

**TWO NEW SPECIES OF *EPSILOGASTER*
WHITFIELD & MASON (HYMENOPTERA: BRACONIDAE)
FROM MEXICO AND COSTA RICA**

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Abstract.—*Epsilogaster williami* new species from Mexico, and *Epsilogaster antoniae* new species (Hymenoptera: Braconidae) from Costa Rica are described with illustrations of wing venation, head, mesosoma, and metasomal segments. A key is provided for the nine known species of *Epsilogaster* Whitfield & Mason, a recently described genus of the rarely collected subfamily Mendesellinae.

Key Words.—Insecta, Braconidae, Mendesellinae, *Epsilogaster*, Taxonomy, new species, New World.

Knowledge of the braconid fauna of Mexico and Costa Rica is rather limited (Delfin et al. 2002, Gauld & Hanson 1996). At least 300 described species of Braconidae have been reported from Mexico (Wharton & Mercado 2000), a small fraction of the likely total. On the other hand, more than 3000 undescribed species may occur in Costa Rica.

Epsilogaster Whitfield & Mason (1994) is a small genus within the subfamily Mendesellinae. Members of this genus, and the subfamily, are apparently restricted to the New World. Seven *Epsilogaster* species are currently described (Valerio & Whitfield 2000, 2002; Whitfield & Mason 1994; Whitfield 1997). In Mexico, *Epsilogaster* is represented in the literature largely by unidentified species from the Mexican states of Morelos (Figueroa et al. 2002) and Yucatan (Delfin et al. 2002). The only named species recorded for Mexico is *Epsilogaster bicolor* Whitfield & Mason, collected in Oaxaca (Whitfield & Mason 1994). For Costa Rica, three species have been reported (Whitfield & Mason 1994, Valerio & Whitfield 2002): *E. bicolor*, *E. faviolae* Valerio & Whitfield and *E. tico* Whitfield & Mason. At this time only one host record exists for *Epsilogaster* species: a twig borer (Lepidoptera: Momphidae) on button bush (*Cephalanthus occidentalis*) (Whitfield & Mason 1994) in the southeastern U.S.

New *Epsilogaster* material has become available for scientific study due to recent collecting efforts by the Colección de Entomología y Acarología del Colegio de Postgraduados in Mexico (CEAM) and the Instituto Nacional de Biodiversidad in Costa Rica (INBio). Here we describe *Epsilogaster williamsi* new species in order to provide a name for a forthcoming braconid checklist for the Reserva de la Biosfera Sierra de Huautla in the Mexican state of Morelos (Figueroa, in preparation). We also describe *E. antoniae* new species from Costa Rica, and provide a key to all known species of the genus.

MATERIALS AND METHODS

All measurements were made using an image analyzer, Image Pro Plus version 3.1 (Media Cybernetics 1997), adapted to a video camera (Hitachi KP-D51) attached to an Olympus BX-50 microscope. All measurements are given in millimeters. Terminology used for the species descriptions follows Whitfield & Mason (1994), Sharkey & Wharton (1997) and Valerio & Whitfield (2000). One term specific for Mendesellinae is the "E-shaped structure" of the second median tergite (Whitfield & Mason 1994). This is formed by the anterior and dorsolateral margins of the tergite, along with an anteromedial longitudinal strip, all being fully sclerotized, while other areas are less sclerotized. The degree to which this structure resembles the letter "E" varies considerably.

Drawings were produced using a Leica MZ 12.5 stereomicroscope equipped with a camera lucida, and a JVC GC-QX5HD digital still camera was attached to the same scope to produce the photographs. The wing illustrations were made using Adobe Illustrator (ver. 10.0.3) by tracing them from a digital photograph.

Acronyms for type depositories are as follows: CEAM (Colección de Entomología y Acarología del Colegio de Postgraduados, México), INBio (Instituto Nacional de Biodiversidad, Costa Rica), INHS (Illinois Natural History Survey, Illinois) and USNM (National Museum of Natural History, Smithsonian Institution, Washington, DC).

Epsilogaster williamsi Figueroa, López & Valerio, NEW SPECIES (Figs. 1–8)

Description.—Female: *Color*: dark brown; except scape, ventral surface of pedicel, base of mandible, clypeus, and malar space all brownish-yellow; palpi, coxae, trochanter, trochantellus, femora, and tibiae all yellow; compound eyes silver; ocelli whitish-yellow; tarsomeres and distal 1/3 of tibia of hind leg brownish-yellow. First metasomal tergum brown; second and third terga light brown, remaining terga brown; metasomal sterna light brown. *Head*: Head rectangular in frontal view (Fig. 2); setae of vertex sparse; frons, face, and gena posteriorly with small punctures; gena smooth anteriorly, with setae; compound eyes large, setose; ocelli forming an equilateral triangle; apical flagellomere acute (Fig. 4); dorsal surface of head punctuate; frons with small punctures and with shallow depressions posteriorly; scape smooth posteriorly; clypeus trapezoidal, 1.59–2.0 times wider than long, without tooth on ventral margin; head height/compound eye height = 1.26–1.59; head height/compound eye length = 2.0–2.30; length of first antennal flagellomere = 0.14–0.2 mm; length of first antennal flagellomere/width of first antennal flagellomere = 3.12–4.49; length of first antennal flagellomere/length of second antennal flagellomere = 1.22–1.67 (Fig. 3); length of first antennal flagellomere/length of third antennal flagellomere = 1.20–1.76; distal flagellomere length/width = 2.64–3.22; intertentorial pit distance = 0.12–0.14 mm; ocell-ocular distance = 0.07–0.12 mm; distance between antennal socket and anterior tentorial pits = 0.15–0.19 mm; face widest at dorsal edge of clypeus = 0.28–0.32 mm; antenna with 24 flagellomeres; malar suture present; malar space = 0.04–0.05 mm. *Mesosoma*. Mesosomal length/mesosomal width = 1.78–1.87; mesosomal height = 0.57–0.68 mm; distal edge of propleuron with small ridge, 95% of surface smooth with scattered punctures; lateral face of pronotum with carinae on middle surface; mesonotum sparsely setose and scarcely punctuate; notauli foveolate, not meeting posteriorly and not reaching transscutal groove (Fig. 1); transscutal groove wide and deeply impressed, with five or six short longitudinal carinae; scutellum smooth, subtriangular, with some setae in central area; metanotum anteromedially with two sub-

circular pits, remainder with transverse carinae; axillar troughs of mesonotum with transverse carinae medioposteriorly; mesopleuron smooth except sternaulus foveolate (Fig. 6); subalar depression with scattered striae; metapleuron reticulate; propodeum sub-rectangular in shape with two longitudinal carinae that join anteriorly, forming an enlarged and narrow areola; propodeum with transverse carinae, some of which pass through the areola; (Fig. 1). *Wings*. Forewing 2.60–2.84 times longer than wide; stigma broad, 2.44–2.82 times longer than wide; 1CUb 1.88–2.73 times longer than 1CUa; 1M straight; (RS+M)a straight; 1m-cu 1.53–2.42 times longer than (RS+M)b; 2RS straight; 2cu-a and 3RSb absent. Hind wing 4.28–4.3 times longer than wide; M+CU 1.93–2.16 times longer than 1M (Fig. 8). *Legs*. Hind femur length 3.46–4.75 times longer than maximum width; hind tibia 6.12–6.41 times longer than basal width; tarsomeres II–IV 1.21–1.28 times longer than basitarsus; tarsal claw simple (Fig. 5). *Metasoma*. Distal width of tergum 1/basal width of tergum 1 = 0.63–0.73; length of tergum 1/distal width of tergum 1 = 1.49–1.9; anterior area of the first metasomal tergum with wide depression, posteromedially with fine striate sculpturing, laterally with one carina and small lobe on which is situated the spiracle (Fig. 1); second tergum sclerotized on anterior and lateral margins and along midline; lateral longitudinal sclerotization extends to (or almost to) tergum 3, and median longitudinal sclerotization does not reach tergum 3; together sclerotized regions of tergum 2 form an “E”-shaped structure (the anterior sclerotized band of tergum 2 is analogous to the left side of the letter E); terminal abdominal segment as in Fig. 7.

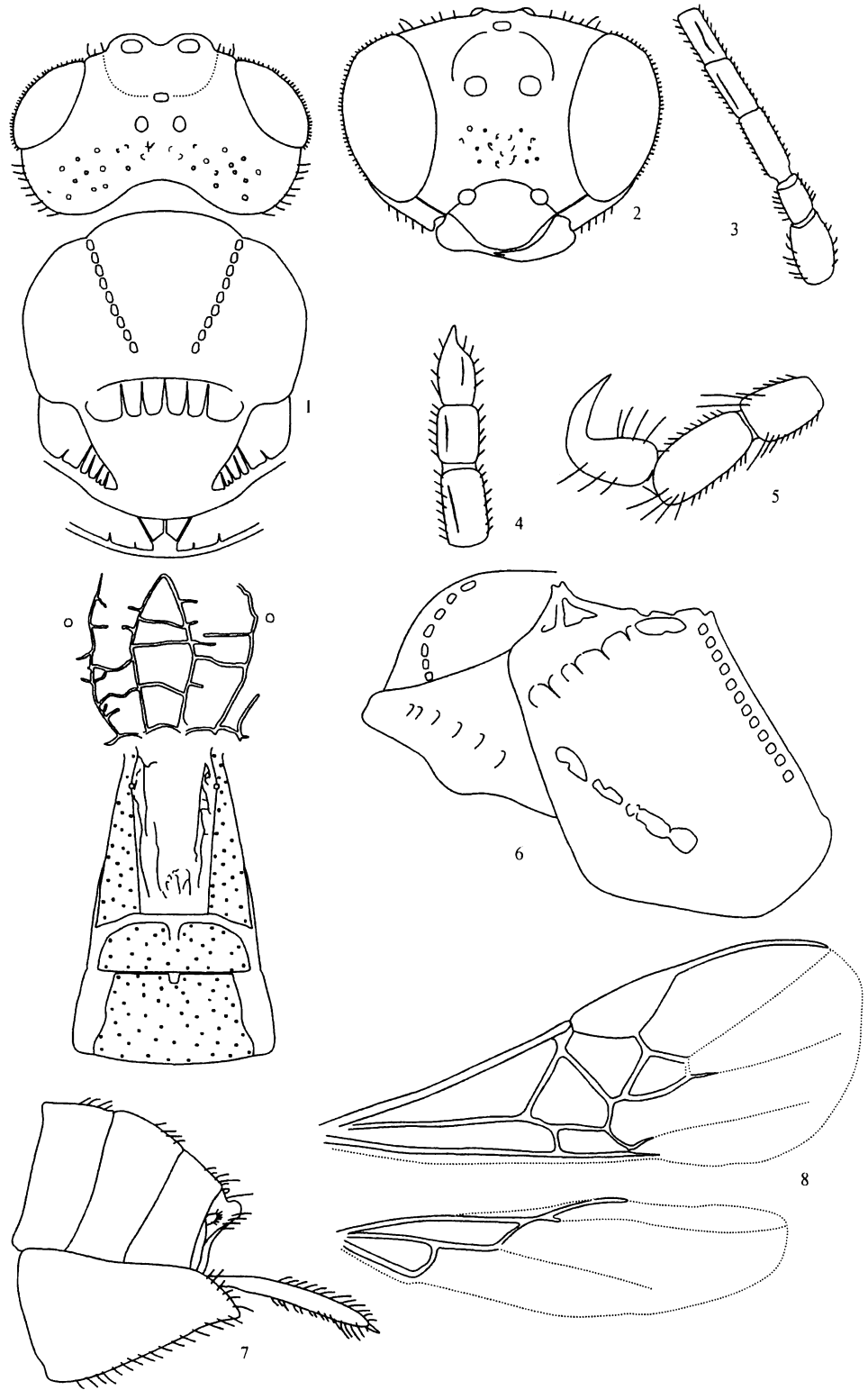
Measurements.—Length (excluding ovipositor) 2.18–2.69 mm; ovipositor length 0.81 mm. *Male*: Similar to female, except abdominal sterna brown and antenna with 22–24 flagellomeres. Clypeus 1.95–2.16 times wider than long; head height/compound eye height = 1.25–1.35; head height/compound eye length = 1.9–2.27; length of first antennal flagellomere = 0.14–0.16 mm; length of first antennal flagellomere/width of first antennal flagellomere = 3.27–4.13; length of first antennal flagellomere/length of second antennal flagellomere = 1.04–1.42; length of first antennal flagellomere/length of third antennal flagellomere = 1.26–1.40; distal flagellomere length/width of distal flagellomere length = 2.24–2.62; intertentorial pit distance = 0.13–0.15 mm; ocello-ocular distance = 0.09–0.13 mm; distance between torulus and tentorial pit = 0.16–0.18 mm; face wide at dorsal edge of clypeus = 0.29–0.32 mm; antenna with 22–24 flagellomeres; malar suture present; malar space short, mesosomal length/mesosomal width = 1.48–1.69; mesosomal height = 0.60–0.67 mm. Forewing 2.58–3.02 times longer than wide; stigma broad, 2.41–2.74 times longer than wide; 1Cub 1.39–2.20 times longer than 1Cua, 1M straight, (RS+M)a straight, 1m-cu 2.11–2.79 times longer than (RS+M)b, 2RS straight, 2cu-a and 3RSb absent. Hind wing 3.92–4.33 times longer than wide; M+CU 1.76–2.49 times longer than 1M. Hind femur 3.12–3.66 times longer than maximum width; hind tibia 5.75–7.79 times longer than basal width; tarsomeres II–IV 1.26–1.45 times longer than basitarsus. *Metasoma*. Distal width of tergum 1/basal width of tergum 1 = 0.61–0.70; length of tergum 1/distal width of tergum 1 = 1.63–1.83.

Measurements.—Body length 2.47–2.69 mm.

Distribution.—México, Morelos State.

Types.—Holotype, female; MÉXICO, MORELOS: Reserva Huautla, 18°27'47" N 99°02'20" W, 1057 m, 12 Dec 1999. Victor López; deposited: USNM. Allotype; MEXICO, MORELOS: Reserva Huautla, Est. Biológica, 18°27'47" N 99°02'20" W, 1057 m, 11 Dec 1999, Jesús Romero N.; deposited: USNM. Paratypes: 1 male and 2 females, same data as allotype; 3 males, same data as allotype but 18°27'50" N 99°02'11" W, 1050

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 Figures 1–8. *Epsilogaster williamsi* Figueroa, López & Valerio new species 1, female, dorsal view; 2, head, anterior view; 3, basal flagellomeres; 4, terminal flagellomeres; 5, tarsal claw; 6, lateral view of mesosoma; 7, terminal metasomal segments; 8, wing venation.



m, 12 Dec 1999, trampas amarillas [yellow traps], José Isaac Figueroa de la Rosa; deposited: two paratypes deposited at INHS and four paratypes deposited at CEAM.

Etymology.—This species is named in memory of William De la Rosa Reyes, uncle of the first author.

Remarks.—This species can be distinguished from others by the propodeal sculpturing and areola shape. Only three species of *Epsilogaster* have similar transverse carinae on the propodeal areola: *E. williami*, *E. faviolae* and *E. antoniae* Valerio & Whitfield sp. nov.; from these species *E. williami* can be separated by the number of flagellomeres (24 vs. ≥ 25 for *E. faviolae* and *E. antoniae*), and individually from each of these two species by other characters given in the key. The species is currently known only from Biosfera de la Reserva de Huautla in Morelos, Mexico, which is a tropical dry forest with many vascular plant species, principally Fabaceae, Poaceae, Asteraceae and Burseraceae (Dorado 1997).

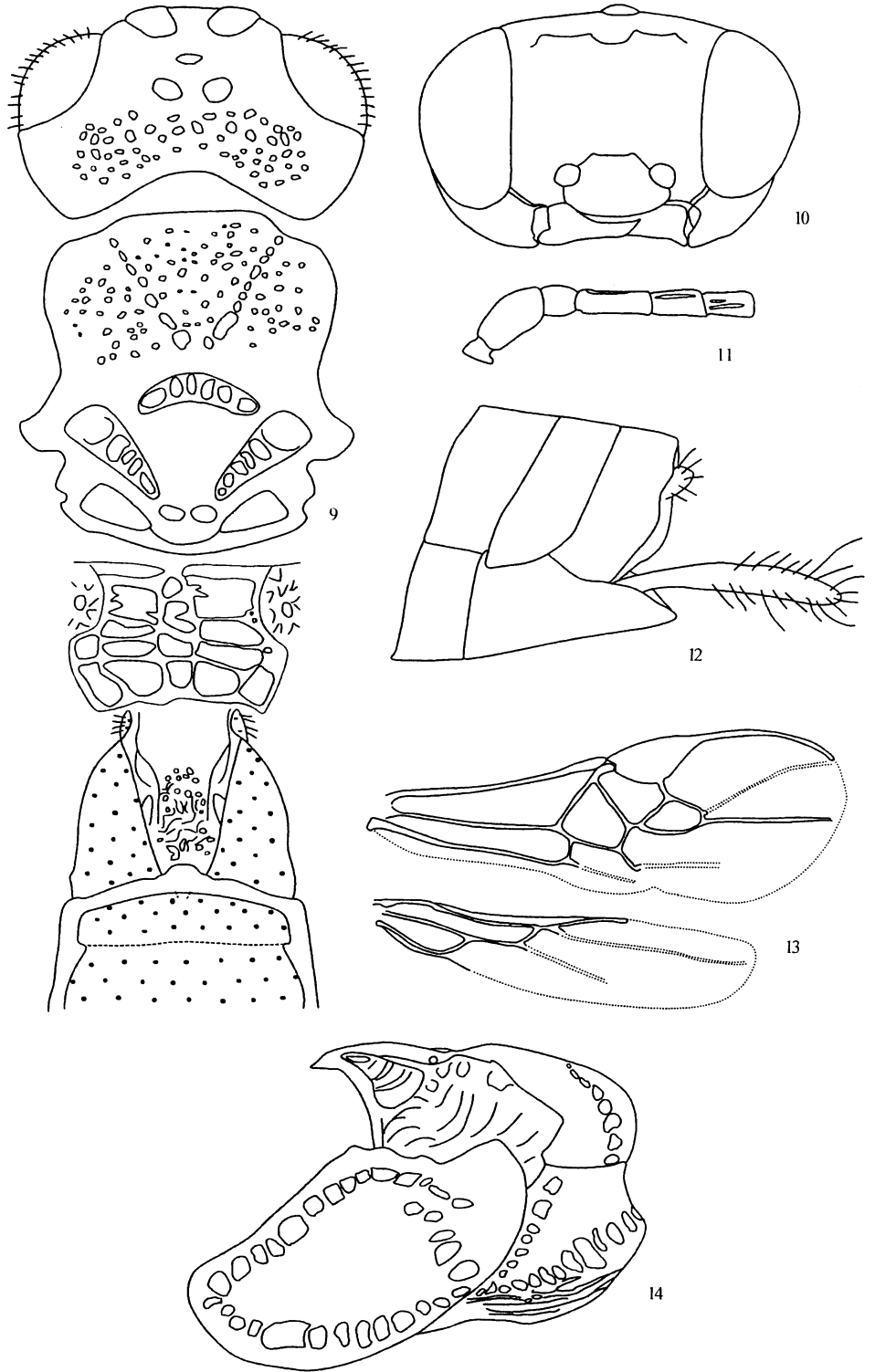
This species runs to couplet two in the key to *Epsilogaster* species by Valerio & Whitfield (2002), but can be separated from *E. bicolor* by: tergum 1 being narrower posteriorly, tergum 1 with posterior 0.3 of surface with scattered striations, and the different shape of the propodeal areola. It can also be separated from *E. palenque* Whitfield & Mason by the second metasomal tergum exhibiting an incomplete "E"-shaped structure, by having more numerous transverse carinae passing through the propodeal areola and by having the third metasomal tergum desclerotized centrally.

Epsilogaster antoniae Valerio & Whitfield, NEW SPECIES
(Figs. 9–14)

Description.—Female: *Color*: Body dark brown except as follows: palpi and coxae whitish yellow; front, middle and hind legs yellow; mandibles, clypeus, scape, pedicel, and tarsomeres and tarsal claws of the hind leg all brownish-yellow; lateral areas of scape and pedicel and flagellomeres brown; compound eyes and ocelli silver. *Head*. Head sub-rectangular in frontal view (Fig. 10); face with upper medial keel present and bulging, remainder of face and clypeus almost nitid except for fine punctate sculpturing; frons and most of vertex nitid; punctures of posterior area of vertex and posterior half of gena denser and larger; remainder of gena and postgena nitid; compound eyes setose, setae conspicuously long; ocelli forming an isosceles triangle; clypeus with ventral edge slightly curved and not conspicuously projecting ventrally, 1.6–2.0 times wider than long; head height/compound eye height = 1.8–1.85; head height/compound eye length = 2–2.30; length of first antennal flagellomere = 0.16–0.18 mm; length of first antennal flagellomere/width of first antennal flagellomere = 3.25–3.35; length of first antennal flagellomere/length of second antennal flagellomere = 1.3–1.4 (Fig. 11); length of first antennal flagellomere/length of third antennal flagellomere = 1.4–1.44; distal flagellomere length/width of distal flagellomere length = 2.25–2.67; intertentorial pit distance = 0.12–0.14; ocell-ocular distance = 0.125–0.138 mm; distance between torulus and tentorial pit = 0.11–0.12 mm; face width at dorsal edge of clypeus = 0.3–0.32 mm; antenna with 25–26 flagellomeres; malar suture present, remainder malar space nitid; malar space 0.06–0.07 mm. *Mesosoma*. Mesosomal length/mesosomal width = 1.42–1.48; mesosomal height = 0.52–0.54 mm; propleuron essentially nitid except transverse median area with few large, shallow foveae, distal edge margined by narrow carinae; anterior margin of pronotum with a groove that ends ventrally in scrobiculate sculpturing, this sculpturing covers most of ventrolateral half of pronotum, upper area nitid but posterior margin with strong scrobiculate sculpturing; basal half of mesonotum with dense punctate sculpturing that becomes more scattered towards transscutal groove; anterior half of mesonotum with dense and well defined punctate sculpturing; notauli with foveate sculpturing that is strongest at mid-length and weaker anteriorly and posteriorly (Fig. 9); transscutal groove crossed by three to six large costulae (lateral ones

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Figures 9–14. *Epsilogaster antoniae* Valerio & Whitfield new species 9, female dorsal view; 10, head, frontal view; 11, antennal basal flagellomeres; 12, terminal metasomal segments; 13, wing venation; 14, lateral view of mesosoma.



at least twice as large as medial ones); scutellum sub-triangular in shape and nitid, except for few fine punctures on margins; axilla of mesonotum with transverse ridges across its width, lateral margin nitid; mesopleuron essentially nitid except for sternaulus with large scrobiculate sculpturing that reaches and fuses with scrobiculate sculpturing from posterior and dorsal margins of mesopleuron (Fig. 14); metapleuron rugose, except for upper half and anterior margin nitid; propodeum with two sub-parallel longitudinal carinae that are more widely separated at midlength and forming an elongated narrow areola, remainder of propodeum with transverse carinae that pass through areola, spiracular area surrounded by conspicuous carina. *Wings.* Forewing 2.2–2.25 times longer than wide; pterostigma 1.06–1.2 times longer than wide; 1Cub 1.6–1.8 times longer than 1Cua; 1M, 2RS and (RS+M)a straight; 1m-cu 2–3 times longer than (RS+M)b; 2cu-a and 3RSb absent. Hind wing 4.18–4.53 times longer than wide; M+CU 2.28–2.54 times longer than 1M (Fig. 13). *Legs.* Hind femur 3.67–3.83 times longer than maximum width; hind tibia 5.9–6.1 times longer than basal width; tarsomeres II–IV 1.21–1.23 times longer than basitarsus; tarsal claw simple. *Metasoma.* Distal width of tergum 1/basal width of tergum 1 = 2.14–2.33; length of tergum 1/distal width of tergum 1 = 4.0–4.33. First metasomal tergum with parallel carinae as long as tergum length and sinuate in shape, basal 1/3 nitid except at lateral areas with scattered rugose sculpturing as remainder of first tergum (except nitid distal tip), first tergum in lateral view not elevated and spiracles not conspicuously demarcated by domelike structures; second metasomal tergum “E”-shaped in dorsal view, with middle arm short and not well defined (arrow in Fig. 9); terminal abdominal segment as in figure 12.

Measurements.—Body length 2.19–2.45 mm.

Distribution.—Costa Rica, Provincia de Limón, in low elevation tropical forest.

Types.—Holotype, female: COSTA RICA. LIMON, Valle de la Estrella, Reserva Biológica Hytoi Cerere, sendero a toma de agua, 100 m, 18 Nov–18 Dec 2000, F. Umaña, Malaise trap. Holotype deposited at INBio. Paratypes: 2 females, same data as holotype except collecting date: 18 Dec 2000–18 Jan 2001; one paratype deposited at INBio and one paratype deposited at the USNM.

Etymology.—Gender: feminine. Named after Jessica Antonia Diaz; “luz de luces!”

Remarks.—This species is distinguished by the presence of transverse carinae that extend the width of the propodeum and pass through the areola, antenna with 25 flagellomeres, second tergum with middle arm of the “E”-shaped structure short and not well defined, and the strongly sculptured mesopleuron. *E. antoniae* is presently known only from Costa Rica (Limón province) in low elevation tropical forest. No host data are known.

Key to the described species of *Epsilogaster* Whitfield & Mason.

- 1 Head and mesosoma black to dark brown 2
- Head and mesosoma fulvous, sometimes shaded with brownish infuscation . . . 5
- 2(1) Transverse carinae across propodeal areola absent; antenna with 23 flagellomeres; first metasomal tergum about 1.5 times as long as maximum anterior width, with medial portions flattened or barely raised
 *E. bicolor* Whitfield & Mason
- Transverse carinae across propodeal areola present; number of flagellomeres variable; first metasomal tergum about 2 times as long as maximum width, if shorter than second metasomal tergum with well defined E- shaped structure, median portion variable 3
- 3(2) First metasomal tergum with medial portion raised in lateral view; antenna with 22 flagellomeres; propodeum with one clearly defined transverse carina . . .
 *E. palenque* Whitfield & Mason
- First metasomal tergum not raised medially in lateral view, number of antennal flagellomeres variable; propodeum with more than one clearly defined transverse carina (Figs. 1, 9) 4

- 4(3) Metapleuron usually without rugulose sculpturing over most of its length, if rugulose sculpturing present then restricted to distal 1/3; mesopleuron smooth except for sternaulus multifoveate and subalar depression with scattered striate sculpturing (Fig. 6); antenna with 22 to 24 flagellomeres; propodeum with few transverse carinae present (Fig. 1) *E. williami* Figueroa, López & Valerio, new species
- Metapleuron with prominent carinae and spaced rugulose sculpturing over most of its surface; mesopleuron essentially nitid except for sternaulus with large scrobiculate sculpturing that reaches and fuses with scrobiculate sculpturing from posterior and dorsal margins of mesopleuron (Fig. 14); antenna with more than 24 flagellomeres present; propodeum with transverse carinae throughout (Fig. 9) *E. antoniae* Valerio & Whitfield, new species
- 5(1) Longitudinal carina of first metasomal tergum strong to at least mid length of tergum, sometimes very near lateral edge of median tergite posteriorly; middle arm of E-shaped sclerotization of second tergum ending abruptly at or before mid length of tergum 6
- Longitudinal carina of first metasomal tergum weak or so laterally placed as to be difficult to discern from the margin of the median tergite; middle arm of E-shaped sclerotization of second tergum variably developed 7
- 6(5) Posterior half of first tergum smooth; ovipositor sheaths strongly darkened relative to metasoma *E. dureno* Whitfield & Mason
- Posterior half of first tergum coarsely sculptured; ovipositor sheaths weakly if at all darkened *E. tico* Whitfield & Mason
- 7(5) First metasomal tergum about 1.5 times long as maximum width *E. braziliensis* Whitfield & Mason
- First metasomal tergum more than 2.0 times long as maximum width 8
- 8(7) Wings not infuscate; propodeum with one transverse carina in anterior 1/3 that does not pass through the areola *E. panama* Whitfield & Mason
- Wings infuscate; propodeum with a series of transverse carinae, some of which pass through the areola *E. faviolae* Valerio & Whitfield

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