Zootaxa 1016: 29–38 (2005)
www.mapress.com/zootaxa/

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

1016

Prasmodon zlotnicki, a new Neotropical species of the genus *Prasmodon* Nixon (Braconidae: Microgastrinae) from Costa Rica, with the first host records for the genus

ALEJANDRO A. VALERIO[1, 2], JOSEPHINE J. RODRIGUEZ[1], JAMES B. WHITFIELD[1] & DANIEL H. JANZEN[3]

[1] *Current Address: Department of Entomology, University of Illinois at Urbana-Champaign, IL 61801, USA; avalerio@life.uiuc.edu, jrodriguez@life.uiuc.edu, jwhitfie@life.uiuc.edu.*

[2] *Central American Institute of Biological Research and Conservation (CIBRC). P.O. Box 2398-2050 San Pedro de Montes de Oca, San José, Costa Rica; avalerio@hotmail.com*

[3] *Department of Biology, University of Pennsylvania, Philadelphia, PA 19104, USA; djanzen@sas.upenn.edu*

ABSTRACT

Prasmodon zlotnicki, a new Costa Rican species of the genus *Prasmodon* Nixon, is described and illustrated. In addition, the first host records for the genus are included along with an updated key to differentiate *Prasmodon zlotnicki* from *P. eminens* Nixon. *Prasmodon* is now known to attack several species of leaf-rolling and leaf-webbing Crambidae (Lepidoptera) in rain forest habitats.

Key words: Braconidae, Microgastrinae, *Prasmodon*, Crambidae, Spilomelinae, host records

INTRODUCTION

The monotypic microgastrine braconid wasp genus *Prasmodon* was erected by Nixon (1965), based on the striking neotropical species *Prasmodon eminens* Nixon from Peru. Members of *Prasmodon* are easily recognized by their possession of the following combination of features: yellowish body coloration with brownish wings, reduced vannal lobe of the hind wing, closed areolet of the forewing and clearly defined transverse propodeal carina crossing the medial longitudinal carina (Whitfield 1997). No host data have been previously reported for the genus, but adults have been frequently captured by Malaise traps placed in secondary successional lowland rain forest throughout much of Central America and northern South America (Mason 1981; Valerio & Whitfield pers. obs.)

Accepted by M. Buffington: 8 Jun. 2005; published: 8 Jul. 2005

This genus has not been revised since Mason's (1981) treatment of the microgastrine genera. Mason placed *Prasmodon* within a "Prasmodon group" within Microgastrini. Prior to Mason, Nixon (1965) placed the genus within the "tribe Microgasterini" and noted that *Prasmodon* "represents a line of development that must have diverged early in the evolution of the tribe." More recent molecular phylogenetic studies, based on 16S, 28S and CO1 gene fragments, recovered *Prasmodon* as closely related to *Clarkinella* and *Xenogaster* (Mardulyn & Whitfield 1997; Whitfield *et al.* 2002). The support for this 3-membered clade, however, was very low (bootstrap value of 51). Further work on the generic relationships of Microgastrinae using additional genes is underway in the Whitfield laboratory (http://www.life.uiuc.edu/whitfield/), so this uncertain placement may be resolved soon.

Prasmodon zlotnicki (see below) is the first species described for the genus since Mason's revision, although he mentioned that he had seen at least five other Neotropical species collected from lowland tropical areas in South America (we are unaware of the location of specimens not matching either of these species).

Here we describe a new reared species of *Prasmodon* from Costa Rica, present an updated key for the two known species and provide a brief review of the first host records for the genus.

MATERIALS AND METHODS

Specimens were identified to genus using the keys in Whitfield (1997). To identify to species, the specimens were compared to published descriptions as well as specimens of *P. eminens* Nixon identified by J.B. Whitfield and deposited at the Illinois Natural History Survey (INHS), Champaign, Illinois.

Most of the morphological terminology in the species descriptions follows Huber and Sharkey (1993) and Schuh (1989). The exceptions are: the morphology of the propodeum follows Townes (1969); terminology of the cuticular sculpturing uses Harris (1979); terminology for the wing venation is a variation of the Comstock-Needham system used by Sharkey and Wharton (1997).

The type specimens were photographed with a Philips XL30 ESEM-FEG electron microscope at the Beckman Microscopy Suite (University of Illinois at Urbana-Champaign). Wing illustrations were traced in Adobe Illustrator v. 10 after digital photographs were taken using a JVC GC-QX5HD digital still camera mounted on a Leica MZ125 stereomicroscope.

Food plant and parasitoid host records were obtained from the inventory of wild-caught caterpillars, their food plants and their parasitoids of the Area de Conservación Guanacaste (ACG) in northwestern Costa Rica being conducted by D. H. Janzen and W. Hallwachs (http://janzen.sas.upenn.edu; Schauff & Janzen 2001; Deans *et al.* 2003; Janzen *et al.* 2003; Janzen 2003; Hebert *et al.* 2004; Gauld & Janzen 2004).

Identifications of the caterpillars in the field by D.H. Janzen were based on a combination of the examination of the caterpillar remains (carcasses) as well as their cocoons; the identifications were also done based on the caterpillar food plants and the descriptions provided by the parataxonomists performing the actual caterpillar husbandry (Janzen 2004).

Key to the described Neotropical species of *Prasmodon* Nixon

1. Mesonotum mainly yellow but with anterior-medial area as well as lateral areas dark brown (Fig. 1A); hind tarsal claws with pectination (teeth) very irregular in spacing and length (Fig. 2C); metasomal terga 3 to 8 yellow with medio-longitudinal area dark brown and first metasomal tergum whitish yellow (Fig.1F) ....*P. zlotnicki* Valerio & Rodriguez n. sp.
- Mesonotum and metasomal terga totally yellow (Figs. 1D, 1G); hind tarsal claw pectination uniform with teeth thick and relatively evenly spaced (Fig. 2D)..... .....*P. eminens* Nixon

***Prasmodon zlotnicki* Valerio & Rodriguez, n. sp.**
(Figs. 1A, 1B, 1E, 1F, 1H, 2A, 2B, 2C, 2E, 2F, 2G)

Female. Body length = 4.55–4.65 mm.

Body color. Distal four flagellomeres of antenna bright yellow, remainder of antenna as well as mid area of metasomal terga 3–8, distal 2/5 of hind and mid tibial leg, hind leg 2nd to 5th tarsomeres, mid leg 3rd to 5th tarsomeres, ventrodistal 1/3 of hind coxae, tibial spurs, mid-frontal and lateral areas of mesonotum as well as interocular area dark brown. All tarsal claws and tips of mandibles dark brown. Remainder of mesonotum, scutellum and metanotum, remainder of terga 3rd to 8th, as well as laterotergites and ocelli, yellow. Compound eyes silverish white (in dead specimens); remainder of body and first metasomal tergum whitish yellow. Wings infumate with dark brown veins.

Head. Head height/width = 1.17–1.18; compound eye height/width = 1.67–1.68; intertentorial pit distance = 0.25–0.28 mm; tentorial pit distance/distance tentorial pit to compound eye = 10–11; width of face at dorsal clypeal edge = 0.43–0.44 mm; clypeus width/height = 3.00–3.33; vertex width/distance between anterior ocelli and edge of torulus = 2.08–2.16; length of first flagellomere = 0.35–0.38 mm; first flagellomere length/width = 2.00–2.15; length of first flagellomere/length of second flagellomere = 1.08–1.11; length of first flagellomere/length of third flagellomere = 1.08–1.11; distal flagellomere length = 0.25 mm; distal flagellomere length/penultimate flagellomere length = 1.11–1.18; distal flagellomere length/width = 2.5; malar space height/basal width of mandible = 0.50–0.57; ocell-ocular distance/lateral ocelli distance = 2.50–2.67. Head densely fine setose (including clypeus and labrum) except for scrobal areas of frons glabrous.

Mesosoma. Mesosoma length/width = 1.27–1.31; mesosoma length = 0.94–0.95 mm; mesosoma height = 1.20–1.30 mm. Propleuron with a series of transverse ridges on anterior 2/3, remainder without ridges but with fine punctulate sculpturing; propleuron with anterior lateral 1/2 with conspicuous transverse ridges, remainder nitid and glabrous except for dorsal edge on posterior upper corner with setosity, ventrolateral edge expanded and about 1/3 height of posterior edge; mesonotum and scutellum densely covered with fine punctate sculpturing, notauli well demarcated; scutellar groove with 6 to 7 well defined costulae of uniform width; axilla through mesonotum with transversal ridges on area next to scutellum, remainder nitid; metanotum depressed with one large distinct costula; axilla through metanotum with short thick ridges on posterior edge, remainder nitid; propodeum nitid except for carination, costular, transverse and medial longitudinal carinae present, complete and well defined; transverse carina slightly sinuate but medio longitudinal carina straight; spiracular area nitid with spiracles well defined by carinae; mesopleuron with sternaulus forming a nitid depressed area, remainder with fine punctate sculpturing; metapleuron nitid except for short transverse ridges throughout the length of metapleural suture.

Legs. Femur length = 1.22–1.25 mm; hind femur length/width = 3.10–3.16; hind tibia length/hind femur length = 1.40–1.41. Fore telotarsus normal in shape; tarsal claws pectinate with last two teeth thick, sharp and separated.

Wings. Forewing length = 5.2–5.4 mm; 1RS length = 0.08–0.10 mm; 1CUa length/ 1CUb length = 0.30–0.31; length RS+Ma = 0.71–0.72 mm; length M+CU = 1.78–1.82 mm; 1M length/ m-cu length = 1.70–1.75; pterostigma length/height = 2.27–2.30. Hind wing: 1M length = 1.04–1.08 mm; 1M length/2M length = 2.59–2.69; 1M length/M+CU length = 2.26–2.30; length r-m/length cu-a= 0.60–0.64; 1RSa length/2r-m = 1.29–1.34; 1A length = 0.34–0.35 mm.

Metasoma. First tergum basal width = 0.94–0.95 mm; first tergum length/distal width = 2.06–2.50; second tergum length/distal width = 0.28–0.32; third tergum length/distal width = 0.38–0.40; hypopygium length = 0.7–0.9 mm; first metasomal segment sharply narrowing posteriorly, nitid as are remainder terga; ovipositor sheaths 0.46–0.50X as long as hind tibia length and densely setose; ovipositor elongate and narrow in lateral view and as long as hind tibia.

Material examined. Holotype, female, "Costa Rica, Guanacaste, Area de Conservación Guanacaste, Sector San Cristobal, Sendero Corredor, 620 m, 317739N 384297E, 6/vii/2002, [Col.] G. Sihezar; voucher code 02-SRNP-18182 & eclosed 07/29/ 2002." Paratype, one female, voucher code 02-SRNP-18180 with same data and eclosing date as holotype.

The holotype and paratype are deposited at Instituto Nacional de Biodiversidad (INBio), Santo Domingo de Heredia, Costa Rica.

Rearing records. Specimens were reared from *Neurophyseta camptogrammalis* (Crambidae: Spilomelinae) caterpillars living in leaflet rolls of, and feeding on, the foliage

of the rain forest tree fern *Alsophila firma* (Cyatheaceae). One parasitoid per caterpillar was reared, the wasp larva emerged from the newly killed last instar/prepupal host larva. The wasp larva spins a single large elongate-ovoid white cocoon glued lightly to the leaf within a few millimeters of the host carcass.

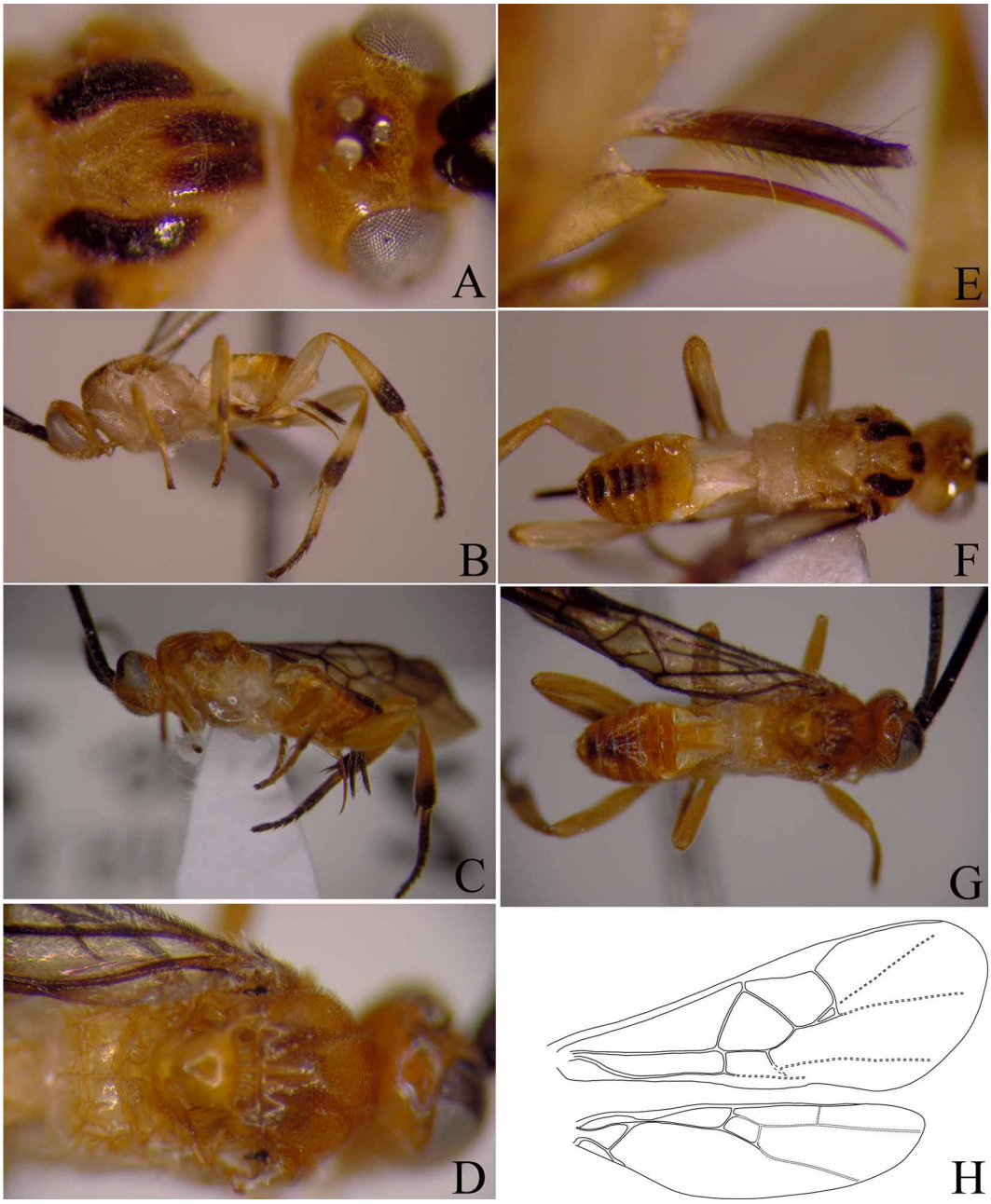

FIGURE 1. *Prasmodon zlotnicki* n. sp. A: mesonotum. B: body in lateral view. E: ovipositor and ovipositor sheaths. F: dorsal view of body. H: hind wing and forewing. *Prasmodon eminens* Nixon. C: lateral view of body. D: mesonotum. G: dorsal view of body.

Etymology. *Prasmodon zlotnicki* is named in honor of Dr. Brad Zlotnick of San Diego, California, in recognition of his two decades of enthusiastic attention to, and support of, the Area de Conservación Guanacaste (including the partial purchase of the forest in which *P. zlotnicki* can be found).

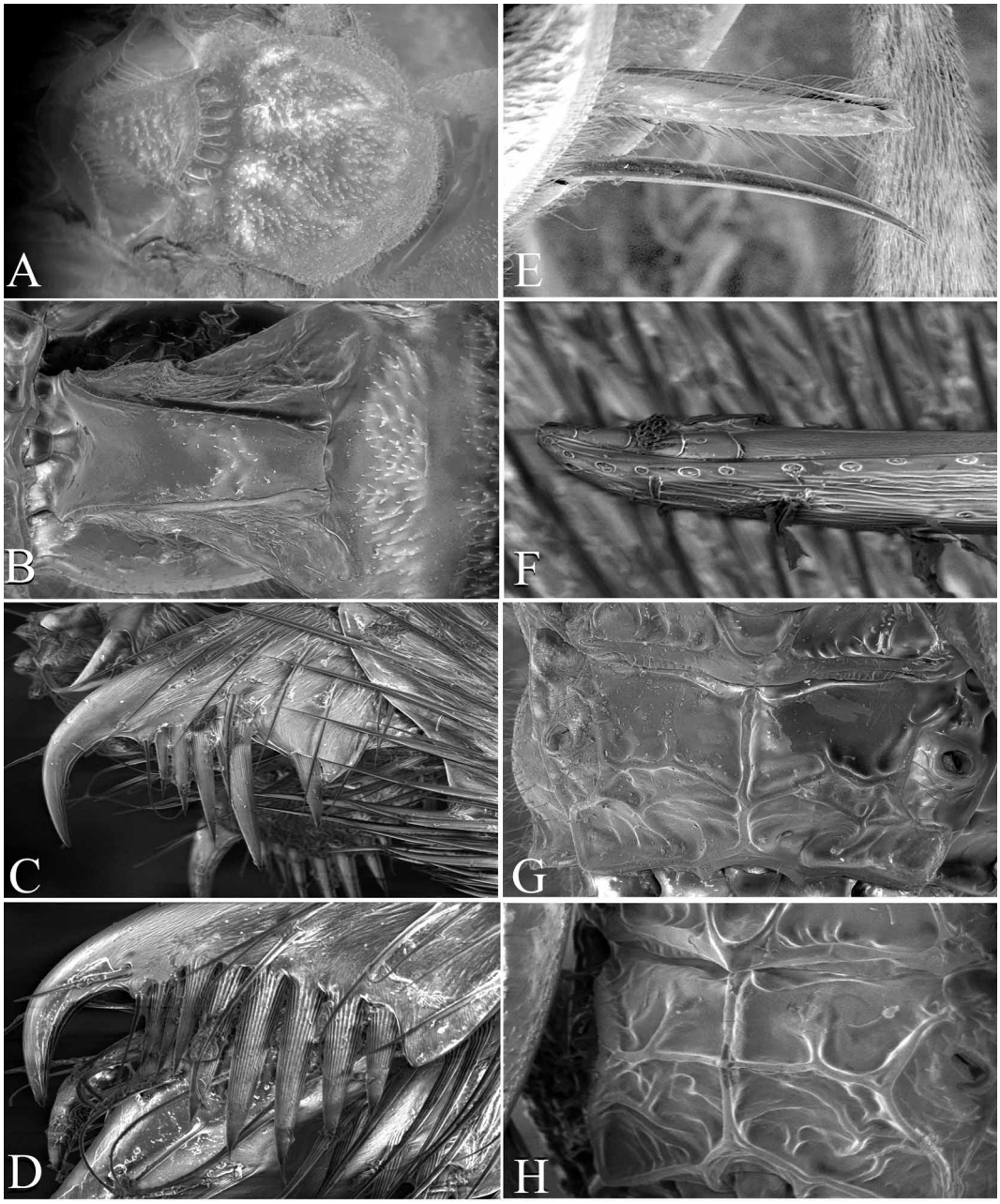

FIGURE 2. *Prasmodon zlotnicki* n. sp. A: mesonotum. B: first metasomal tergum. C: hind tarsal claw. E: ovipositor and ovipositor sheath. F: tip of ovipositor. G: propodeum. *Prasmodon eminens* Nixon. D: hind tarsal claw. H: propodeum.

***Prasmodon eminens* Nixon (Figs. 1C, 1D, 1G, 2D, 2H, 3)**

Rearing records. Specimens were reared from the following leaf-rolling and webbing caterpillars: *Anarmodia nebulosalis* (Crambidae: Spilomelinae) feeding on *Dendropanax arboreus* (Araliaceae); *Omiodes humeralis* (Pyraustinae: Crambidae) feeding on *Inga oerstediana* (Fabaceae); *Portentomorpha xanthialis* (Crambidae: Spilomelinae) feeding on *Margaritaria nobilis* (Euphorbiaceae) and *Parastenia retractalis* (Hampson) (Crambidae: Spilomelinae) feeding on an unidentified plant.

Related voucher codes: 02-SRNP-21137, 02-SRNP-6643, 02-SRNP-6645, 03-SRNP-8915, 03-SRNP-10289, 03-SRNP-10965, 04-SRNP-541, 02-SRNP-29656, 04-SRNP-25140, 04-SRNP-25148, 04-SRNP-25149, 04-SRNP-25159, 04-SRNP-25160, 04-SRNP-25165, 04-SRNP-25164, 04-SRNP-25166 and 04-SRNP-25167. These specimens are preserved in ethanol and refrigerated in the laboratory of J.B. Whitfield, or pinned dry at the Illinois Natural History Survey.

Collection localities in Costa Rica. i) Guanacaste: Area de Conservación Guanacaste: Del Oro, Quebrada Romero, Lat. 11.00519, Long.—85.47398, 490 m, Col. R. Moraga; Sector El Hacha, Finca Arraya, Lat. 11.01541, Long.—85.51125, 295 m, Col. D. Garcia. ii) Alajuela, Area de Conservación Guanacaste, Rincón Rain forest: Sendero Anonas, Lat. 10.90528, Long. —85.27882, 405 m, Col. J. Pérez; San Lucas, Lat. 10.91847, Long. —85.30338, 320 m, Col. J. Perez; Rincón Rainforest, Sendero Juntas, Lat. 10.90661, Long. —85.28784, 400 m, Col. M. Carmona; Sector San Cristóbal, Sendero Soterrey, Lat. 10.90014, Long. —85.38284, 495 m, Col. O. Espinoza. iii) Alajuela, Dos Ríos, San Gabriel, Finca San Gabriel, Lat. 10.87766, Long. —85.39343, 645 m, Col. G. Sihezar.

Widely distributed in rain forest in northern South America and Central America. This species shows some regional morphological variation, and might well represent a complex of sibling species.

DISCUSSION

All 19 rearings of *Prasmodon* have been from ACG rain forest between 320 and 645 m elevation. The ACG caterpillar inventory, however, has not extended below this elevation, so only the upper elevation has a possibility of being a "limit". All of the reared wasps have been solitary parasitoids of leaf-rolling or leaf-webbing Spilomelinae (Crambidae) feeding on shrubs, treelets and tree saplings across a wide range of plant families (Cyathaceae, Araliaceae, Euphorbiaceae, Fabaceae). The hosts are both solitary species (e.g., *Omiodes humeralis*) and social species in masses of webbed leaves (e.g., "same as 04-SRNP-25134"). Since these species do not feed exposed to the outer world the only way that the wasp could exploit their host is either to oviposit through layers of silked leaves or burrow through this material in search of the host. It cannot be determined from the data at hand what host instar is attacked by the parasitoid, but the wasp larva exits from

the full-sized last instar (rarely or usually). Within the moth's cocoon the wasp spins a shaggy large white ovoid “apanteloid” cocoon on the leaf surface a few millimeters from the carcass (Fig. 3).

Prasmodon eminens and *P. zlotnicki* do not attack rain forest Crambidae with high frequency. The 19 wasp rearings are from approximately 8,000 rearings of wild-caught ACG rain forest Crambidae (including more than 1,000 caterpillars of the species from which it has been reared) in the past 20 years. There is no evidence of this genus parasitizing caterpillars in other families, but there are candidates (Pyralidae, Elachistidae, Tortricidae, Gelechiidae) in the same habitat. While solitary *Omiodes humeralis* feeding on *Inga* sp. might be one of its focal host species, the nine records from *Omiodes humeralis* are all from a single clutch of sibling caterpillars living among a group-constructed mass of webbing and leaves. Crambidae occur at a high density throughout ACG habitats, so even a very low frequency of parasitization could result in this being a common wasp in Malaise traps.

FIGURE 3. White silk cocoon (16 mm in length) and the carcass of a crambid host (*Omiodes humeralis*) of *Prasmodon eminens* Nixon reared in the Area de Conservación Guanacaste (03-SRNP-10289). Photograph taken by D.H. Janzen.

ACKNOWLEDGMENTS

This study was partially supported by National Science Foundation grants DEB 0072730 to D.H. Janzen and DEB 0346712 to J.B. Whitfield. We are grateful to Dr. M.A. Solis of the Systematic Entomology Laboratory, USDA, National Museum of Natural History, for moth identifications.

REFERENCES CITED

Deans, A.R., Whitfield, J.B. & Janzen, D.H. (2003) Taxonomy and natural history of the microgastrine genus *Alphomelon* Mason (Hymenoptera: Braconidae). *Journal of Hymenoptera Research*, 12, 1–41.

Gauld, I.D. & Janzen, D.H. (2004) The systematics and biology of the Costa Rican species of parasitic wasps in the *Thyreodon* genus-group (Hymenoptera: Ichneumonidae). *Zoological Journal of the Linnean Society*, 141, 297–351.

Harris, R.A. (1979) A glossary of surface sculpturing. *Occasional Papers of the Bureau of Entomology of the California Department of Agriculture*, 28, 1–32.

Hebert, P.D.N., Penton, E.H., Burns, J.M., Janzen, D.H. & Hallwachs, W. (2004) Ten species in one: DNA barcoding reveals cryptic species in the neotropical skipper butterfly *Astraptes fulgerator. Proceedings of the National Academy of Sciences*, 101, 14812–14817.

Janzen, D.H. (2003) How polyphagous are Costa Rican dry forest saturniid caterpillars? *In:* Basset, Y., Novotny, V., Miller, S.E. & Kitching, R.L., (Eds.), *Arthropods of tropical forests. Spatio-temporal dynamics and resource use in the canopy.* Cambridge University Press, Cambridge, pp. 369–379.

Janzen, D.H. (2004) Setting up tropical biodiversity for conservation through non-damaging use: participation by parataxonomists. *Journal of Applied Ecology*, 41, 181–187.

Janzen, D.H., Walker, A.K., Whitfield, J.B., Delvare, G. & Gauld, I.D. (2003) Host-specificity and hyperparasitoids of three new Costa Rican species of *Microplitis* Foerster (Hymenoptera: Braconidae: Microgastrinae), parasitoids of sphingid caterpillars. *Journal of Hymenoptera Research*, 12, 42–76.

Mardulyn, P. & Whitfield, J.B. (1999) Phylogenetic signal in the CO1, 16S and 28S genes for inferring relationships among the genera of Microgastrinae (Hymenoptera; Braconidae): Evidence of high diversification rate in this group of parasitoids. *Molecular Phylogenetics and Evolution*, 12, 282–294.

Mason, W.R.M. (1981) The polyphyletic nature of *Apanteles* Foerster (Hymenoptera: Braconidae): a phylogeny and reclassification of Microgastrinae. *Memoirs of the Entomological Society of Canada*, 155, 1–147.

Nixon, G.E.J. (1965) A reclassification of the tribe Microgasterini (Hymenoptera: Braconidae). *Bulletin of the British Museum (Natural History), Entomology Supplement*, 2, 1–284.

Schauff, M.E. & Janzen, D.H. (2001) Taxonomy and ecology of Costa Rican *Euplectrus* (Hymenoptera: Eulophidae), parasitoids of caterpillars (Lepidoptera). *Journal of Hymenoptera Research*, 10, 181–230.

Schuh, R.T. (Ed.) (1989) *The Torre-Bueno Glossary of Entomology* (revised edition). The New York Entomological Society, New York, 849 pp.

Sharkey, M.J. & Wharton, R.A. (1997) Morphology and terminology. *In*: Wharton, R.A., Marsh, P.M. & Sharkey, M.J. (Eds.), *Manual of the New World Genera of the Family Braconidae (Hymenoptera). International Society of Hymenopterists Special Publication*, 1, 19–37.

Townes, H. (1969) The genera of Ichneumonidae, Part 1; Ephialtinae to Agriotypinae. *Memoirs of the American Entomological Institute*, 11, 1–300.

Whitfield, J.B. (1997) Subfamily Microgastrinae. *In*: Wharton, R.A., Marsh, P.M & Sharkey, M.J. (Eds.), *Manual of the New World Genera of the Family Braconidae (Hymenoptera)*. *International Society of Hymenopterists Special Publication*, 1, 333–364.

Whitfield, J.B., Mardulyn, P., Austin, A.D. & Dowton, M. (2002) Phylogenetic relationships among microgastrine braconid wasp genera based on data from the 16S, COI and 28S genes and morphology. *Systematic Entomology*, 27, 337–359.

