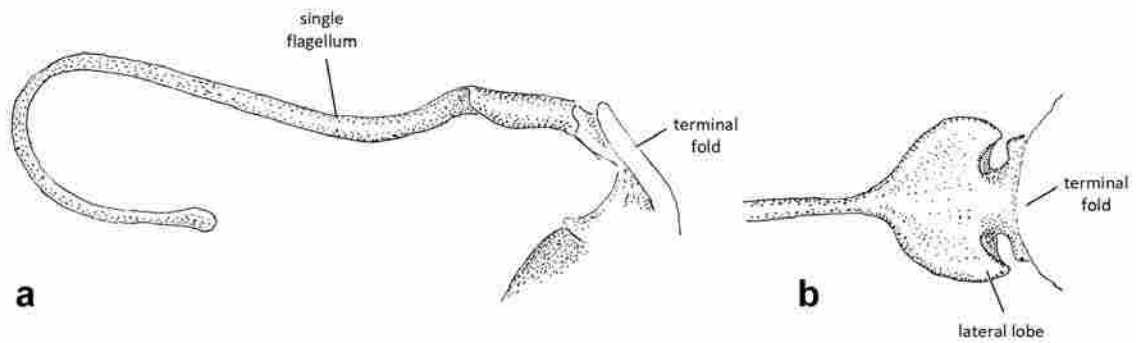
632



A. oenea

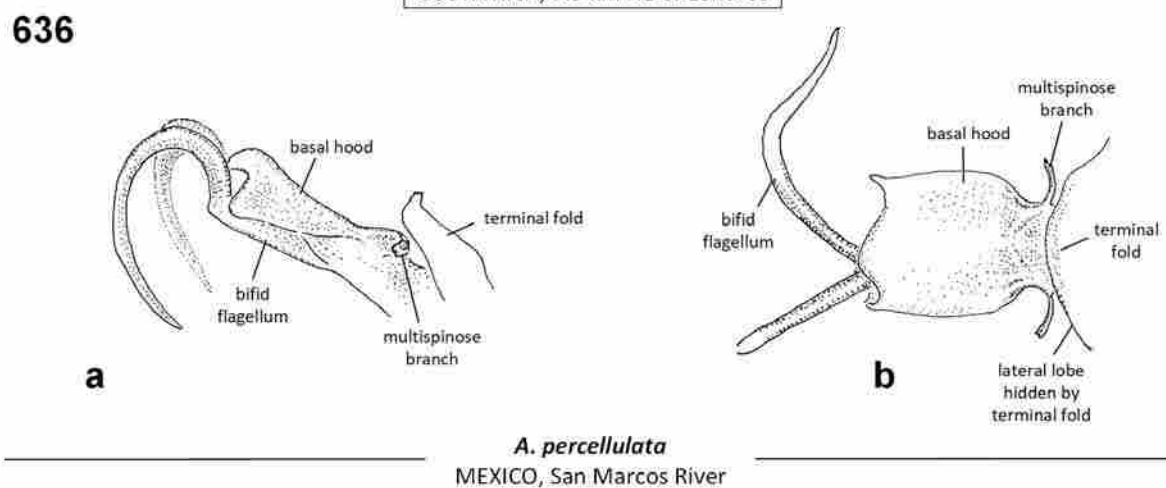
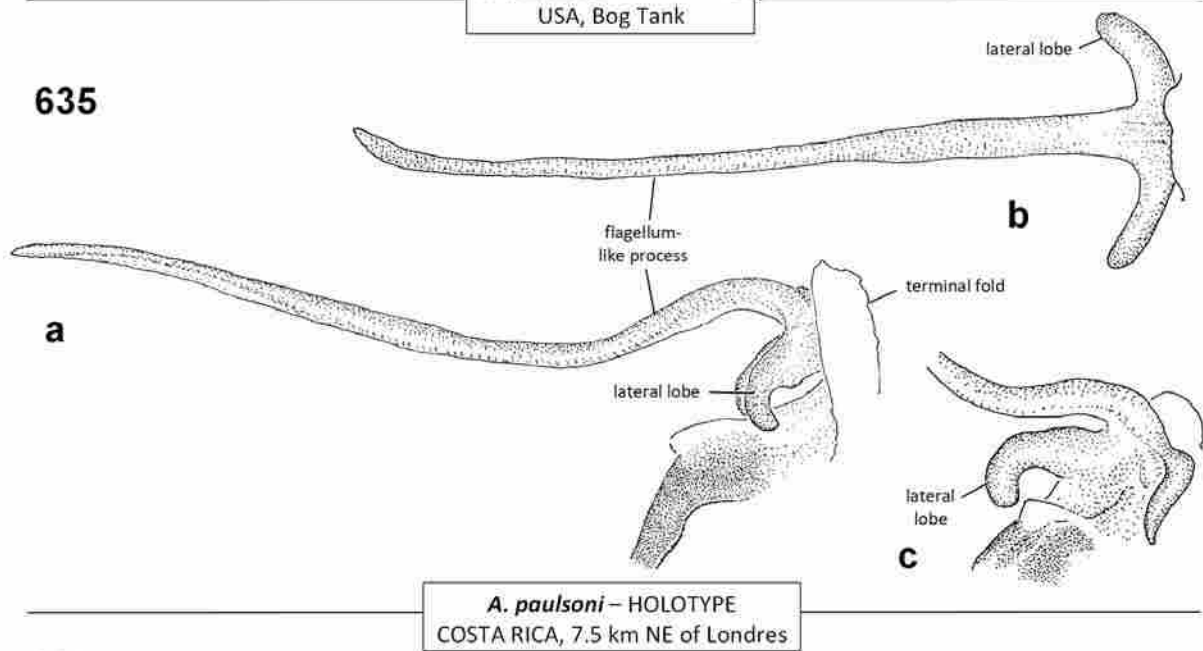
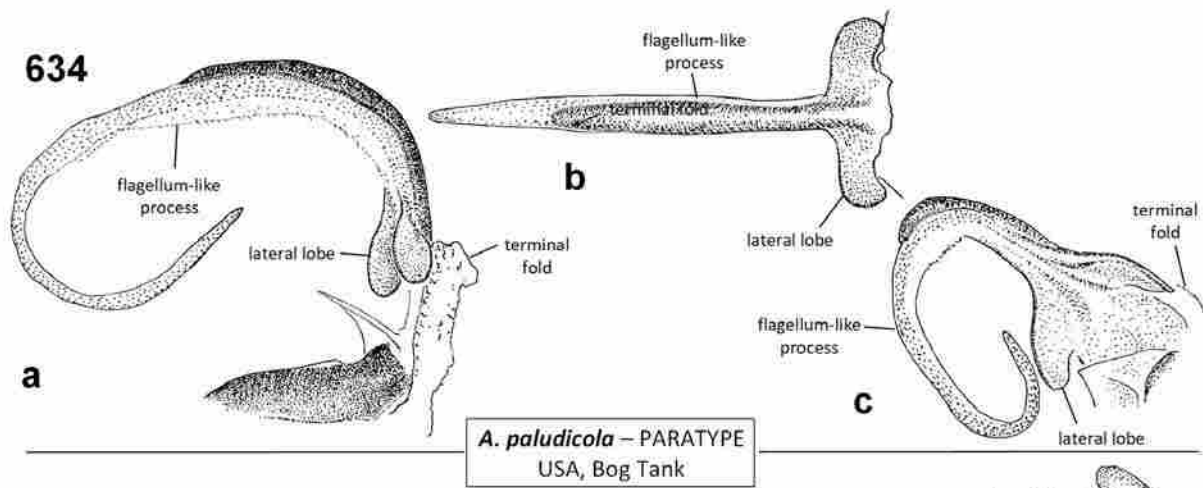
COSTA RICA, 5.5 km W of Villa Colón

633

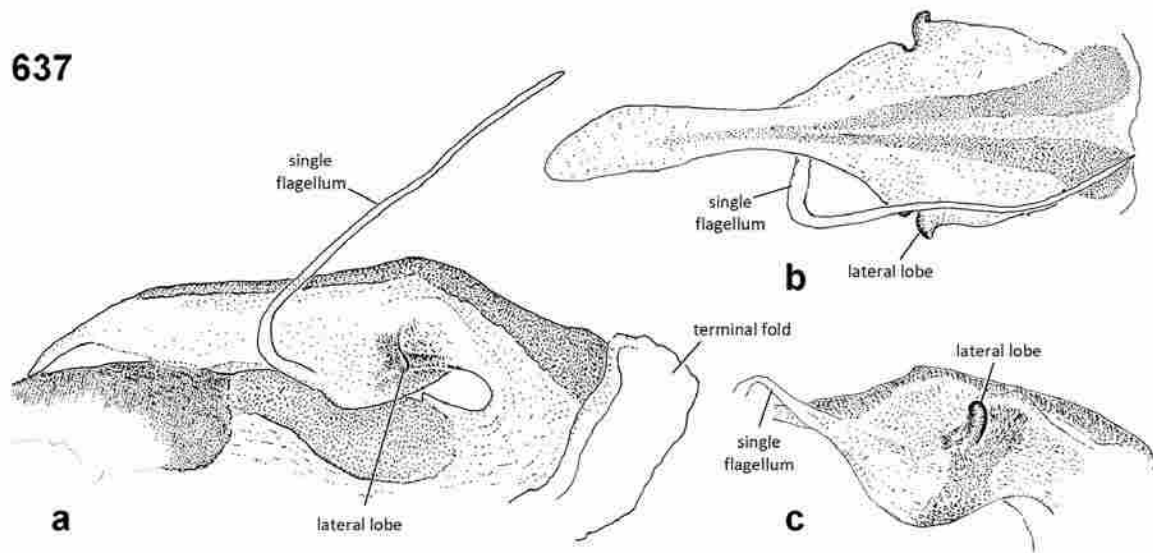


A. pallens

GUATEMALA, Agua Caliente



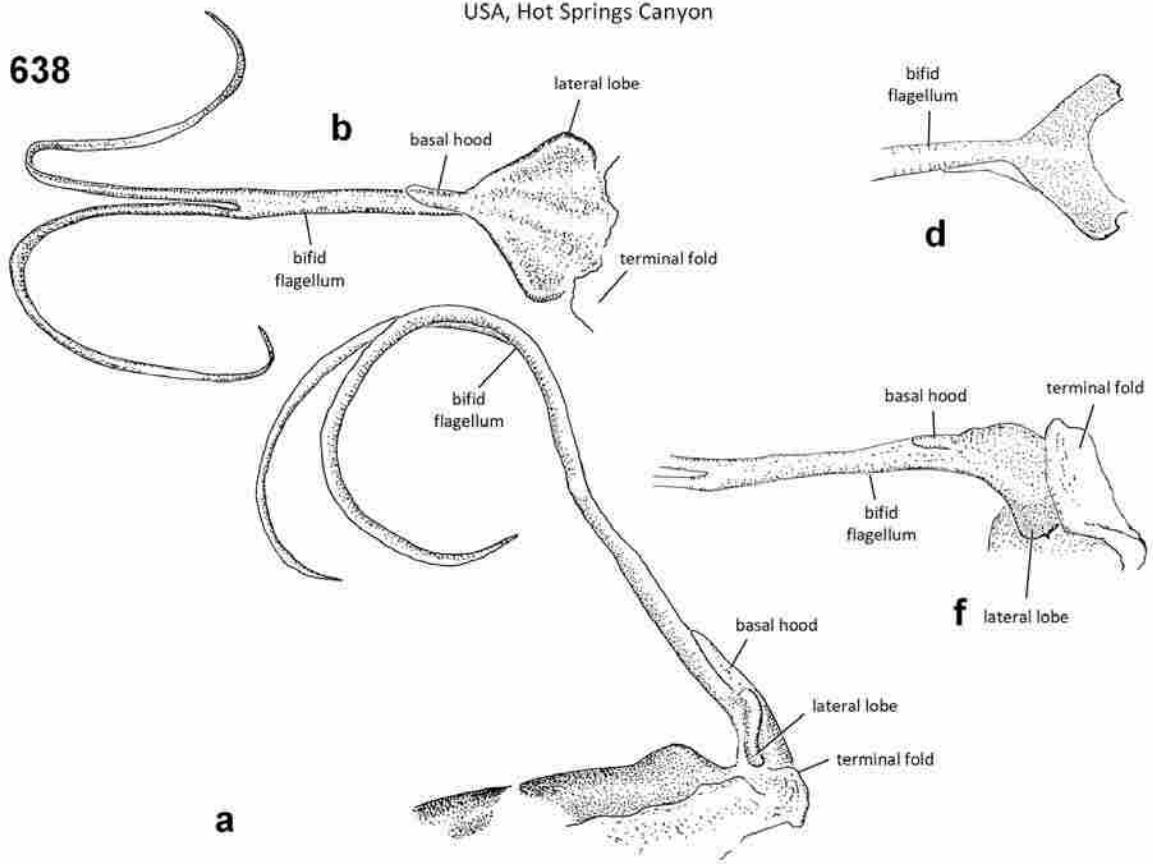
637



A. pima

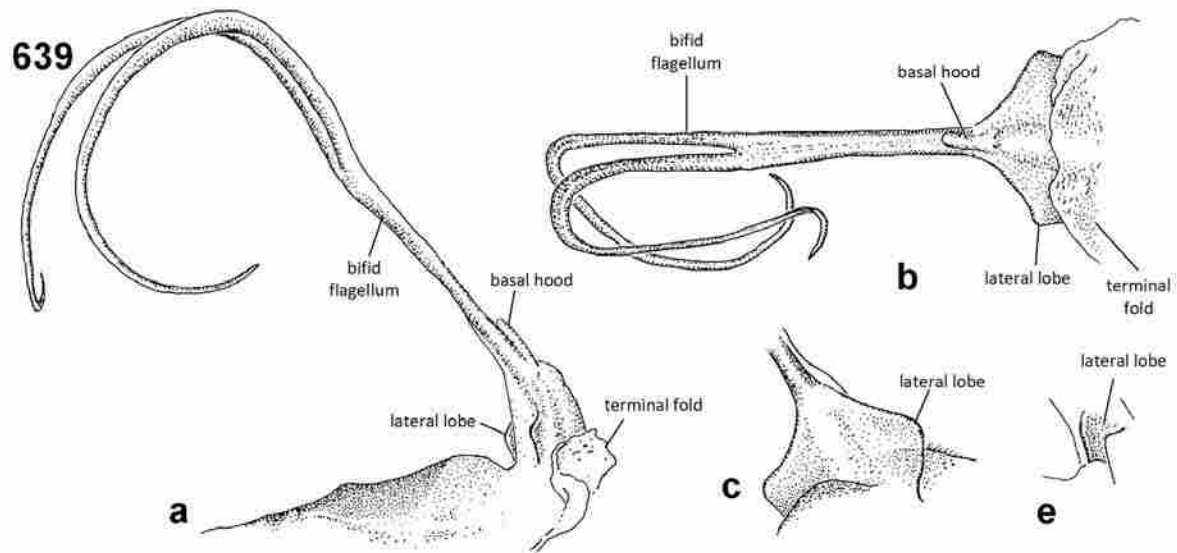
USA, Hot Springs Canyon

638

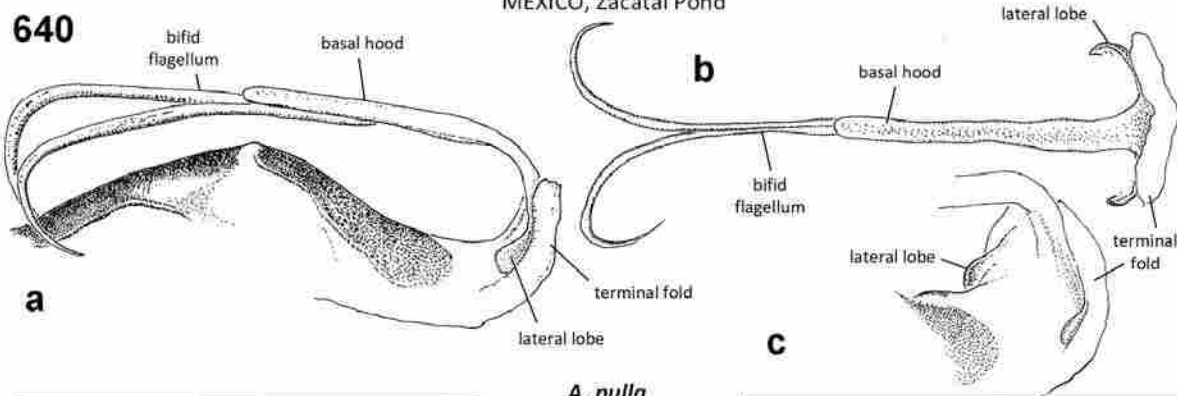


A. popoluca

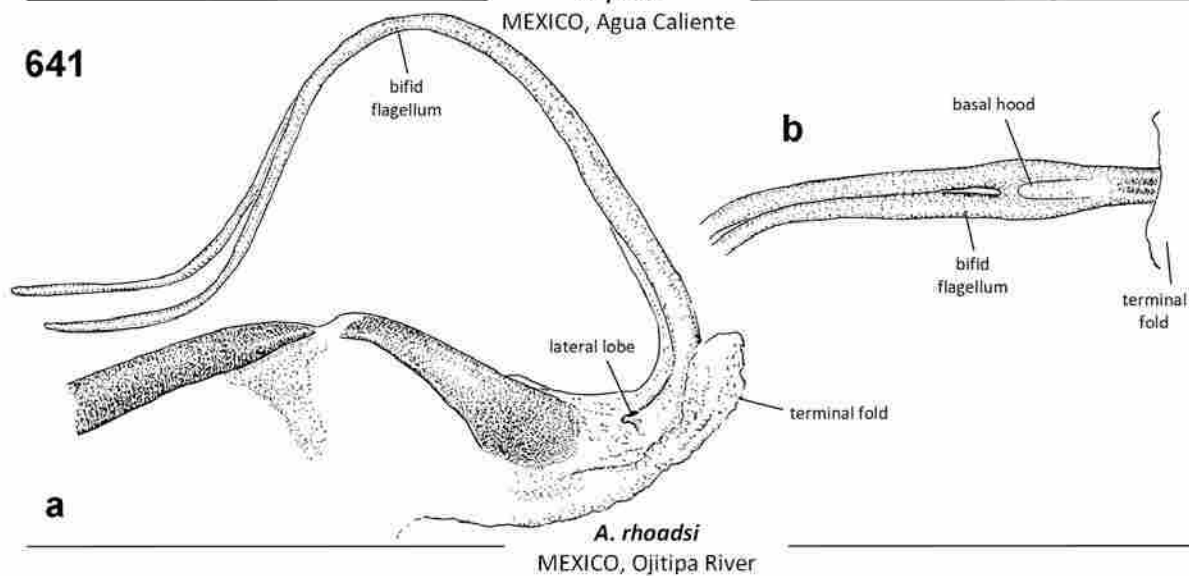
MEXICO, Los Tuxtlas Biological Station



A. popoluca
MEXICO, Zacatal Pond

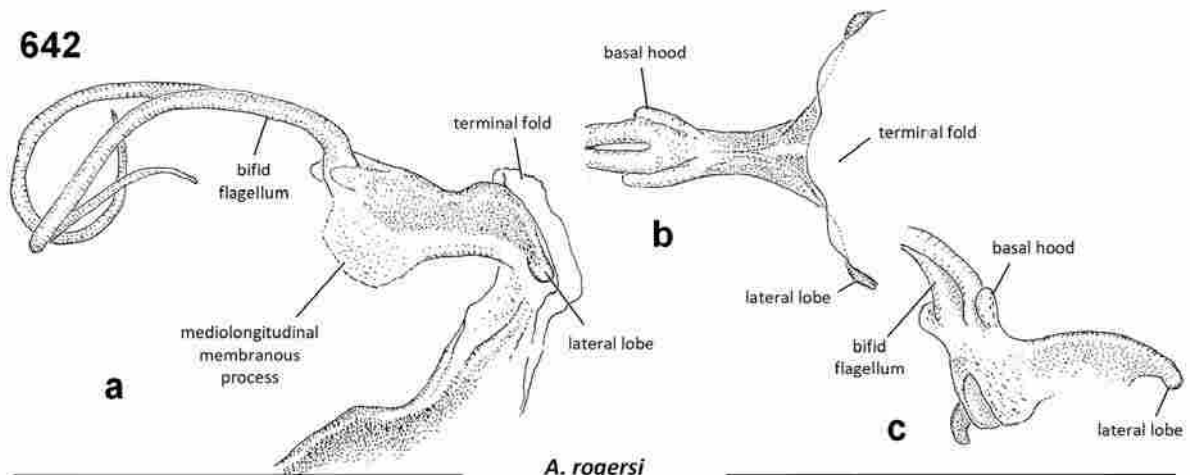


A. pulla
MEXICO, Agua Caliente



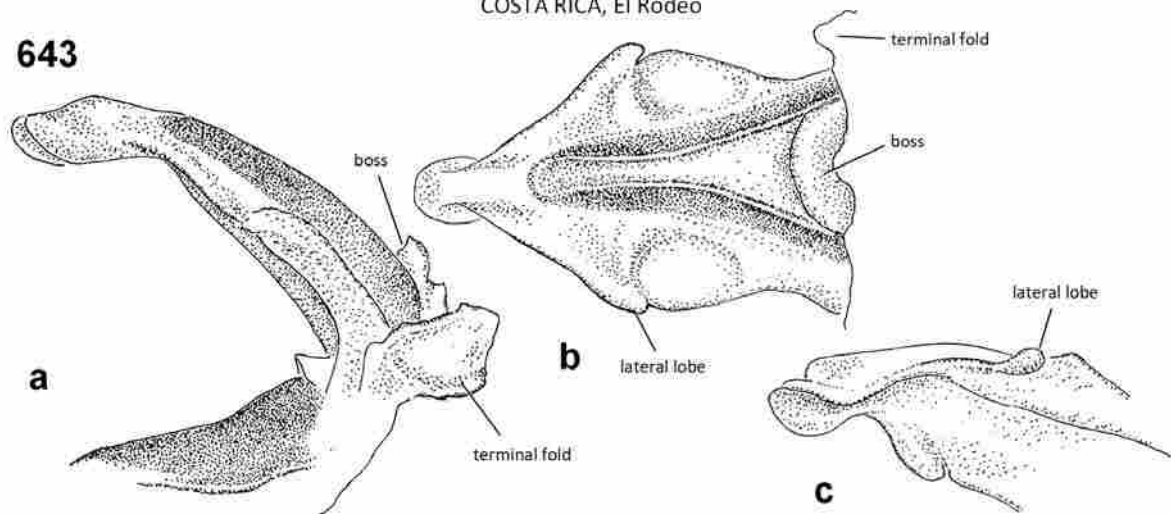
A. rhoadsi
MEXICO, Ojitipa River

642



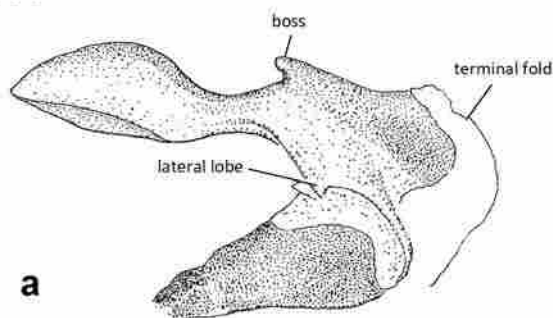
A. rogersi
COSTA RICA, El Rodeo

643



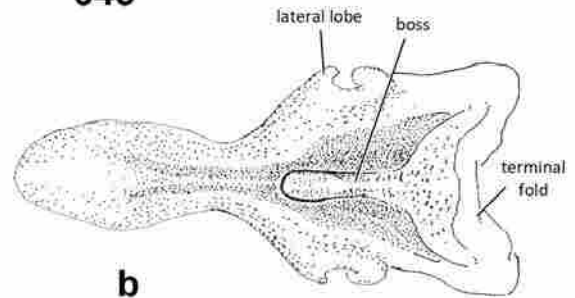
A. rudolphi – HOLOTYPE
MEXICO, La Unión

644

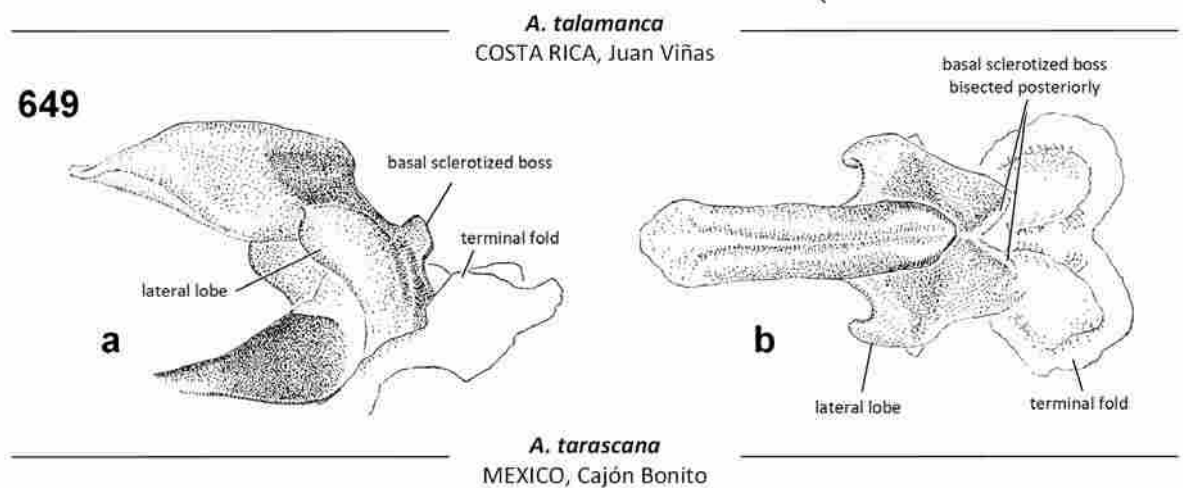
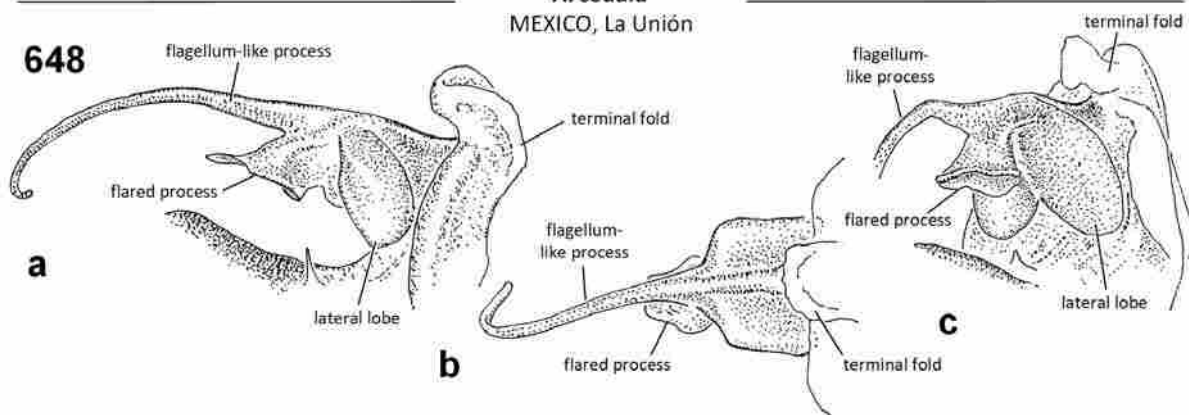
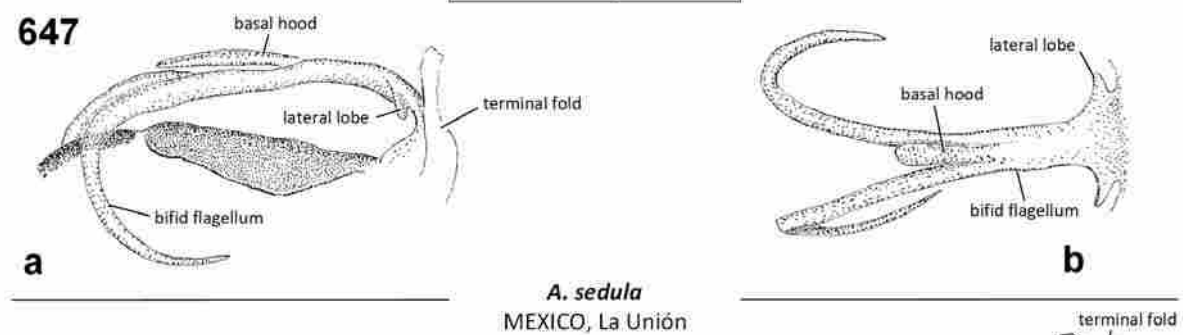
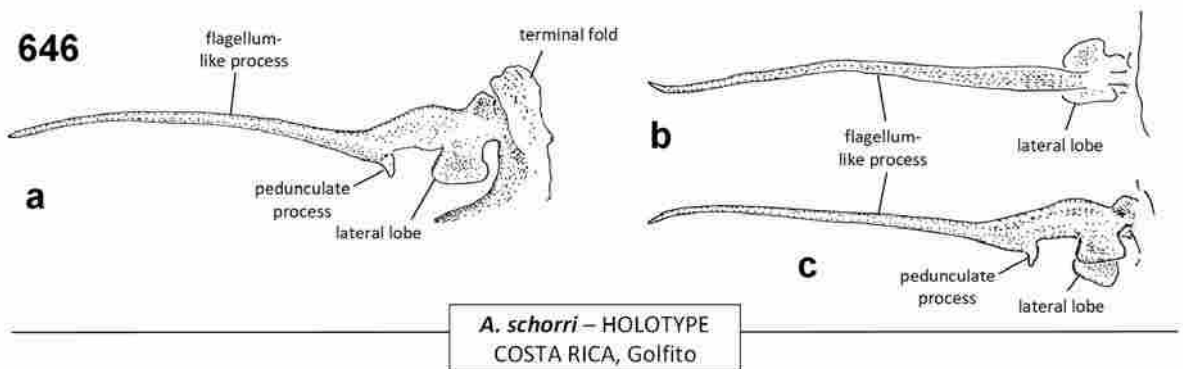


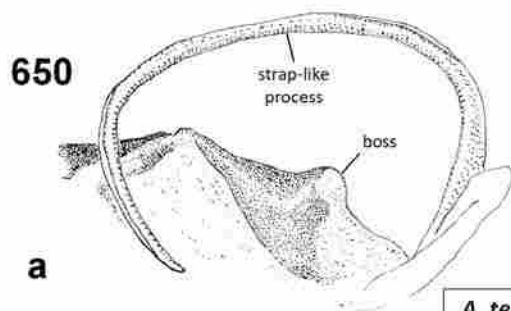
A. sabino – PARATYPE
USA, Upper Sabino Canyon

645



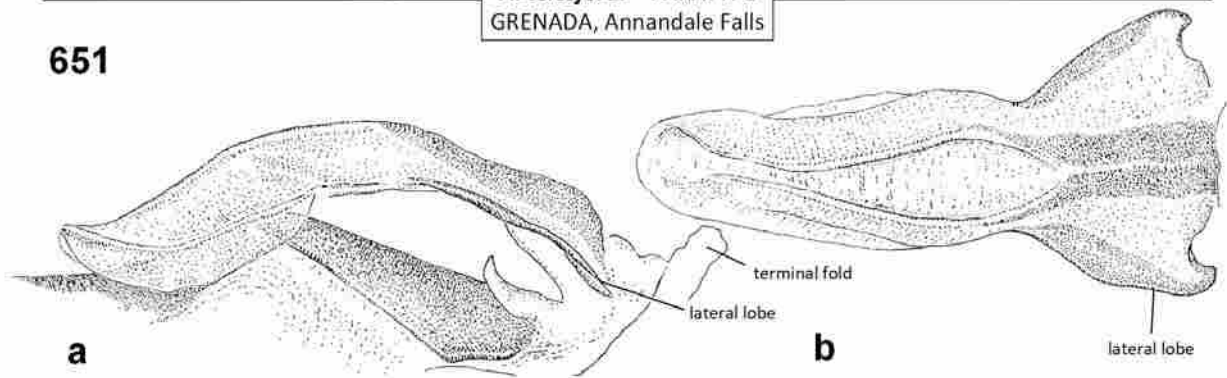
A. sabino – PARATYPE
USA, Sycamore Canyon





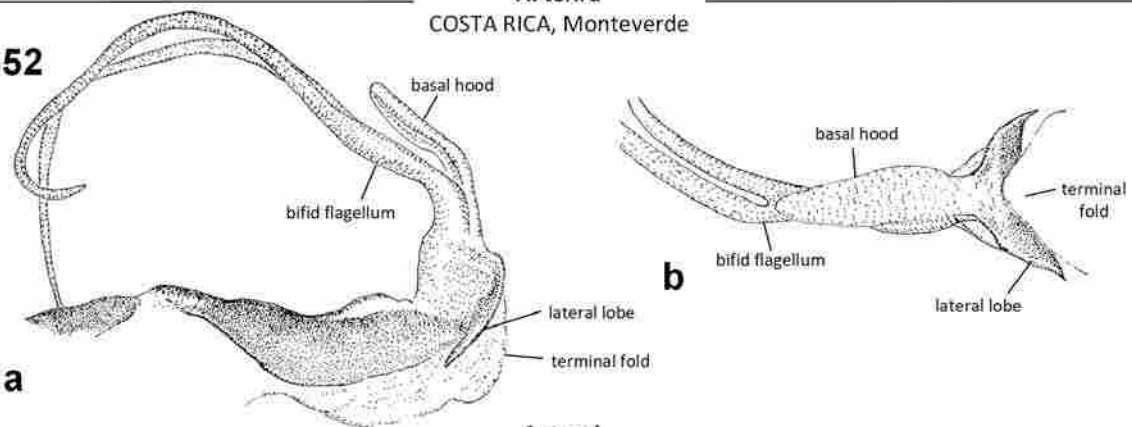
A. telesfordi – PARATYPE
GRENADA, Annandale Falls

651



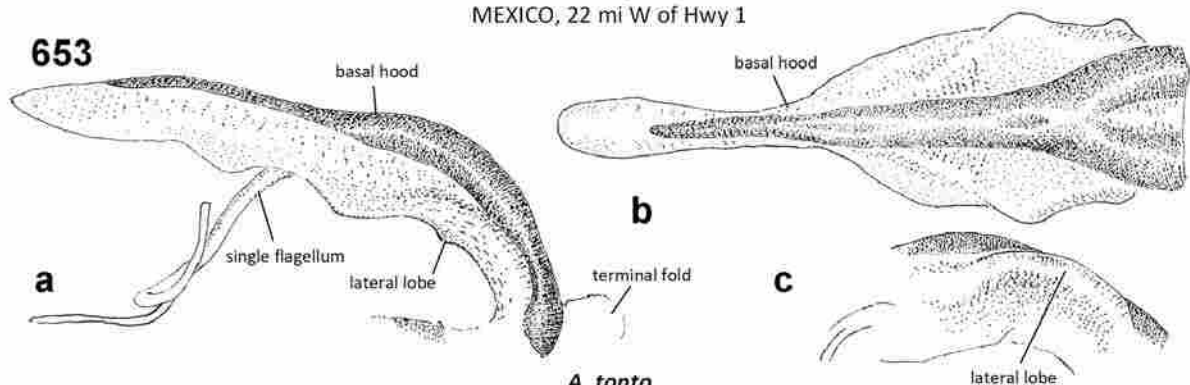
A. terira
COSTA RICA, Monteverde

652



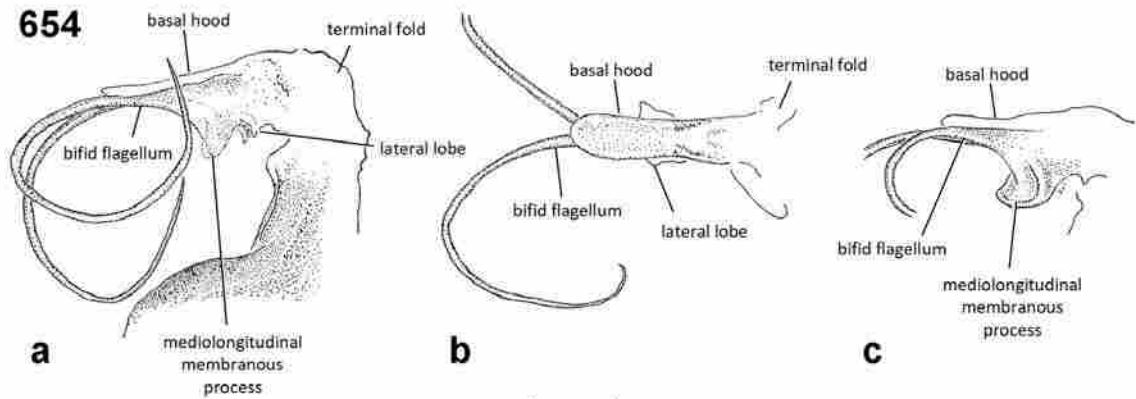
A. tezpi
MEXICO, 22 mi W of Hwy 1

653



A. tonto
USA, Rucker Forest

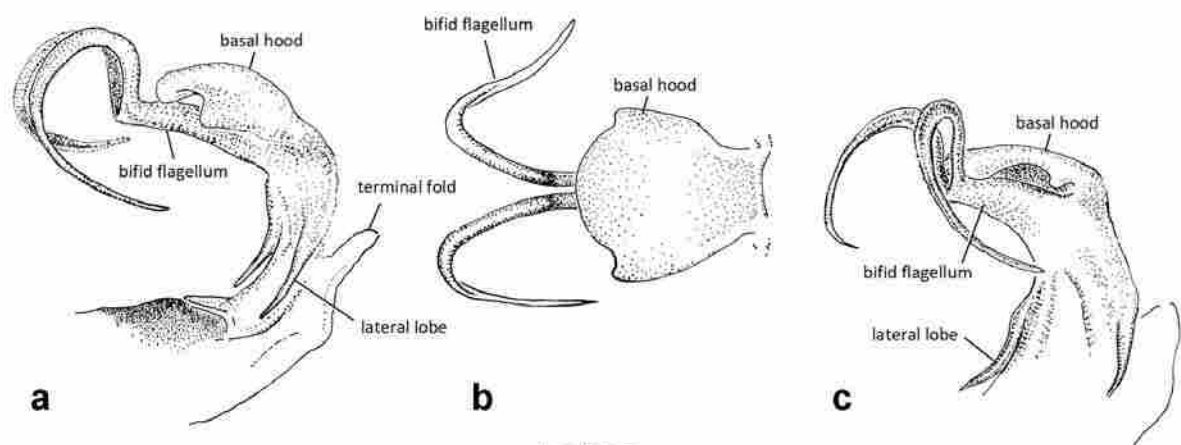
654



A. translata

COSTA RICA, 2 km N of Terraba River

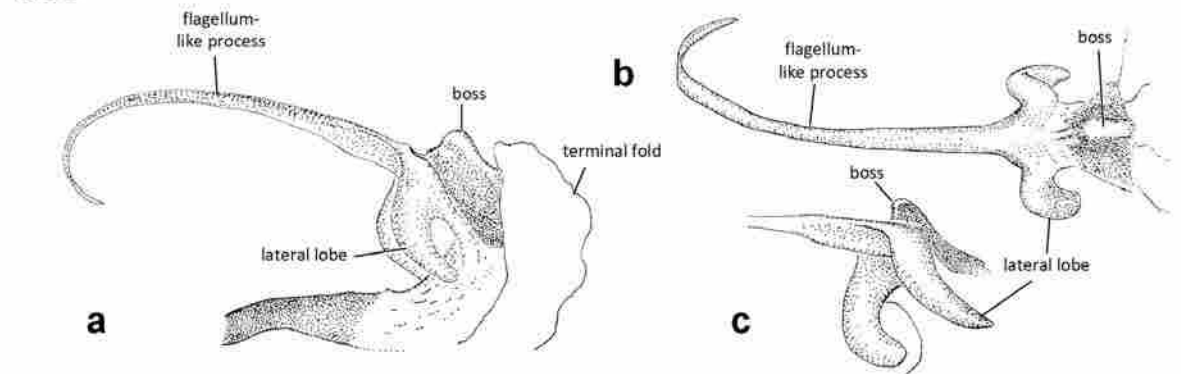
655



A. ulmeca

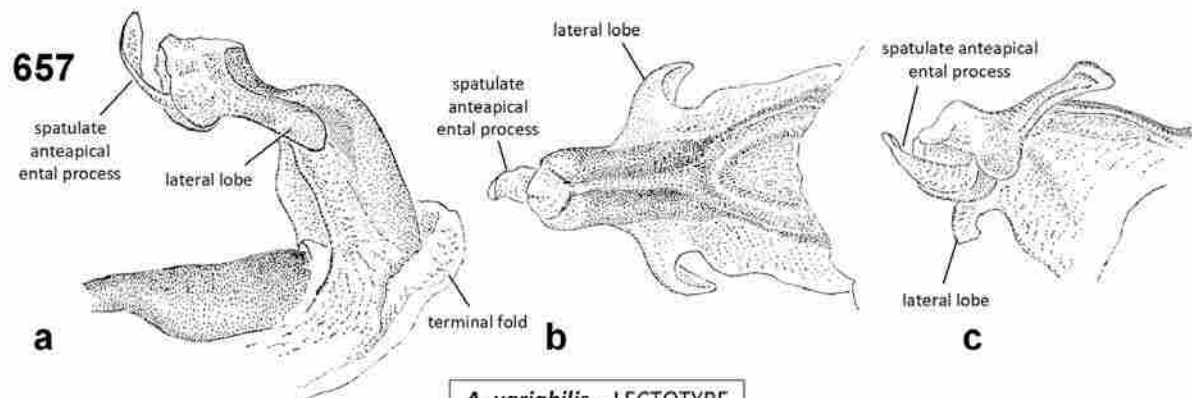
GUATEMALA, El Fiscal

656

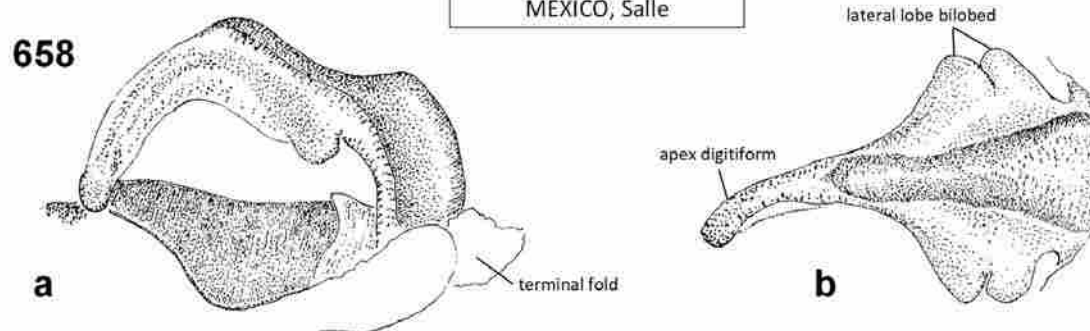


A. underwoodi

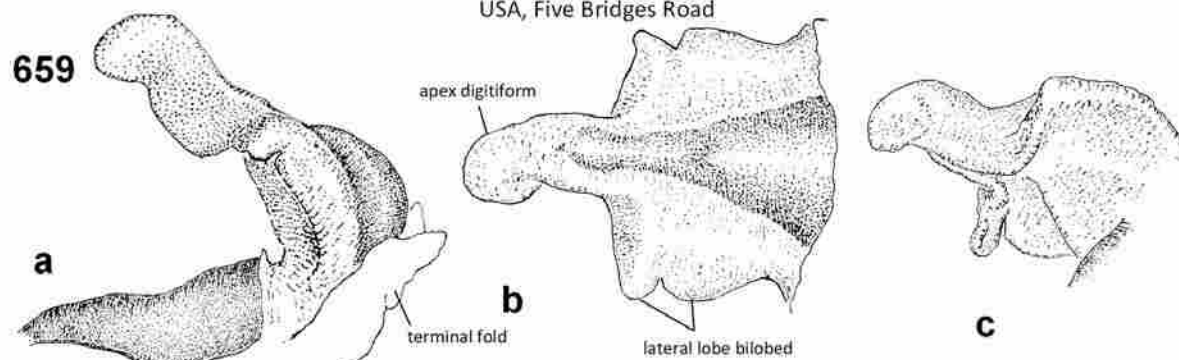
COSTA RICA, Monteverde



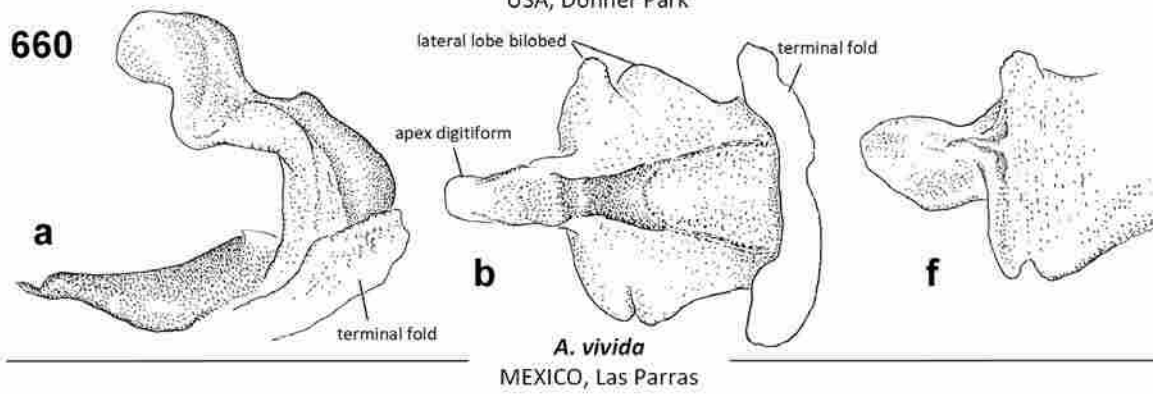
A. variabilis – LECTOTYPE
MEXICO, Salle



A. vivida
USA, Five Bridges Road

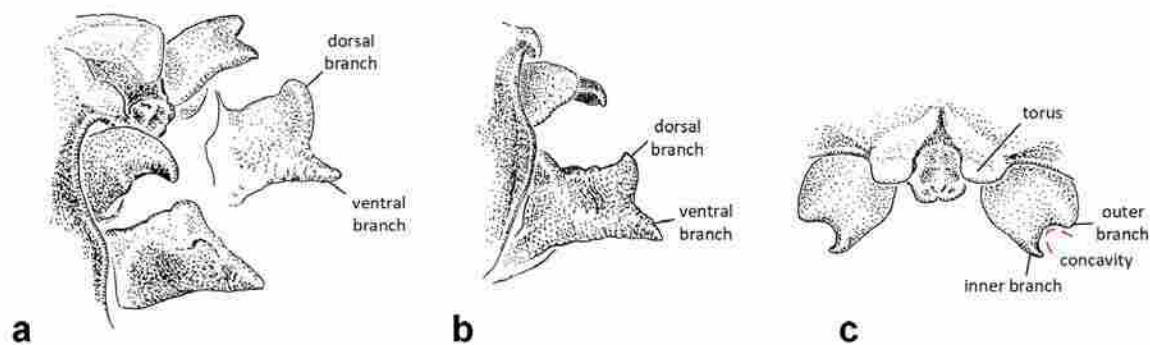


A. vivida
USA, Donner Park



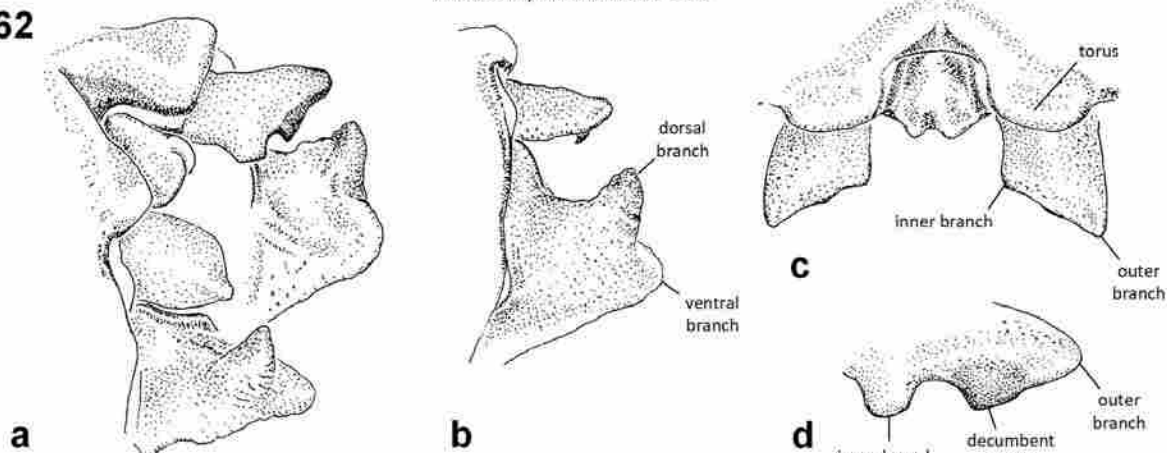
A. vivida
MEXICO, Las Parras

661



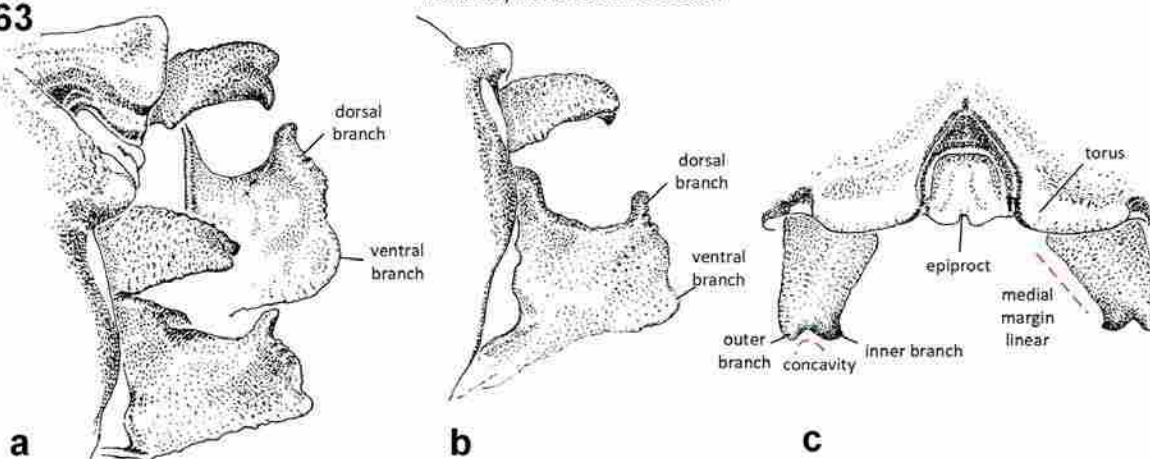
A. adamsi
PANAMA, Limbo Hunt Club

662

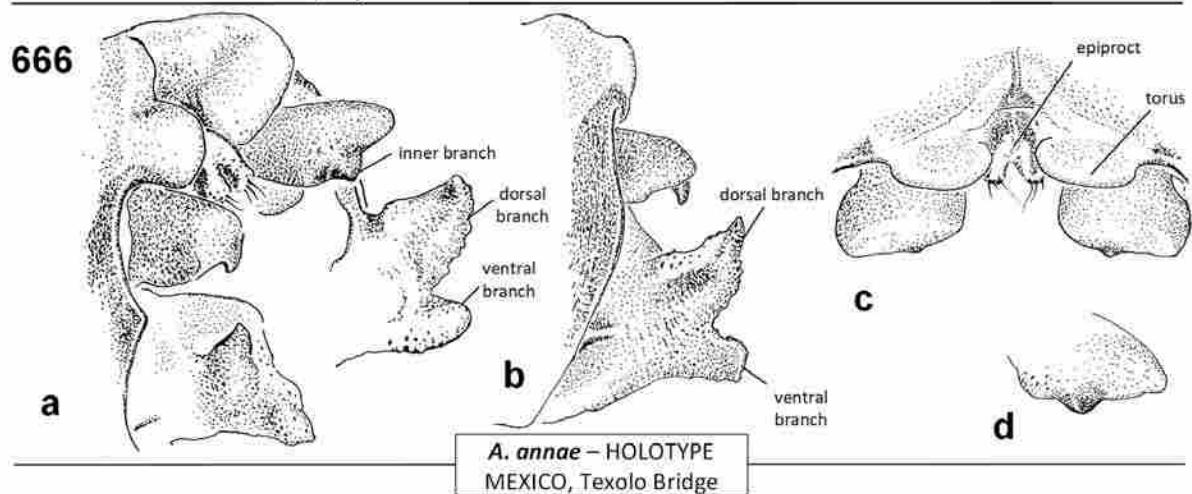
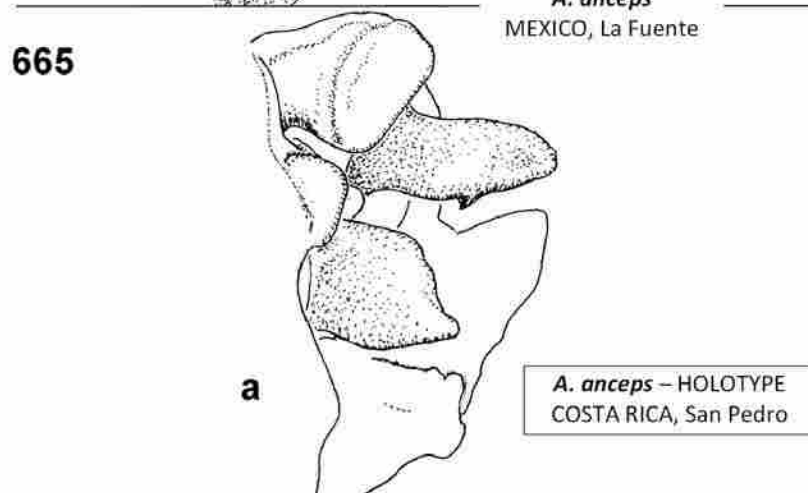
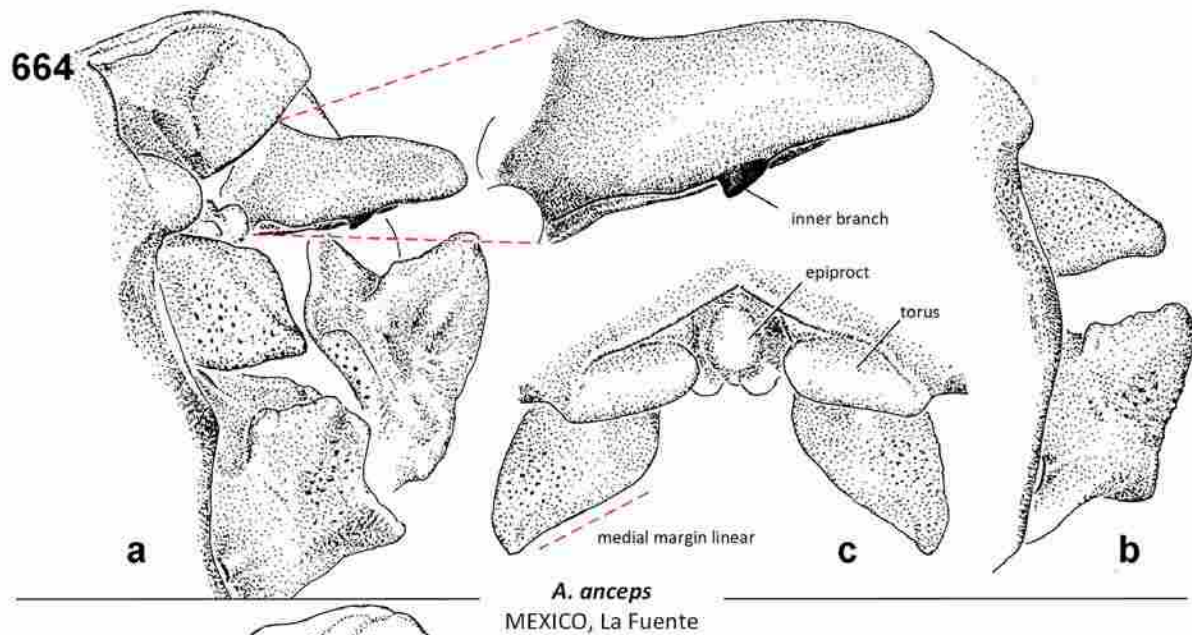


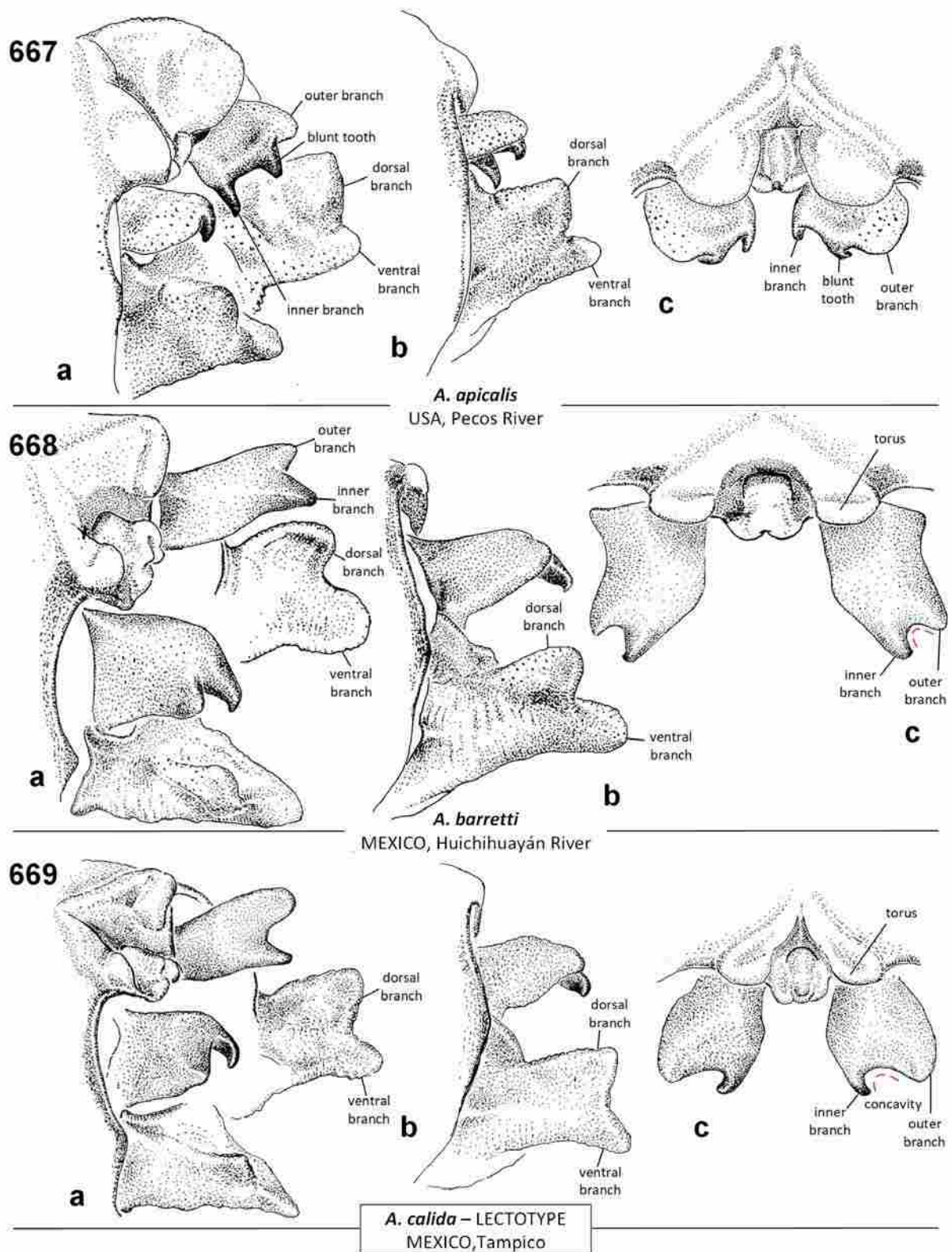
A. agrioides
MEXICO, Rancho San Esteban

663

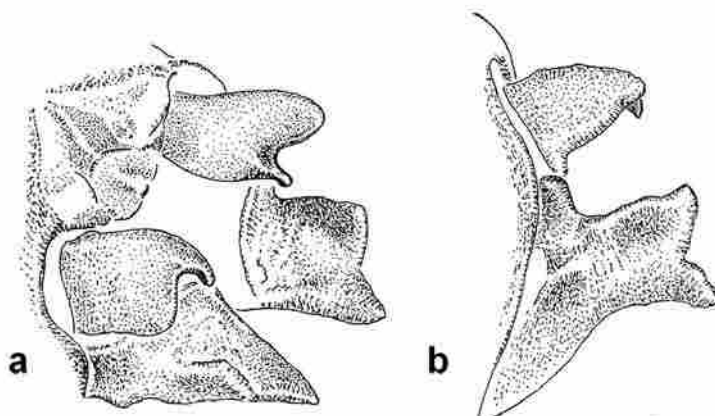


A. alberta
USA, Five Bridges Road



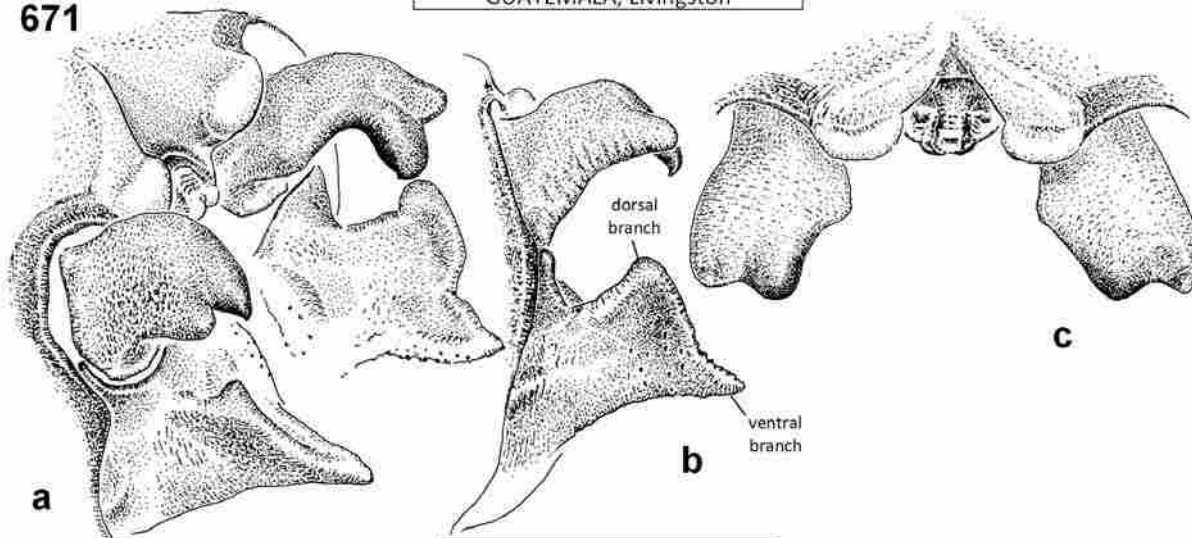


670



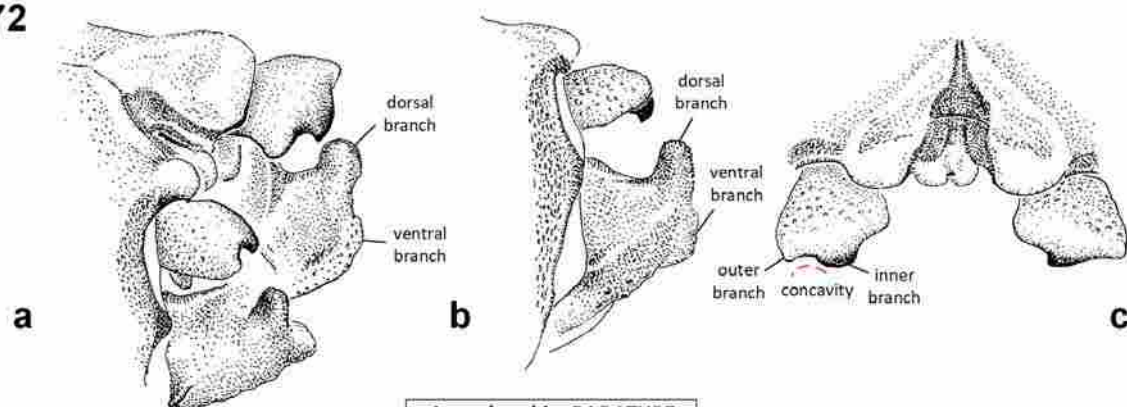
A. calida – HOLOTYPE of *A. wilsoni*
GUATEMALA, Livingston

671



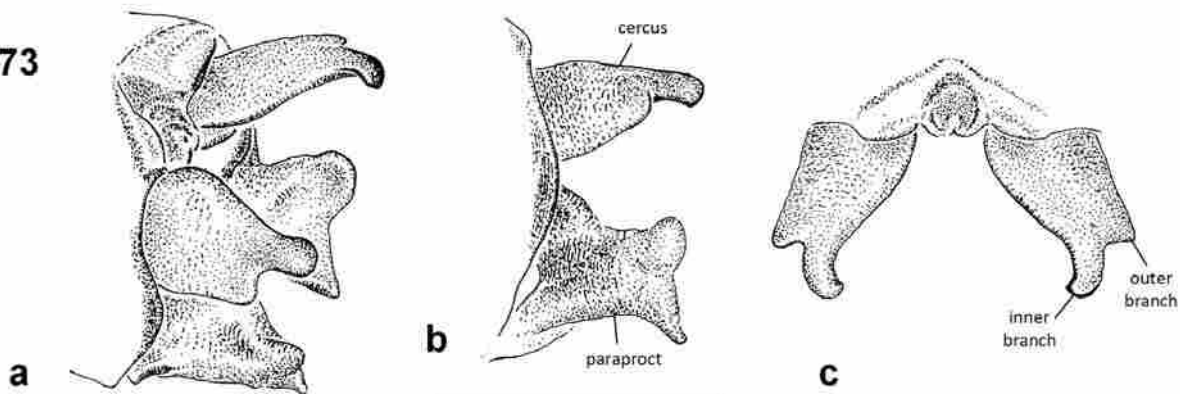
A. calverti – HOLOTYPE
COSTA RICA, Tapandi Preserve

672



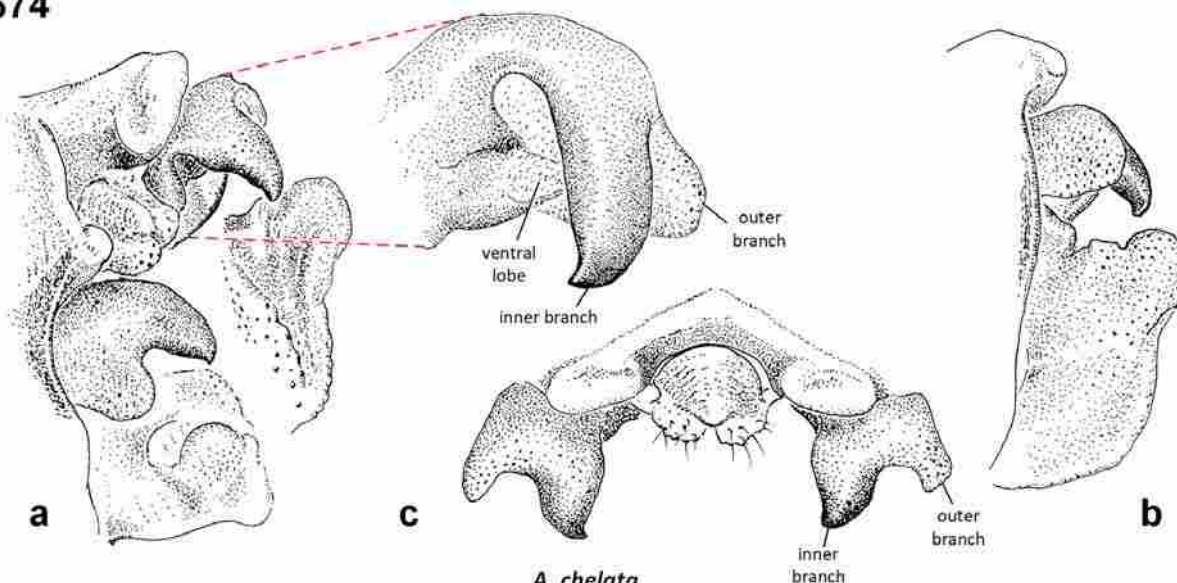
A. carlcooki – PARATYPE
MEXICO, Las Palmas

673



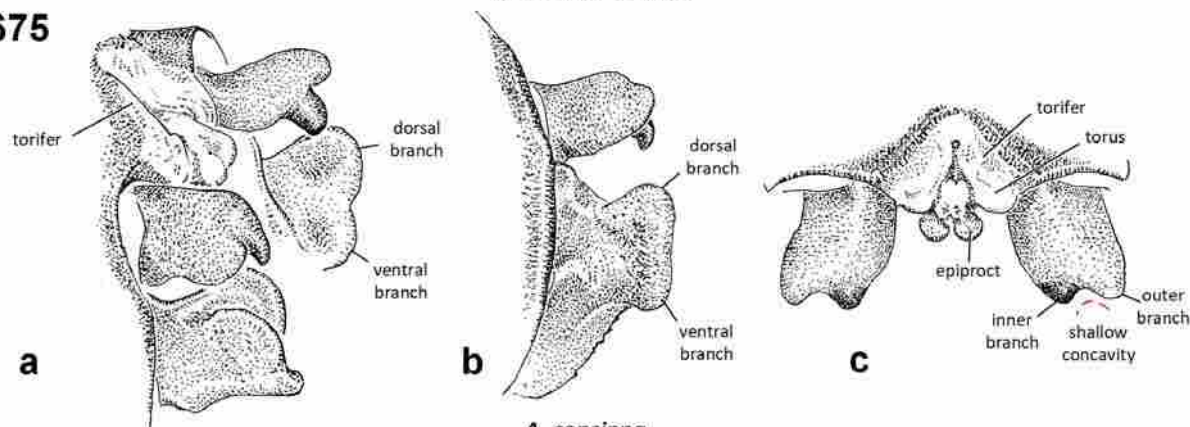
A. carolus – HOLOTYPE
COSTA RICA, El Rodeo

674



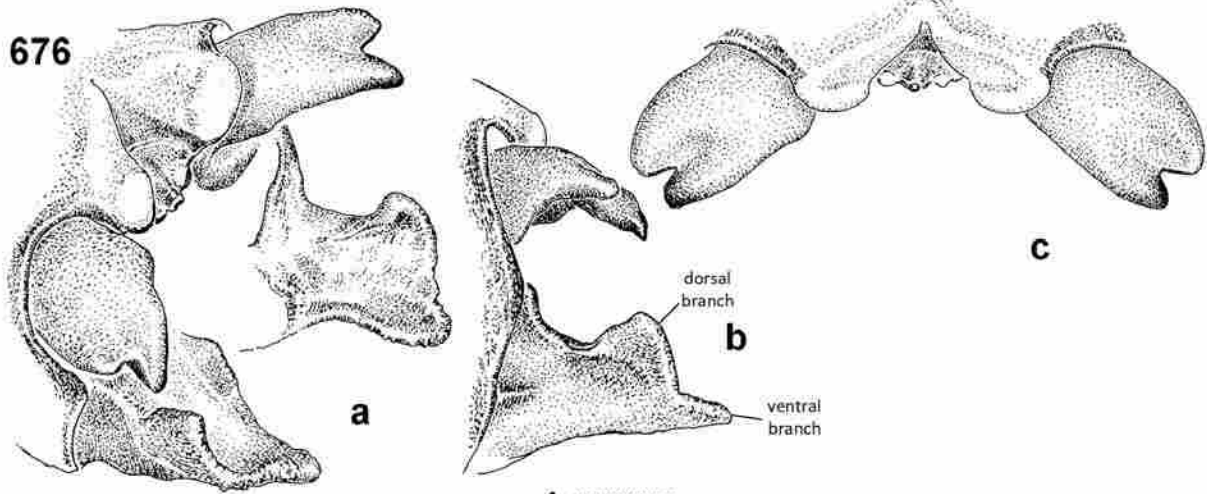
A. chelata
HONDURAS, Cantiles

675



A. concinna
DOMINICA, 12 mi N of Rosseau

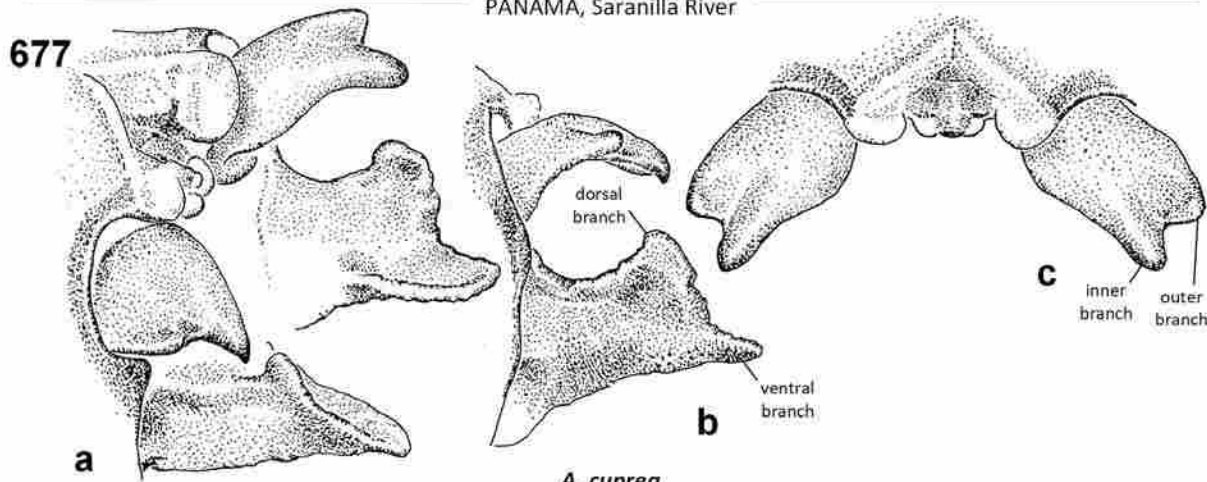
676



A. cupraurea

PANAMA, Saranilla River

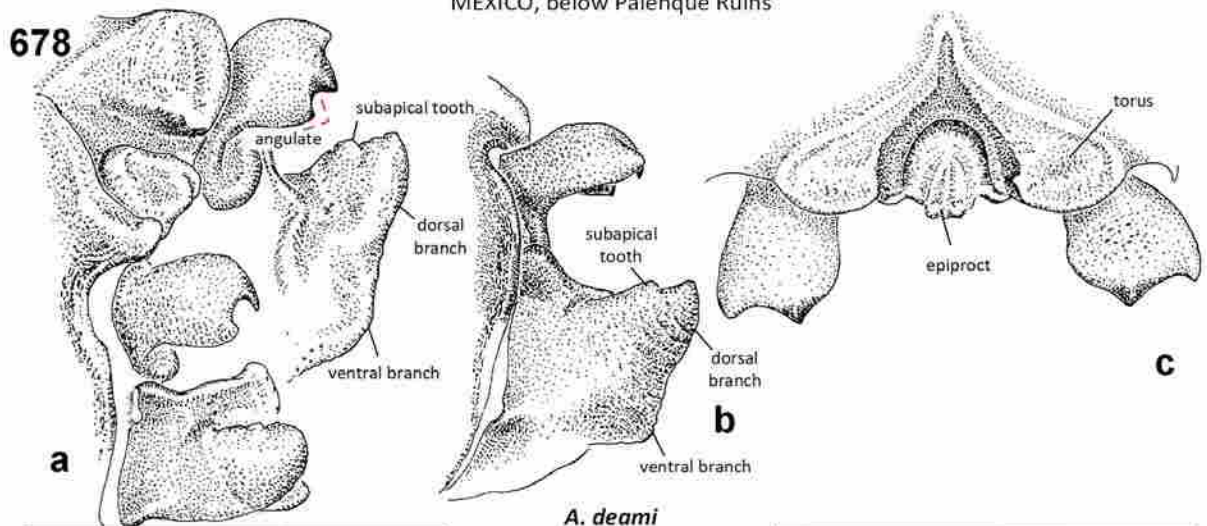
677



A. cuprea

MEXICO, below Palenque Ruins

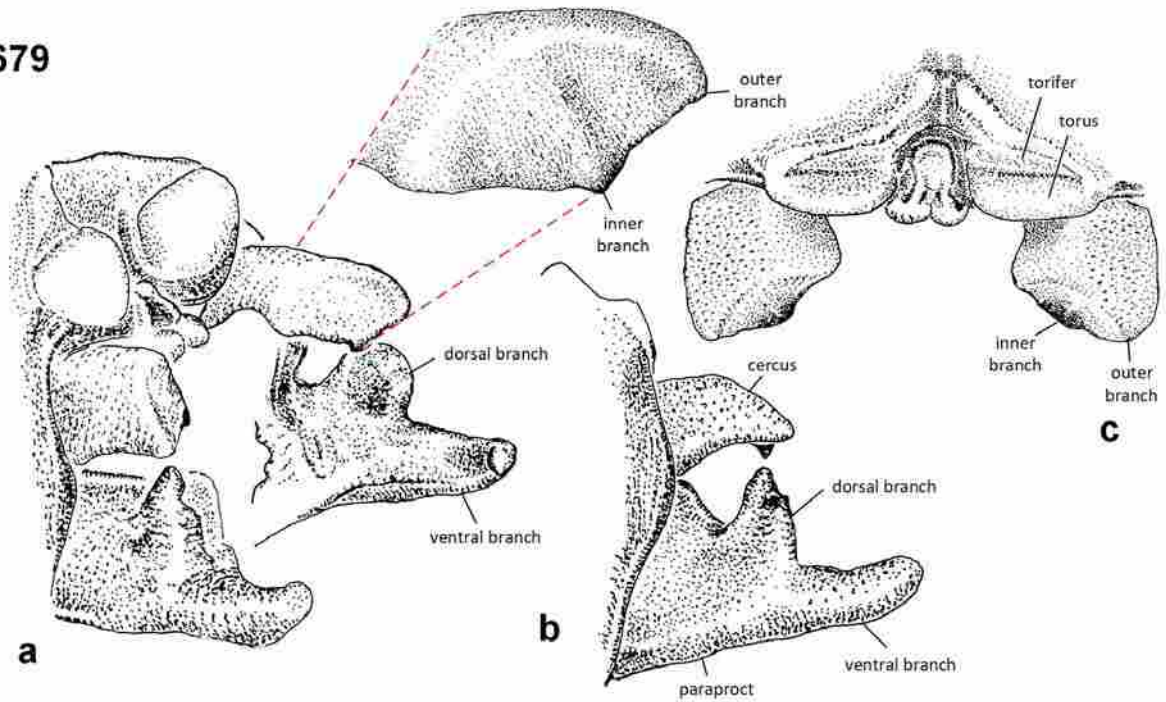
678



A. deami

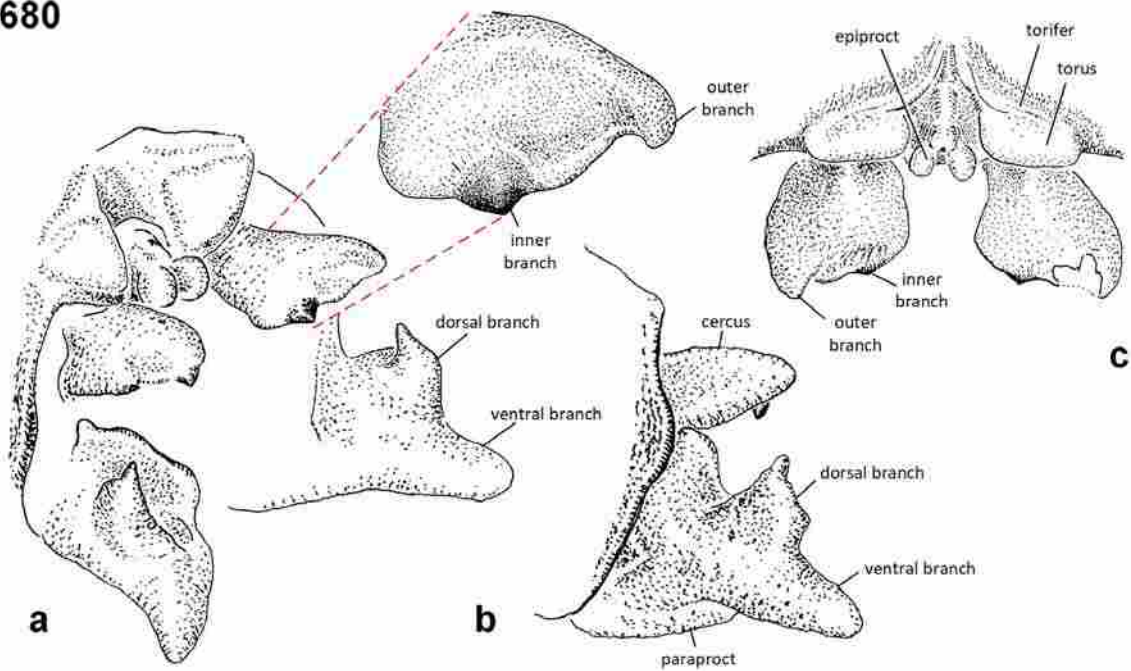
MEXICO, Camécuaro Lake

679



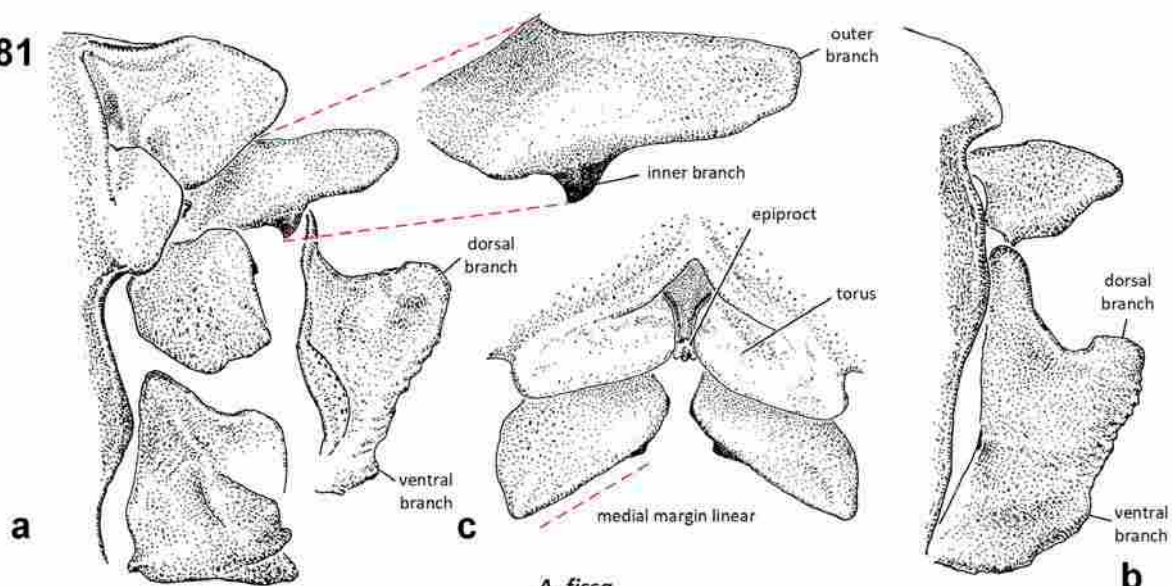
A. elongata – HOLOTYPE
COSTA RICA, Reventazón River

680



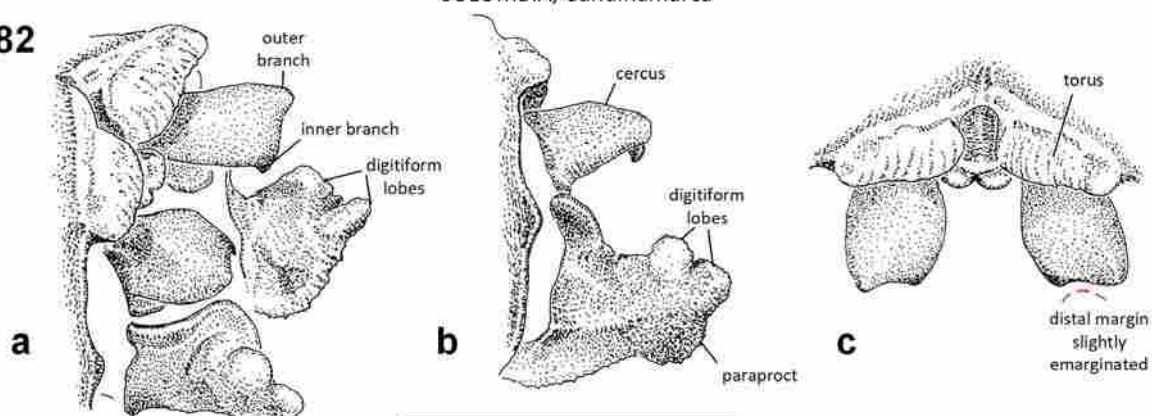
A. extranea – HOLOTYPE
MEXICO, Tamaulipas

681

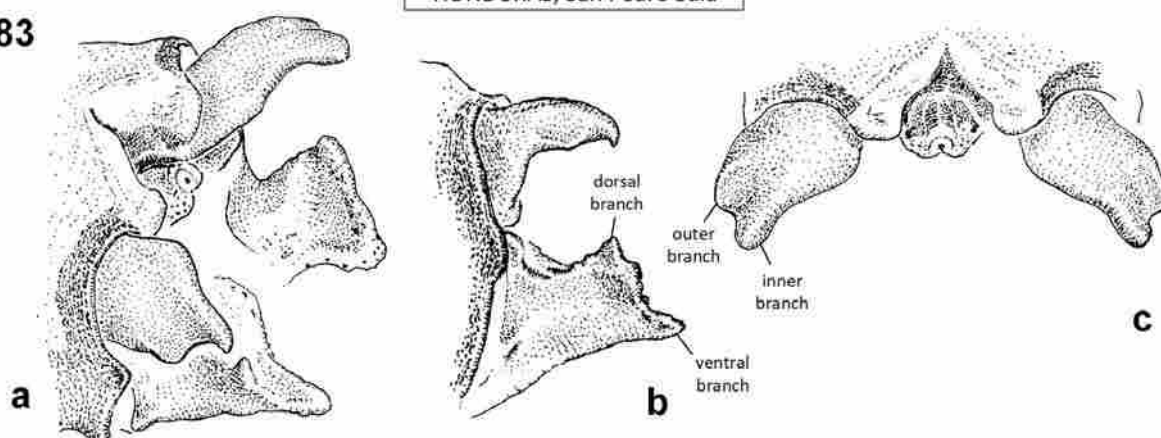
*A. fissa*

COLOMBIA, Cundinamarca

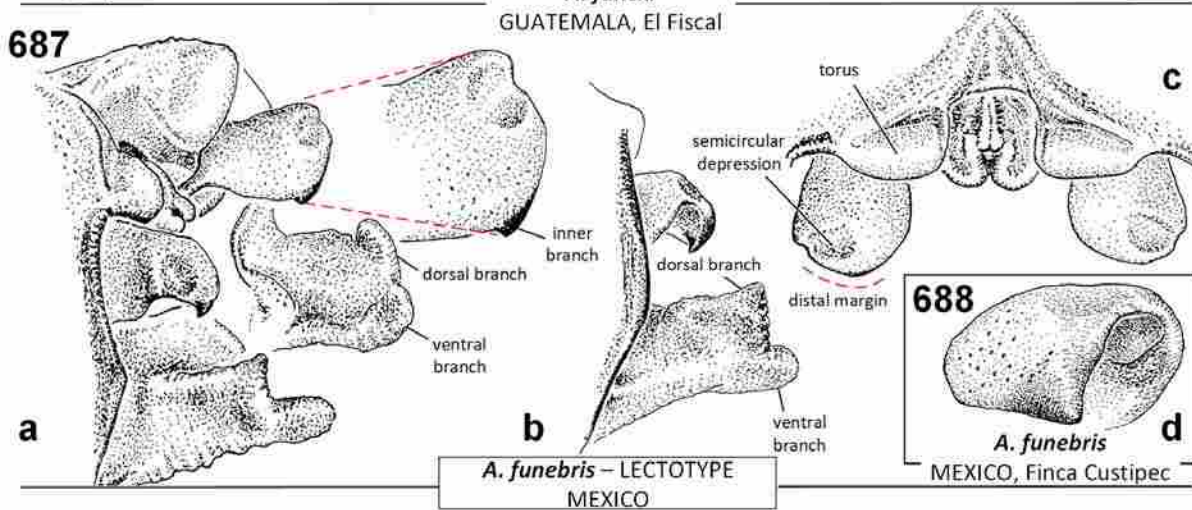
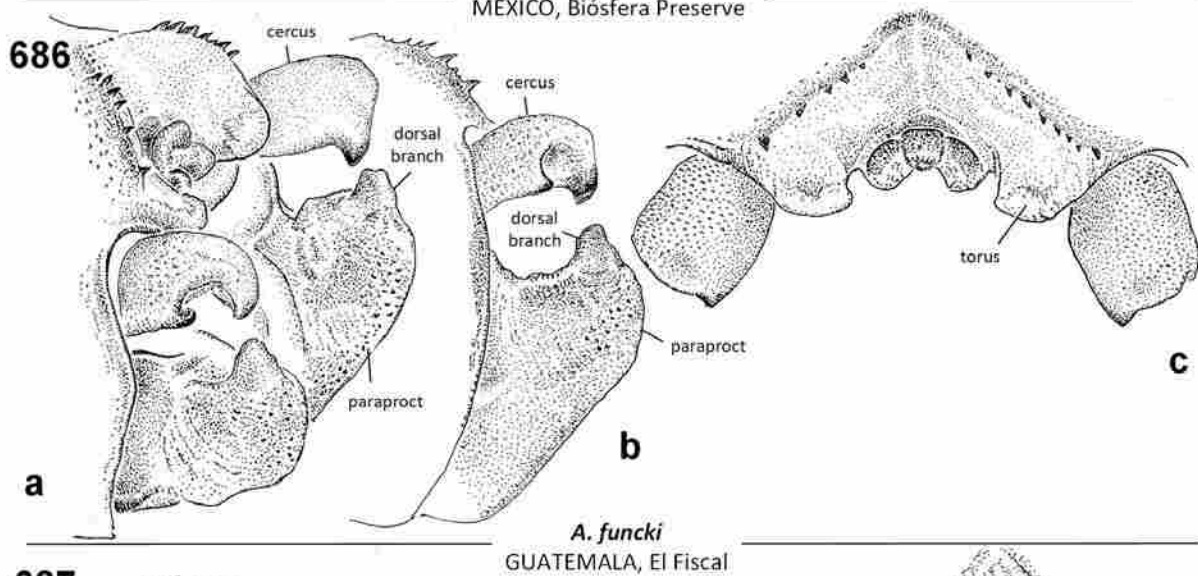
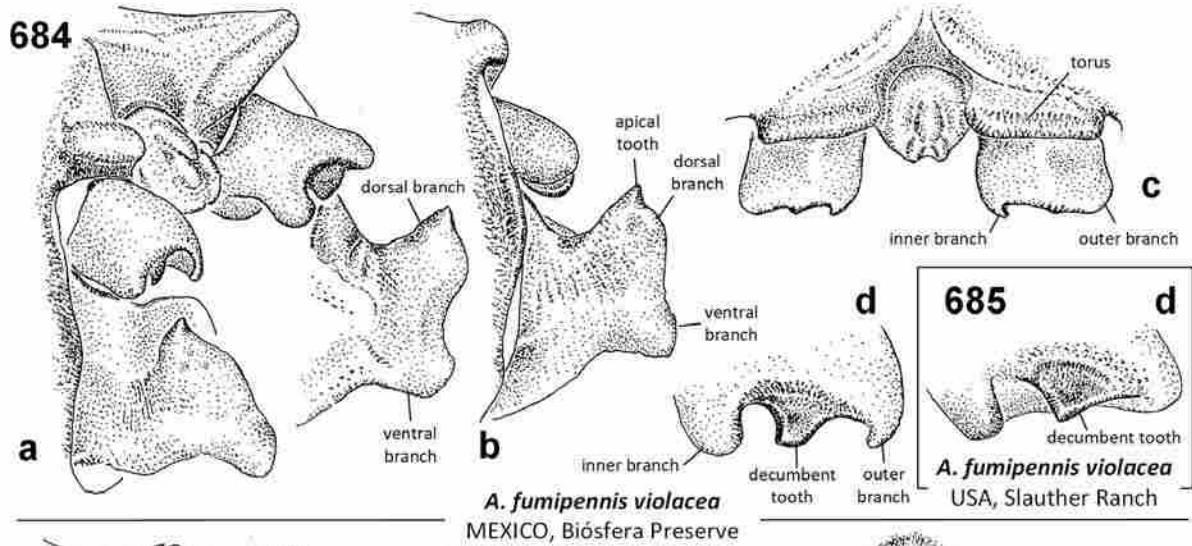
682

*A. frequentula* – PARATYPE
HONDURAS, San Pedro Sula

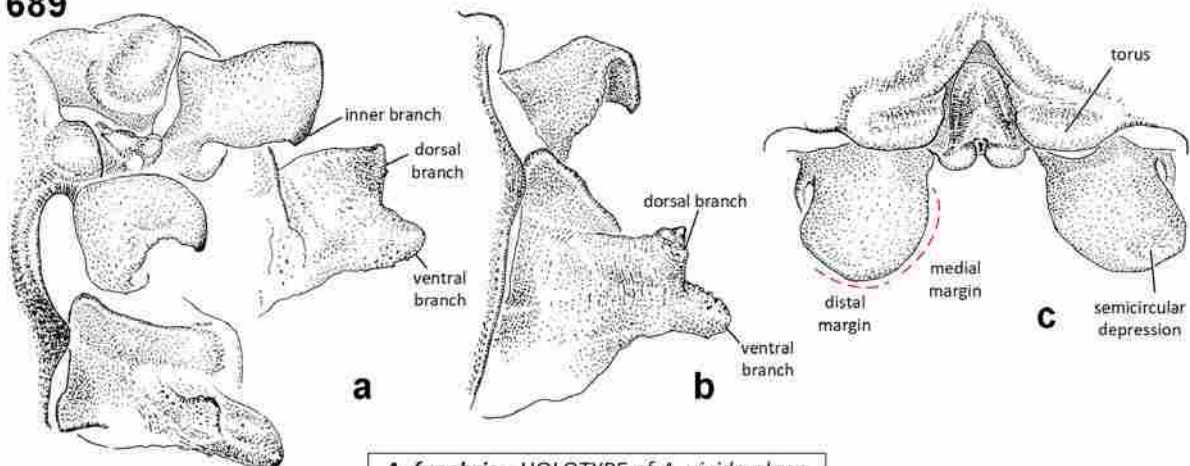
683

*A. fulgida*

PANAMA, Santa Fe

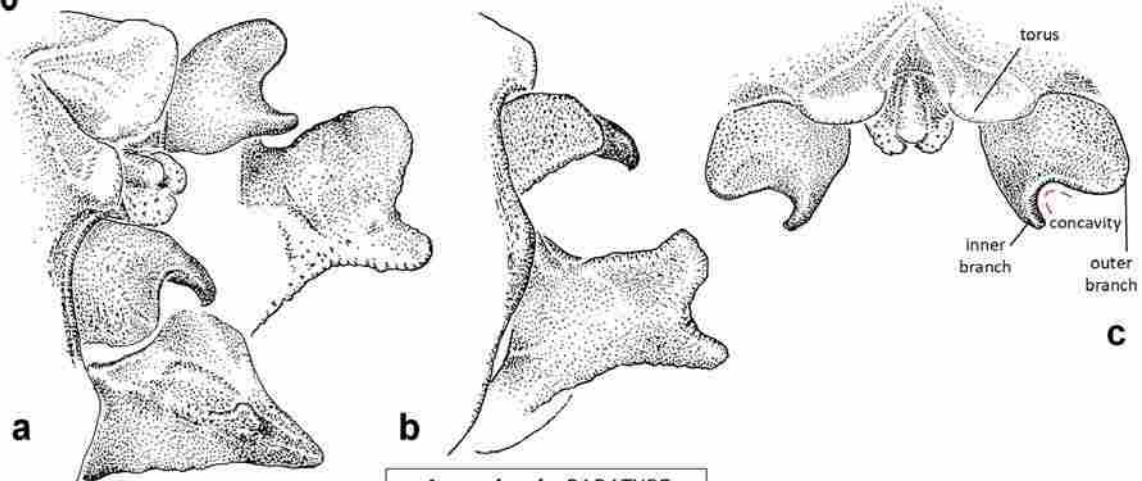


689



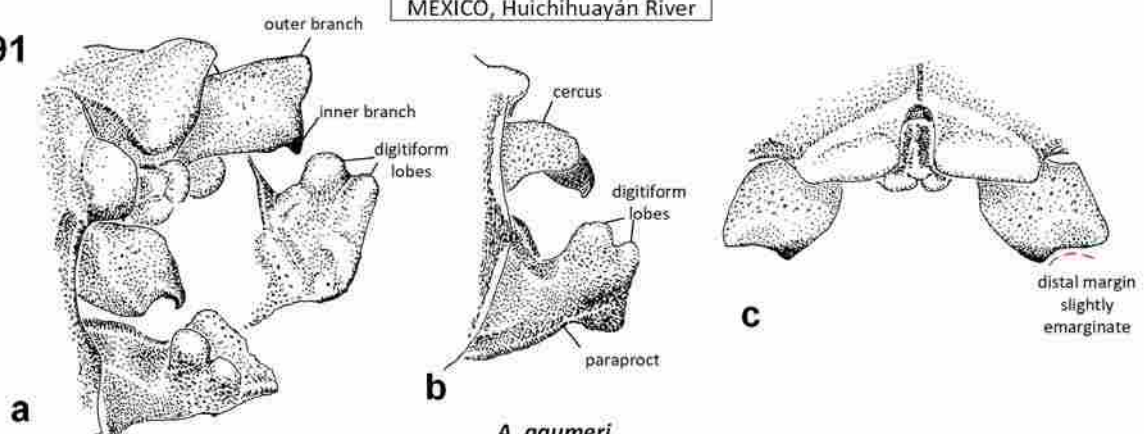
A. funebris – HOLOTYPE of *A. vivida plana*
MEXICO, Sierra de las Aguas Escondidas

690



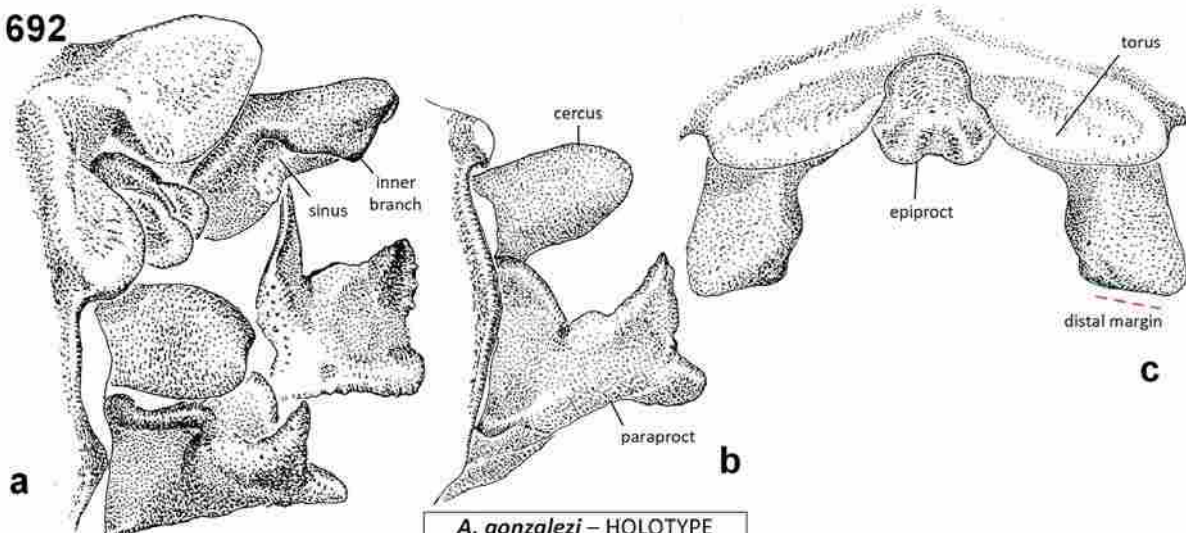
A. garrisoni – PARATYPE
MEXICO, Huichihuayán River

691



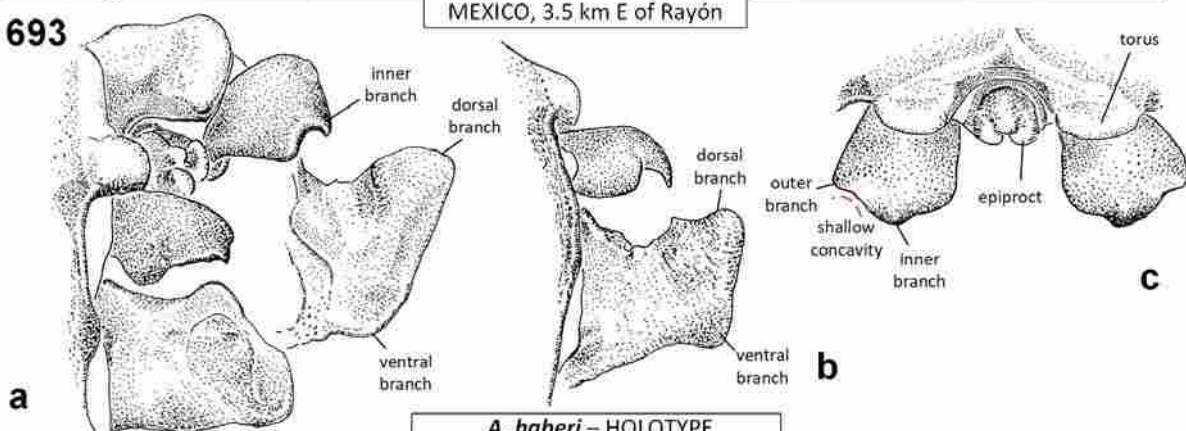
A. gaumeri
MEXICO, Caldera Lake

692



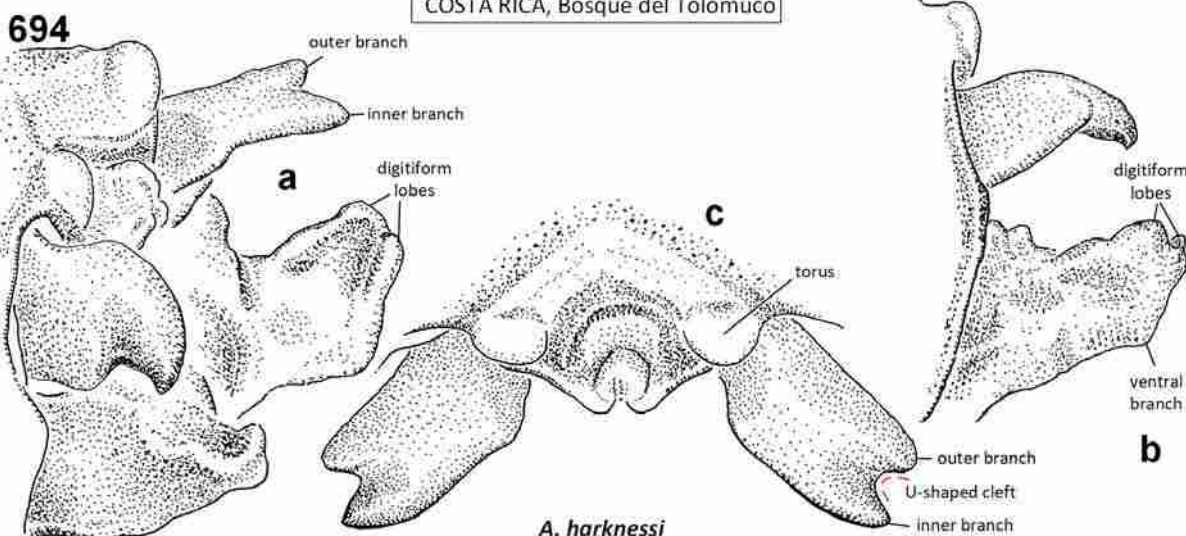
A. gonzalezi – HOLOTYPE
MEXICO, 3.5 km E of Rayón

693



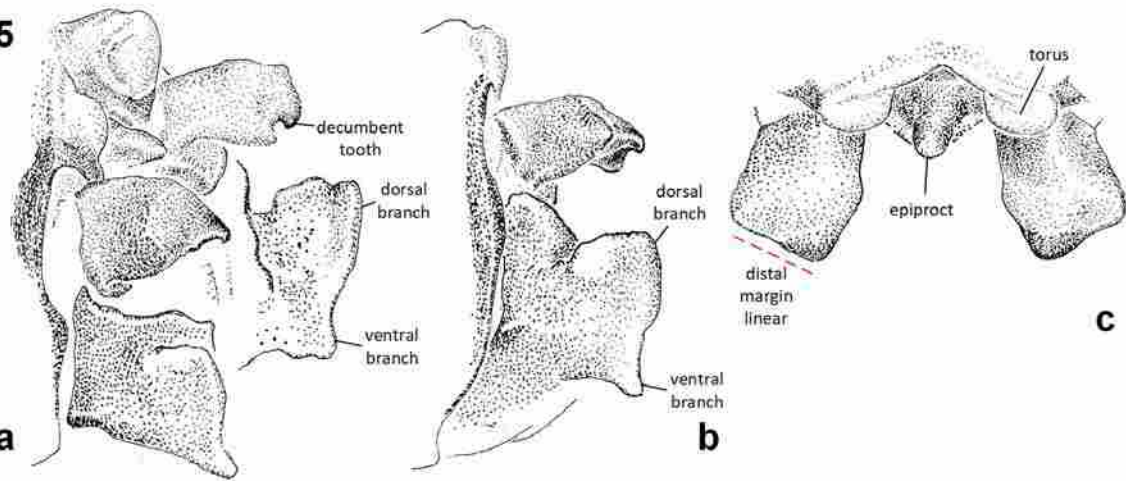
A. haberi – HOLOTYPE
COSTA RICA, Bosque del Tolomuco

694



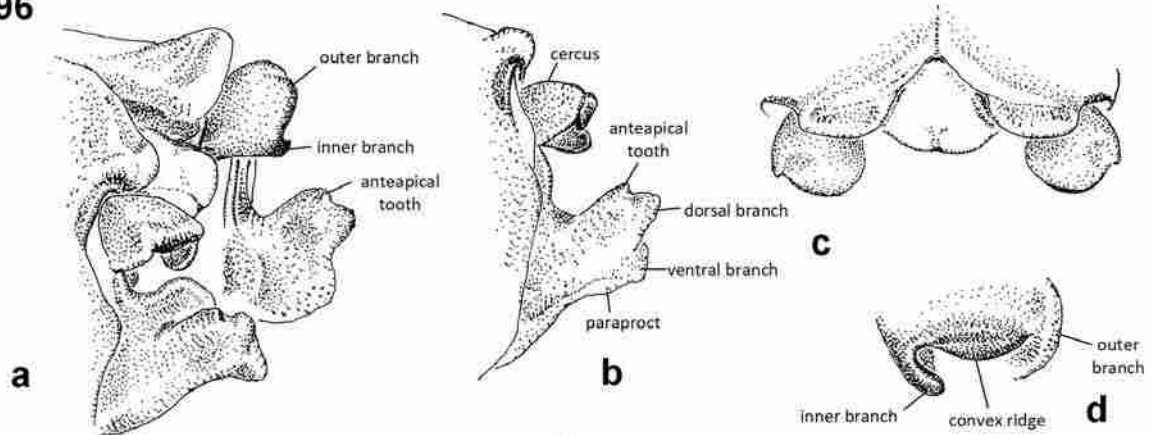
A. harknessi
MEXICO, Tepic

695



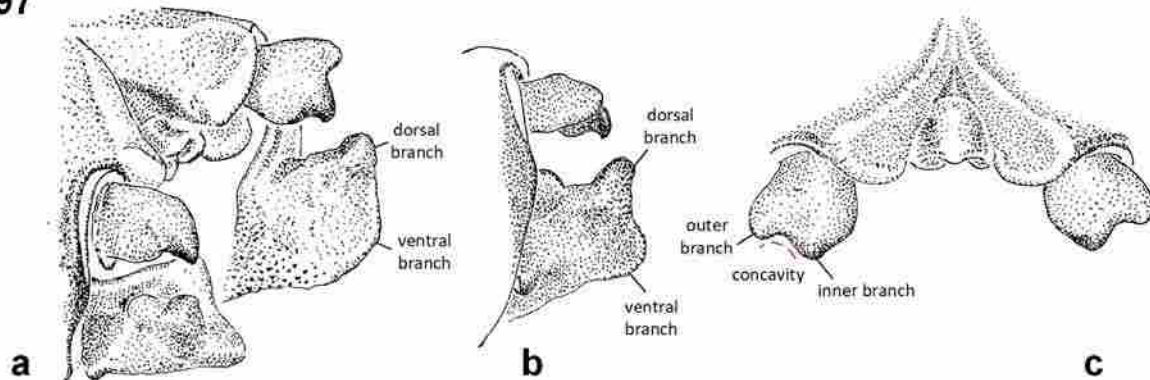
A. herberti
MEXICO, Los Pílares River

696

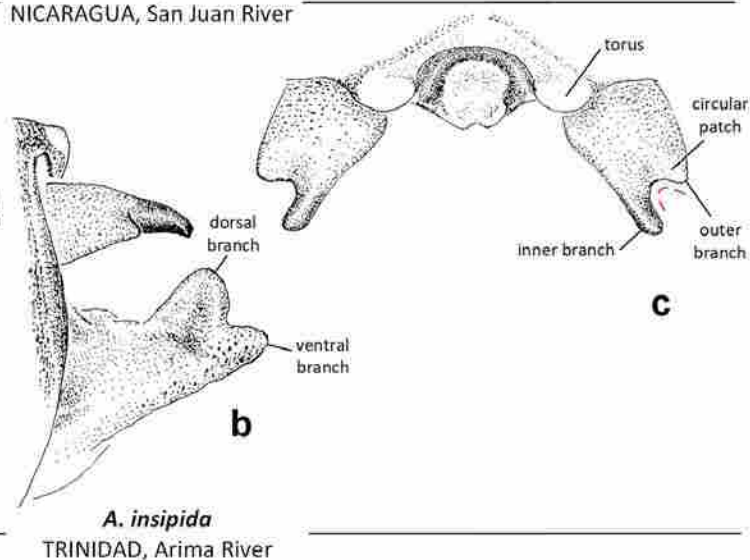
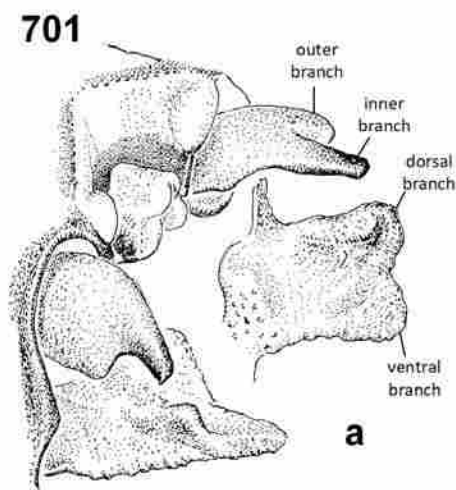
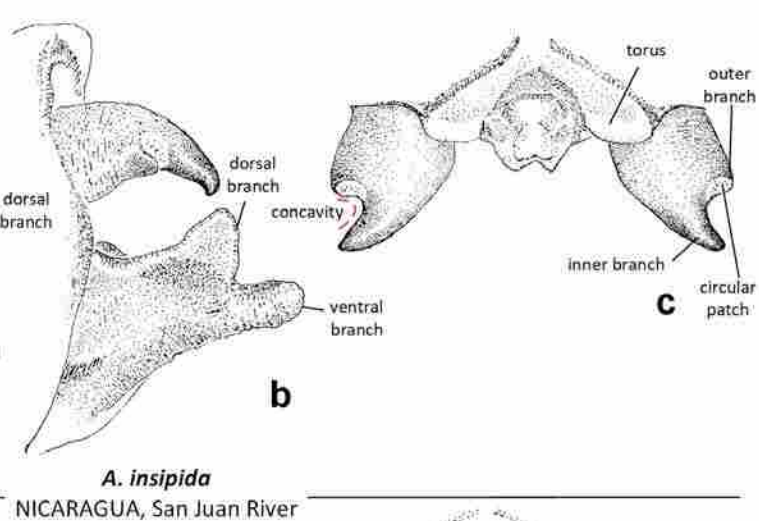
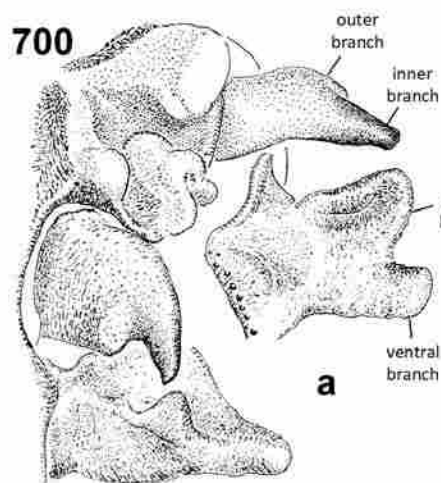
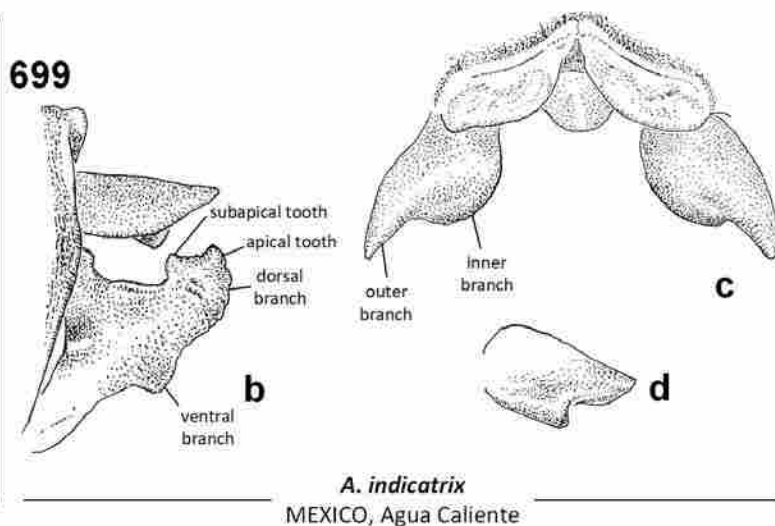
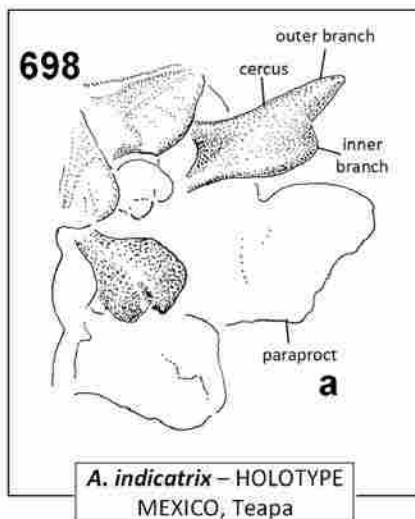


A. hinei
MEXICO, Aconchi Hot Springs

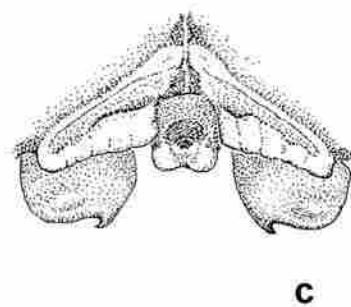
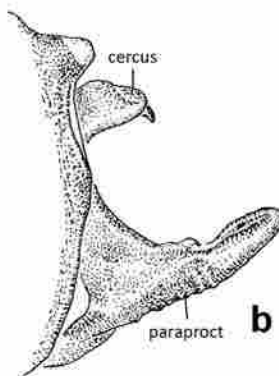
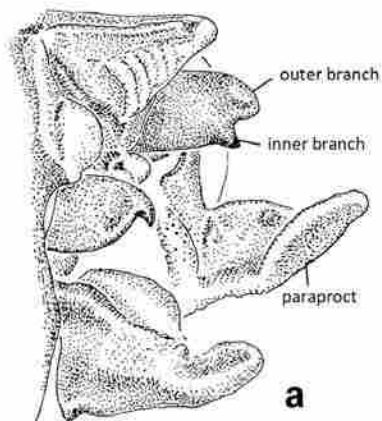
697



A. immunda
BELIZE, Little Vaquero Creek

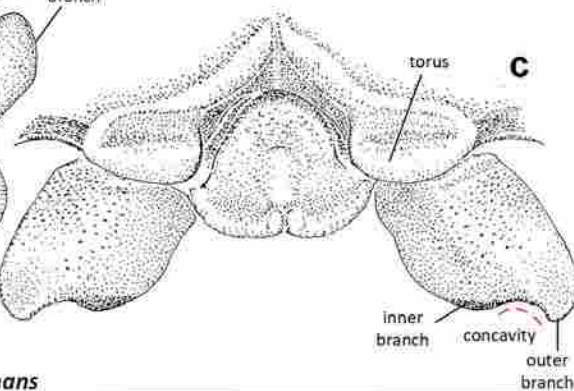
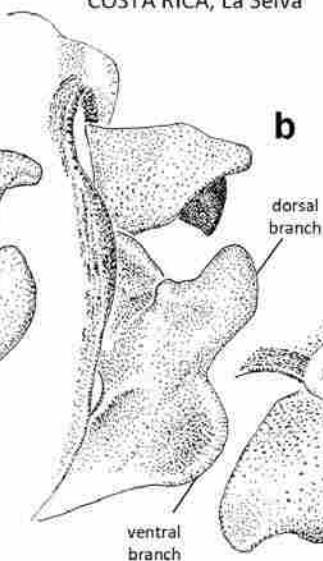


702



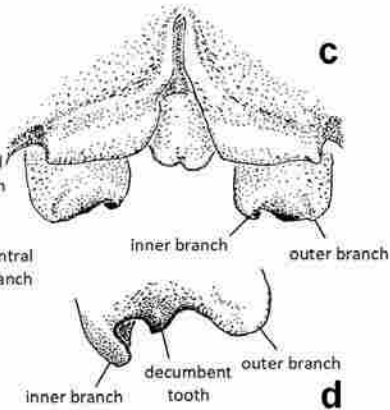
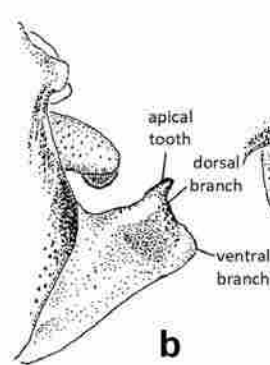
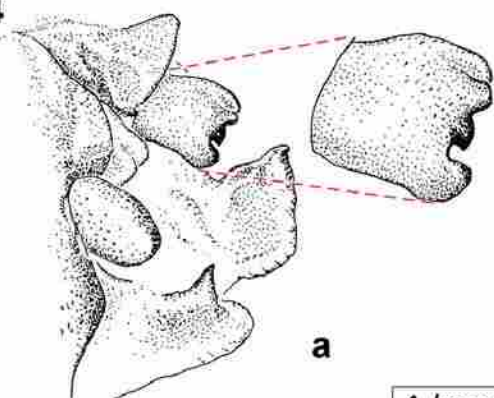
A. johannella
COSTA RICA, La Selva

703



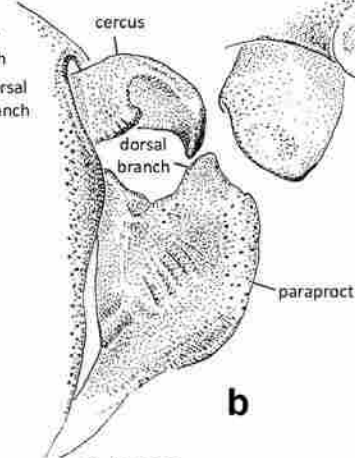
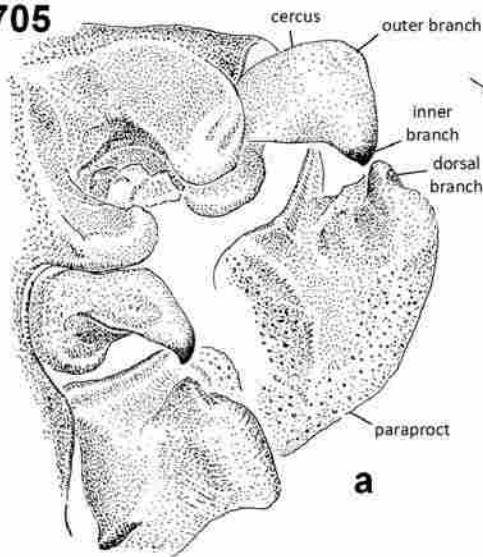
A. lacrimans
MEXICO, La Fuente

704



A. leonora – PARATYPE
MEXICO, Nacataz Park

705



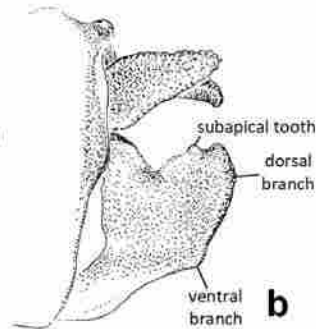
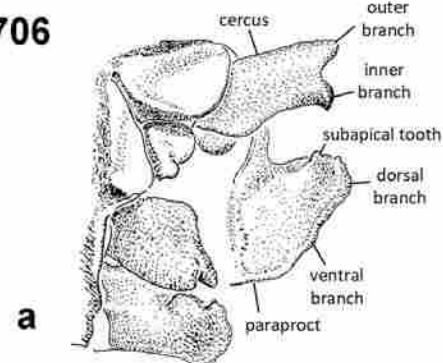
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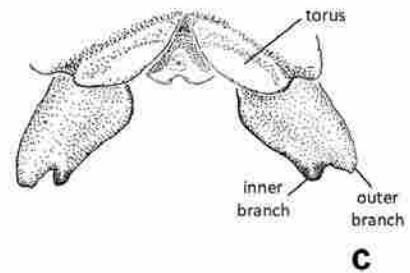
A. lugens

USA, Seven Springs

706



b

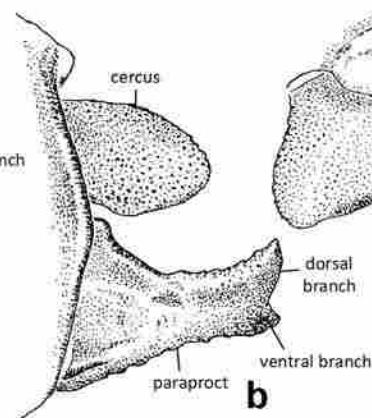
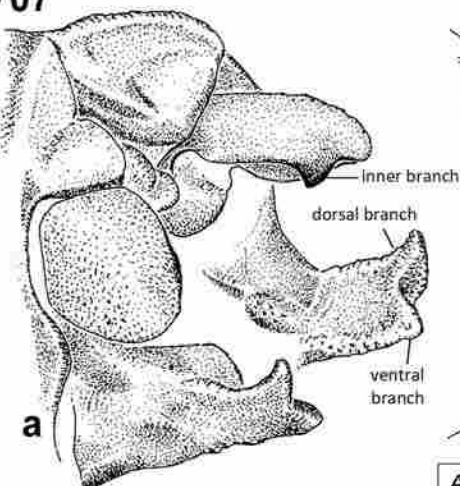


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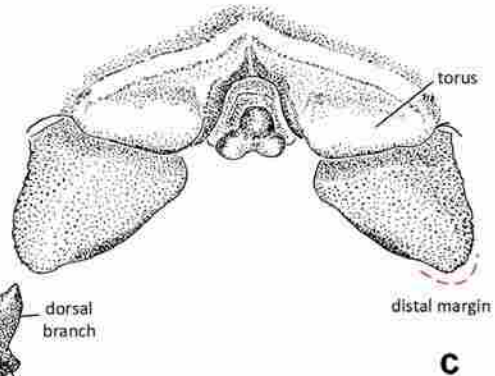
A. mayi

MEXICO, La Palma

707



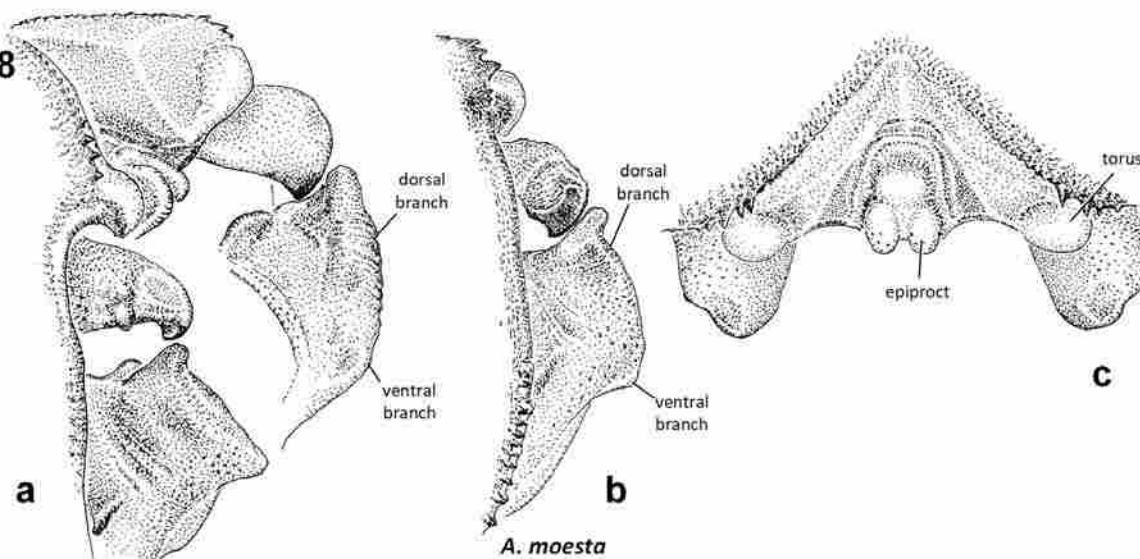
b



c

A. medullaris – LECTOTYPE
COLOMBIA, Bogotá

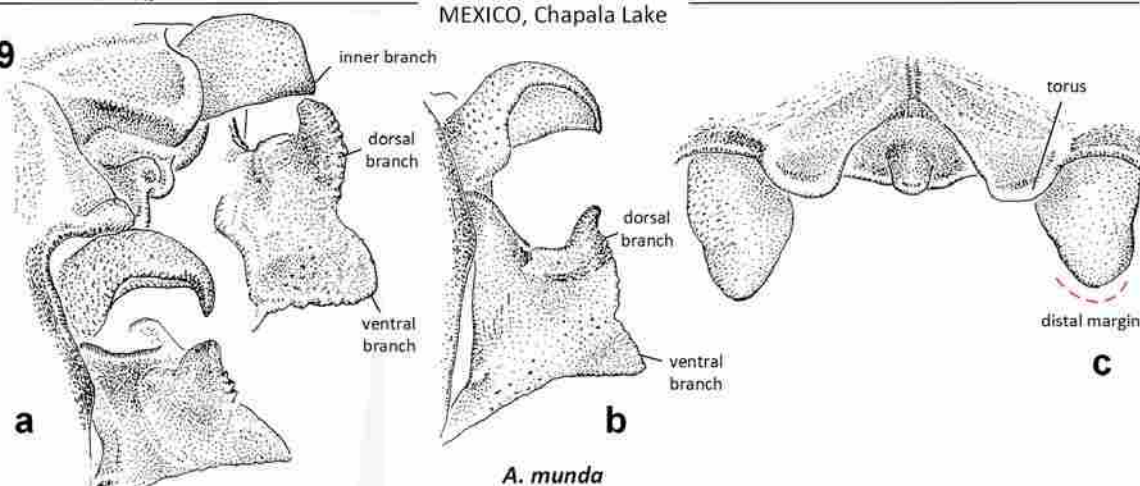
708



A. moesta

MEXICO, Chapala Lake

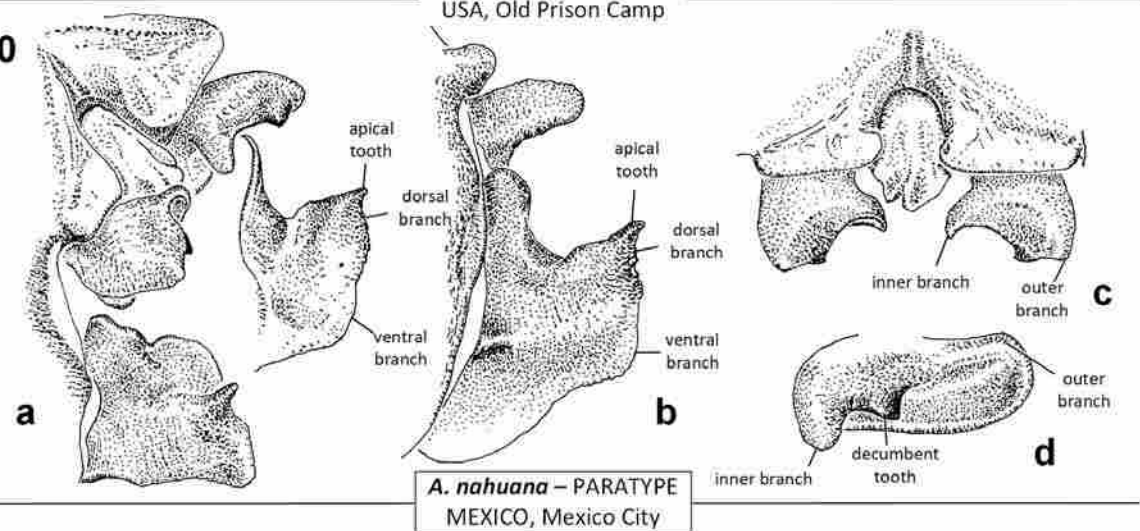
709



A. munda

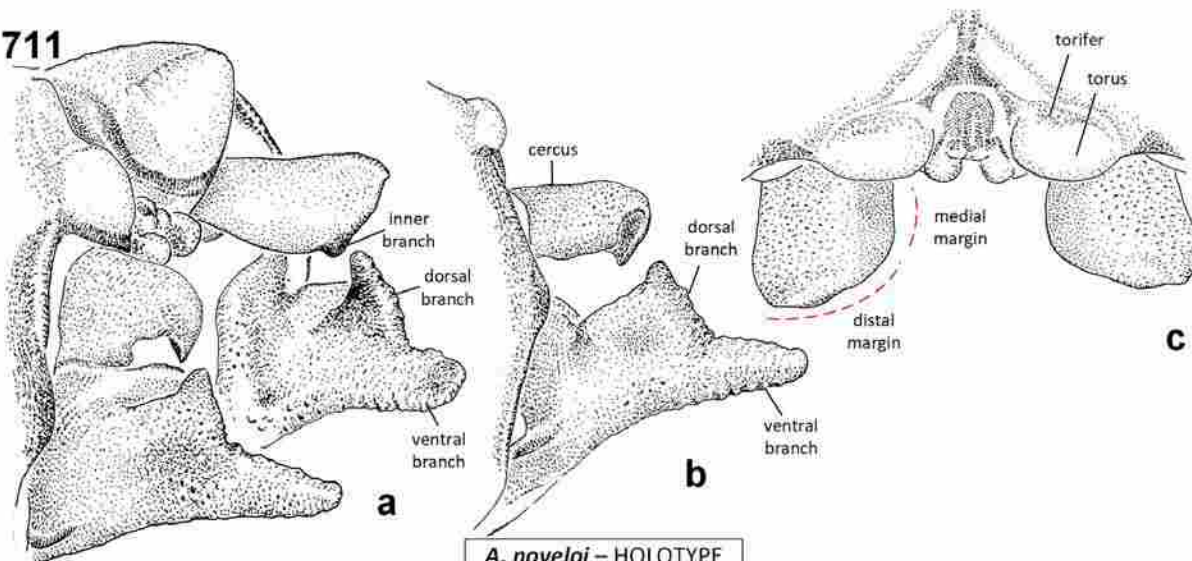
USA, Old Prison Camp

710



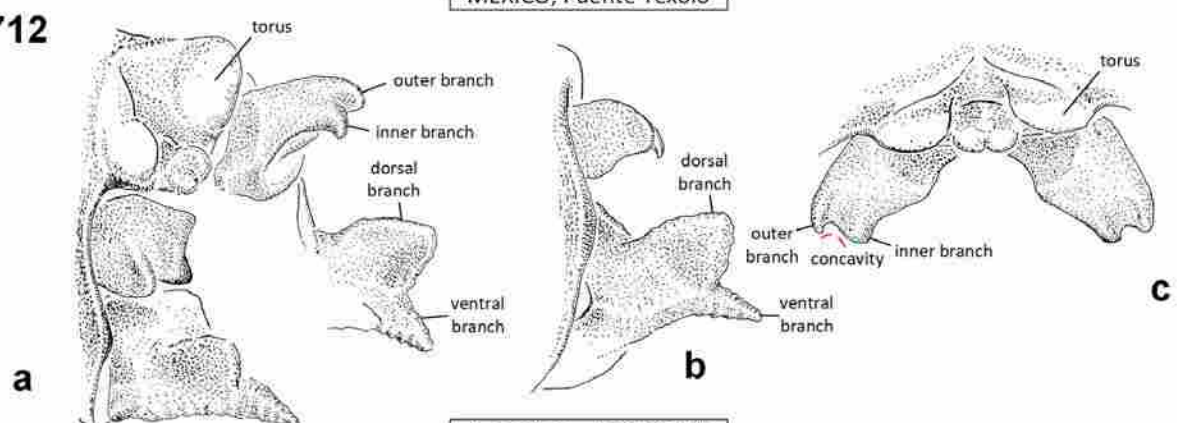
A. nahuana – PARATYPE
MEXICO, Mexico City

711



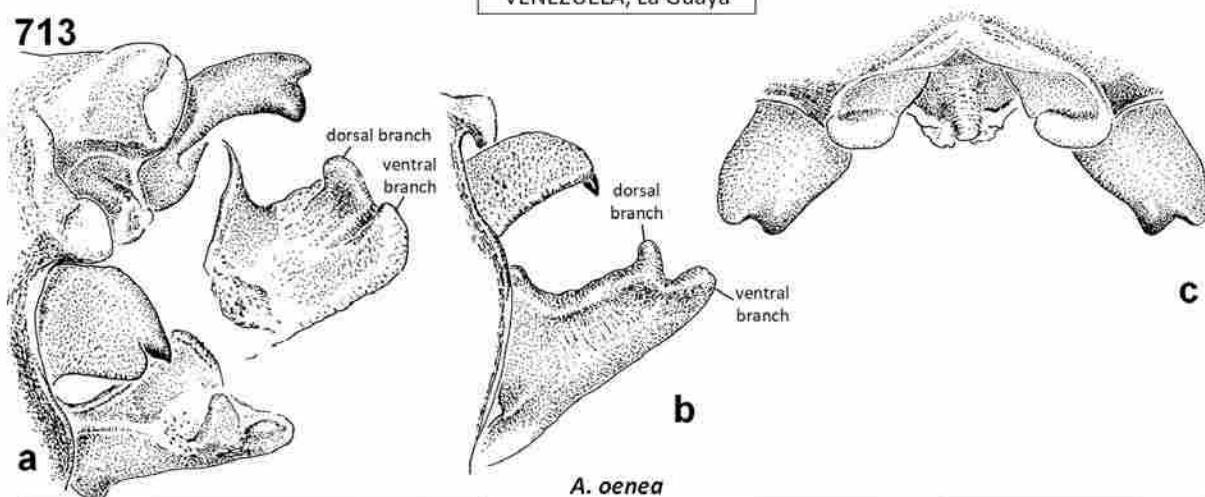
A. noveloi – HOLOTYPE
MEXICO, Puente Texolo

712



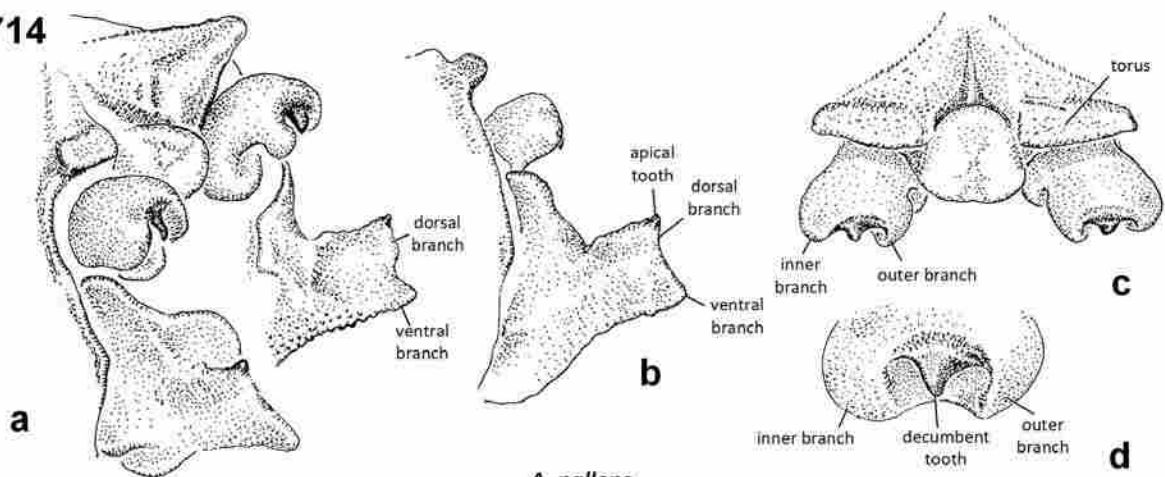
A. oculata – LECTOTYPE
VENEZUELA, La Guaya

713



A. oenea
MEXICO, La Fraternidad

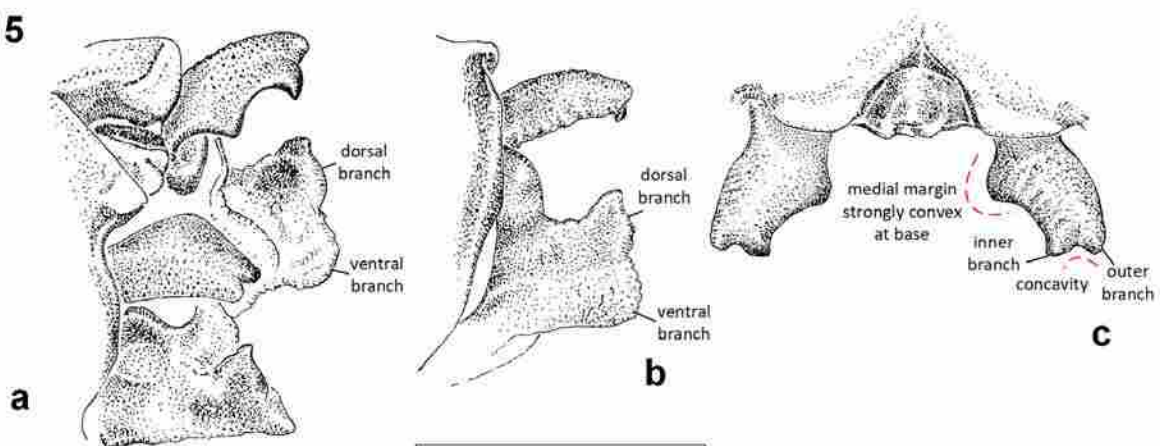
714



A. pallens

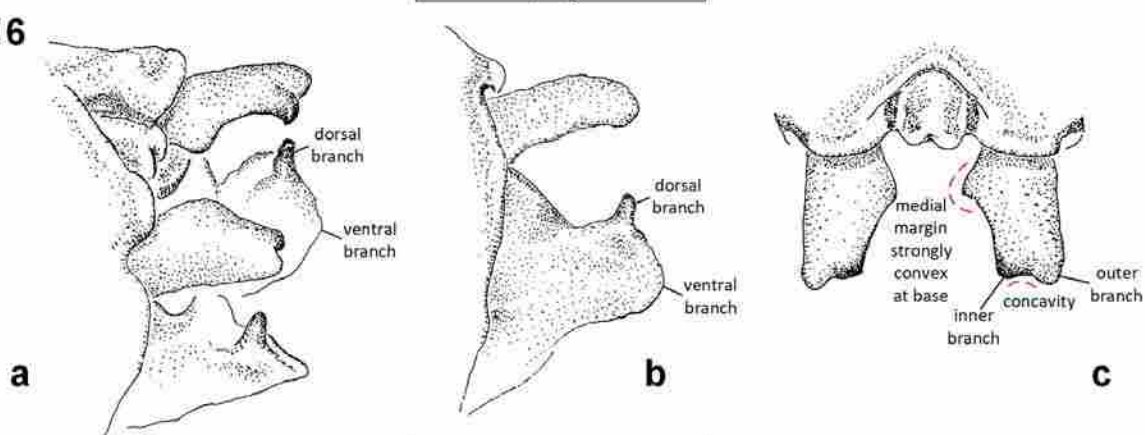
GUATEMALA, Agua Caliente

715

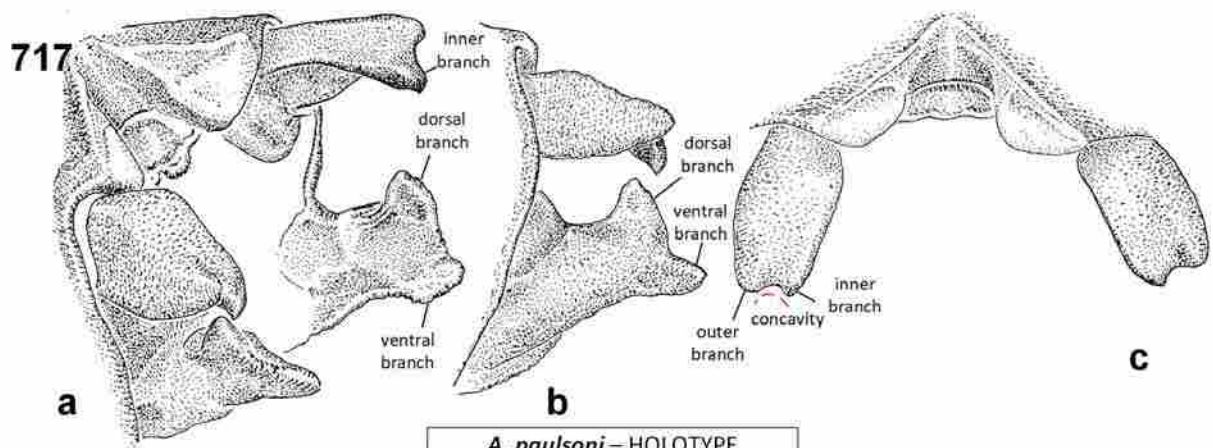


A. paludicola – HOLOTYPE
USA, Bog Tank

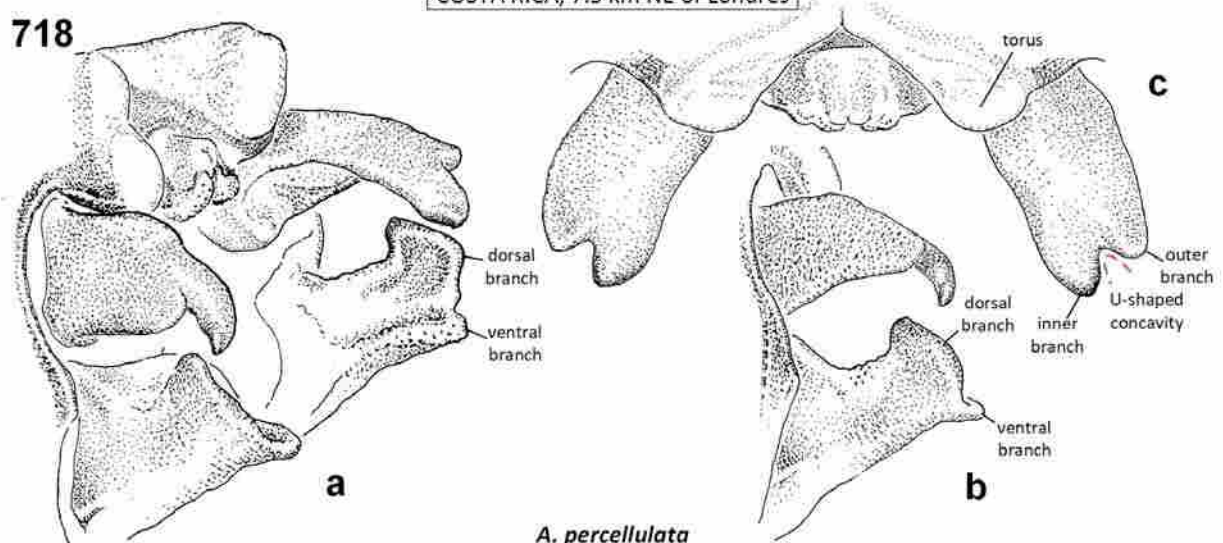
716



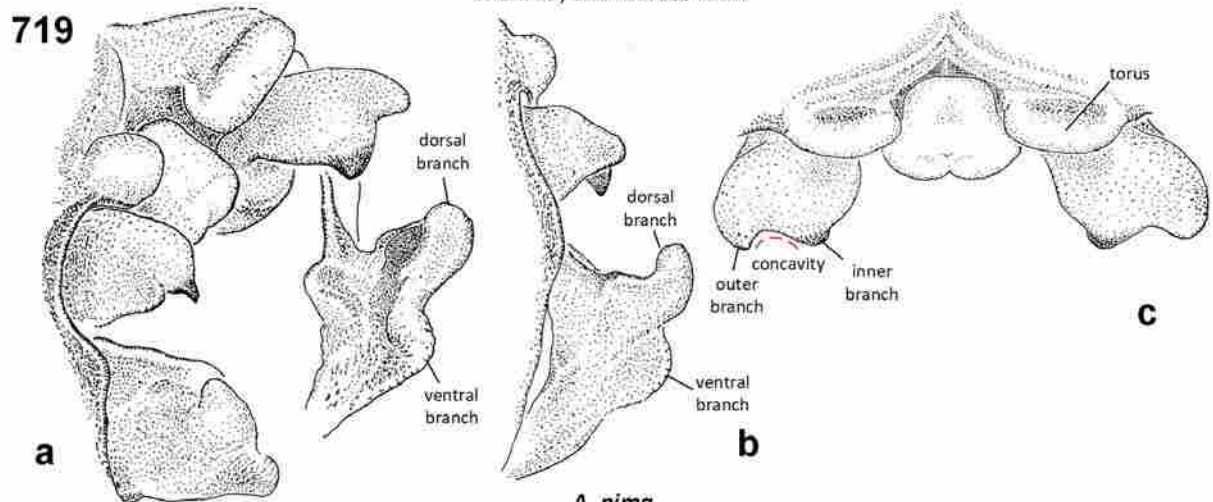
A. paludicola – PARATYPE
MEXICO, La Michilia Reserve



A. paulsoni – HOLOTYPE
COSTA RICA, 7.5 km NE of Londres

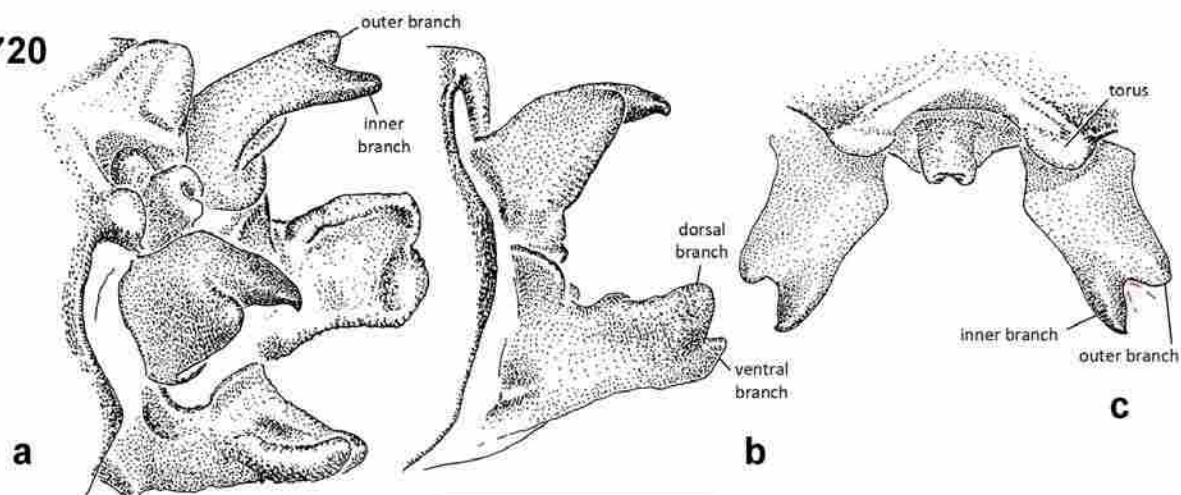


A. percellulata
MEXICO, San Marcos River



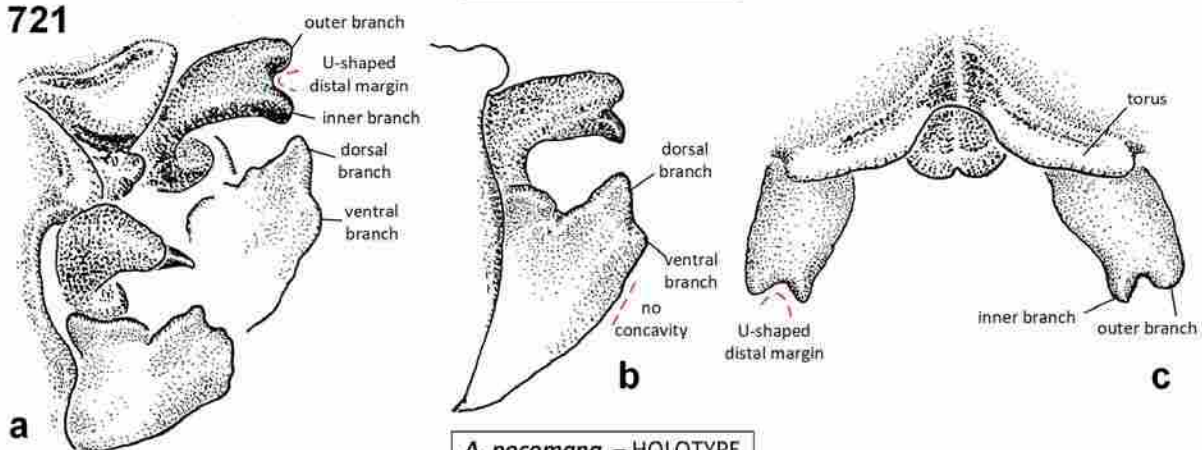
A. pima
USA, Upper Sabino Canyon

720



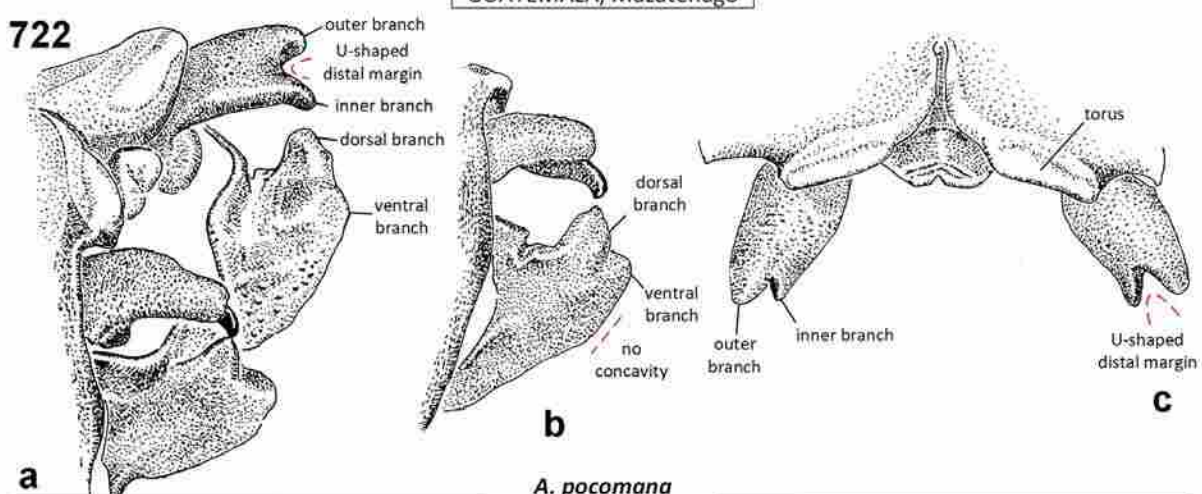
A. pipila – PARATYPE
GUATEMALA, Escuintla

721



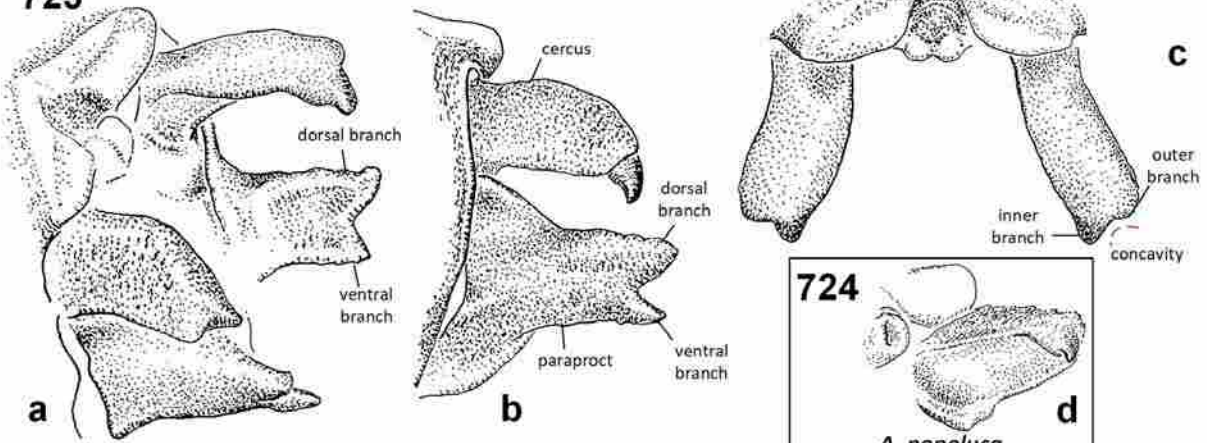
A. pocomana – HOLOTYPE
GUATEMALA, Mazatenango

722



A. pocomana
COSTA RICA, Mesas

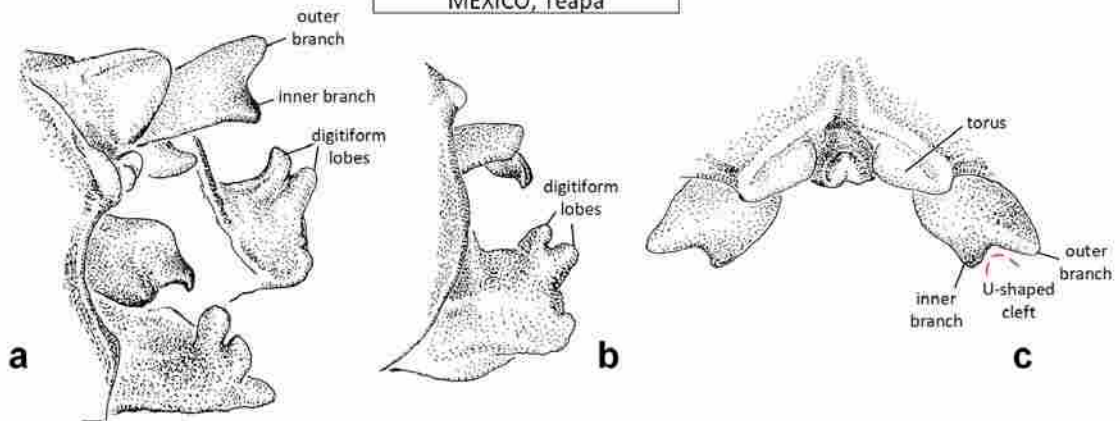
723



A. popoluca – HOLOTYPE
MEXICO, Teapa

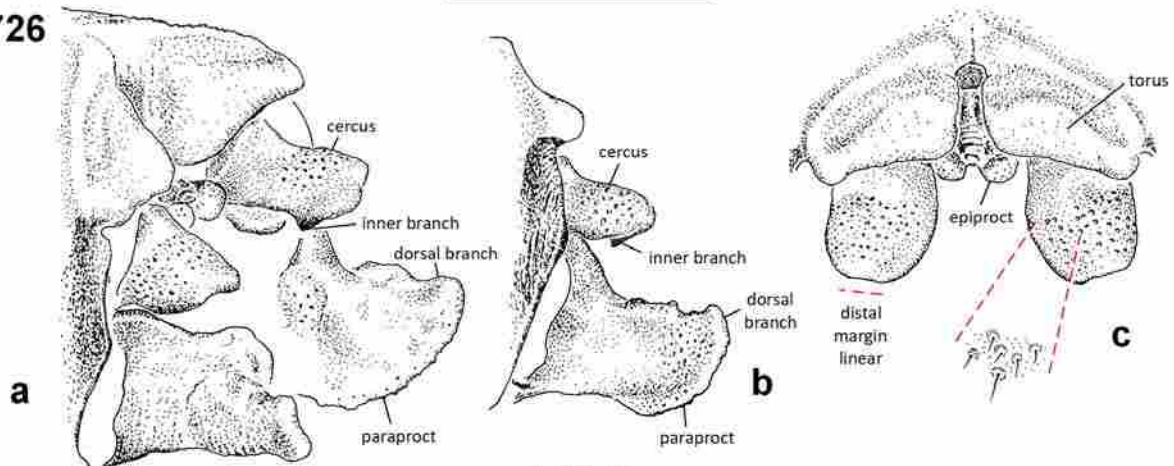
COSTA RICA, La Selva

725



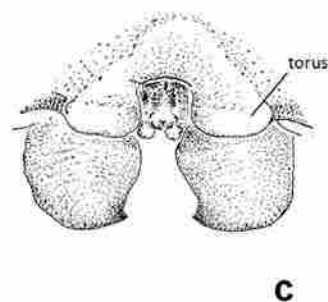
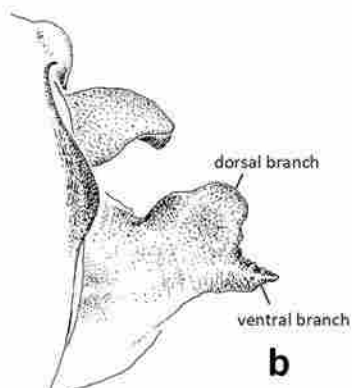
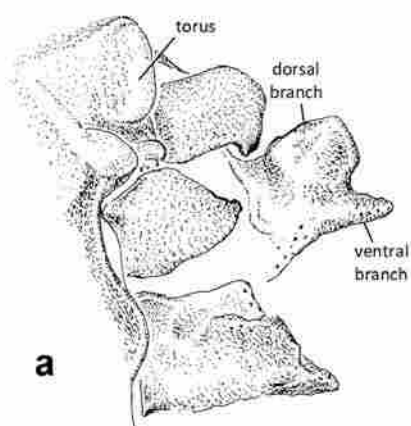
A. pulla – LECTOTYPE
VENEZUELA

726



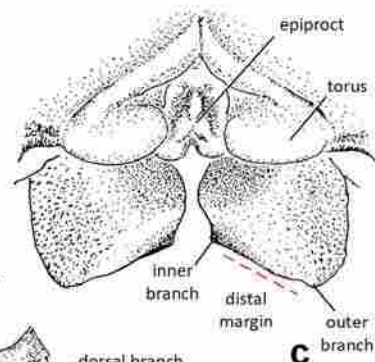
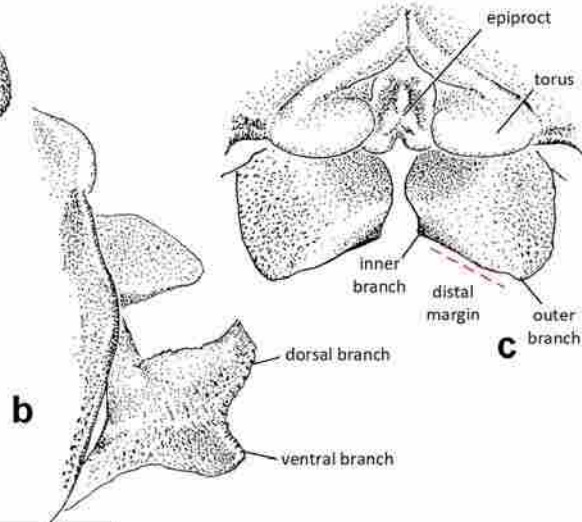
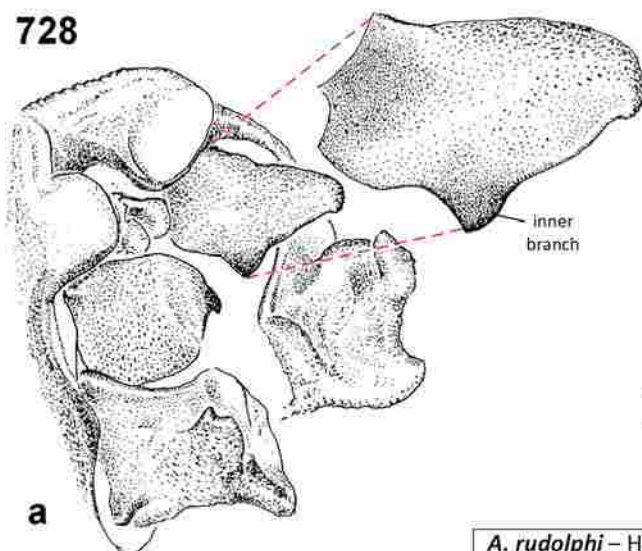
A. rhoadsi
MEXICO, Ojitipa River

727



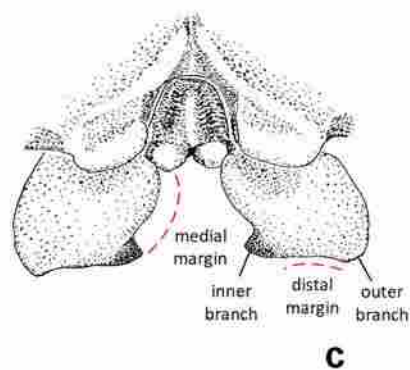
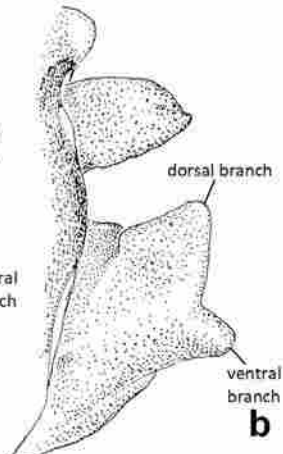
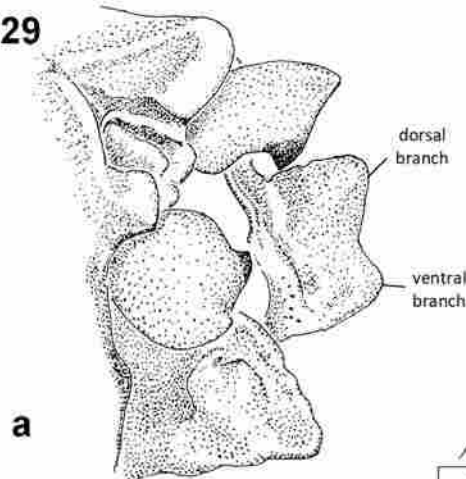
A. rogersi
COSTA RICA, El Rodeo

728



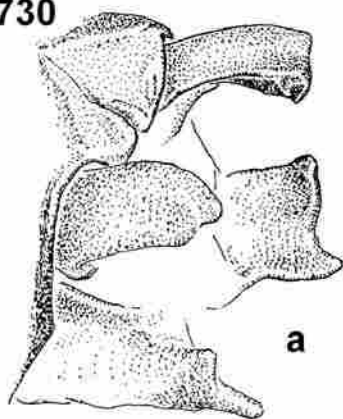
A. rudolphi – HOLOTYPE
MEXICO, La Unión

729

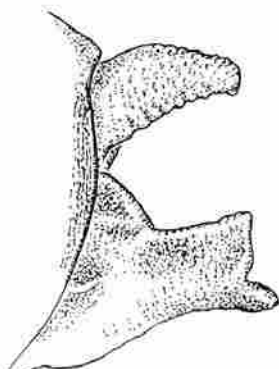


A. sabino – PARATYPE
USA, Sabino Canyon

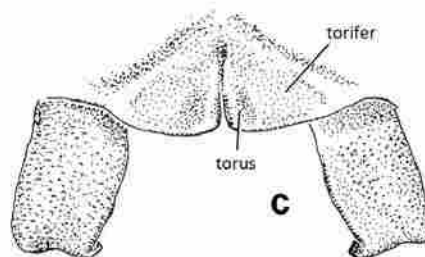
730



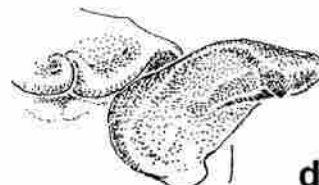
a



b



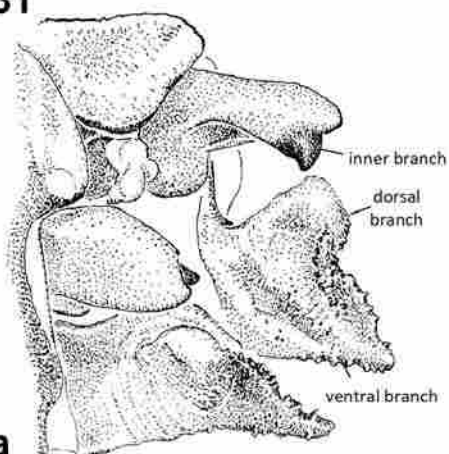
c



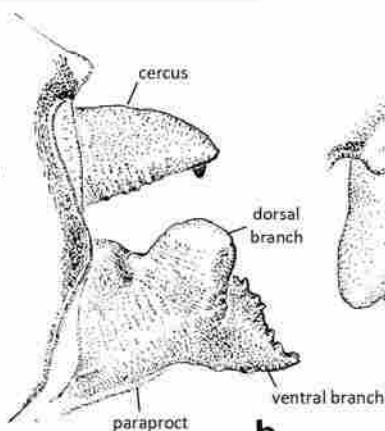
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A. schorri – HOLOTYPE
COSTA RICA, Golfito

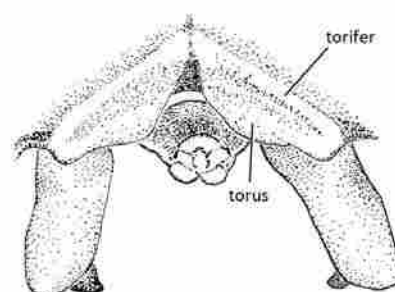
731



a



b

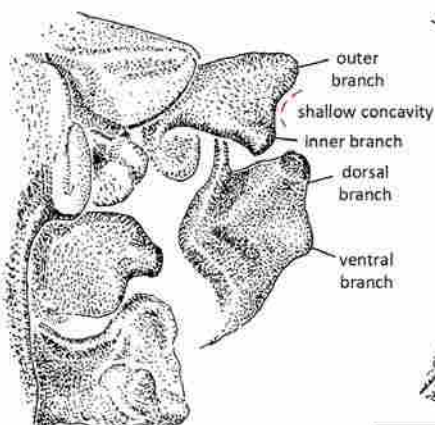


c

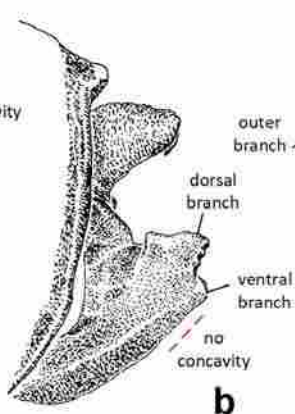
A. sedula

MEXICO, Headwater of Coy River

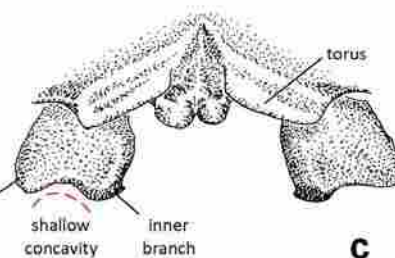
732



a



b

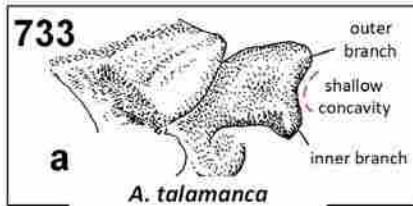


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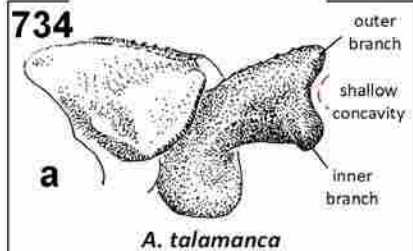


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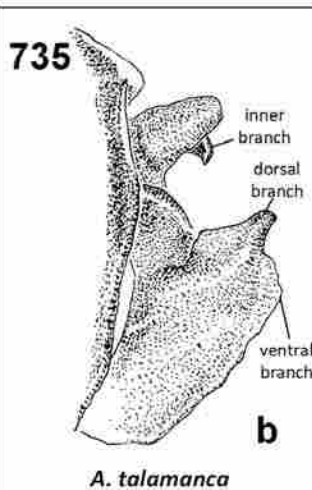
A. talamanca – HOLOTYPE
COSTA RICA, Carrillo



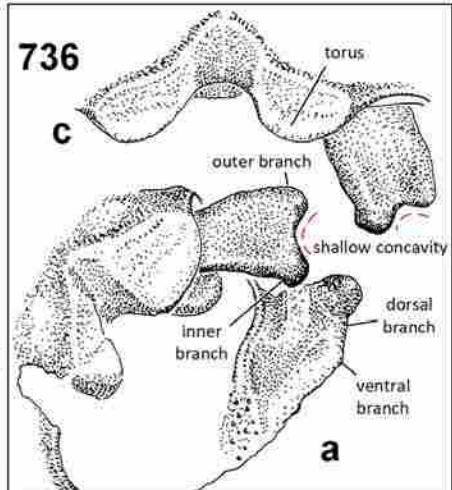
COSTA RICA, Juan Viñas



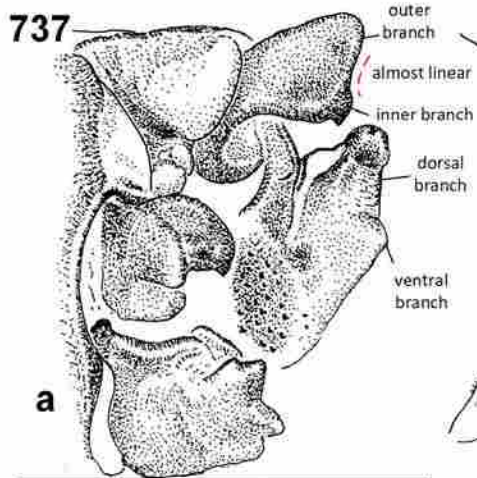
COSTA RICA, 13 km SE of Buenos Aires



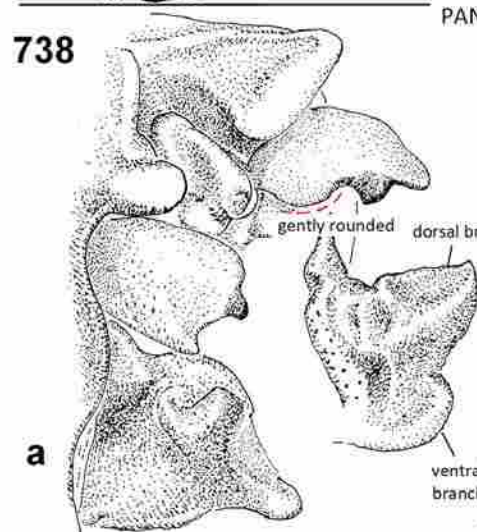
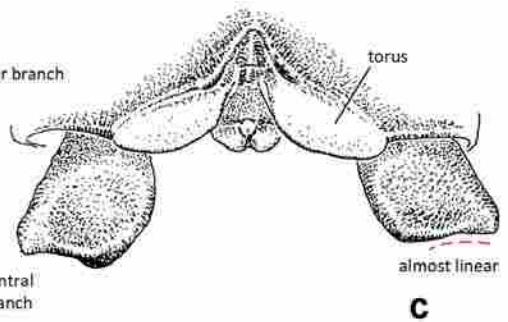
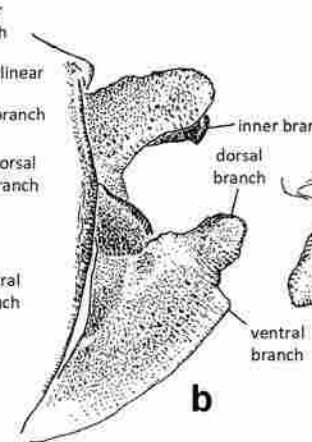
COLOMBIA, Digua River Dam



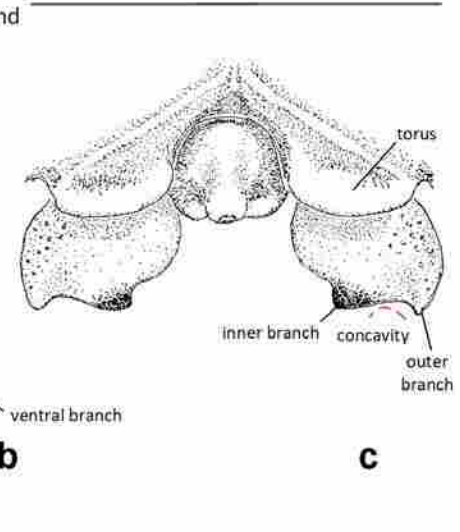
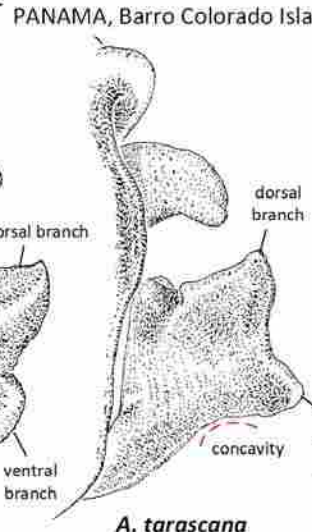
COLOMBIA, Umbria



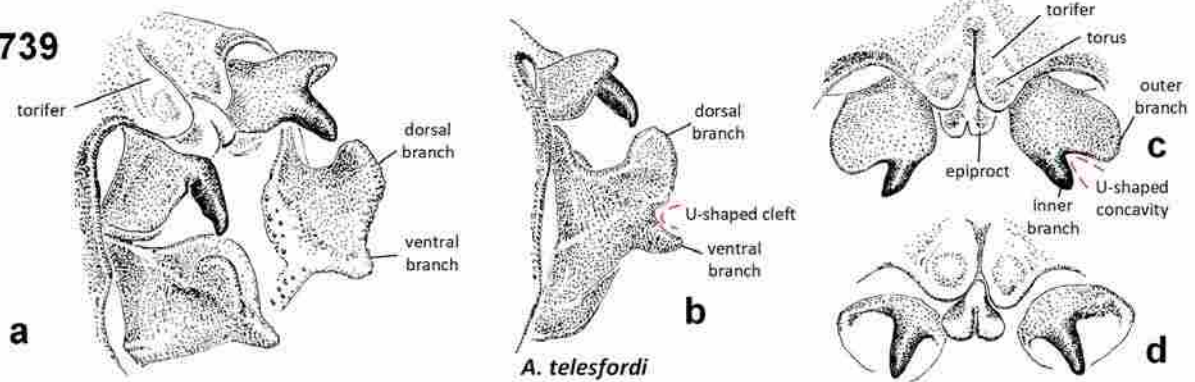
PANAMA, Barro Colorado Island



MEXICO, 10 km W of Cuernavaca

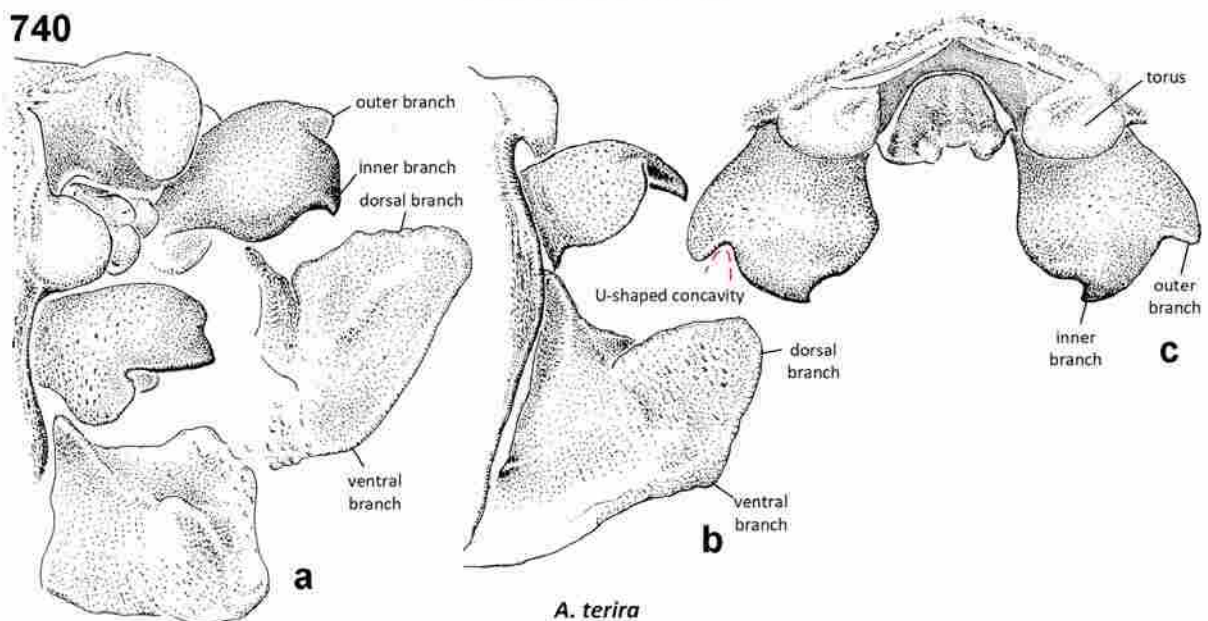


739



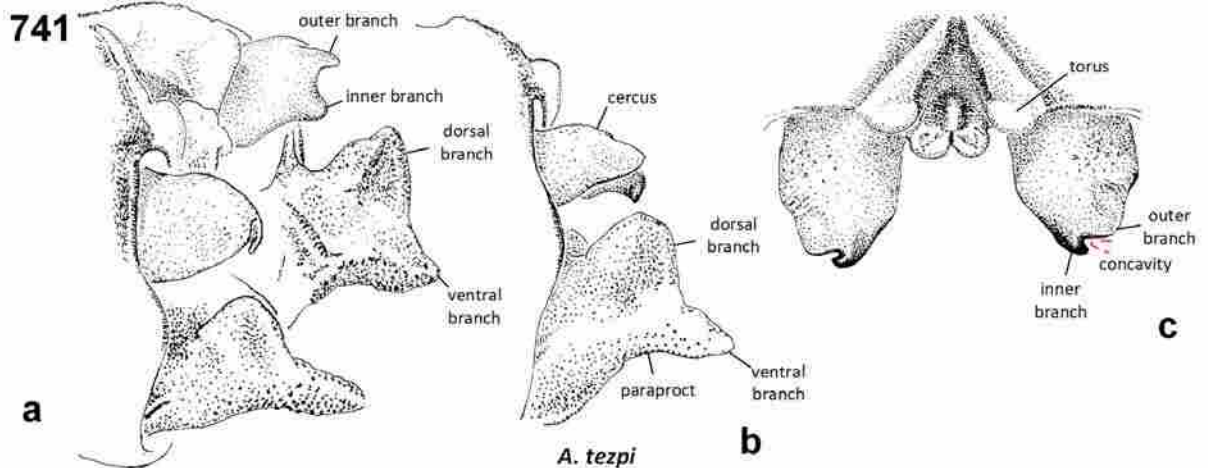
A. telesfordi
GRENADA, Annandale Falls

740



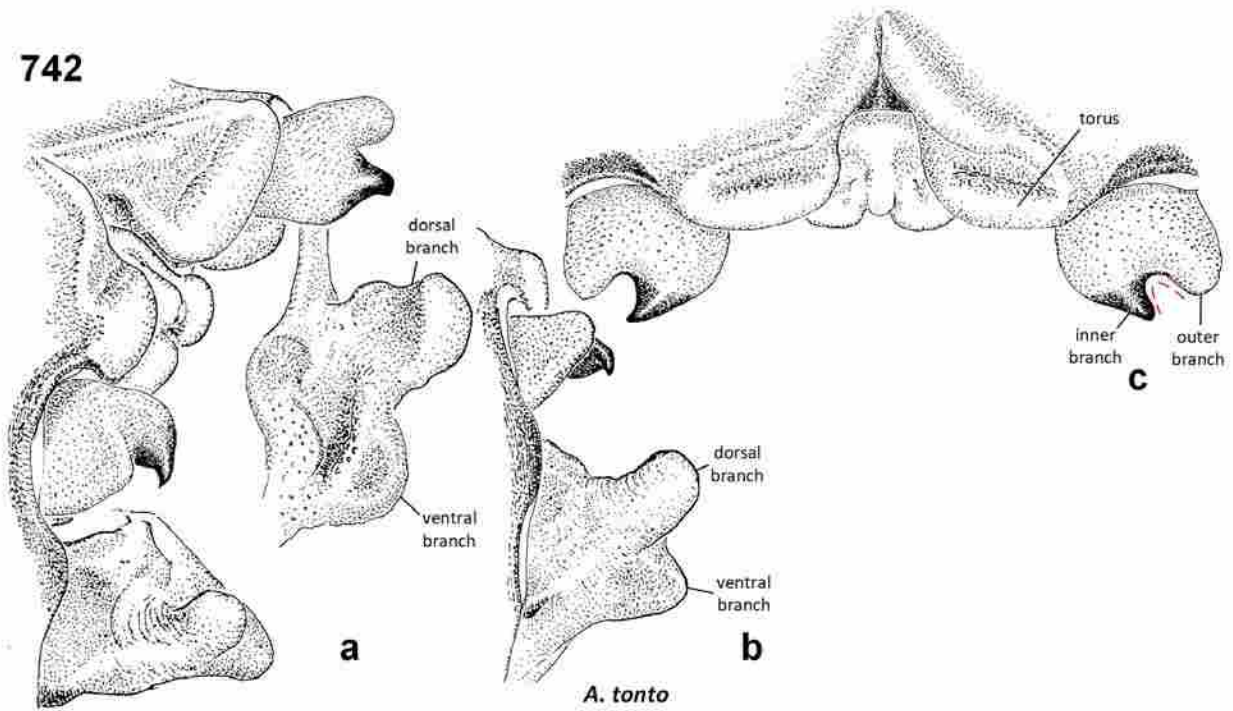
A. terira
COSTA RICA, Tapanti

741



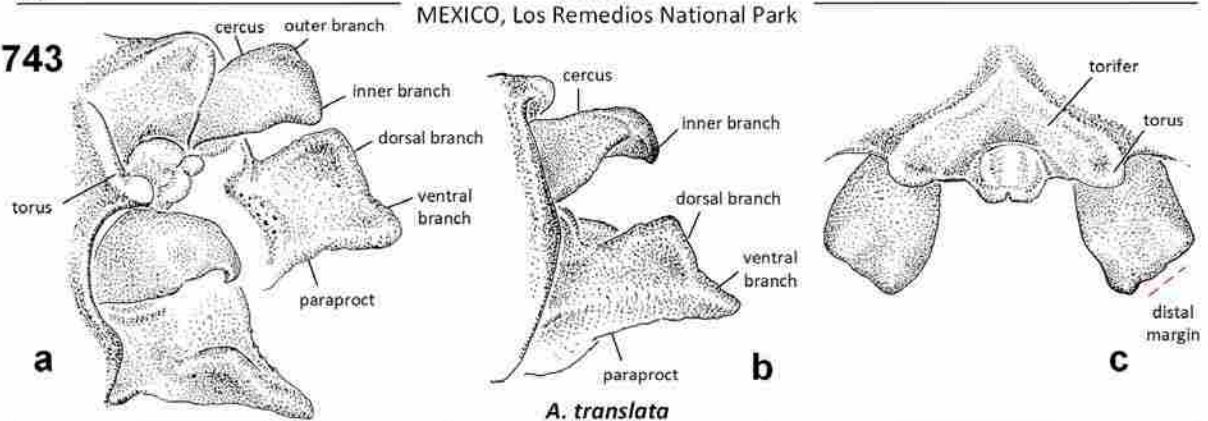
A. tezpi
MEXICO, 12 km S of Loreto

742



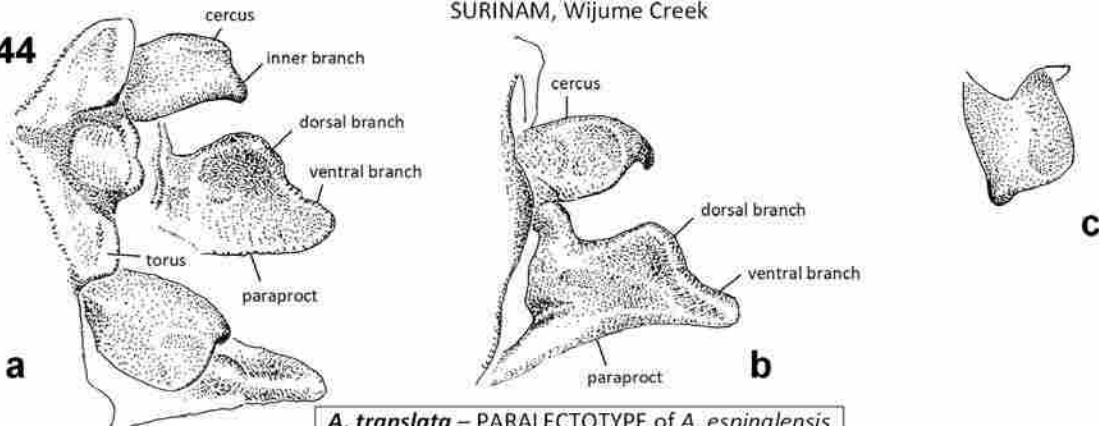
MEXICO, Los Remedios National Park

743



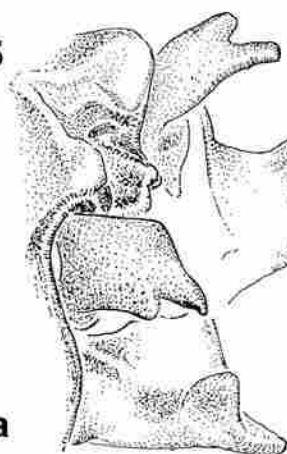
SURINAM, Wijume Creek

744

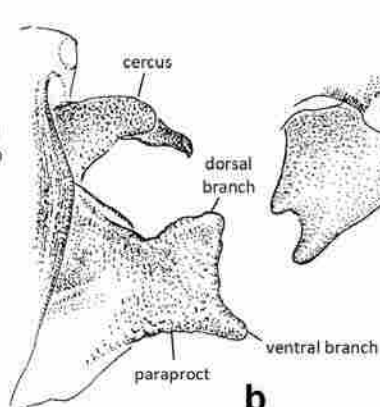


A. translata – PARALECTOTYPE of *A. espinalensis*
COLOMBIA, Espinal

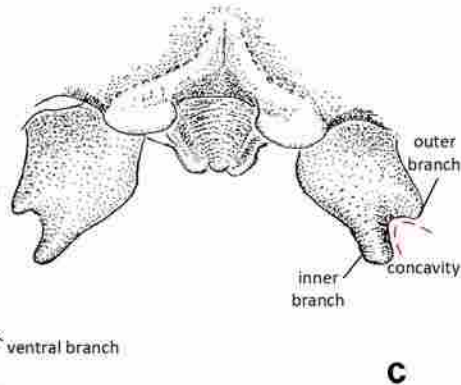
745



a



b

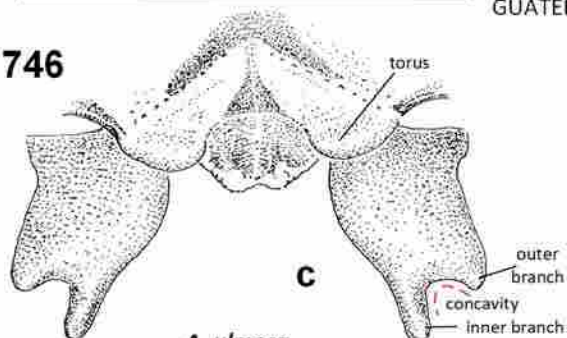


c

A. ulmeca

GUATEMALA, El Fiscal

746

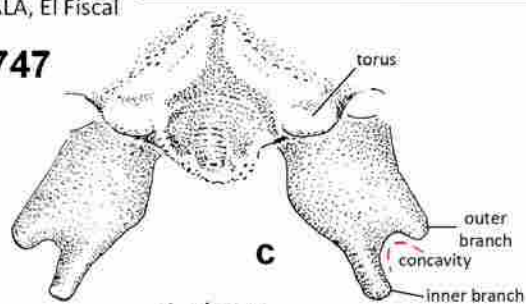


c

A. ulmeca

MEXICO, Cuernavaca

747

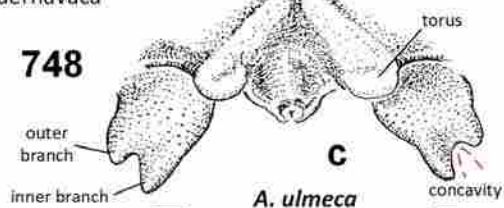


c

A. ulmeca

MEXICO, La Cañada Ancha

748

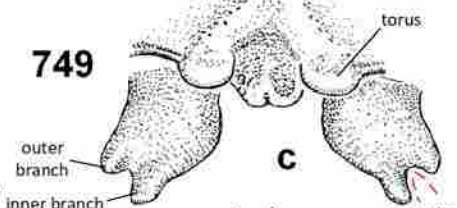


c

A. ulmeca

MEXICO, Laguna Azul

749

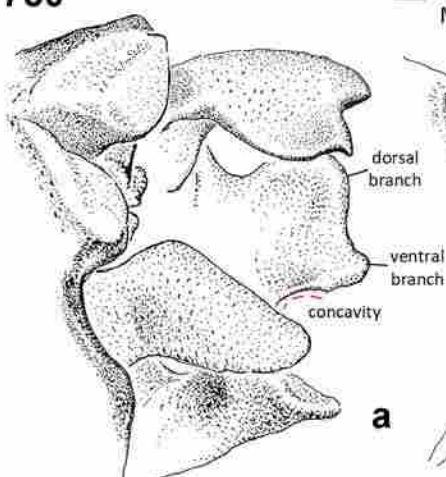


c

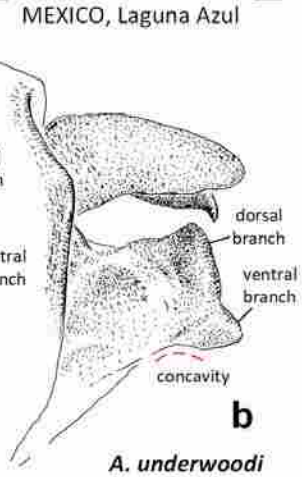
A. ulmeca

COLOMBIA, Mariquita

750



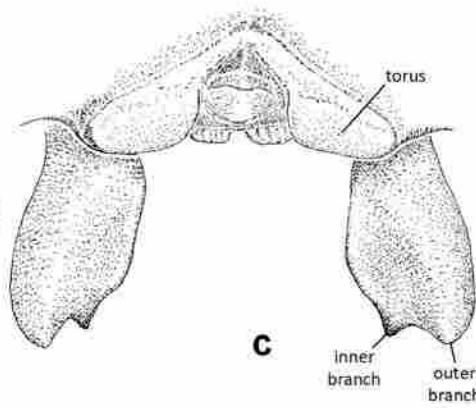
a



b

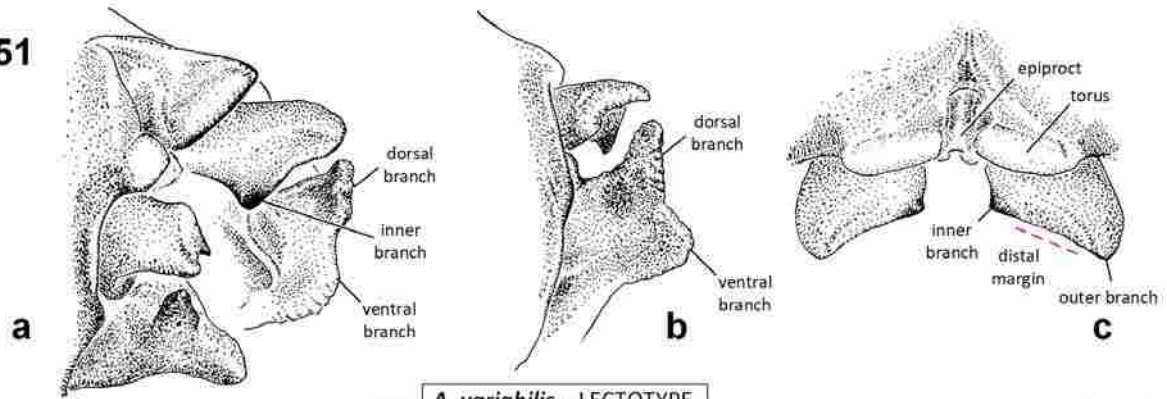
A. underwoodi

COSTA RICA, Sarapiquí River



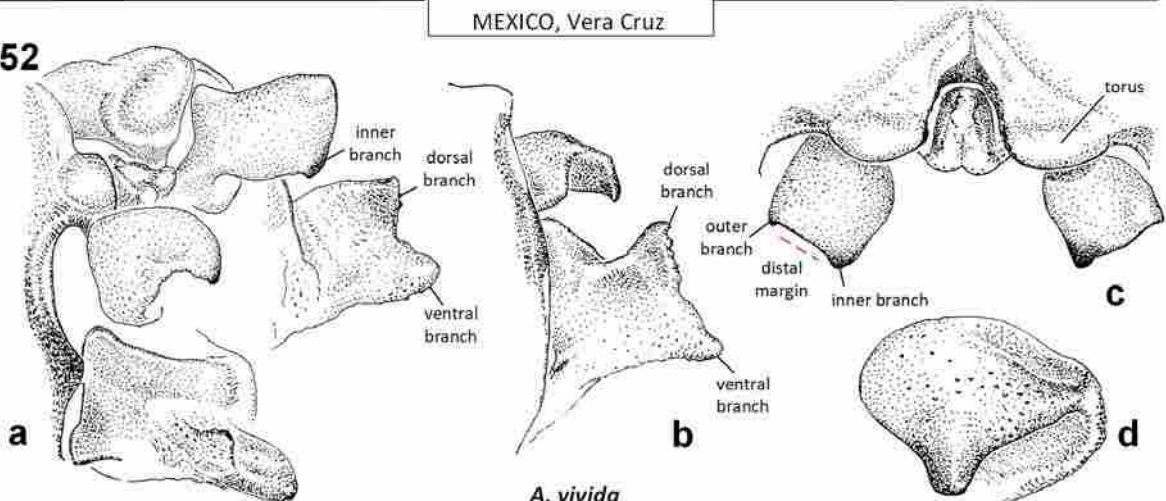
c

751



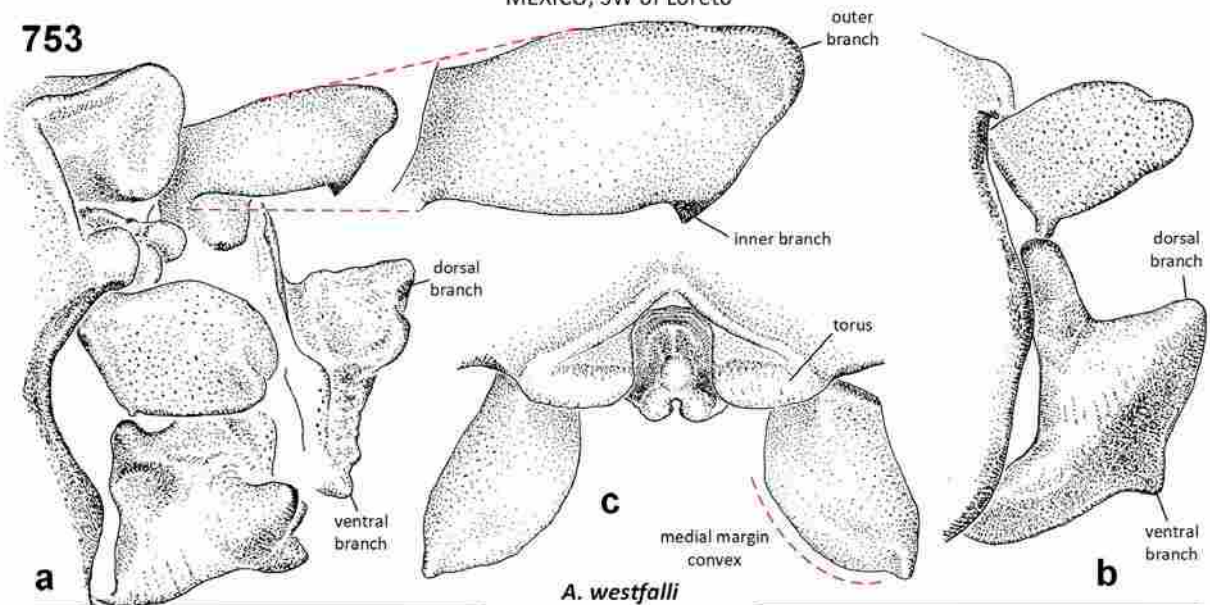
A. variabilis – LECTOTYPE
MEXICO, Vera Cruz

752



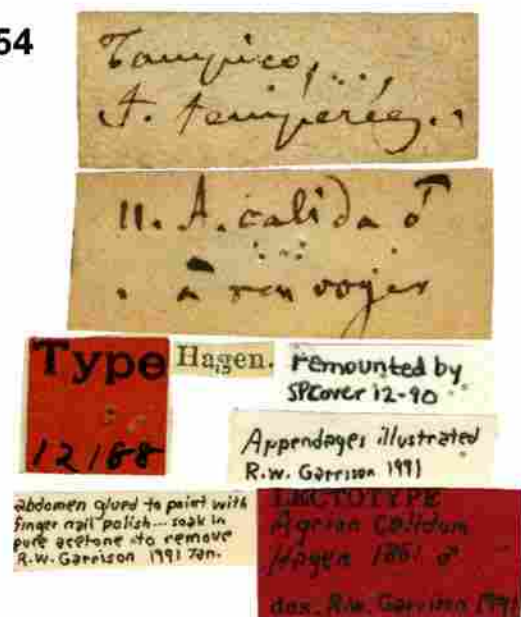
A. vivida
MEXICO, SW of Loreto

753



A. westfalli
MEXICO, Horsetail Falls

754



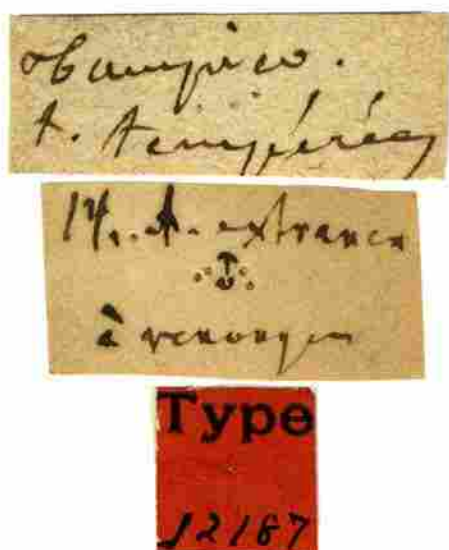
A. calida – LECTOTYPE
labels MCZ

755



A. wilsoni – HOLOTYPE
labels MCZ

756



A. extranea – HOLOTYPE
labels MCZ

757



A. mista – HOLOTYPE
labels MNHP

758

Mexican Type
Muf. Mexico

A. funebris
a new species

Type
12180

Penis
drawn

A. funebris – LECTOTYPE
labels MCZ

760

San Juan Sentehuecan
Mexico
14. XI. 31

Argia
Spegazzinii ♂ Nav.
P. Navás S. J. det.

Argia spegazzinii
Navás, 1934
Lectotype ♂
J. Legrand det. 1994

TYPE

MUSEUM PARIS
LONGIN NAVAS LEGIT. 19

LECTOTYPE

A. spegazzinii – HOLOTYPE
labels MNHP

759

Sierra de las
Aguas Escondidas,
Guerrero, 4000 ft.
July. H. H. Smith.

Original of § 58
Pl. IV. B. C. A. Neur.
ARGIA VIVIDA
PLANA CALV. ♂
COTYPE.
P. P. Calvert det. 1901.

B. C. A.
Neuroptera.

Brit. Mus.
1911–339.

LECTO-
TYPE

A. vivida plana – HOLOTYPE
labels BMNH

761

Cordoba
Mexico.
(to the artist).

A. lacrimans ♂
a new species.

Type
12175

Hagen.

LECTOTYPE
Argia lacrimans Hagen
1861
des. R. W. Gorman (1911)

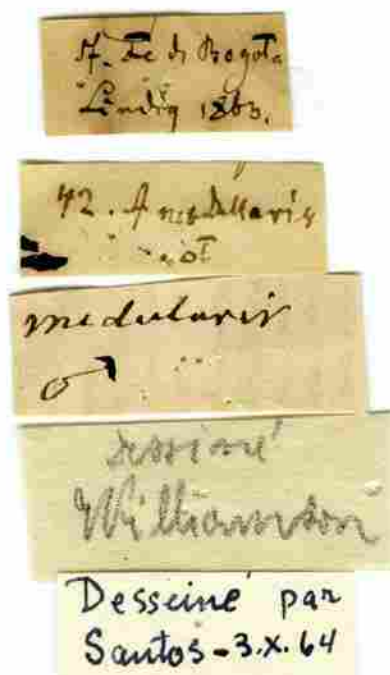
A. lacrimans – LECTOTYPE
labels MCZ

762



A. lugens – HOLOTYPE
labels MNB

763



A. medullaris – LECTOTYPE
labels RBINS

764



A. variata – HOLOTYPE
labels MNHP

765



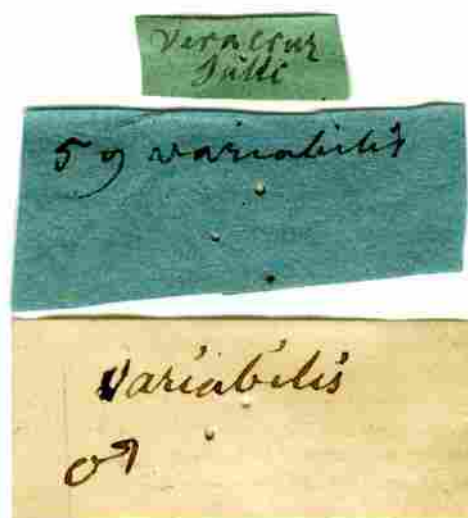
A. espinalensis – LECTOTYPE
labels FSCA

766

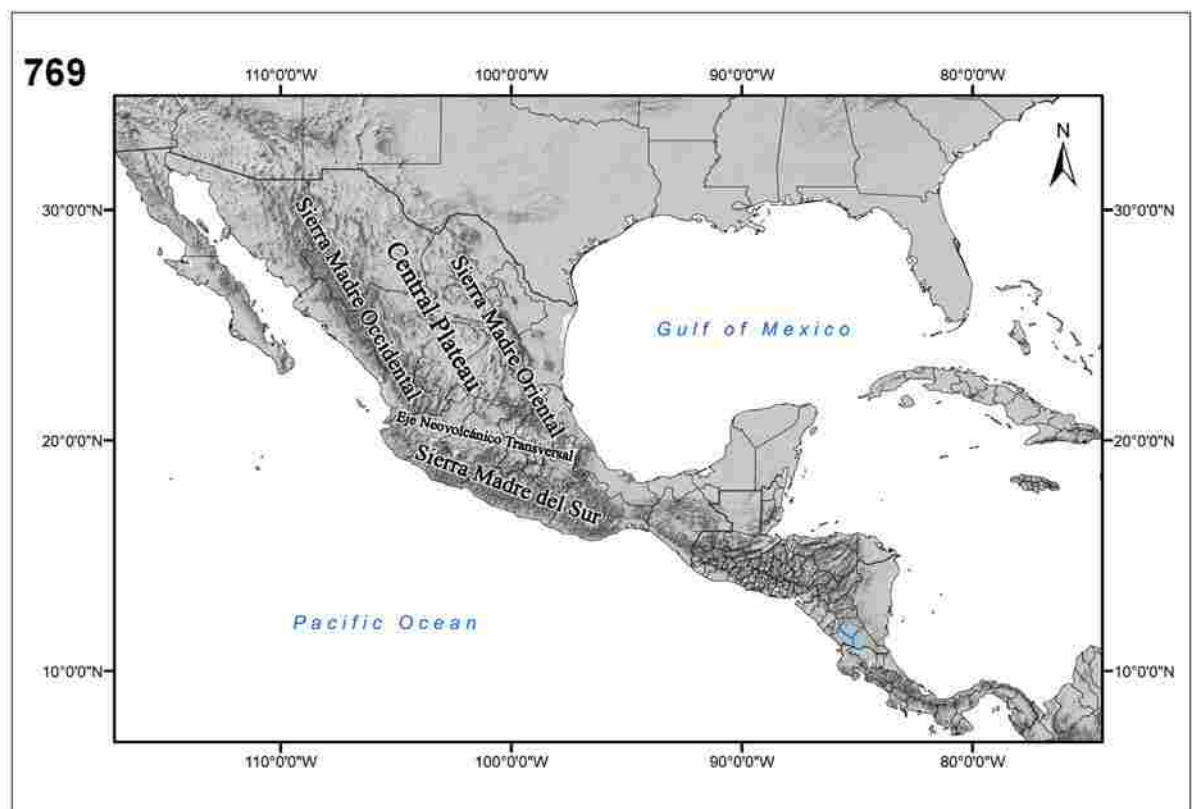


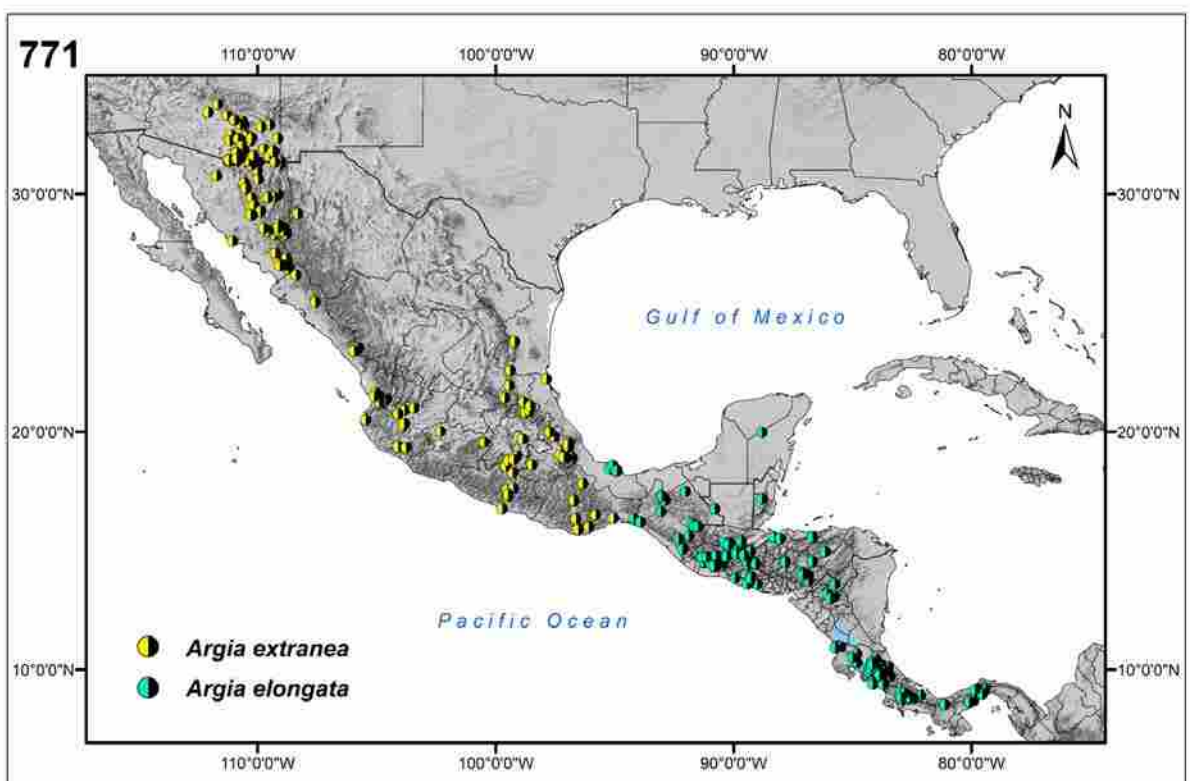
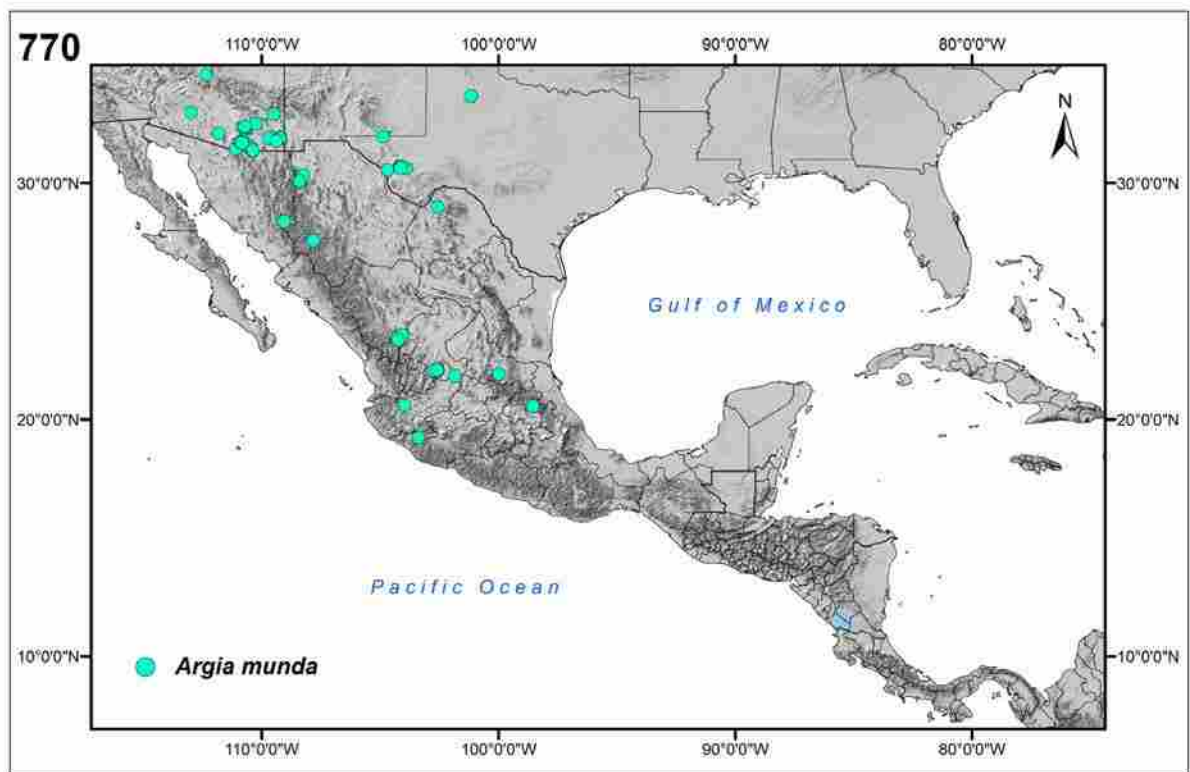
A. espinalensis – PARALECTOTYPE
labels MHNN

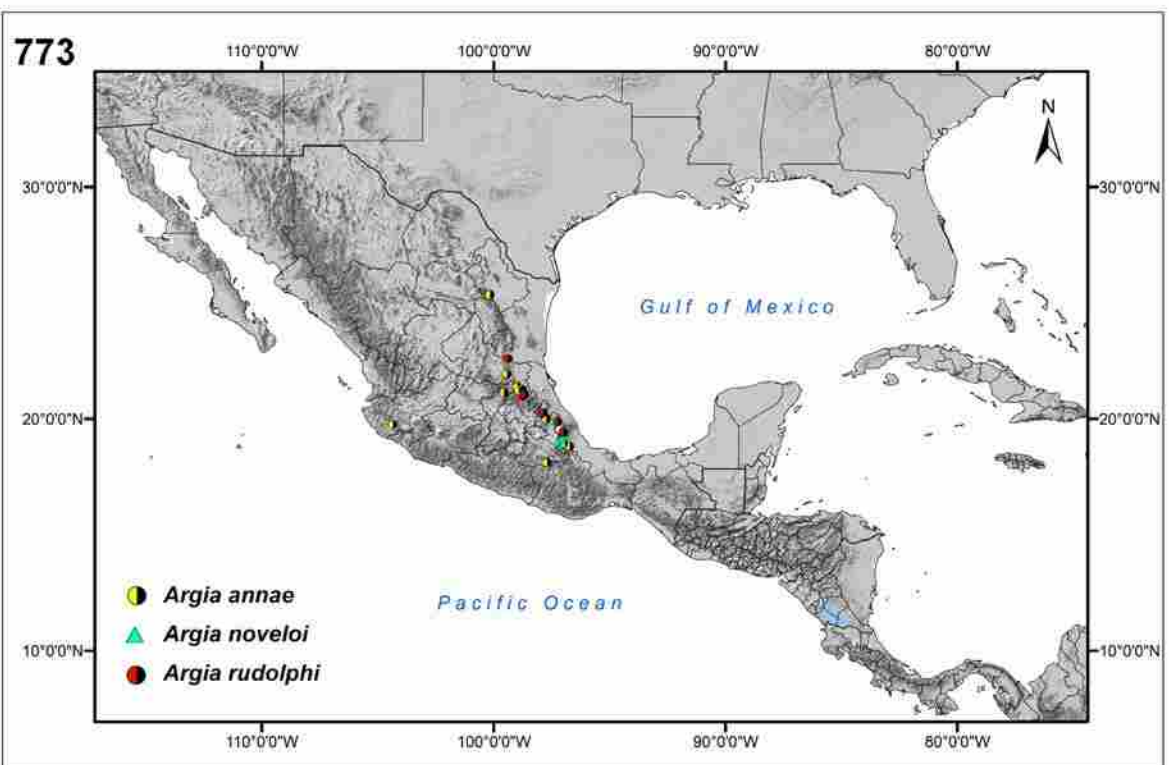
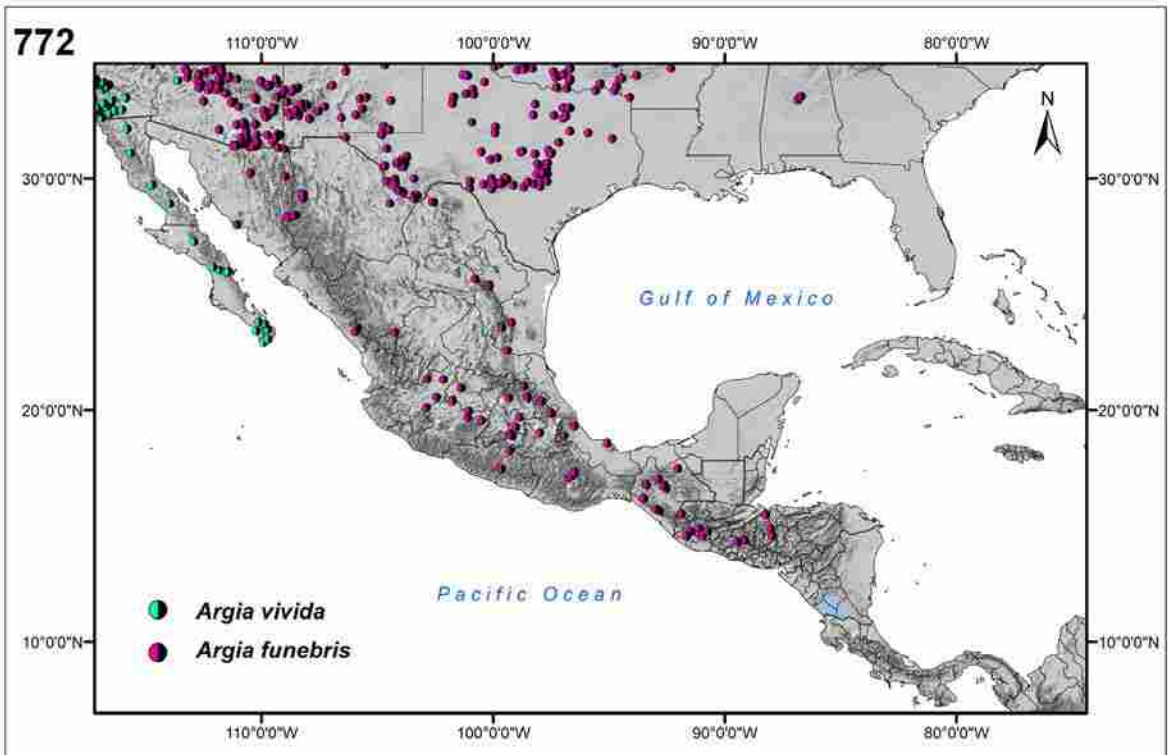
767



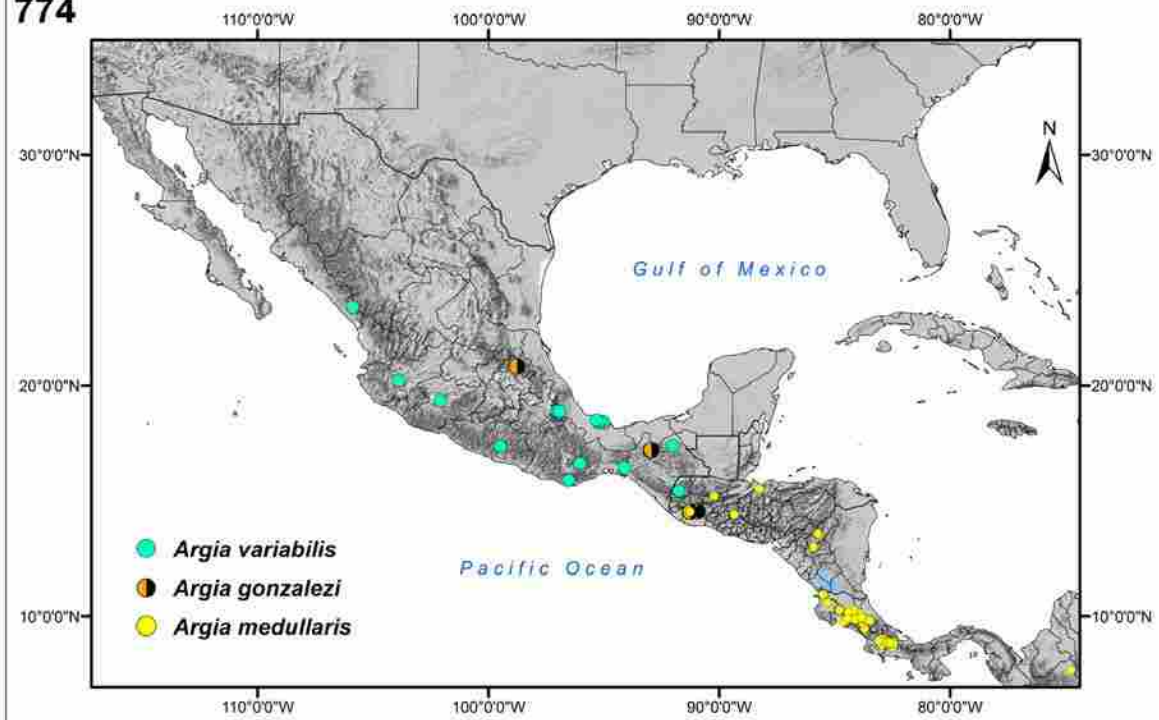
A. variabilis – LECTOTYPE
labels RBINS



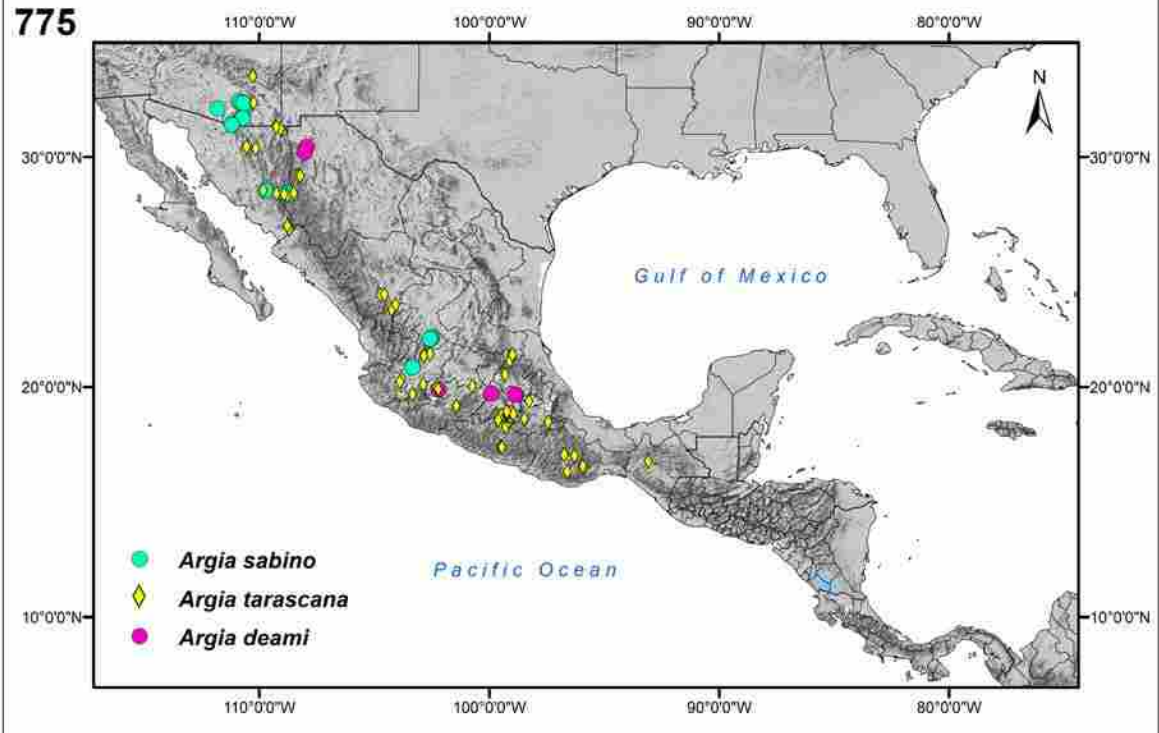


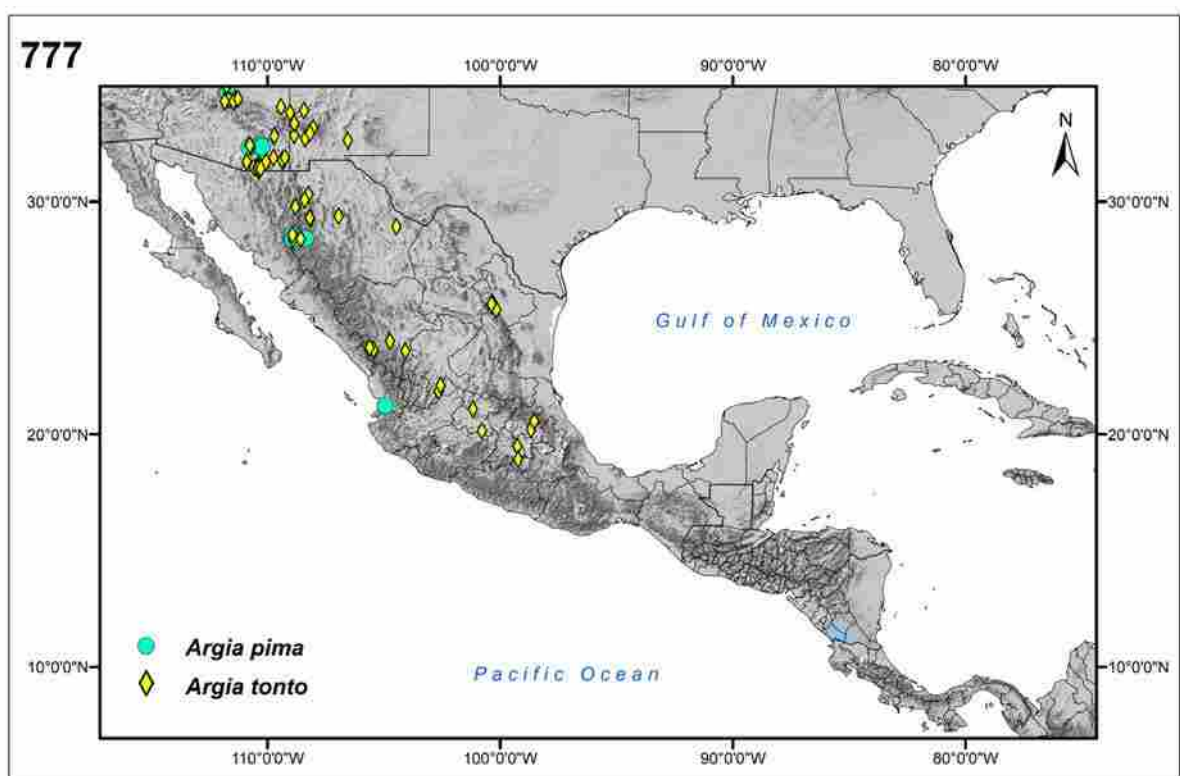
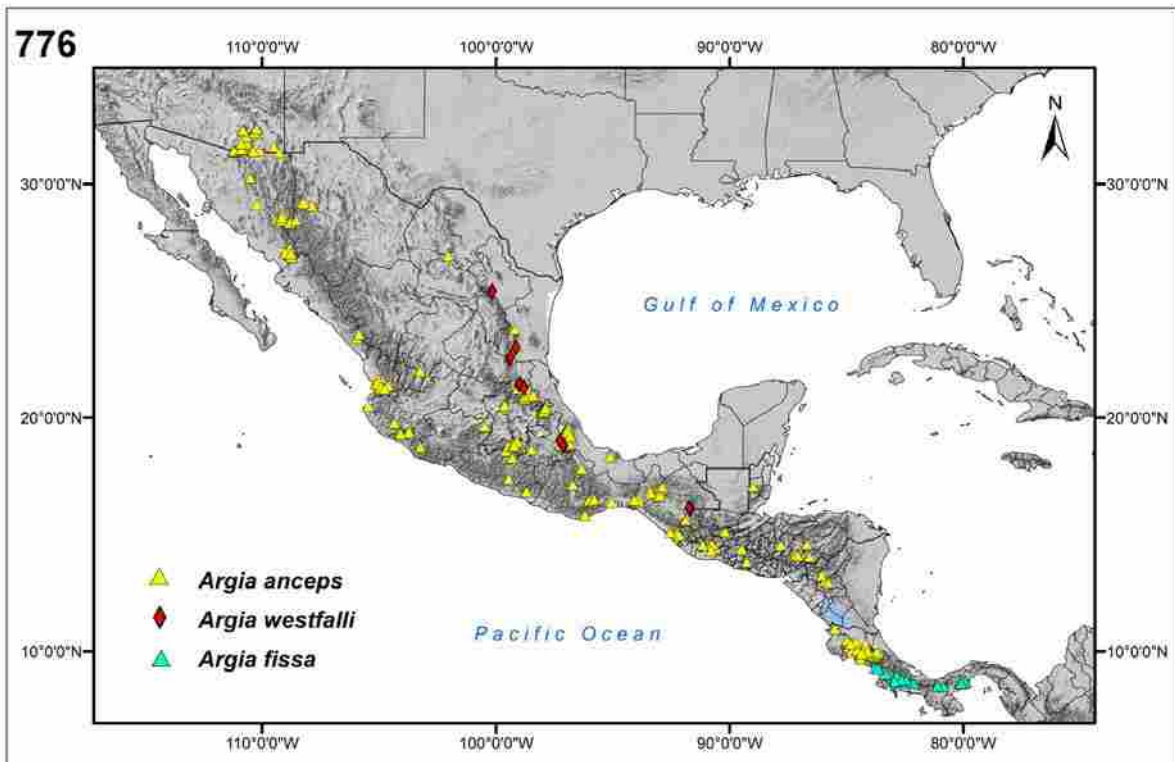


774

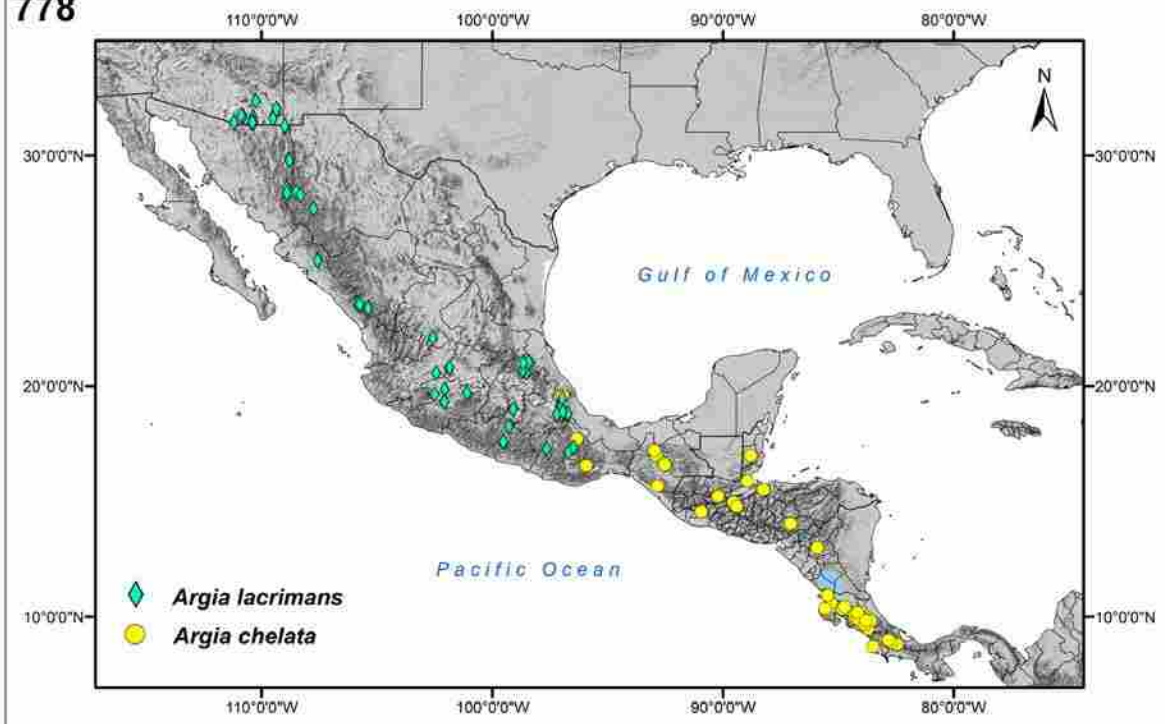


775

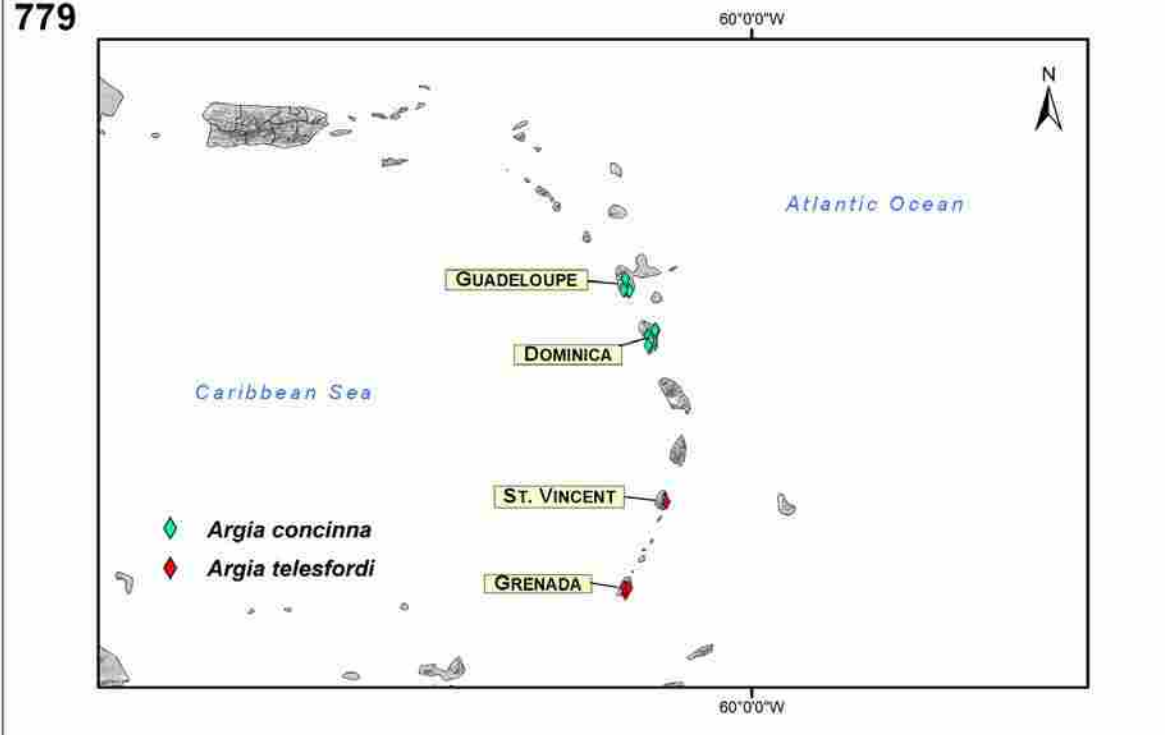


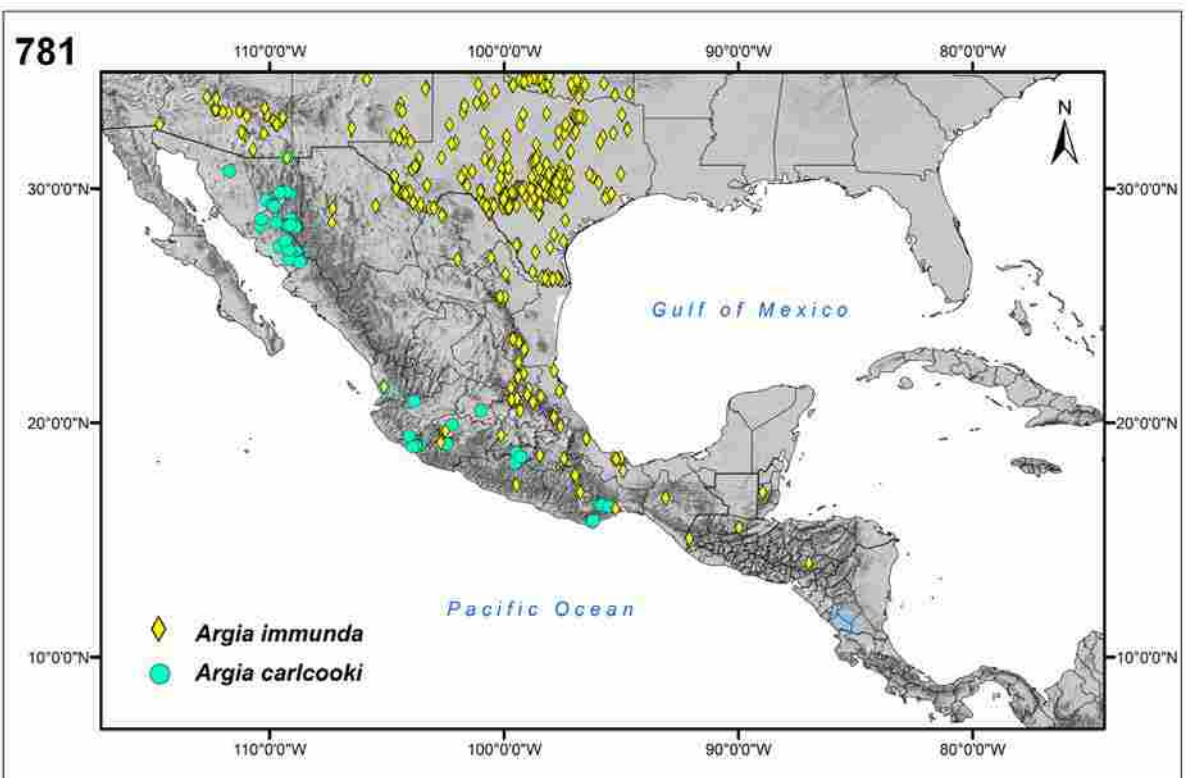
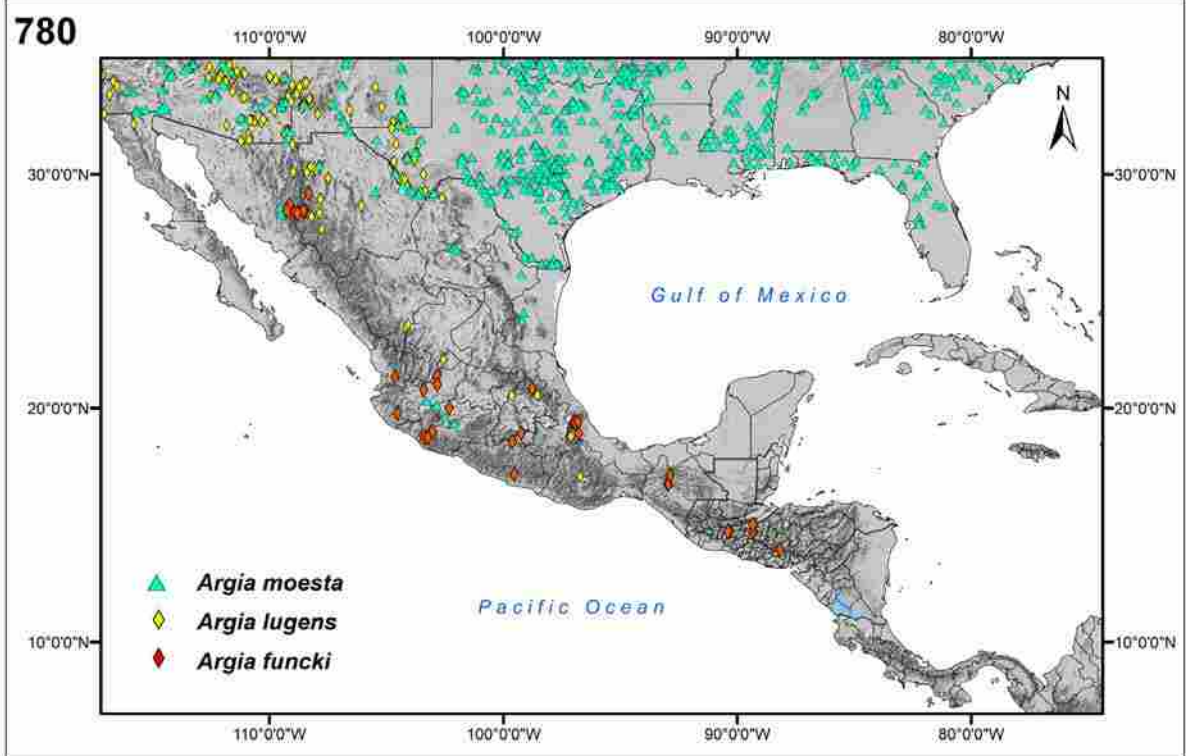


778

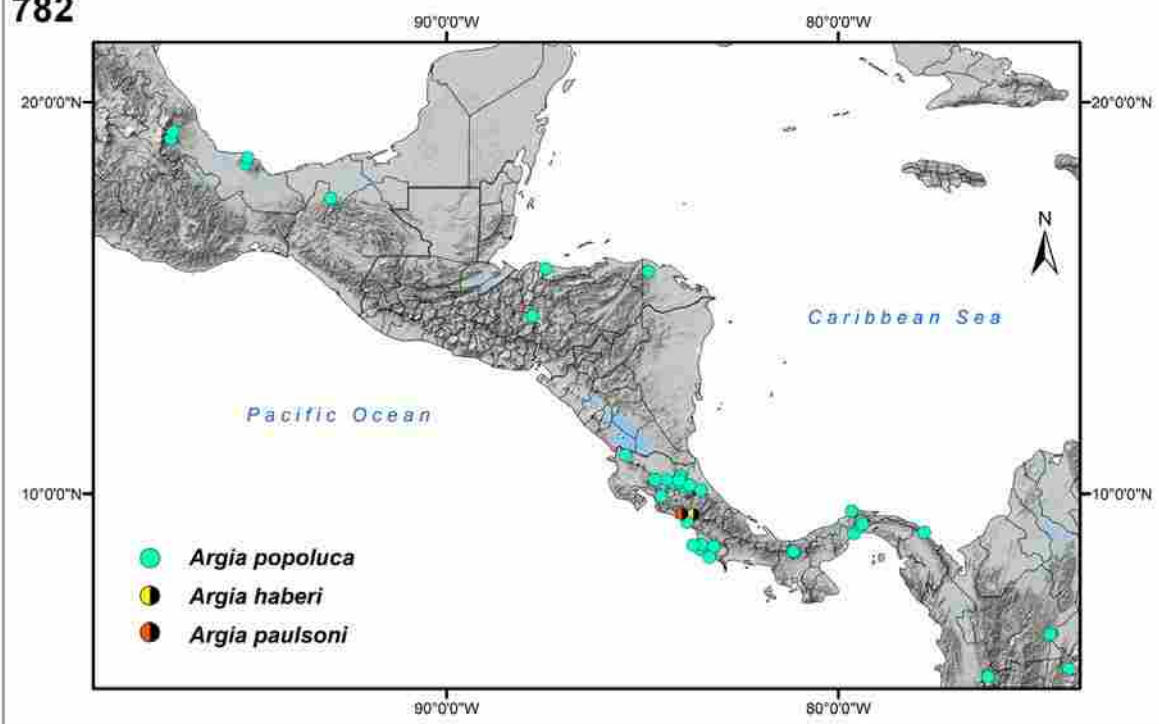


779

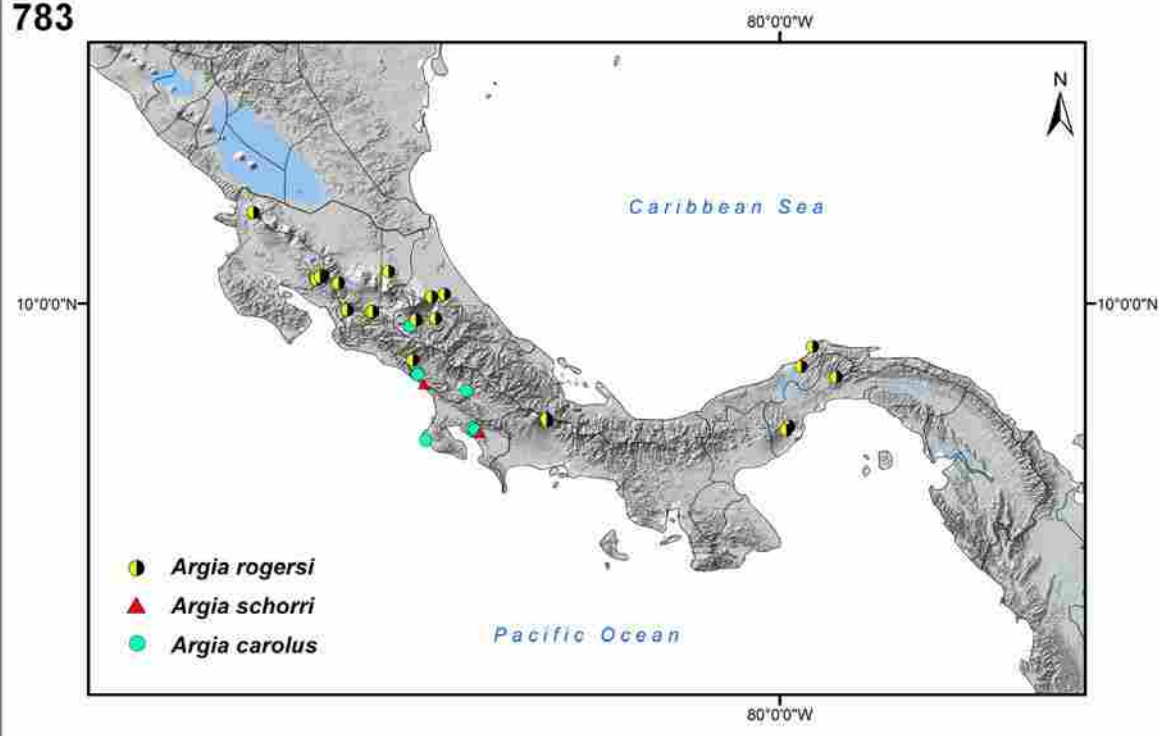




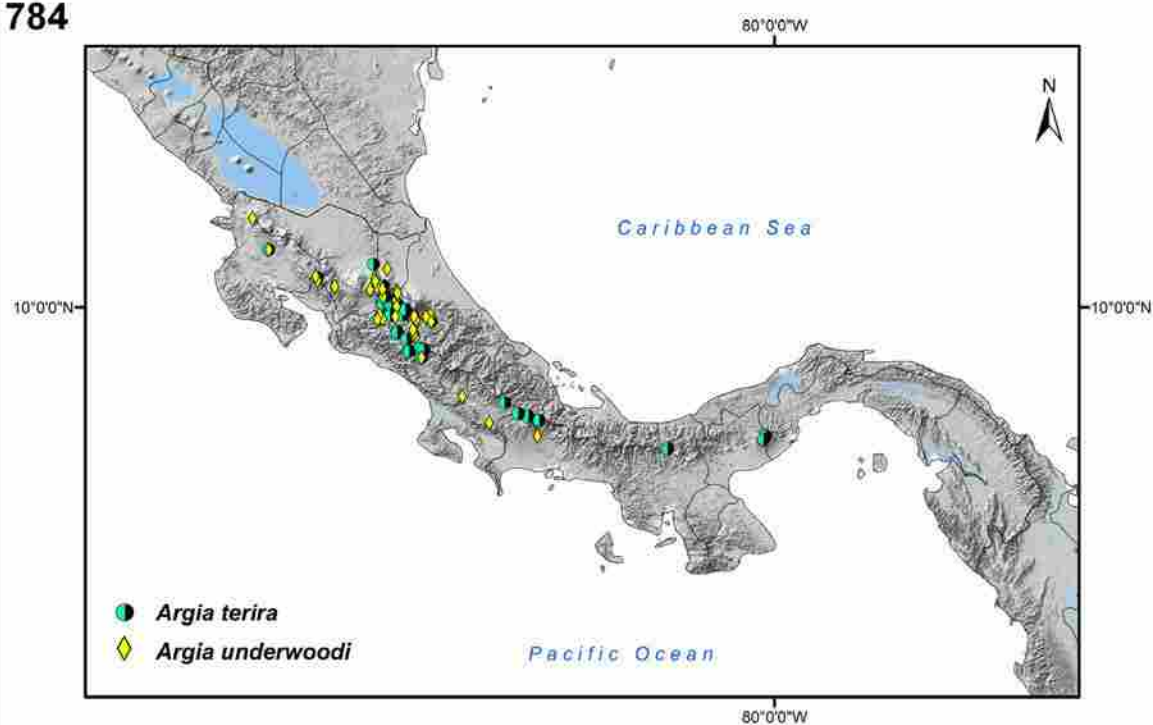
782



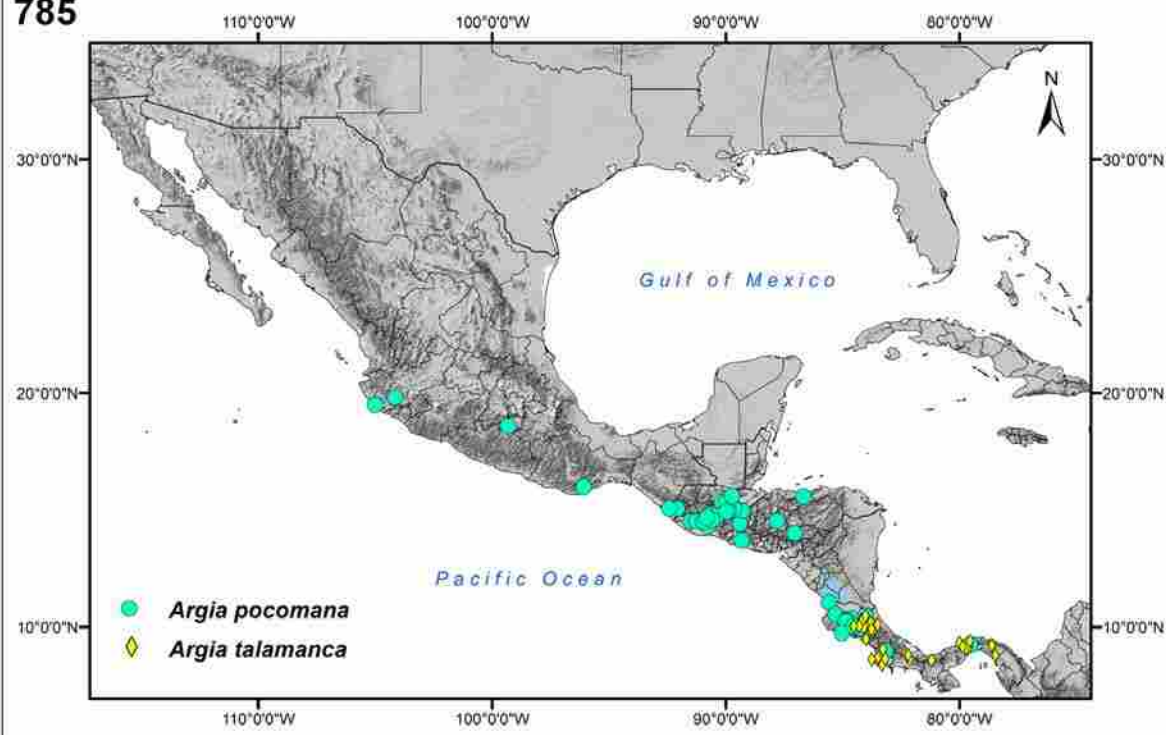
783



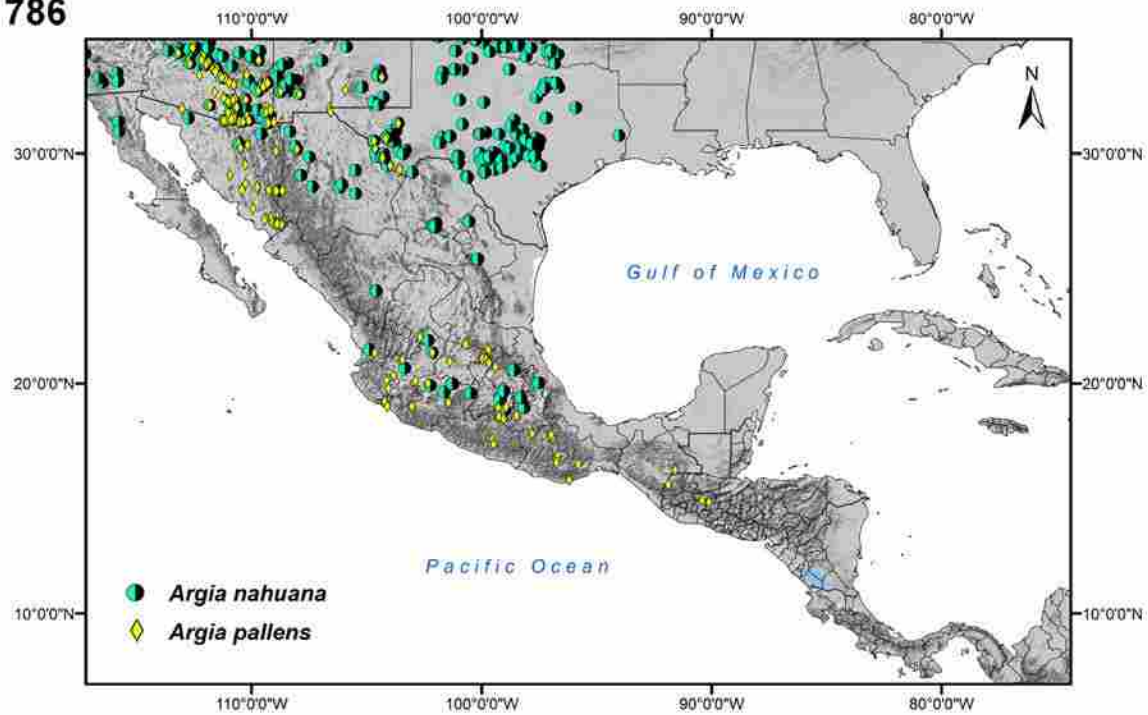
784



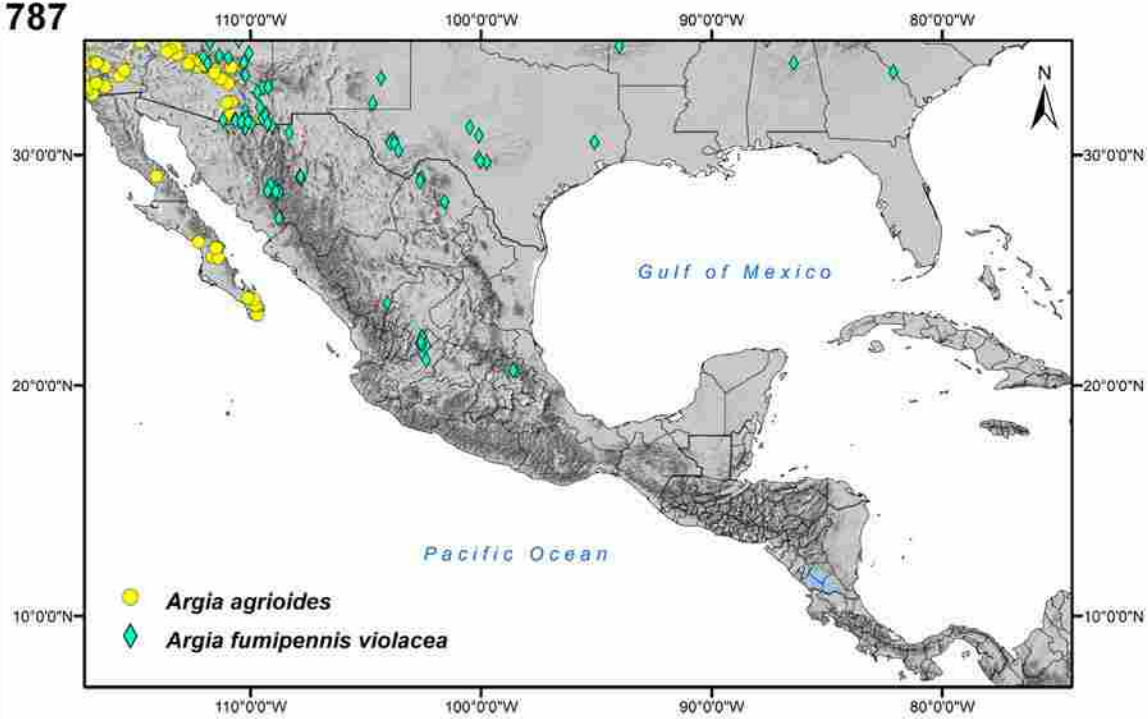
785



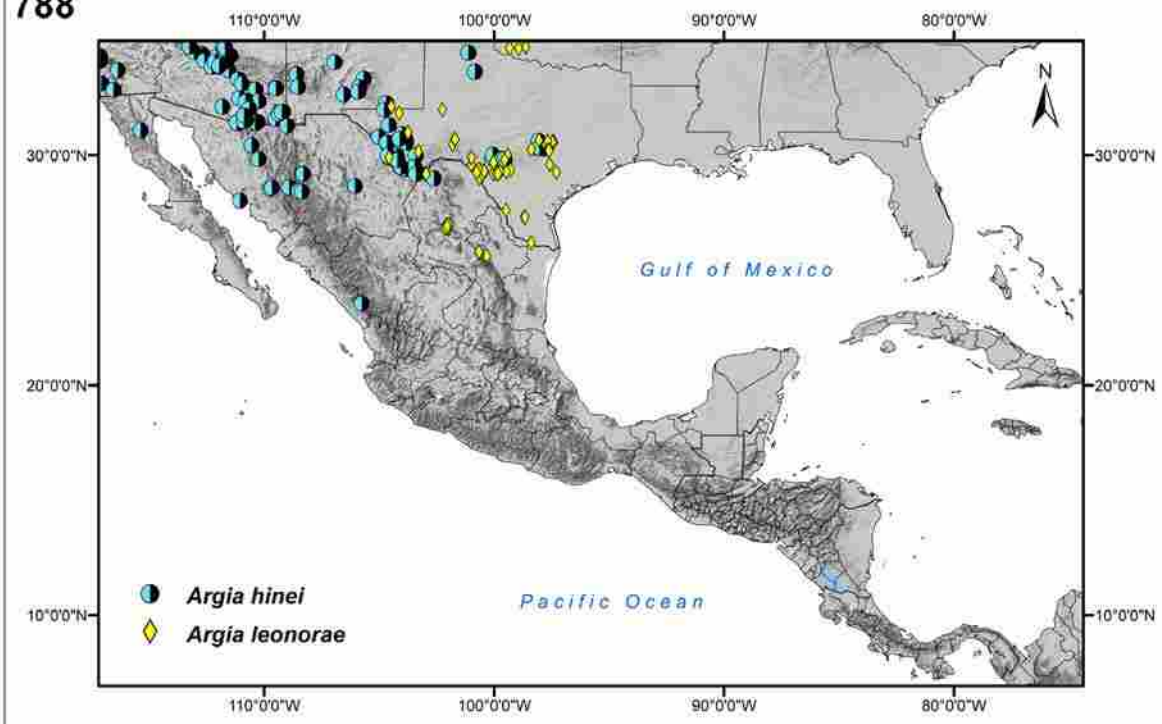
786



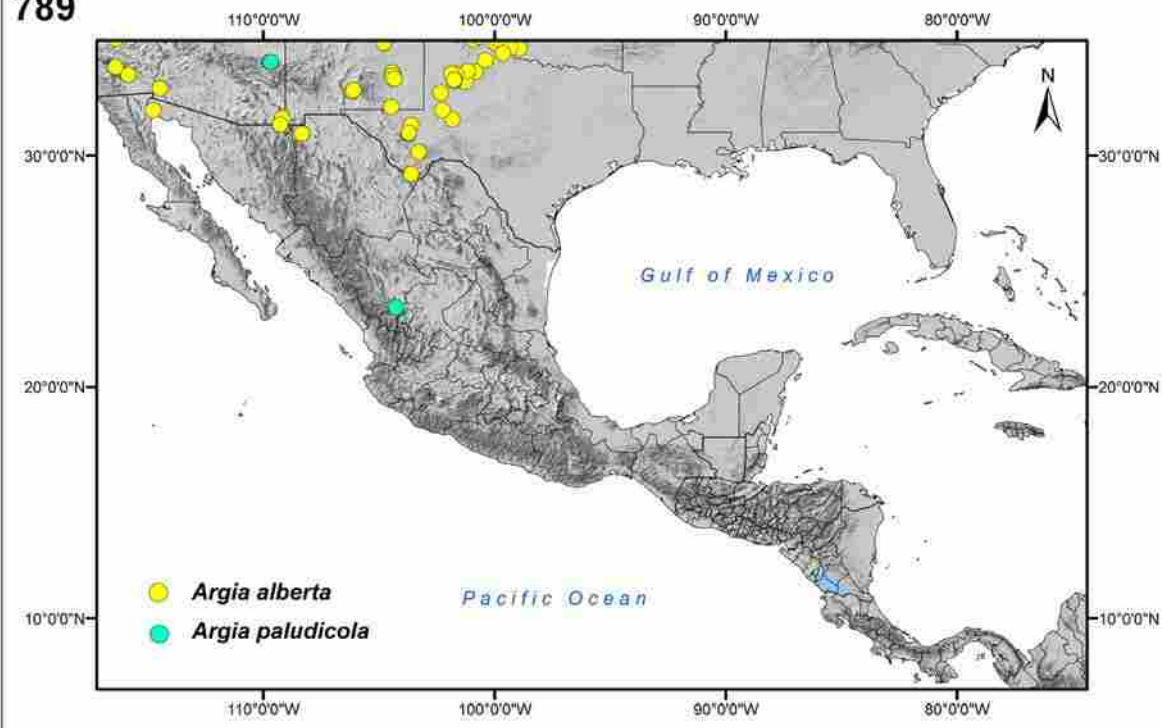
787

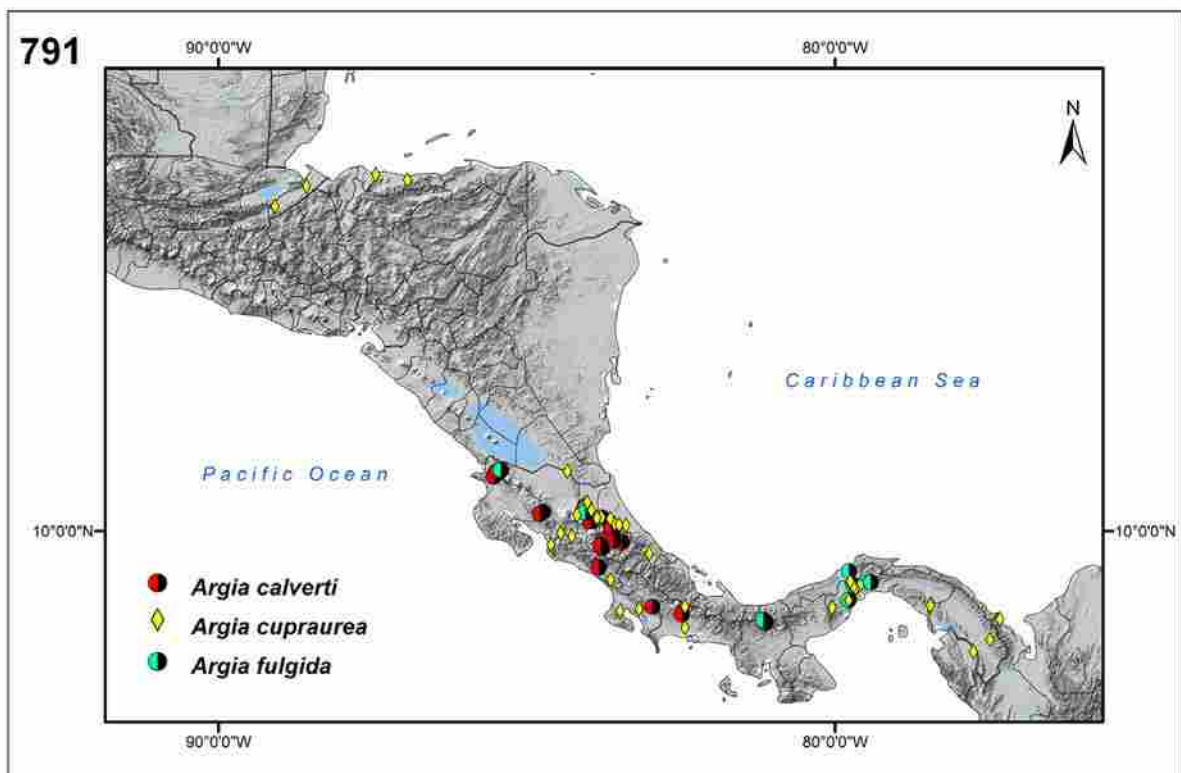
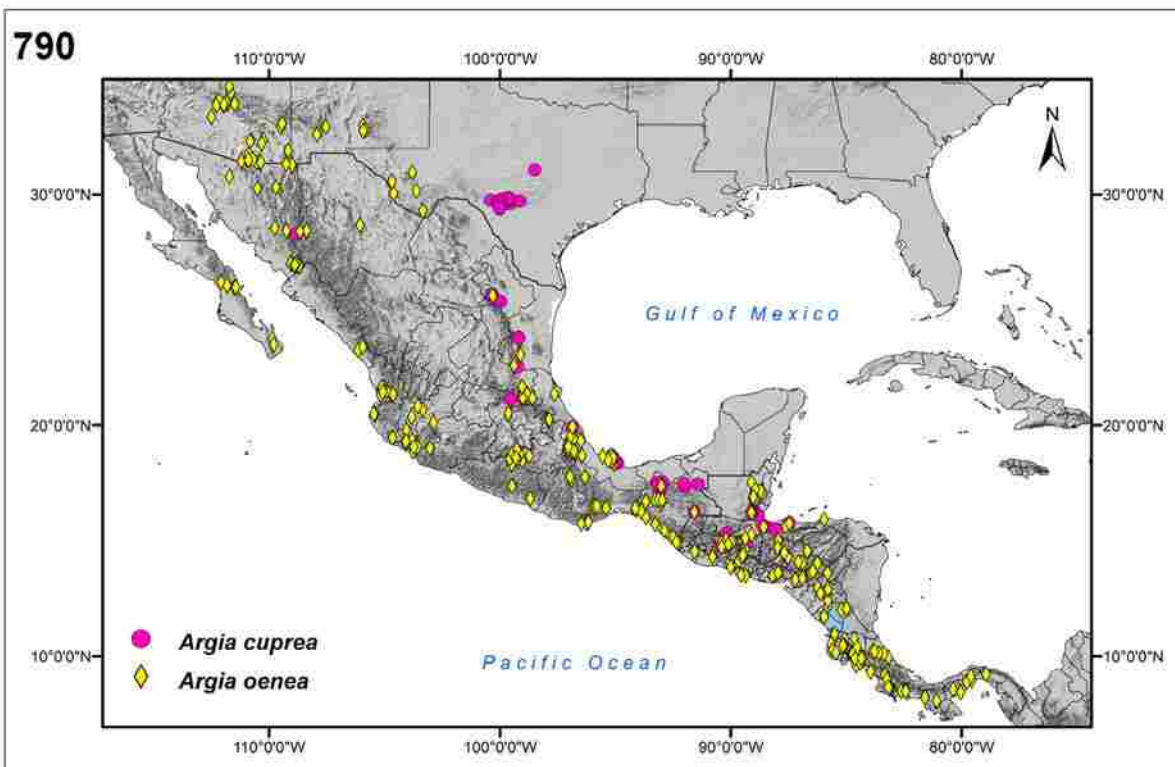


788

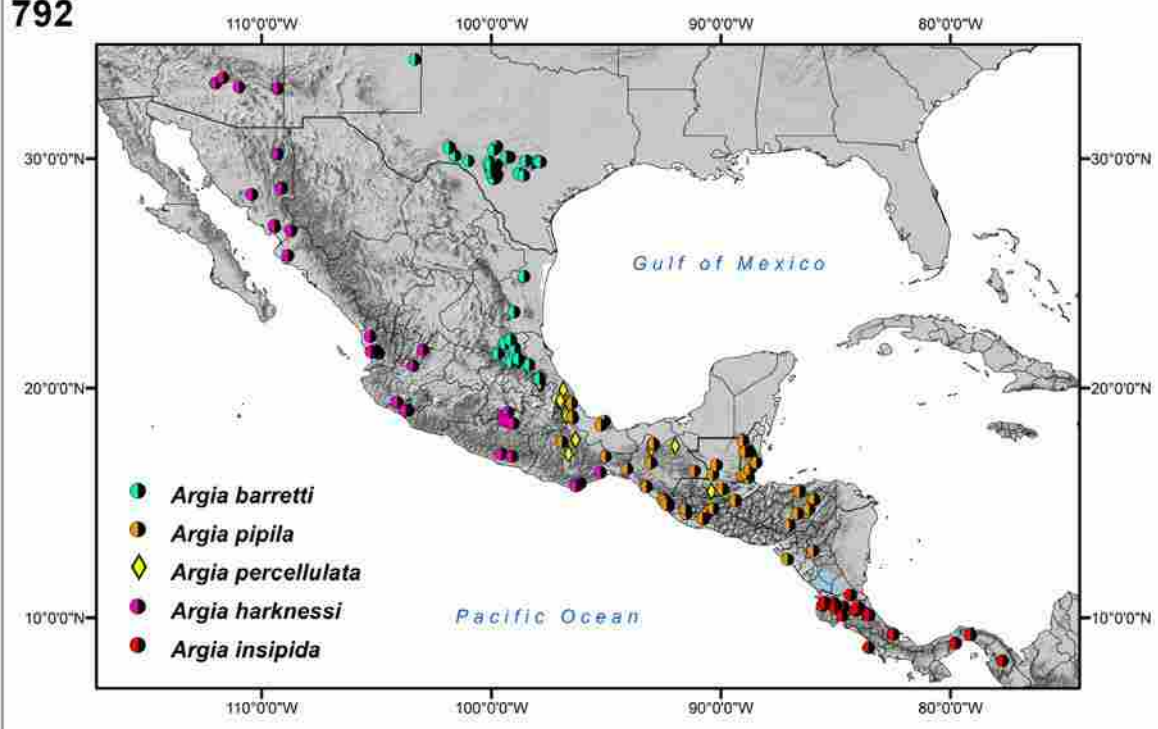


789

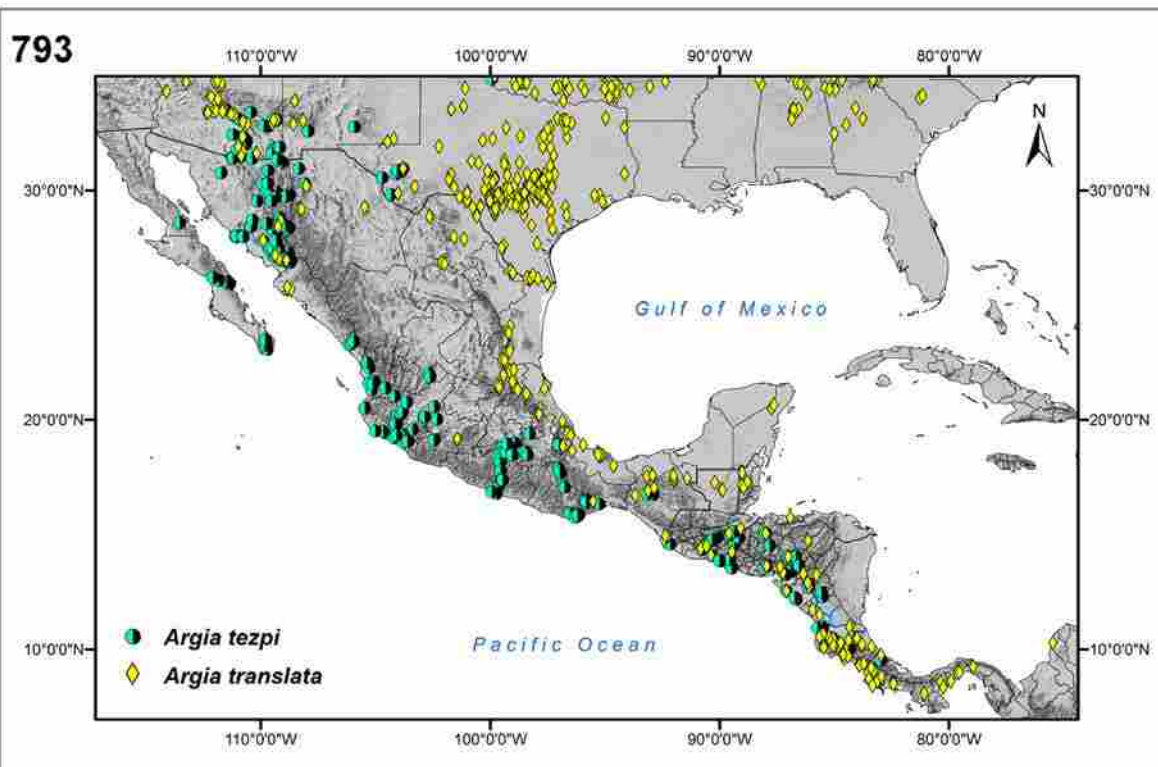




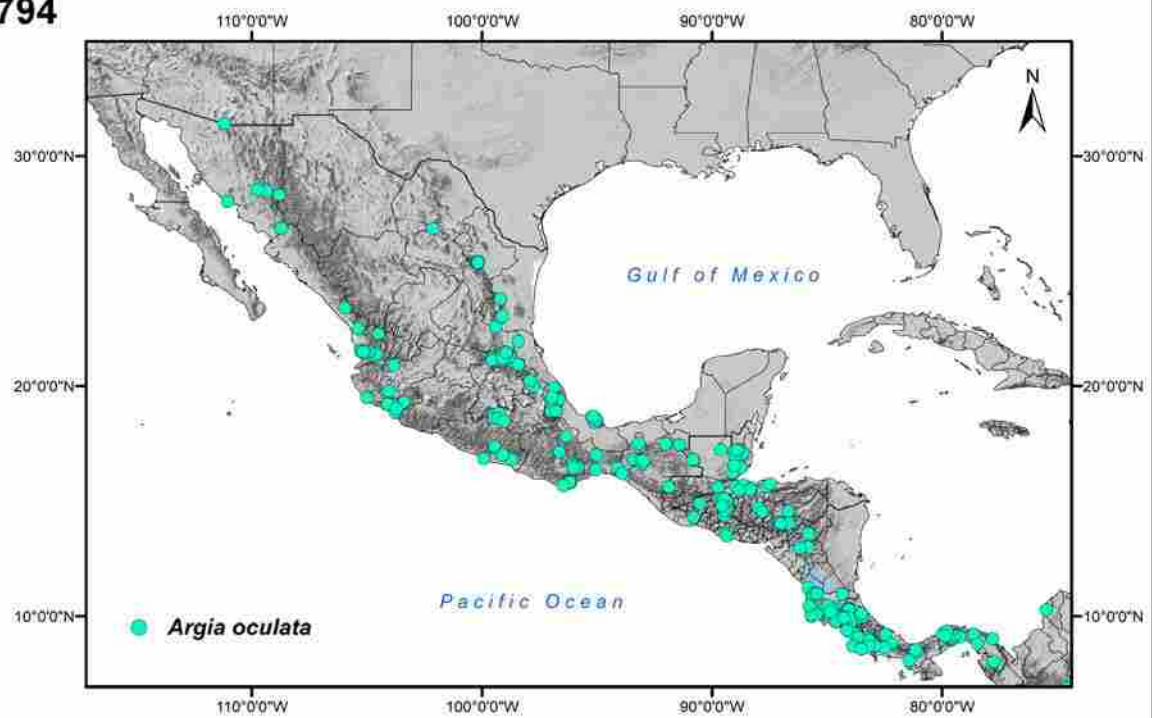
792



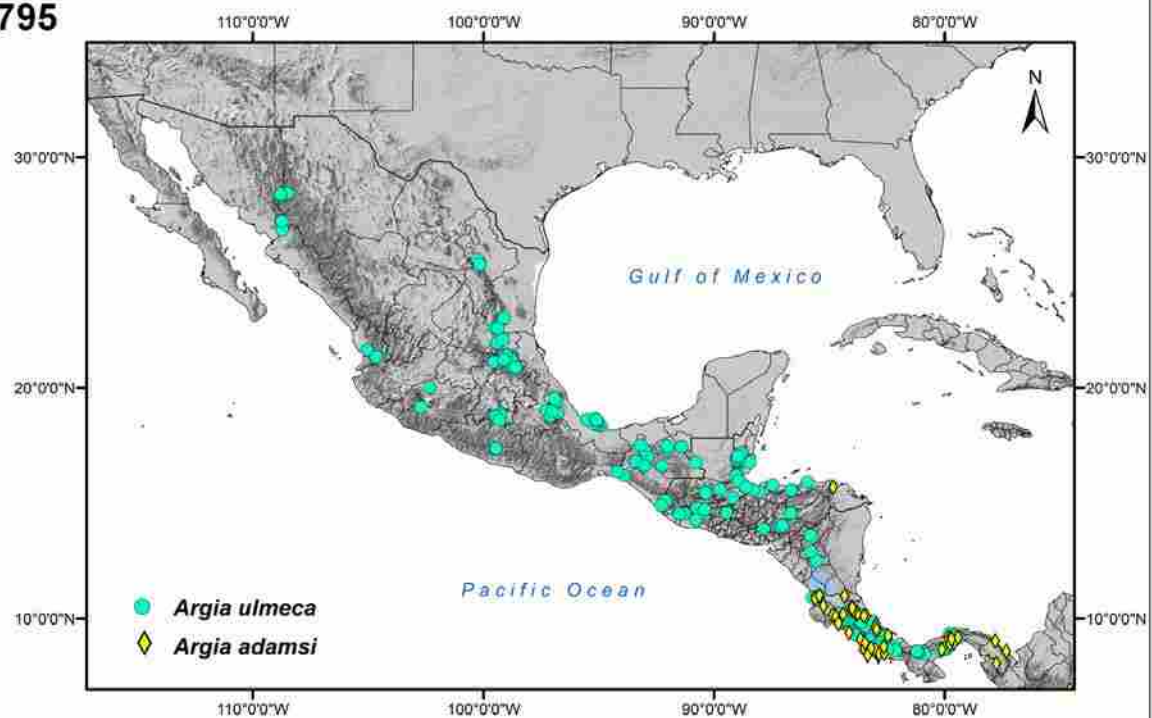
793

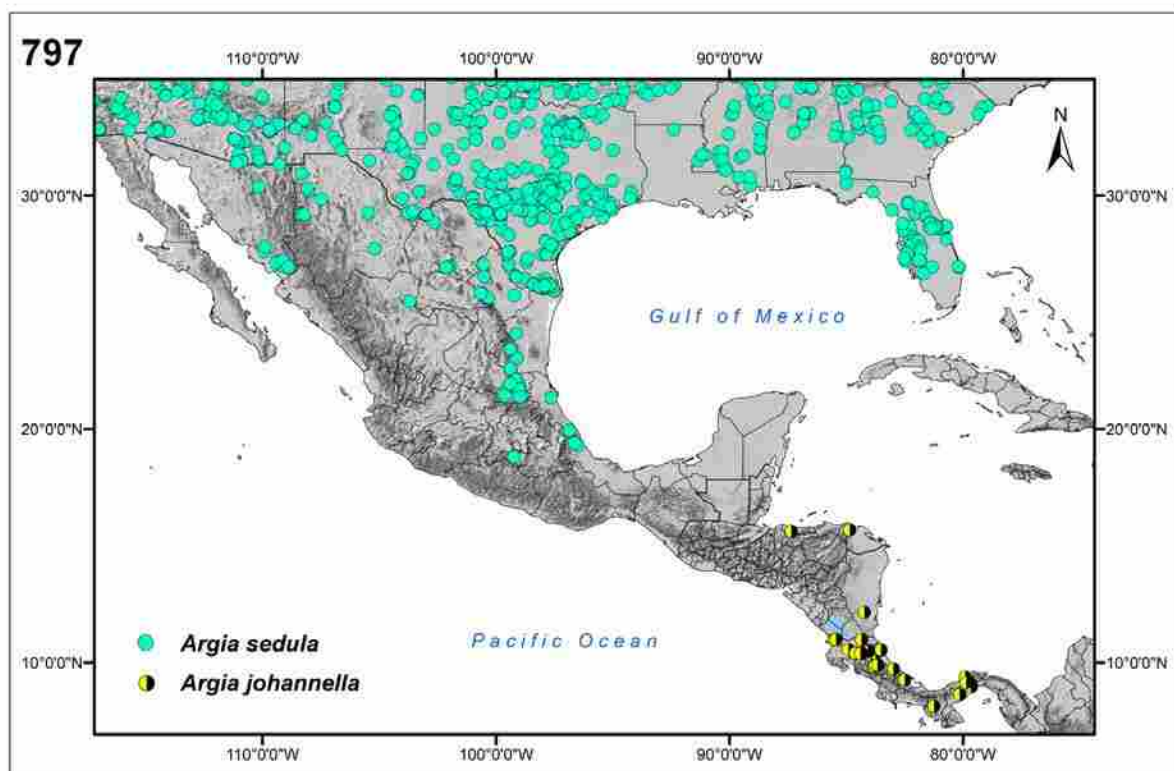
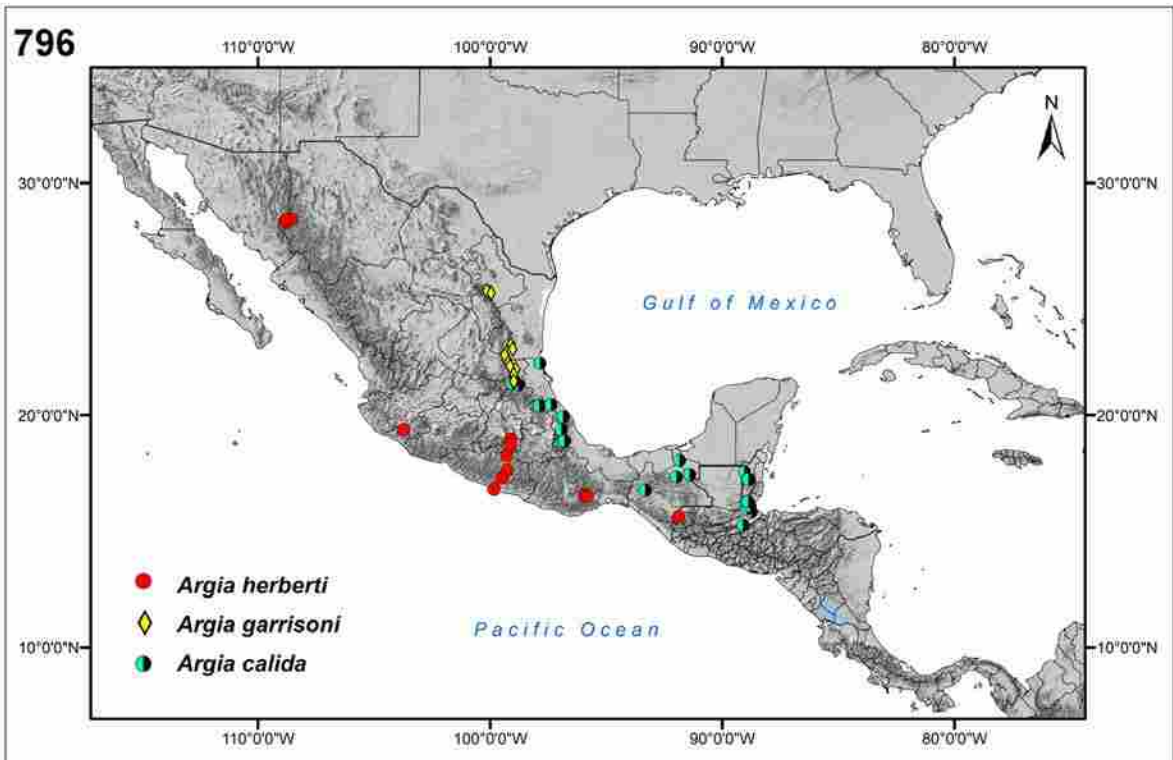


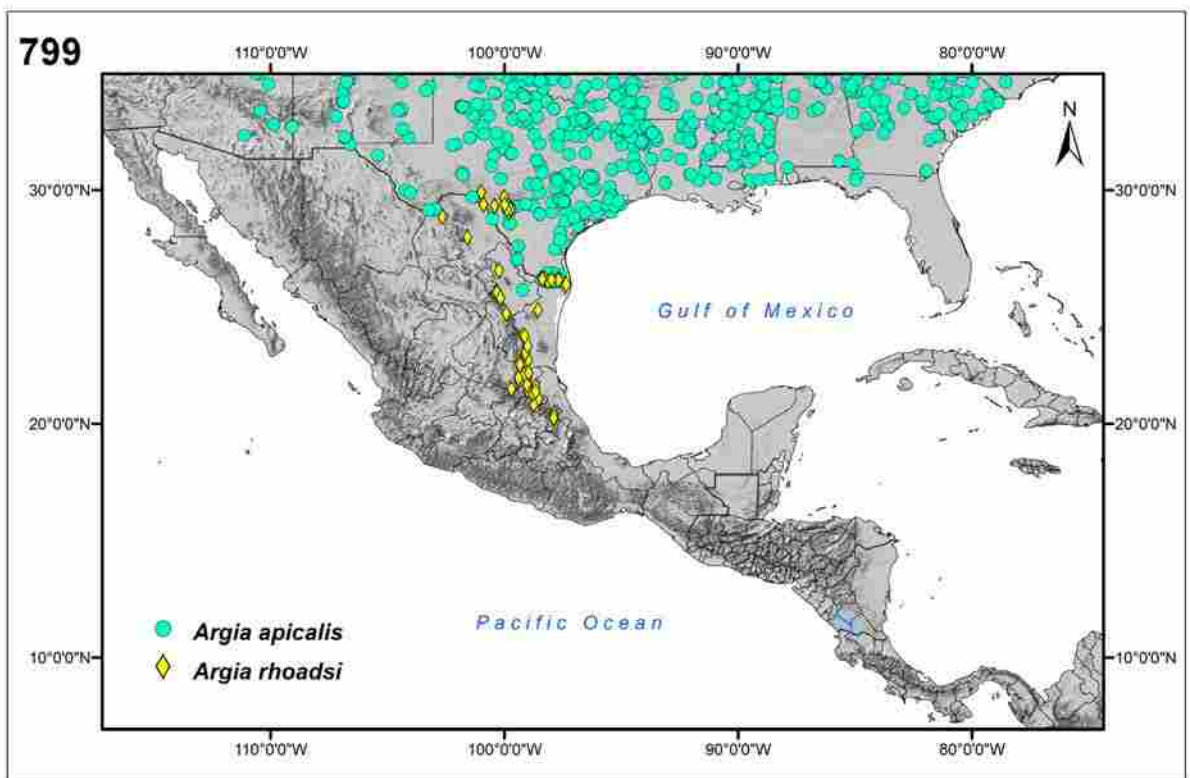
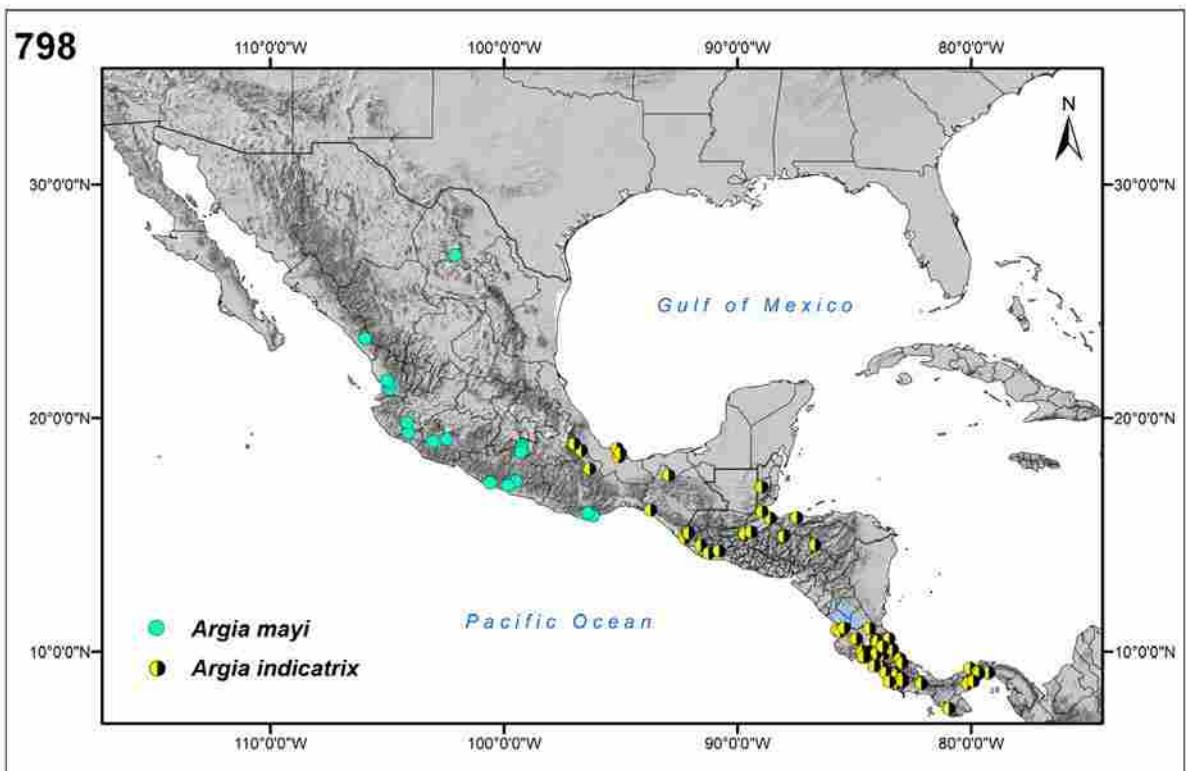
794

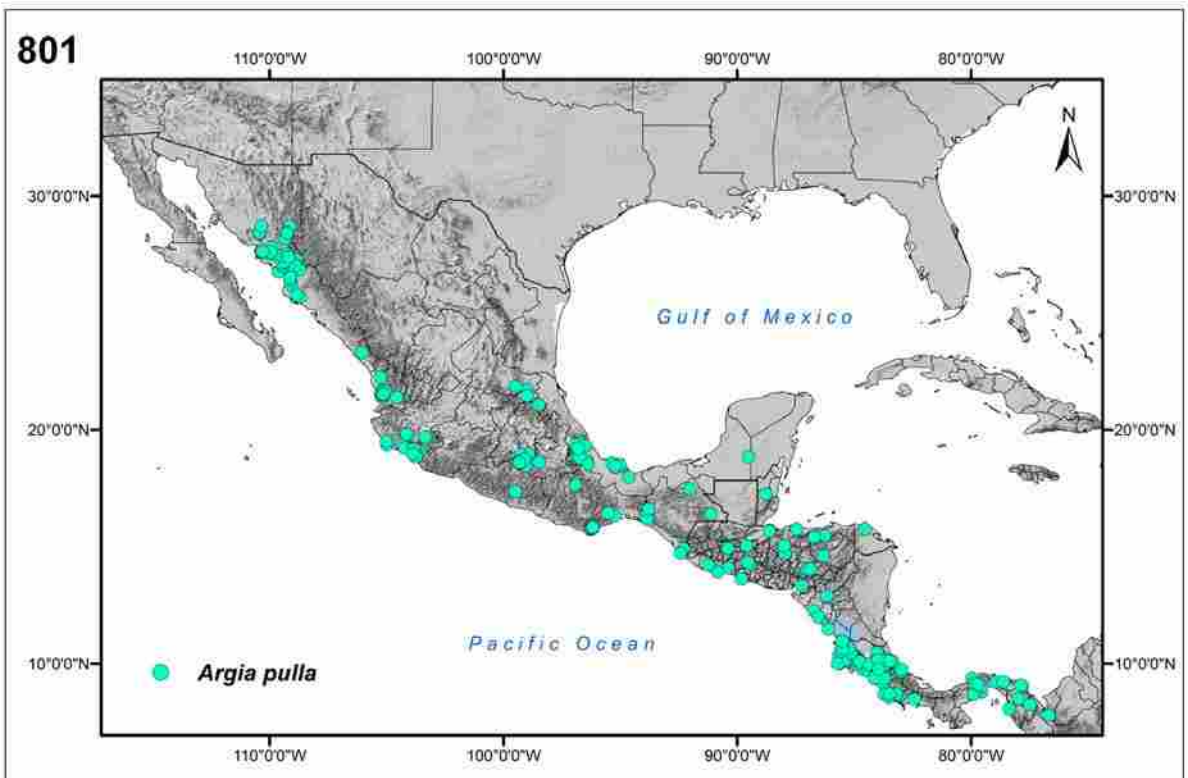
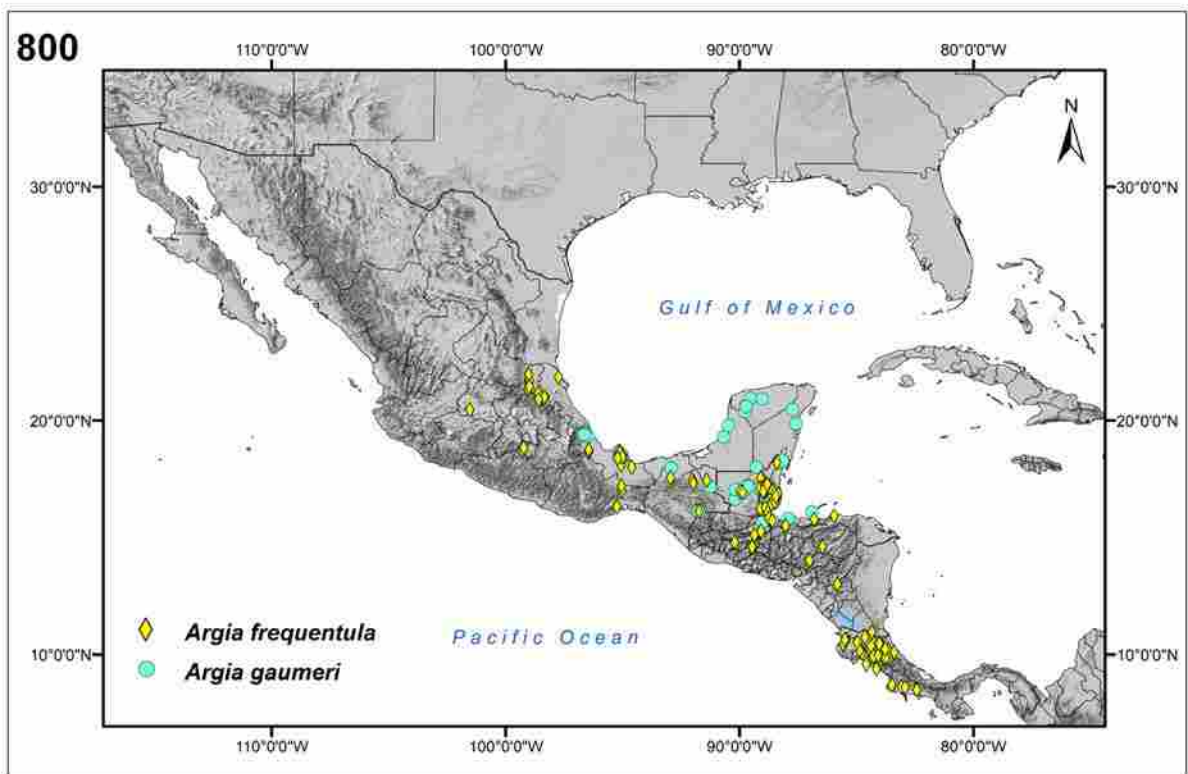


795









Field photos

802



803



804



802 ♂ *Argia anceps* (cold individual), U. S. A., California, Gulch, 2 July 2015, by Douglas Danforth.

803 ♂ *Argia annae*, Mexico, Veracruz, Puente Texolo, 17 June 2009, by Rosser W. Garrison.

804 ♂♀ *Argia carlcooki*, Mexico, Sonora, Yécora, 1 October 2011, by Douglas Danforth.

805



806



807



805 ♂ *Argia chelata*, Costa Rica, San José, area of Hondura River, 16 August 1979, by Rosser W. Garrison.

806 ♂ *Argia elongata*, Panama, Coclé, El Valle de Antón, small stream along Hotel Valle Verde property (8.6089°N, 80.1194°W), 27 May 2022, by Kenneth J. Tennessen.

807 ♂ *Argia extranea*, U. S. A., Arizona, Harshaw Creek, 23 August 2002, by Rosser W. Garrison.

808



809



808 ♂♀ *Argia funcki*, Mexico, Sonora, Río Los Pilares at Puente El Castillo on Highway 16, km 301 (28.4012°N, 108.795°W, 1255 m), 26 June 2004, by Robert A. Behrstock.

809 ♀ *Argia funcki*, Mexico, Sonora, Arroyo Los Pilares at Puente El Castillo on Highway 16, E of Yécora (28.4011°N, 108.796°W, 1310 m), 5 September 2005, by Dennis R. Paulson.

Field photos

810



811



812



810 ♂ *Argia funcki*, Mexico, Sonora, Río Maycoba at Puente El Talayote on Highway 16, E of Yécora, 14 September 2004, by Dennis R. Paulson.

811 ♂ *Argia funebris*, Mexico, Sonora, Guaymas, Nacapule Canyon, 22 October 2006, by Douglas Danforth.

812 ♂ *Argia garrisoni*, Mexico, San Luis Potosí, Río Huichuayán, 19 August 1999, by Rosser W. Garrison.

813



814



813 ♂♀ *Argia gaumeri*, Mexico, Quintana Roo, Carwash Cenote, NW of Tulum, 4 July 2015, by Netta Smith.

814 ♂ *Argia harknessi*, Mexico, Sonora, Río Mayo at Navojoa, 30 August 2006, by Netta Smith.

Field photos

815



816



817



815 ♀ *Argia harknessi*, Mexico, Sonora, Río Cuchujaqui, ca. 10 km SE of Álamos, 30 August 2006, by Dennis R. Paulson.

816 ♂ *Argia herberti*, Mexico, Sonora, Arroyo Los Pilares at Puente El Castillo on Highway 16, E of Yécora (28.4011°N, 108.796°W, 1310 m), 14 September 2004, by Dennis R. Paulson.

817 ♀ *Argia herberti*, Mexico, Sonora, stream at El Trigo Colón, 15 km E of Yécora, 6.3 mi S of Highway 16 (28.3323°N, 108.8076°W, 1386 m), 16 September 2004, by Dennis R. Paulson.

818



819



820



818 ♂ *Argia johannella*, Costa Rica, Alajuela, Laguna del Lagarto to Boca Tapada, 14 July 2017, by Netta Smith.

819 ♀ *Argia johannella*, Panama, Coclé, Altos de María above El Valle de Antón, 2 September 2012, by Netta Smith.

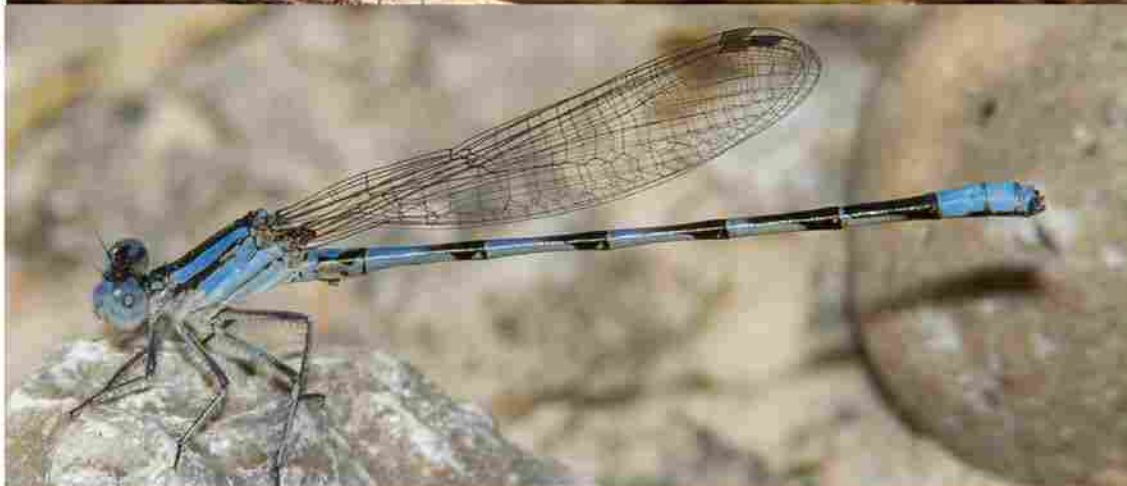
820 ♂ *Argia lacrimans*, U. S. A., Arizona, Rucker Forest Campground, 22 August 2002, by Rosser W. Garrison.

Field photos

821



822



823



821 ♀ *Argia lacrimans*, U. S. A., Arizona, Leslie Canyon, 22 August 2002, by Rosser W. Garrison.

822 ♂ *Argia leonorae*, U. S. A., Texas, Brewster, Big Bend National Park, Rio Grande Village Nature Trail, 1 May 2010, by John C. Abbott.

823 ♀ *Argia leonorae*, U. S. A., Texas, Jim Hogg, stream below sewage pond 0.8 mi E of FM 1071 on Highway 258, 4 June 2005, by Dennis R. Paulson.

Field photos

824



825



826



824 ♂ *Argia lugens*, U. S. A., Arizona, Cochise, San Pedro River N of Benson, 4 June 2013, by Douglas Danforth.

825 ♀ *Argia lugens*, Mexico, Sonora, Cajón Bonita, 25 July 2008, by Douglas Danforth.

826 ♀ *Argia lugens*, U. S. A., Arizona, Greenlee, Blue River at Juan Miller Road, 28 June 2008, by Douglas Danforth.

Field photos

827



828



829



827 ♂ *Argia mayi*, Mexico, Sinaloa, Copala Stream, 7 February 2022, by David F. Smith.

828 ♂ *Argia mayi*, Mexico, Oaxaca, Arcoiris Fall near Pluma Hidalgo, 12 January 2022, by David F. Smith.

829 ♂ *Argia moesta*, U. S. A., Arizona, Graham, Gila River, 29 September 2002, by Rosser W. Garrison.

Field photos

830



831



832



830 ♀ *Argia moesta*, U. S. A., Texas, Gonzalez, Guadeloupe River, 4 mi S of Gonzalez, 25 July 1977, by Rosser W. Garrison.

831 ♂ *Argia munda*, U. S. A., Arizona, Molino Basin Camp, 26 August 1998, by Rosser W. Garrison.

832 ♂ *Argia noveloi*, Mexico, Xalapa, Santuario del Bosque de Niebla, stream in cloud forest (19.5130°N, 96.9413°W, 1336 m), 20 July 2018, by Rodolfo Novelo-Gutiérrez.

Field photos

833



834



835



833 ♂ *Argia paludicola*, U. S. A., Arizona, Bog Tank, 18 June 2009, by Pierre Deviche.

834 ♂ *Argia paludicola*, U. S. A., Arizona, North Fork of White River, 16 July 2016, by Pierre Deviche.

835 ♀ *Argia paludicola*, U. S. A., Arizona, Bog Tank, 11 June 2016, by Pierre Deviche.

836



837



836 ♂ *Argia pima*, U. S. A., Arizona, Hot Spring Creek, 3 September 1999, by Robert A. Behrstock.

837 ♂ *Argia pipila*, Mexico, Veracruz, Salto de Eyipantla, 15 June 2009, by Rosser W. Garrison.

838



839



838 ♂ *Argia pocomana*, Costa Rica, Guanacaste, Catarata Llanos de Cortez, 7 June 2015, by Netta Smith.

839 ♀ *Argia pocomana*, Costa Rica, Guanacaste, Catarata Llanos de Cortez, 7 June 2015, by Netta Smith.

840



841



840 ♂ *Argia popoluca*, Costa Rica, Puntarenas, El Remanso, NW of Cabo Matapalo and 22 km by road S of Puerto Jimenez (8.3833°N, 83.2833°W), 23 January 2005, by Dennis R. Paulson.

841 ♂♀ *Argia rhoadsi*, Mexico, Hidalgo, forest stream at McAllen Nature Center, 12 November 2005, by Dennis R. Paulson.

842



843



844



842 ♂ *Argia sabino*, U. S. A., Arizona, Sycamore Canyon, 27 September 2002, by Rosser W. Garrison.

843 ♂ *Argia sedula*, Mexico, San Luis Potosí, Salto de Agua, 4 November 2001, by Robert A. Behrstock.

844 ♂ *Argia talamanca*, Panama, Chiriquí, waterfall near Santa Clara, 18 August 2012, by Netta Smith.

845



846



845 ♂ *Argia tarascana*, U. S. A., Arizona, Muleshoe Ranch, 17 Aug 2002, by Rosser W. Garrison.

846 ♂♀ *Argia tarascana*, U. S. A., Arizona, Cochise, Muleshoe Preserve, Bass Canyon, October 2002, by Doug Danforth.

847



848



847 ♂ *Argia terira*, Costa Rica, Puntarenas, Monteverde, Biological Station Bosque Nuboso, 7 June 2013, by Rosser W. Garrison.

848 ♀ *Argia terira*, Costa Rica, Puntarenas, Monteverde (10.2749°N, 84.8255°W), 29 May 2015, by Joshua Lincoln.

849



850



849 ♂ *Argia tezpi*, Costa Rica, Puntarenas, stream and marshy seeps NNW Sardinal, 5 August 2010, by Netta Smith.

850 ♀ *Argia tezpi*, Mexico, Sonora, Cajón Bonito, E of Agua Prieta, 1 June 2019, by Netta Smith.

Field photos



851 ♂♀, *Argia ulmeca*, Mexico, Sonora, Yécora, Los Pilares, 19 July 2006, by Douglas Danforth.

Field photos

852



853



854



852 ♂ *Argia ulmeca*, Costa Rica, Cartago, Rancho Naturalista, Platanillo, 28 May 2015, by Netta Smith.

853 ♂ *Argia underwoodi*, Costa Rica, Alajuela, La Paz Waterfall Gardens, 16 June 2018, by Dennis R. Paulson.

854 ♂ *Argia westfalli*, Mexico, San Luis Potosí, Salto de Agua, 4 Nov 2001, by Robert A. Behrstock.

Genital ligula distal segment lacking a flagellum or straplike process

855

Lacking paired lateral lobes



A. munda – male
USA, Upper Sabino Canyon

856



A. munda – female
USA, Molino Basin Camp

857

With paired lateral lobes



A. elongata – HOLOTYPE male
COSTA RICA, Reventazón River

858



A. elongata – PARATYPE female
HONDURAS, Santo Tomás Camp

859

With paired lateral lobes



A. extranea – male
MEXICO, Teocelo

860



A. extranea – female
MEXICO, Teocelo

Genital ligula distal segment lacking a flagellum or straplike process

861

With paired lateral lobes



A. annae – PARATYPE male
MEXICO, La Unión

862



A. annae – PARATYPE female
MEXICO, Teziutlán

863

With paired lateral lobes



A. variabilis – male
MEXICO, 2 km E of Coyame

864



A. variabilis – female
MEXICO, 2 km E of Coyame

865

With paired lateral lobes



A. terira – male
PANAMA, 1 km Salto del María

866



A. terira – male
COSTA RICA, Monteverde

867

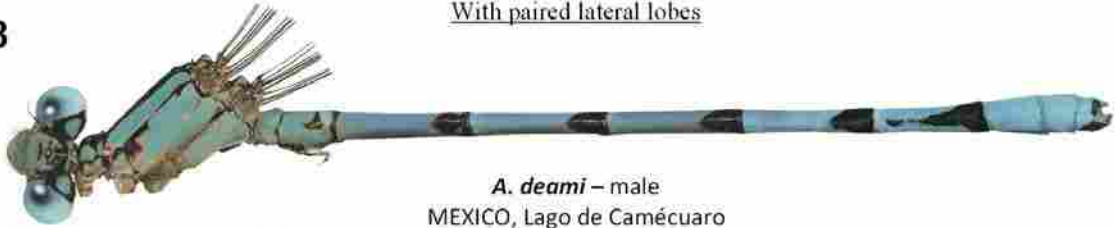


A. terira – female
COSTA RICA, Hacienda Zurqui

Genital ligula distal segment lacking a flagellum or straplike process

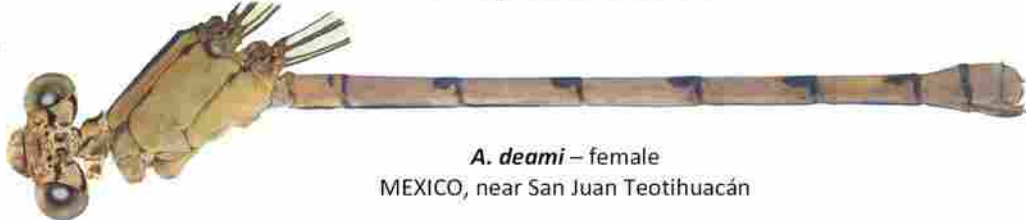
With paired lateral lobes

868



A. deami – male
MEXICO, Lago de Camécuaro

869



A. deami – female
MEXICO, near San Juan Teotihuacán

With paired lateral lobes

870



A. tarascana – male
MEXICO, La Fuente

871



A. tarascana – male
USA, Hot Springs Canyon

872



A. tarascana – female
MEXICO, La Fuente

873



A. tarascana – female
MEXICO, La Fuente

Genital ligula distal segment lacking a flagellum or straplike process

874

With paired lateral lobes



A. vivida – male
CANADA, Banff

875



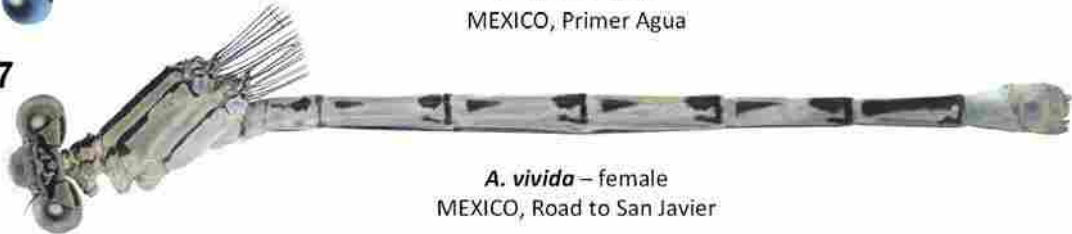
A. vivida – male
USA, end of Five Bridges Road

876



A. vivida – male
MEXICO, Primer Agua

877



A. vivida – female
MEXICO, Road to San Javier

With paired lateral lobes

878



A. sabino – male
USA, Molino Basis Forest Camp

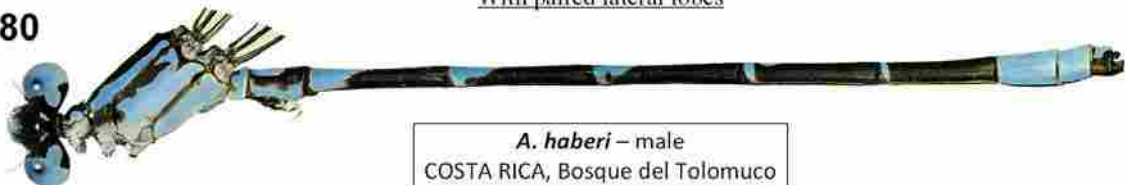
879



A. sabino – female
USA, Molino Basis Forest Camp

With paired lateral lobes

880

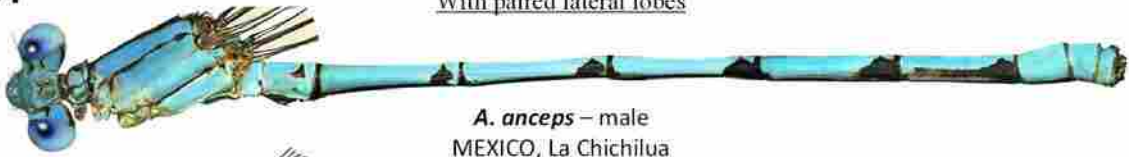


A. haberi – male
COSTA RICA, Bosque del Tolomuco

Genital ligula distal segment lacking a flagellum or straplike process

881

With paired lateral lobes



A. anceps – male
MEXICO, La Chichilua

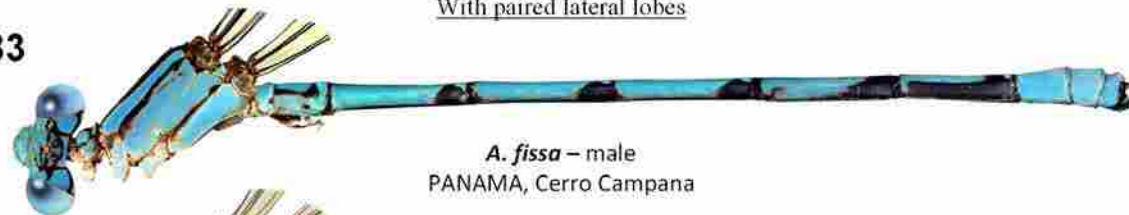
882



A. anceps – female
MEXICO, La Chichilua

883

With paired lateral lobes



A. fissa – male
PANAMA, Cerro Campana

884



A. fissa – female
PANAMA, Chiriqui Mountains

885

With paired lateral lobes



A. westfalli – male
MEXICO, Cola de Caballo Falls

886



A. westfalli – female
MEXICO, Lagunas de Montebello

887

With paired lateral lobes



A. funebris – male
USA, Ponka Lake

Genital ligula distal segment lacking a flagellum or straplike process

888

With paired lateral lobes



A. funebris – male

MEXICO, SE of San Cristóbal de las Casas

889



A. funebris – male

MEXICO, Los Tuxtlas

890



A. funebris – male

MEXICO, 7.7 mi W of La Ciénaga

891



A. funebris – female

MEXICO, 5 km SE of Jitolol

892

With paired lateral lobes



A. noveloi – PARATYPE male

MEXICO, Puente Texolo

893



A. noveloi – PARATYPE female

MEXICO, Puente Texolo

894

With paired lateral lobes



A. rudolphi – HOLOTYPE male

MEXICO, La Unión

895



A. rudolphi – PARATYPE female

MEXICO, El Muro

Genital ligula distal segment with a single soft flexible flagellum or strap-like process attached to ental surface of long trowel-shaped basal membranous hood

896



A. chelata – male
COSTA RICA, Monteverde

897



A. chelata – female
MEXICO, Banderillas

898



A. chelata – female
COSTA RICA, Monteverde

899



A. tonto – male
USA, Garden Canyon

900



A. tonto – female
USA, Hot Springs Canyon

901



A. pima – male
USA, Hot Springs Canyon

902



A. pima – female
USA, Hot Springs Canyon

Genital ligula distal segment with a single soft flexible flagellum or strap-like process attached to ental surface of long trowel-shaped basal membranous hood

903



A. lacrimans – male
MEXICO, La Fuente

904



A. lacrimans – female
MEXICO, La Fuente

905



A. lacrimans – female
MEXICO, La Fuente

Genital ligula distal segment with a single flagellum or apical strap-like process

With a flagellum attached to ental surface of ovoid basal membranous hood, and lateral lobes digitiform and lacking or hyaline

906



A. concinna – male
GUADELOUPE, Grand Etang

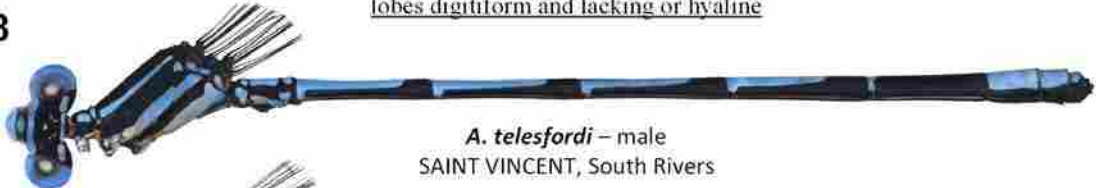
907



A. concinna – female
DOMINICA, 12 mi N Roseau

With a flagellum attached to ental surface of ovoid basal membranous hood, and lateral lobes digitiform and lacking or hyaline

908



A. telesfordi – male
SAINT VINCENT, South Rivers

909



A. telesfordi – female
SAINT VINCENT, South Rivers

Genital ligula distal segment with a single flagellum or apical strap-like process

With a flattened strap-like process

910



A. moesta – male
MEXICO, Lago de Chapala

911



A. moesta – male
USA, Gila River at Highway 95

912



A. moesta – female
USA, Gila River at Highway 95

913



A. moesta – female
USA, Mustang Creek

With a flattened strap-like process

914



A. lugens – male
USA, Webber Creek

915



A. lugens – male
MEXICO, Piedras River near Pacheco

916



A. lugens – female
USA, Julius Klein Conservation Camp

Genital ligula distal segment with a single flagellum or apical strap-like process

917



With a flattened strap-like process

A. funcki – male
MEXICO, Taxco

918



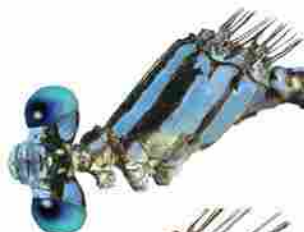
A. funcki – male
MEXICO, Maycoba River

919



A. funcki – female
GUATEMALA, El Fiscal

920



With a short strap-like process

A. carlcooki – male
MEXICO, Balneario Las Palmas

921



A. carlcooki – female
MEXICO, Balneario Las Palmas

922



With a short strap-like process

A. immunda – male
MEXICO, Agua Caliente

923



A. immunda – female
MEXICO, Agua Caliente

Genital ligula distal segment with a single flagellum or apical strap-like process

With a long, linear flagellum with a small ventral pedunculate process

924



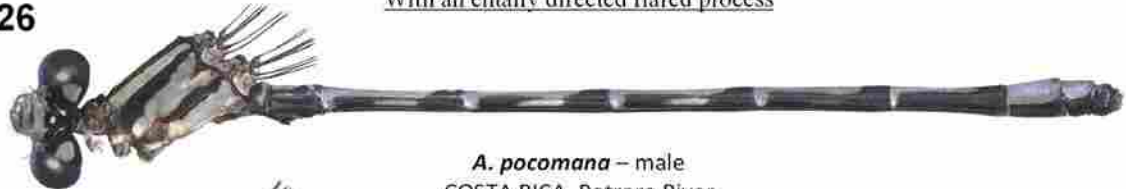
A. schorri – PARATYPE male
COSTA RICA, 2 mi N of Uvita

925



A. schorri – PARATYPE female
COSTA RICA, 2 mi N of Uvita

926



A. pocomana – male
COSTA RICA, Potrero River

927



A. pocomana – female
COSTA RICA, Grande de Tárcoles River

928



A. talamanca – male
COSTA RICA, 13 km SE of Buenos Aires

929



A. talamanca – female
COSTA RICA, 5–6 mi SW of Rincón de Osa

Genital ligula distal segment with a single flagellum or apical strap-like process

With distal portion of lateral lobes curved at about a right angle

930



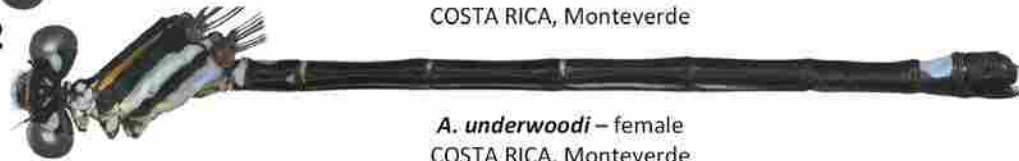
A. paulsoni – PARATYPE male
COSTA RICA, 7.5 km N of Londres

931



A. underwoodi – male
COSTA RICA, Monteverde

932



A. underwoodi – female
COSTA RICA, Monteverde

With lateral lobes represented by flattened ovoid flaps

933



A. apicalis – male
USA, Niobrara Valley Reserve

934



A. apicalis – female
USA, Smith Falls State Park

With a flagellum and lateral lobes digitiform and sclerotized or darkened

935



A. hinei – male
MEXICO, Aconchi Hot Springs

936

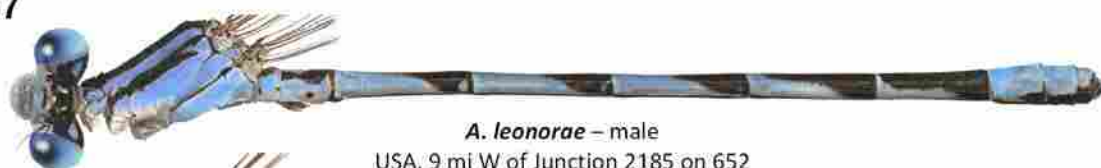


A. hinei – female
USA, Upper Sabino Canyon

Genital ligula distal segment with a single flagellum or apical strap-like process

With a flagellum and lateral lobes digitiform and sclerotized or darkened

937



A. leonora – male

USA, 9 mi W of Junction 2185 on 652

938



A. leonora – female

MEXICO, 5-6 mi W of Cuatro Ciénagas

With a flagellum and lateral lobes digitiform and sclerotized or darkened

939



A. nahuana – male

MEXICO, Lago de Camécuaro

940



A. nahuana – male

USA, San Bernardino Ranch

941



A. nahuana – female

USA, Slaughter Ranch

With a flagellum and lateral lobes digitiform and sclerotized or darkened

942



A. agrioides – male

MEXICO, Primer Agua

943



A. agrioides – female

MEXICO, Rancho San Enrique

Genital ligula distal segment with a single flagellum or apical strap-like process

With a flagellum and lateral lobes digitiform and sclerotized or darkened

944



A. fumipennis violacea – male
MEXICO, La Michilia

945



A. fumipennis violacea – male
USA, Bottomless Lakes

946



A. fumipennis violacea – female
USA, Bottomless Lakes

With a flagellum and lateral lobes digitiform and sclerotized or darkened

947



A. pallens – male
USA, Cave Creek

948



A. pallens – female
USA, Slaughter Ranch

With a flagellum and lateral lobes digitiform and sclerotized or darkened

949



A. alberta – male
USA, Afton Canyon

950



A. alberta – female
USA, Double Springs

Genital ligula distal segment with a single flagellum or apical strap-like process

With a flagellum and lateral lobes digitiform and sclerotized or darkened

951



A. paludicola – PARATYPE male
USA, Apache Bog Tank

952



A. paludicola – PARATYPE female
USA, Apache Bog Tank

Genital ligula distal segment with a bifid flagellum and a pair of lateral multispinose branches

With metallic coloration

953



A. fulgida – male
COSTA RICA, La Selva

954



A. fulgida – female
PANAMA, Cerro Azul

With metallic coloration

955



A. calverti – male
COSTA RICA, Monteverde

956



A. calverti – female
COSTA RICA, Monteverde

Genital ligula distal segment with a bifid flagellum and a pair of lateral multispinose branches

With metallic coloration

957



A. cupraurea – male
COSTA RICA, near La Unión

958



A. cupraurea – female
COSTA RICA, near La Unión

With metallic coloration

959



A. cuprea – male
MEXICO, Las Pozas de Xilitla

960



A. cuprea – female
MEXICO, Palenque Ruins

With metallic coloration

961



A. oenea – male
MEXICO, near Playa Escondida

962



A. oenea – male
USA, Seven Springs

963



A. oenea – female
COSTA RICA, near La Unión

Genital ligula distal segment with a bifid flagellum and a pair of lateral multispinose branches

With blue coloration

964



A. percellulata – male

MEXICO, Veracruz River near Concordia

965



A. percellulata – male

MEXICO, Puente Texolo

966



A. percellulata – male

MEXICO, San Marcos River

967



A. percellulata – female

MEXICO, San Marcos River

With blue coloration

968



A. harknessi – male

MEXICO, Vicente Aranda (San Rafael)

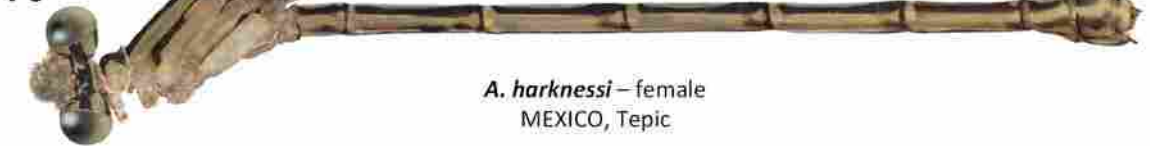
969



A. harknessi – female

MEXICO, Balneario Las Palmas

970



A. harknessi – female

MEXICO, Tepic

Genital ligula distal segment with a bifid flagellum and a pair of lateral multispinose branches

With blue coloration

971



A. insipida – male
COSTA RICA, Parismina River

972



A. insipida – female
NICARAGUA, Refugio Bartolo

With blue coloration

973



A. barretti – male
USA, Nueces River

974



A. barretti – female
MEXICO, San Marcos River

With blue coloration

975



A. pipila – male
MEXICO, Salto Epiyantla

976



A. pipila – female
MEXICO, Salto Epiyantla

Genital ligula distal segment with a bifid flagellum and lacking lateral multispinose branches

With an ental semicircular or keel-like membranous process

977



A. translata – male
COSTA RICA, 12 km E of Golfito

978



A. translata – male
MEXICO, Salto de Epiyantla

979



A. translata – female
MEXICO, Salto de Epiyantla

With an ental semicircular or keel-like membranous process

980



A. oculata – male
COSTA RICA, Reventazón River

981



A. oculata – male
MEXICO, Guiracoba River

982



A. oculata – female
MEXICO, Javier Clavijero Park

Genital ligula distal segment with a bifid flagellum and lacking lateral multispinose branches

With an ental semicircular or keel-like membranous process

983



A. rogersi – male
COSTA RICA, Finca Mauricio Ramirez

984



A. rogersi – male
COSTA RICA, Monteverde

985



A. rogersi – female
COSTA RICA, Monteverde

986



A. rogersi – female
COSTA RICA, Finca Mauricio Ramirez

With flagellum base arching entally towards basal segment

987



A. adamsi – male
COSTA RICA, near La Unión

988



A. adamsi – female
MEXICO, Piedras River near Pacheco

Genital ligula distal segment with a bifid flagellum and lacking lateral multispinose branches

With flagellum base arching entally towards basal segment

989



A. herberti – male
MEXICO, Las Estacas

990



A. herberti – male
MEXICO, El Camarón

991



A. herberti – male
MEXICO, Los Pilares River

992



A. herberti – female
MEXICO, tributary of Los Pilares River

With flagellum base arching entally towards basal segment

993



A. calida – male
MEXICO, Puente Palictla

994



A. calida – female
MEXICO, Ruinas del Tajín

Genital ligula distal segment with a bifid flagellum and lacking lateral multispinose branches

With flagellum base arching entally towards basal segment

995



A. garrisoni – male
MEXICO, Huichihuayán River

996



A. garrisoni – female
MEXICO, Cascada de Micos

With flagellum base arching entally towards basal segment

997



A. carolus – PARATYPE male
COSTA RICA, Cataratas River

998



A. carolus – PARATYPE female
COSTA RICA, El Rodeo

999



A. carolus – PARATYPE female
COSTA RICA, Diamantes River

1000



A. carolus – PARATYPE female
COSTA RICA, El Rodeo

Genital ligula distal segment with a bifid flagellum and lacking lateral multispinose branches

With flagellum base arching entally towards basal segment

1001



A. ulmeca – male
MEXICO, Arroyo Claro

1002



A. ulmeca – male
GUATEMALA, Escuintla

1003



A. ulmeca – female
MEXICO, Arroyo Claro

With flagellum bifid along its distal 0.20

1004



A. gonzalezi – PARATYPE male
GUATEMALA, Finca Moca Grande

1005



A. gonzalezi – PARATYPE female
GUATEMALA, Finca Moca Grande

With flagellum bifid along its distal 0.20

1006



A. medullaris – male
COSTA RICA, Monteverde

1007



A. medullaris – female
COSTA RICA, Monteverde

Genital ligula distal segment with a bifid flagellum and lacking lateral multispinose branches

With flagellum bifid along its distal 0.50 to its entire length

1008



A. johannella – male
COSTA RICA, Reventazón River

1009



A. johannella – female
COSTA RICA, Puerto Viejo

With flagellum bifid along its distal 0.50 to its entire length

1010



A. sedula – male
MEXICO, Coy River headwaters

1011



A. sedula – female
USA, Mecca

With flagellum bifid along its distal 0.50 to its entire length

1012



A. indicatrix – male
MEXICO, Agua Caliente

1013



A. indicatrix – female
MEXICO, Agua Caliente

1014



A. indicatrix – female
HONDURAS, Nance River

Genital ligula distal segment with a bifid flagellum and lacking lateral multispinose branches

With flagellum bifid along its distal 0.50 to its entire length

1015



A. popoluca – male
COSTA RICA, La Selva

1016



A. popoluca – male
MEXICO, Los Tuxtlas

1017



A. popoluca – female
PANAMA, near Santa Fe

1018



A. popoluca – female
PANAMA, near Santa Fe

With flagellum bifid along its distal 0.50 to its entire length

1019



A. tezpi – male
MEXICO, road to San Javier

1020



A. tezpi – female
MEXICO, Amacuzac River

1021



A. tezpi – female
HONDURAS, El Paraíso

Genital ligula distal segment with a bifid flagellum and lacking lateral multispinose branches

With flagellum bifid along its distal 0.50 to its entire length

1022



A. mayi – male
MEXICO, La Palma

1023



A. mayi – female
MEXICO, La Palma

With flagellum bifid along its distal 0.50 to its entire length

1024



A. rhoadsi – male
USA, Las Moras Creek

1025



A. rhoadsi – female
MEXICO, Ojitipa River

With flagellum bifid along its distal 0.50 to its entire length

1026



A. frequentula – male
MEXICO, Otapa River

1027



A. frequentula – female
MEXICO, 7.5 mi ESE of Guácimo

Genital ligula distal segment with a bifid flagellum and lacking lateral multispinose branches

With flagellum bifid along its distal 0.50 to its entire length

1028



A. pulla – male
COSTA RICA, 3 mi E of Golfito

1029



A. pulla – male
COSTA RICA, between Hatillo and Matapalo

1030



A. pulla – female
COSTA RICA, 11 km N of Sardinal

With flagellum bifid along its distal 0.50 to its entire length

1031



A. gaumeri – male
MEXICO, Laguna Azul and Emilia

1032



A. gaumeri – female
BELIZE, N of Agustine

1033



A. gaumeri – female
BELIZE, 3.6 mi S of Blanden River