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## ***Neoeubria inbionis* Shepard & Barr, a new genus and new species of Neotropical water penny beetle (Coleoptera: Psephenidae: Eubriinae), with a key to the adult Eubriinae of the Neotropic Zone**

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### **Abstract**

*Neoeubria inbionis*, **new genus and new species**, is described from Costa Rica, Nicaragua, Panama and Ecuador. All life stages are described and illustrated, and a key to adults of the Eubriinae genera of the Neotropics is provided. *Neoeubria* is one of the most basal genera of the Eubriinae.

**Key words:** Costa Rica, Nicaragua, Panama, Ecuador, aquatic insect

### **Introduction**

The family Psephenidae has experienced increased research interest and activity in the last decade or so, a major milestone of which was the publication of a phylogeny of the family by Lee *et al.* in 2007. Much of the research has focused on the fauna of the Oriental and Australasian biogeographic zones, largely due to the studies of Chi-Feng Lee and colleagues who have described many new genera and an abundance of new species from that region (Lee & Jäch 1995; Lee & Yang 1996; Lee *et al.* 1999, 2001). Although the psephenids of Africa are still largely uncollected and unknown, a few recent papers have been published on the South African fauna (Lee *et al.* 2003a, 2003b; Shepard & Lee 2007). Together, these studies have led to a completely new understanding of the subfamilies Eubrianacinae and Eubriinae. In the Neotropical biogeographic zone, research which centers on the subfamily Psepheninae is being conducted primarily by Roberto Arce-Pérez and collaborators (Arce-Pérez 2004; Arce-Pérez & Novelo-Gutiérrez 2000, 2001; Arce-Pérez & Shepard 2001; Arce-Pérez *et al.* 2012). As a result of worldwide efforts, there is now a better understanding of the evolution of the Psephenidae and clearer definitions of almost all known genera.

Globally, the subfamily Eubriinae is comprised of 14 described, valid genera, and known but undescribed genera, including *Neoeubria* **gen. n.** Three genera with 10 species have been described from the Neotropics: *Dicranopselaphus* Guérin-Meneville from Mexico and Guatemala (5 species); *Ectopria* LeConte from Panama and Brazil (4 species); and *Tycheapsephus* Waterhouse from Chile (1 species). It is probable that three of the *Ectopria* species belong in *Dicranopselaphus* and one belongs in *Tycheapsephus*. We have recently collected specimens in Costa Rica and Panama of *Eubria* Germar, which is known only from the Palearctic, or a genus near *Eubria*.

During field work in January 2000, supporting the efforts of the Instituto Nacional de Biodiversidad (INBio) to catalog the beetles of the protected areas of Costa Rica, we collected 24 larvae and one pupa of an undescribed genus of eubriine psephenid at Parque Nacional Rincón de la Vieja in Guanacaste Province. We attempted, but failed, to rear the pupa to into an adult. A second visit to the site by the senior author in June 2001 yielded three additional larvae and three pupae, and of these, two pupae successfully metamorphosed into a male and a female adult. A third visit in 2003 by both authors yielded only larvae. Seven additional adults, all from Ecuador, were subsequently discovered in the collection of the California State Collection of Arthropods (CSCA) of the California Department of Food and Agriculture in Sacramento. In addition to those from Rincón de la Vieja, Costa Rica, larvae have been examined from Nicaragua, Panama and from one other site in Costa Rica.

## Material and methods

Our field collections resulted in a total of four pupal and 41 larval specimens; although we beat and swept adjacent riparian vegetation, no adults were collected. At the type locality of Rincón de la Vieja (Fig. 27), larvae and pupae were hand-picked from waterlogged wood and the larvae were preserved in 70% ethanol. In the hope of rearing adults, the pupae were placed in Styrofoam containers with small pieces of wood from the habitat, and checked frequently. The two adults which eclosed were point-mounted and two pupae which failed to emerge were preserved in 70% ethanol. At stream localities the larvae were taken in aquatic kick net samples.

Photographs of adult and larval specimens were taken with a Visionary Digital BK Plus Lab System. A Zeiss DSM 940 scanning electron microscope was used to examine the external larval morphology after a larva was mounted on an SEM stub and then gold-coated. The line drawings were made using a Leica MZ12.5 stereomicroscope with camera lucida. The male genitalia, which is lightly sclerotized and quite membranous, was stained to improve visibility of details.

Depository collections are the Instituto Nacional de Biodiversidad (INBio), Santo Domingo de Heredia, Costa Rica (INBC); the California State Collection of Arthropods, California Department of Food and Agriculture, Sacramento, California, USA (CSCA); and the Essig Museum of Entomology, University of California, Berkeley, California, USA (EMEC).

## *Neoeubria* gen. n.

**Type species.** *Neoeubria inbionis* sp. n.



**FIGURE 1.** *Neoeubria inbionis*, adult female, dorsal habitus.



**FIGURE 2.** *Neoeubria inbionis*, adult female, ventral habitus.

**Adult description.** Body elongate oval, dorso-ventrally flattened (Figs. 1–2); 4.6–5.6 mm long; densely setose, with pale blond setae forming a pattern of irregular bands and patches over darker integument.

Head deeply withdrawn into prothorax, hypognathus. Eyes finely faceted, very prominent (Figs. 3–4). Frons narrow, between eyes less than width of eye in male, wider than eye in female; hour-glass shaped between eyes; surface densely and confusedly granulate (distance between granules variable) and densely setose; antennal ridges raised above plane of frons; no visible frontal-clypeal suture. Clypeal disc at 90° to frontal disc, surface densely and confusedly granulate and densely setose, lateral and apical edges margined, apical edge slightly emarginate, apicolateral corners rounded. Labrum very short and transverse. Mouthparts not visible between labrum and apex of prosternum except for palpi. Maxillary palpus with three visible palpomeres; antepenultimate palpomere elongate-conical, setose; penultimate palpomere as long as wide, setose; ultimate palpomere as long as antepenultimate palpomere, cultriform, setose. Labial palpus with two visible palpomeres, half as long as maxillary palpus; ultimate palpomere cultriform, setose. Antenna with 11 antennomeres; pectinate in male (Fig. 3), serrate in female (Fig. 4); antennomere 1 basally constricted, globular beyond, setose; antennomere 2 very short; antennomeres 3–10 with lateral projections; in male projections long, thin and originating basally on antennomeres 4–10, in female projections short, wide and originating apically on antennomeres 3–10; surface microgranulate, very setose; antennomere 11 elongate, surface as on preceding antennomeres.

Pronotum broader than long, widest just anterior to base, narrower than elytra. Apical edge emarginate, smooth. Apicolateral corners right-angled. Lateral edges serrate, margined and slightly explanate. Basolateral corners greater than a right angle, covered by setae. Basal edge finely and densely crenulate to pectinate, gently bisinuate, straight medially anterior to scutellum. Disk raised posterior to head, sloping toward lateral edges; densely and confusedly granulate, granules separated by own width or more; densely setose. Propleura (=

hypomeron) wide, concave, shiny; with widely scattered granules and long setae; narrow, acutely-tipped posterior projection extending medially along posterior margin of procoxa making procoxal cavity half-closed.



**FIGURE 3.** *Neoeubria inbionis*, adult male, frontal view.

Scutellum broadly pentagonal, flat; disc granulate and setose as on pronotum; setae more dense on male. Basal edge finely and densely crenulate to pectinate, teeth interdigitating with those on pronotum.

Elytra together longer than wide, widest slightly beyond middle; integument medium brown, covered with patches of brown and blond setae. Basal edges finely and densely crenulate to pectinate, teeth interdigitating with those on pronotum. Basolateral corners wider than pronotum, humeri gently curved. Disc flat, sides sloping downward; lateral edges slightly explanate; slightly serrate basally, smooth thereafter to apex. Ten striae per elytron; each stria a line of closely spaced granules; innermost stria very short (10 or fewer granules), extending posteriorly from scutellum a short distance; remaining striae complete, parallel to near end of elytron where they join each other. Setation of two types: fewer, longer setae that project up off the elytron and very numerous, shorter, recumbent setae; both types of setae having patches of lighter and darker setae; all recumbent setae on adjacent stria intervals oriented either anteriorly or posteriorly, giving a striped appearance. Epipleuron concave; widest basally, tapering to apex; only long setae present; granules absent.

Prosternum wider than long, extending laterally no further than outer edges of procoxae; raised in middle and sloping to lateral edges. Anterior edge smooth, projecting forward to cover mouthparts and ventral margins of eyes. Lateral edges emarginate in male, straight in female. Posterior edges straight laterally, medially wrapping around inner margins of procoxae to form a long narrow prosternal process between. Prosternal process within a deep medial cleft extending one-third the length of the mesoventrite. Procoxal cavity open at medial half. Prosternal disc shiny, with scattered granules and numerous long setae.

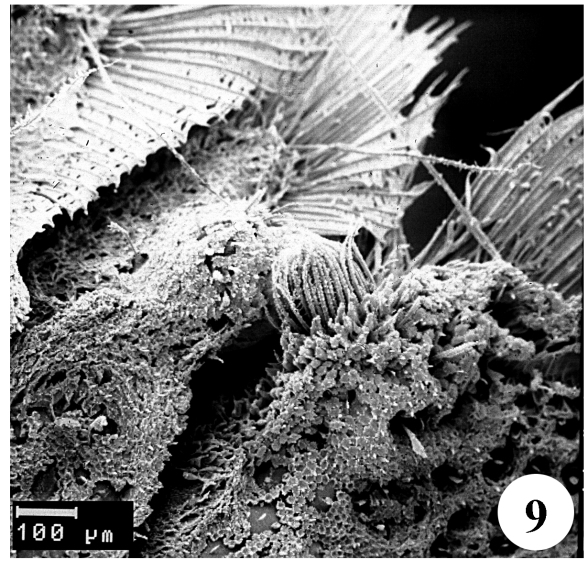
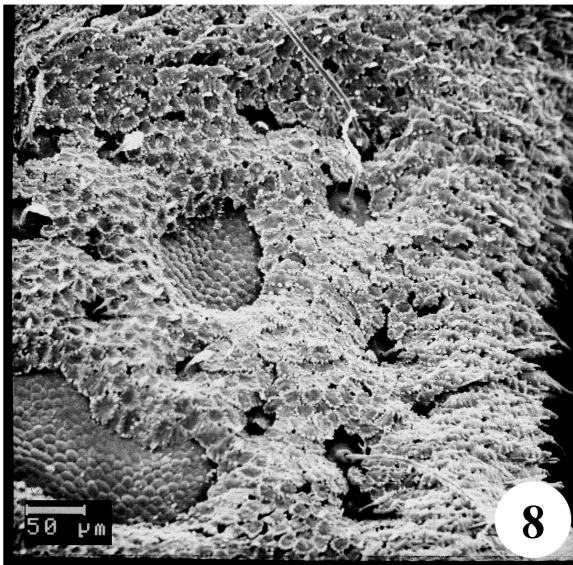
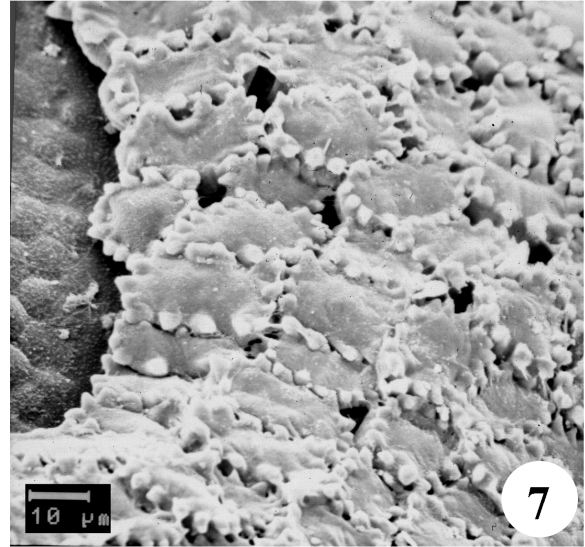
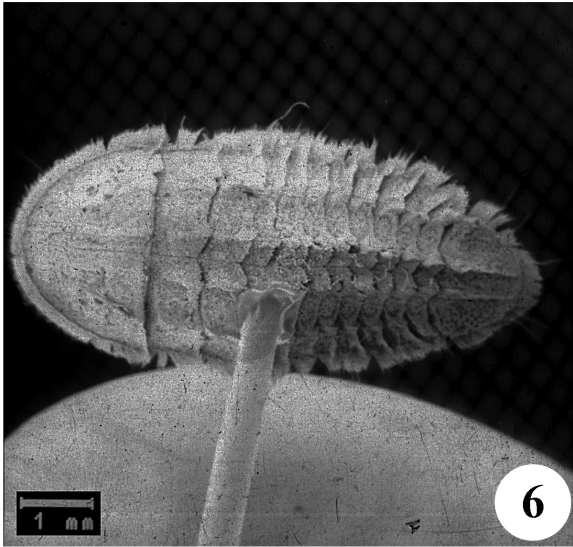




**FIGURE 4.** *Neoeubria inbionis*, adult female, frontal view.



**FIGURE 5.** *Neoeubria inbionis*, larva, dorsal habitus.



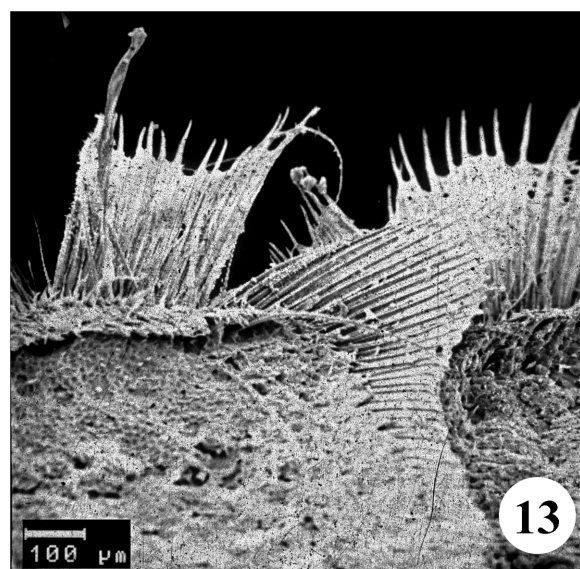
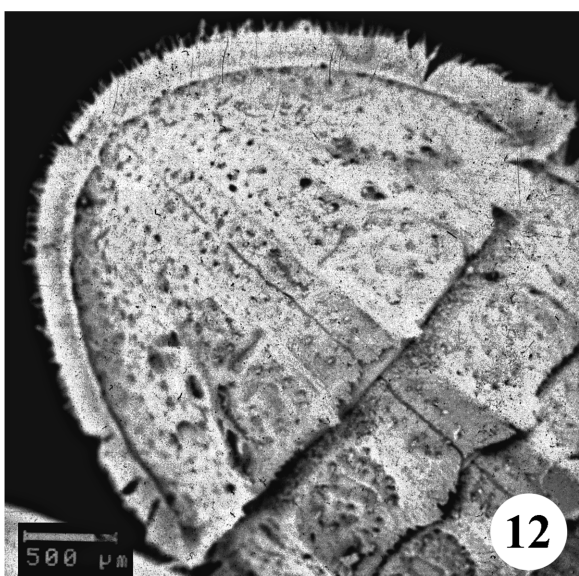
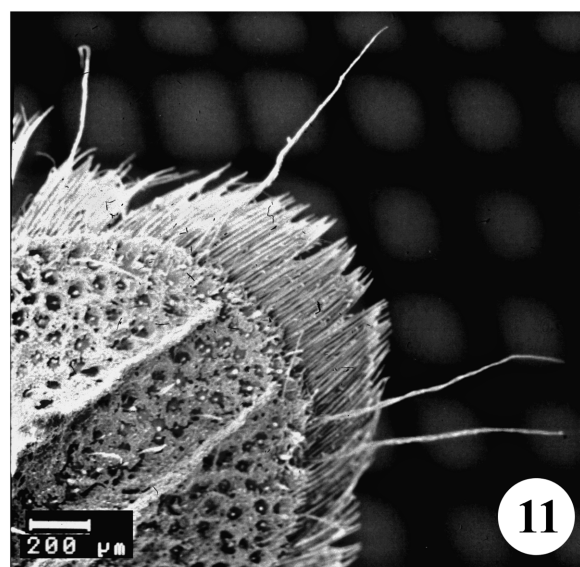
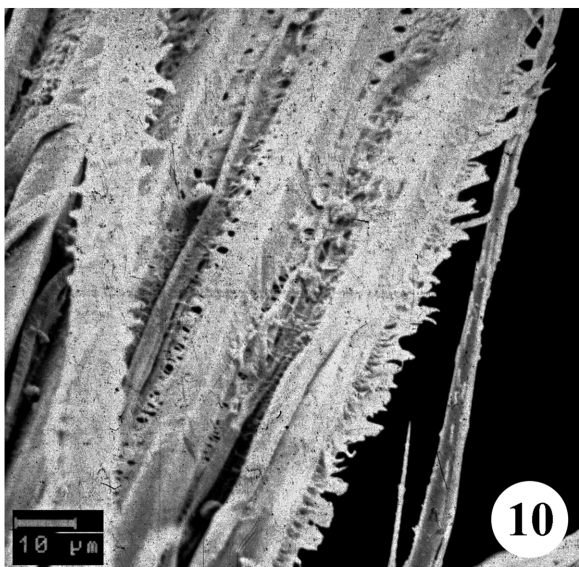
**FIGURES 6–9.** 6. *Neoeubria inbionis*, larva, dorsal habitus. 7. *Neoeubria inbionis*, larva, plastral setae on pronotum, 1000 X. 8. *Neoeubria inbionis*, larva, plastral setae on pronotum, 200 X. 9. *Neoeubria inbionis*, larva, eight and ninth abdominal tergites, 100 X.

Mesoventrite about as wide as long; broadly Y-shaped; anterior half raised in middle; median sulcus deep and wide anteriorly to receive prosternal process, shallow and narrow posteriorly. Anterior edge bicurved, forming long anterolateral arms along anterior border of mesanepisternum. Lateral edges highly curved, smooth. Posterior edges bisinuate, curving around trochantins and mesocoxae forming a medial mesoventral process between. Mesoventral process extends no further than mesocoxae. Mesocoxae broadly open. Mesoventral disc shiny, with scattered granules and numerous long setae. Mesanepisternum and mesepimeron twice as wide as long, subquadrate; disc flat, shiny, covered with short clothing setae.

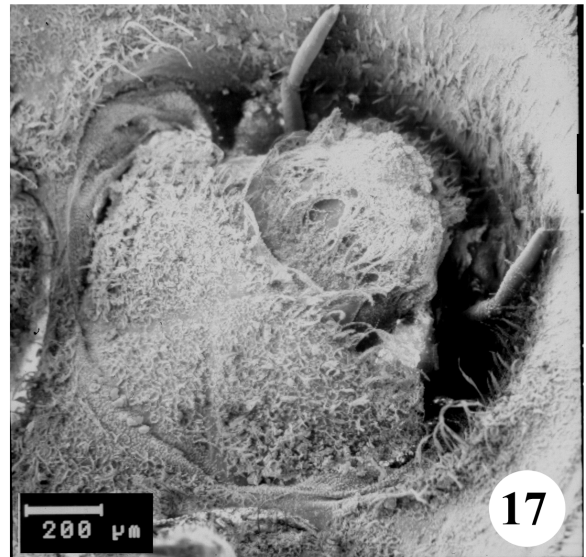
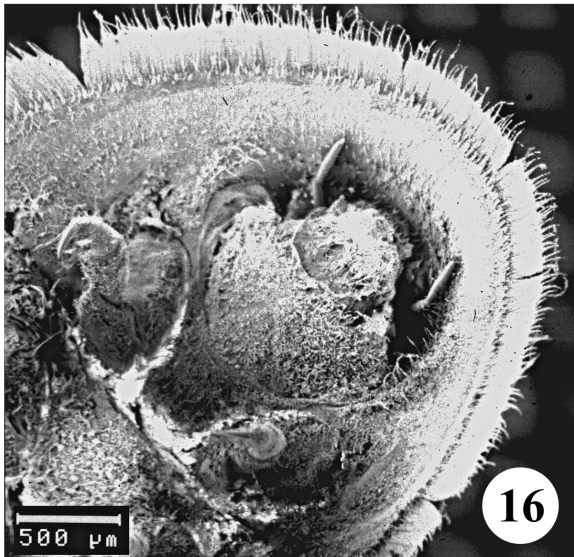
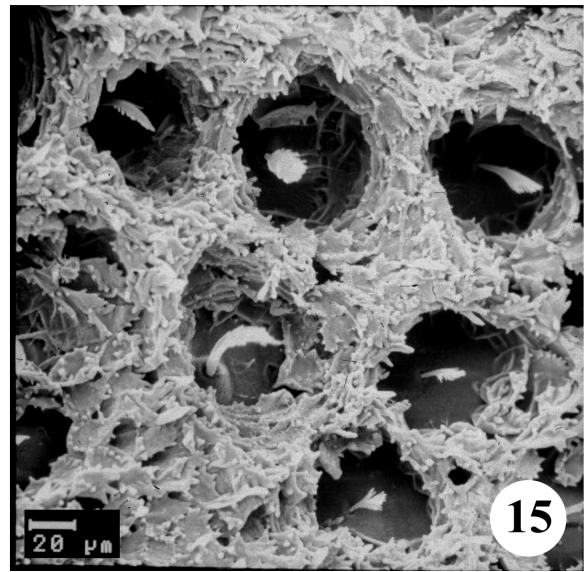
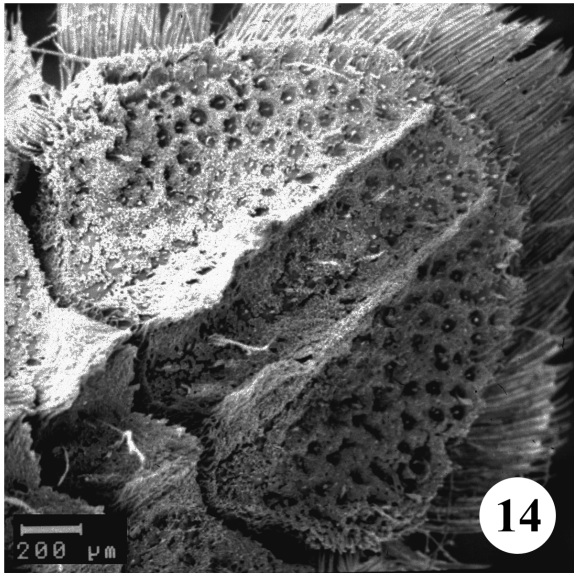
Metaventrite three times wider than long, irregularly rectangular. Anterior edge bicurved around mesocoxae; lateral edges straight; posterior edge mostly straight except for two small medial teeth adjacent to midline. Disc surface punctate, covered with numerous long setae; medial, longitudinal, glabrous line ending in a deep depression anterior to and between metacoxae; short, transverse suture parallel to posterior edge and just anterior to medial teeth. Metanepisternum elongate, subquadrate; disc flat, punctate, covered with long setae and with

scattered granules in anterolateral corners. Metepimeron reduced to small triangular plate at posterolateral corner of metanepisternum; disk covered with setae.

Prothoracic leg with procoxa transverse, swollen in middle, long setae on surface; trochantin exposed, with a small patch of very short projecting setae. Trochanter short, triangular, with long setae. Femur elongate, covered with long, pale setae; ventrally flattened to receive tibia when leg is retracted, flattened area bordered by longitudinal ridges of equal height on either side. Tibia elongate, punctate, covered with long, pale setae; with two rows of stouter darker setae along lateral aspect; two stout apicomedial spines slightly overlapping base of tarsus. Tarsus with five tarsomeres; all tarsomeres covered with long, pale setae; tarsomeres 2–3 with ventral dense patch of shorter, pale setae; tarsomere 1 elongate; tarsomeres 2 and 3 half the length of tarsomere 1; tarsomere 4 very short, not extending beyond end of tarsomere 3; tarsomere 5 as elongate as tarsomere 1. Claws simple in both sexes; angulate at base.



**FIGURES 10–13.** 10. *Neoeubria inbionis*, larva, straight, fringed setae along margin of body, 1000 X. 11. *Neoeubria inbionis*, larva, ninth abdominal tergite showing two setal types, 50 X. 12. *Neoeubria inbionis*, larva, pronotum and mesonotum, 30 X. 13. *Neoeubria inbionis*, larva, right side of mesonotum showing marginal setae continuing onto posterior border, 100 X.



**FIGURES 14–17.** 14. *Neoeubria inbionis*, larva, ninth abdominal tergite, 50 X. 15. *Neoeubria inbionis*, larva, setae on ninth abdominal tergite, 400 X. 16. *Neoeubria inbionis*, larva, anterior venter showing head, prosternum and mesosternum, 35 X. 17. *Neoeubria inbionis*, larva, head below prothoracic shield, 65 X.

Meso- and metathoracic legs similar to prothoracic leg except metacoxa very transverse and grooved for reception of femur.

Abdomen with five visible ventrites; ventrites all short and very transverse, covered with long setae; apex of ventrites I–IV straight and smooth, apex of ventrite V evenly rounded in both sexes.

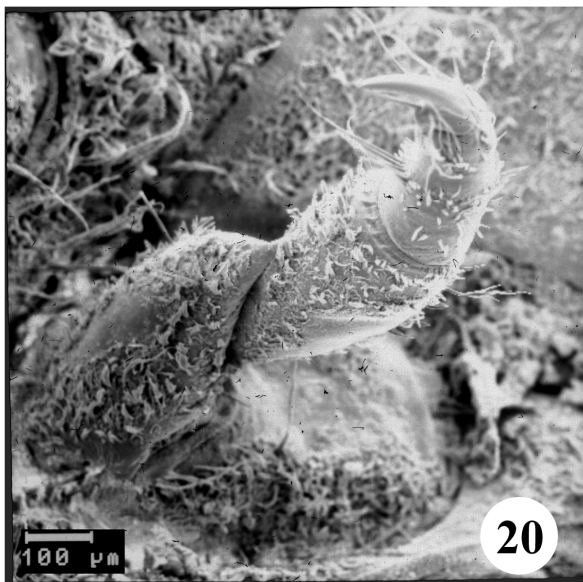
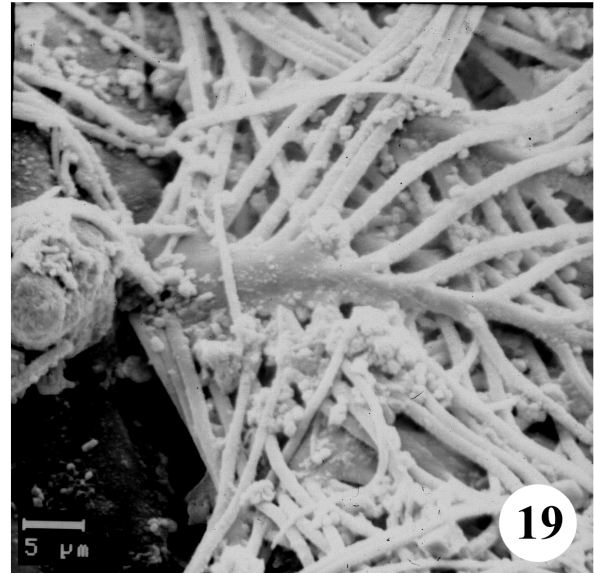
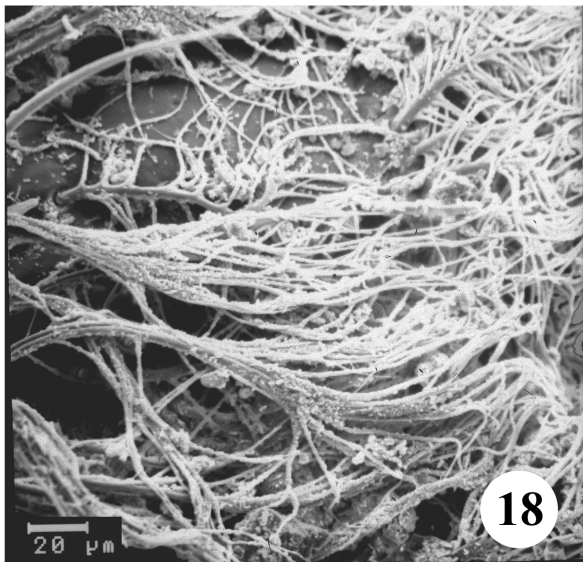
**Egg Description.** Egg oval, approximately 1.2 x as long as wide; 0.313–0.350 mm long, 0.25–0.313 mm wide. Chorion covered with small polygons.

**Larval description.** Body a very elongate oval (Figs. 5–6), flattened; mature larva 9 mm long and 3.6 mm wide, widest at metanotum; pairs of lateral processes, derived from margins of nota and terga, present on mesothorax, metathorax and abdominal segments I–VIII; four prominent longitudinal dorsal ridges; head and legs not visible dorsally. Dorsal color yellow; brown markings on thorax and abdominal segments 1–9 (Fig. 5); ventral color all yellow or all white. Dorsal surface covered with plastron; plastron setae (Figs. 7–8) flat and rounded with scalloped margins, scattered granules visible below plastron. Lateral margins with two types of setae: a dense



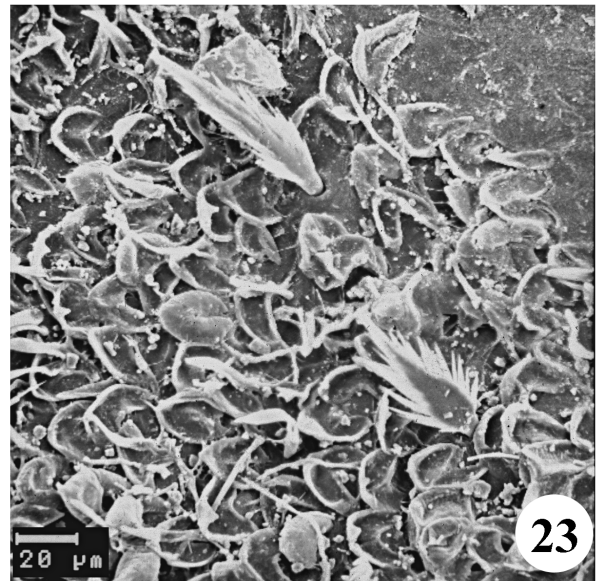
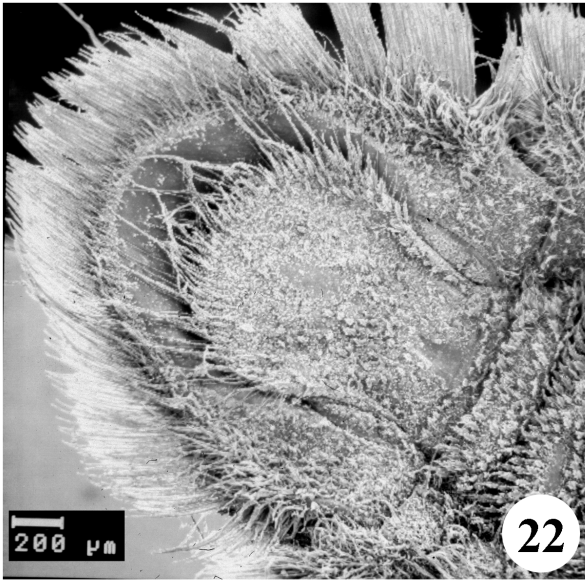
fringe of fused, shorter, plumose, white setae (Fig. 10) and occasional very long, filiform, golden setae (Fig. 11), both dorsal and ventral to previous row. Four longitudinal ridges on dorsum, two medial and two sublateral.

Pronotum (Figs. 6, 13) with smoothly curved edges; posterior margin smooth except for spinose setae along margin; two medial ridges parallel to longitudinal axis, two sublateral ridges diverging from anterior to posterior (Figs. 5–6, 13); disc covered with plastron (Figs. 7–8) except over brown markings, thin medial line, and around setae. Mesonotum similar to pronotum except short and transverse (Figs. 6, 12), lateral margin with a pair of quadrate processes; gap between lateral processes of pro- and mesonotum covered by dense setal row (Fig. 13). Metanotum similar to mesonotum.



**FIGURES 18–21.** 18. *Neoeubria inbionis*, larva, plumose setae covering labium, 500 X. 19. *Neoeubria inbionis*, larva, plumose setae covering labium, 2000 X. 20. *Neoeubria inbionis*, larva, prothoracic leg, 110 X. 21. *Neoeubria inbionis*, larva, tarsungulus, 282 X.





FIGURES 22–23. 22. *Neoeubria inbionis*, larva, ninth abdominal sternite and operculum, 42 X. 23. *Neoeubria inbionis*, larva, setae on base of operculum, 500 X.

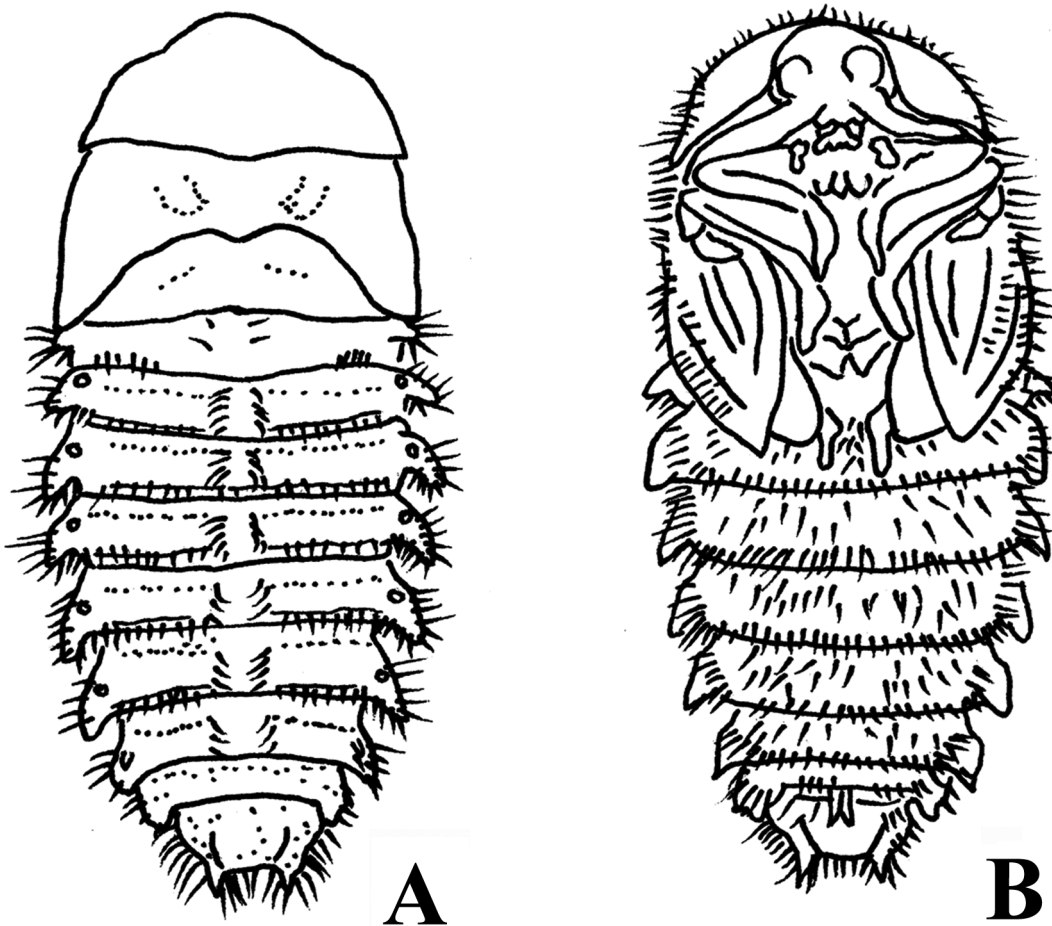


FIGURE 24. *Neoeubria inbionis*, pupa, A—dorsal view, B—ventral view.

Abdominal segments similar to thoracic nota except posteriorly increasingly narrower (Fig. 5); segments I–VIII each with a pair of elongate, apically rounded, lateral processes; brown, spot-like markings only between medial and sublateral ridges; ridges taller than on thoracic nota. Segment VIII shortest; with spiracular cones just lateral to end of sublateral ridges and medial to lateral processes; spiracular cones present in all instars examined. Segment IX longest (but shorter than pronotum), broadly subtriangular (Fig. 14), apex evenly curved; disc brown in color; sublateral ridges absent; plastron setae projecting up off surface except around plumose setae (Figs. 14–15); marginal setae of two types; anterolateral corners with a dense spiracular brush (Fig. 9).

Venter highly membranous except for tip of tarsungulus; surface densely setose. Head withdrawn into pouch to middle of labium (Figs. 16–17), tips of antennae and maxillary palpi protruding; anterior margin of cervical area and venter of head heavily setose. Epicranial suture absent. Frontal area heavily setose, especially over stemmata; setae stout, recumbent and projecting anteriorly; one pair of very long setae projecting dorsally; anterior margin broadly emarginate in an arc. Antenna with four antennomeres; antennomere 1 short, as long as broad; antennomere 2 several times longer than broad; antennomere 3 as long as antennomere 2, bearing a stout seta adjacent to and as long as antennomere 4; antennomere 4 very small, four times longer than broad. Clypeus transverse; anterior margin straight; disc setose. Labrum transverse, as long as clypeus; basal half smooth, with no setae; apical half very setose, setae ramose. Mandible with three teeth, teeth black at tips; prosthema plumose. Maxilla with cardo transverse; stipes elongate, rectangular, apically with ramose setae; lacinia and galea cultriform and fused to stipes, apex of each with dense fringe of ramose setae; palpus with four palpomeres, each palpomere about as long as broad. Labium trapezoidal, wider at base; mentum basally with an elongate medial tubercle, apical half covered with long, highly ramose setae (Figs. 16–19); prementum very short; palpus very short, with two palpomeres.

Prosternum with posterior sternum trapezoidal, wider anteriorly; pleural area divided into three sclerites. Coxal cavities broadly open. Legs five-segmented (Fig. 20); coxa conical; trochanter longer than femur; tibia as long as femur, long setae present apically and ventrally; tarsungulus stout and angular basally (Figs. 20–21). Mesosternum and metasternum similar to prosternum except pleurites longitudinally rectangular.

Abdominal sternites I–VIII broadly transverse; sternopleural sutures present; tergopleural sutures present at base of lateral processes; entire surface setose except for narrow, bare transverse sulcus, entire or divided in two. Abdominal sternite IX broad; sternopleural sutures present along base of operculum; operculum (Fig. 22) almost parallel-sided in basal half, circular apically, apical margin with setal row; two accessory sclerites on each side of basal half of operculum, a short basal sclerite and an elongate apical sclerite; setose (Fig. 23) with a mixture of upright plumose setae and recumbent lily-pad-like setae.

**Pupal Description (Female).** Body (Fig. 24) exarate; elongate-oval; widest at abdominal segment III; 8.5 mm long and 4 mm wide. Color pale yellow. Prothorax, elytra and wings wrapping around to venter; elytra covering wings. Long curved setae in two medial rows on abdominal segments I–VII. Lateral processes on abdominal segments I–VIII; lateral processes on segment I projecting laterally; processes on segments II–VIII recurved postero-laterally but short and blunt; all processes fringed by long unfused setae; processes on segment IX fused to tergum. Pairs of spiracular tubercles on segments II–VII, emerging from the base of each process; tubercles on segment VII longest and most projecting; spiracles slit-like. Abdominal terga with scattered granules; posterior row of setae on each side from lateral process nearly to longitudinal medial row of curved setae. Abdominal tergum IX trapezoidal; disk densely covered with scale-like setae; lateral and apical margins with dense row of long white setae; apex broadly emarginate; ends spinose.

Venter white; membranous. Anterior margin of prothorax with dense row of long setae; propleura broad, reaching eyes. Antennae wrapping extremities of legs but not reaching lateral margins. Legs folded with tarsi along midline. Elytra wrapped around ventrally, covering much of wings and metathoracic legs; three rows of long setae along longitudinal axis of each elytron. Abdominal sterna I and II covered by elytra and metathoracic legs. Abdominal sterna III–VII broadly transverse; heavily setose, especially on lateral margins. Abdominal sternum VIII similar to preceding sterna except much shorter. Abdominal sternum IX trapezoidal and heavily setose.

**Etymology.** *Neo-* from Neotropics; *-eubria* from type genus of the subfamily Eubriinae. The name is feminine singular.

**Differential diagnosis.** *Neoeubria* is defined by the following set of psephenid character states. ADULT: Posterior margin of pronotum and anterior margin of elytra and scutellum crenulate to serrate; elytra granulate in striae; 10 striae per elytron; antennae pectinate in male and serrate in female; claws angulate at base and simple in both sexes. LARVA: Very elongate oval body; four longitudinal dorsal ridges; all lateral processes project laterally;

spiracular cone of abdominal segment VIII emerging from tergum, not end of lateral process; margin of abdominal segment IX entire; operculum circular apically. PUPA: Large (8.5 mm long); two medial longitudinal rows of long curved setae on abdominal segments I–VII only; lateral processes of abdominal segments short, recurved, blunt; spiracular tubercles emerging from abdominal terga II–VII near base of lateral processes; elytra with only three rows of setae.

Of all eubriine genera, *Neoebria* shares most character states with the East Asian genus *Macroebria* Pic. However, *Macroebria* differs in the following ways. ADULT: Male antenna serrate (male antenna pectinate in *Neoebria*); pronotal granules in reticulæ or vermiculæ (granules randomly distributed in *Neoebria*); scutellum without granules and triangular (granulate and pentagonal in *Neoebria*); elytra with nine elytral striae (10 striae in *Neoebria*); mesoventrite densely granulate (only scattered granules in *Neoebria*); metaventrite with granules in reticulæ (metaventrite punctate, not granulate in *Neoebria*); male claws bifurcate (male claws simple in *Neoebria*). LARVA: Lateral processes of abdominal segments sharp and recurved (straight and not recurved in *Neoebria*); operculum rectangular and tapering slightly from base to apex (operculum parallel-sided in basal third and circular beyond in *Neoebria*); abdominal segment IX apically emarginate (apically entire in *Neoebria*). PUPA: Smaller, 5 mm long (longer, 8.5 mm long in *Neoebria*); dorsomedial rows of setae from pronotum to abdominal segment VIII (setae only on abdominal segments I–VII in *Neoebria*); several rows of setae on elytra (only three rows in *Neoebria*); lateral processes on abdomen long and sharp-tipped (short and blunt in *Neoebria*); spiracular tubercles long (short in *Neoebria*); abdominal tergum IX elongate and bifurcate apically (short, broad and emarginate apically in *Neoebria*).

### Key to adults of Neotropical genera of Eubriinae<sup>1</sup>

1	Posterior margin of pronotum and anterior margin of elytra and scutellum smooth . . . . .	<i>Eubria</i> , or near <i>Eubria</i>
1'	Posterior margin of pronotum and anterior margin of elytra and scutellum crenulate . . . . .	2
2	Elytra punctate, not granulate . . . . .	<i>Tychepephus</i>
2'	Elytra granulate, not punctate . . . . .	3
3	Granules on elytra confined to striae . . . . .	<i>Neoebria</i>
3'	Granules on elytra not confined to striae . . . . .	<i>Dicranopselaphus</i>

### *Neoebria inbionis* sp. n.

Figs. 1–4, 25–27

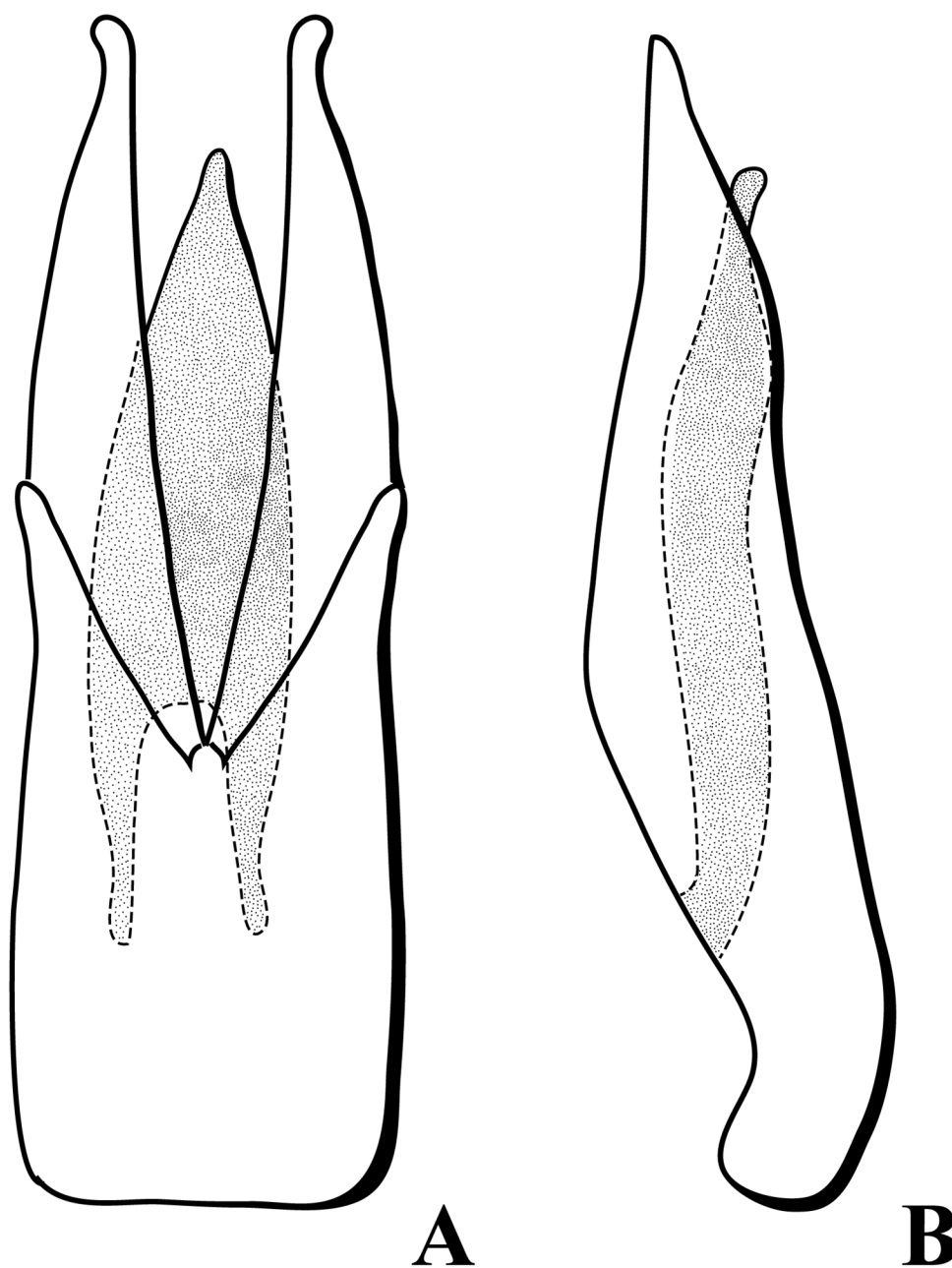
**Type material.** *Holotype* (male): COSTA RICA: Guanacaste Prov., Parque Nacional Rincón de la Vieja, Las Pailas Trail, 14-VI-2001, William D. Shepard, leg. // reared from pupa collected on wood in seep basin // HOLOTYPE *Neoebria inbionis* Shepard & Barr [red label]. Deposited in INBC. *Allotype* (female): locality data same as holotype // ALLOTYPE *Neoebria inbionis* Shepard & Barr [red label]. Deposited in INBC. *Paratypes* (2 M & 5 F): ECUADOR: Napo Prov., Huahua Sumaco, Km 44 on Hollin-Loreto Rd., XII-15-1989, Malaise Trap, MS/JS Wasbauer, H. Real // CALIFORNIA STATE COLLN AGRICULTURE // PARATYPE *Neoebria inbionis* Shepard & Barr [yellow label] (1 M) (EMEC); data same, except XII-16-1989 (1 F) (CSCA); data same, except XII-18-1989 (1 M) (CSCA); data same, except XII-19-1989 (1 F) (CSCA); data same, except XII-21-1989 (2 FF) (CSCA, EMEC); data same, except XII-22-1989 (1 F) (CSCA).

**Adult Description.** Body oval; males (Fig. 3) smaller than females (Figs. 1–2, 4); males 4.6–5.0 mm long and 2.75 mm wide, females 5.0–5.6 mm long and 2.8–3.5 mm wide. Integument color medium brown, shiny where setae sparse; covered dorsally with a combination of different kinds of setae: widely-spaced, long, erect blond and dark brown setae; sparse, shorter, pale brown setae; and very dense, recumbent, pale blond setae forming a pattern of broad bands and large spots. Venter uniformly clothed in medium-length pale blond setae.

Aedeagus of trilobed type (Fig. 25) and lightly sclerotized. Basal piece long, reduced to ventral plate basally with lateral flanges that clasp the base of parameres. Parameres long, widest at apical three-fourths of aedeagus; tips narrow, curved laterally; dorsally conjoined just anterior to midlength. Penis lanceolate; shorter than parameres; tip slightly curved ventrally and laterally compressed; base deeply cleft.

1. *Ectopria* is omitted from the key because it is probable that the Neotropical species belong in other genera.

Ovipositor (Fig. 26) with bacula long, 1.4 times as long as coxites, thin, gently curved; only partially sclerotized. Coxites 0.7 times as long as bacula; joined medially in basal half, divergent medially in apical half; laterally gently sinuate. Styli short, one-segmented. Long, thin accessory sclerite dorsally in basal third of membrane between coxites.

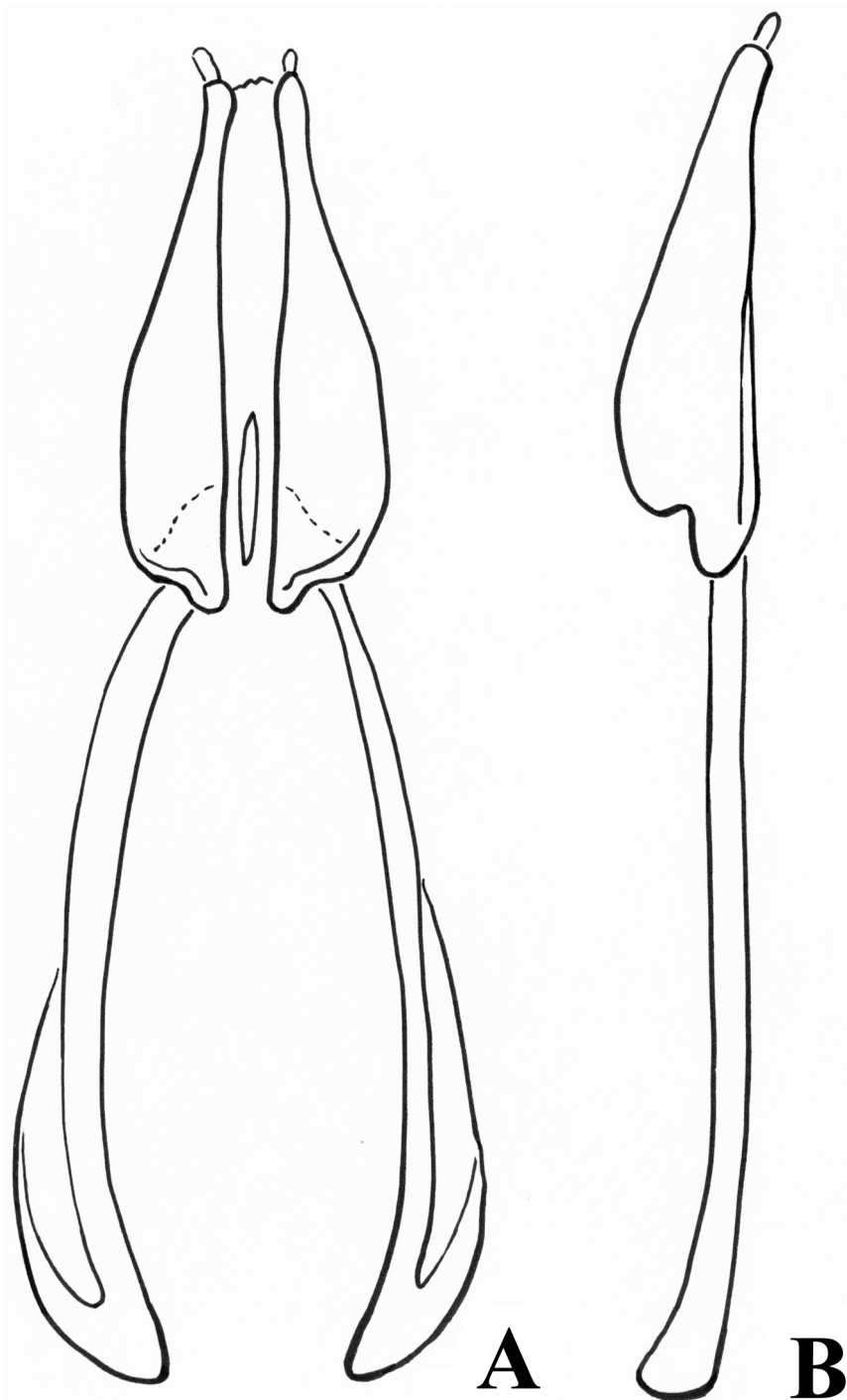


**FIGURE 25.** *Neoeubria inbionis*, aedeagus, A— dorsal view, B—left lateral view.

**Immature specimens examined. COSTA RICA:** Alajuela, Alta Masis, 9 VI 2000, Río San Lorenzo [WDS-A-1302] // William D. Shepard, leg. (1 larva); Guanacaste Prov., Parque Nacional Rincón de la Vieja, Las Pailas Trail, 18-I-2000, William D. Shepard & Cheryl B. Barr, collected on wood in seep basin [WDS-A-1283](24 larvae, 1 pupa); data same, except 14-VI-2001, William D. Shepard, leg. [WDS-A-1386] (3 larvae, 3 pupae); data same, except 15-VI-2003, William D. Shepard & Cheryl B. Barr [WDS-A-1541] (11 larvae); data same, except Quebrada Pailas below Catarata, 14-VI-2001, William D. Shepard, leg. [WDS-A-1387] (1 larva). **NICARAGUA:** Río San Juan, Refugio Bartola, 10 VIII 2002, riffle 3, Río Bartola, William D. Shepard, leg. [WDS-A-1492] (1 larva). **PANAMA:** Chiriquí, Fortuna Forest Res., March 2004, Checo Colón-Gaud, leg. (1 larva). All immature specimens are deposited in EMEC.

**Etymology.** Named in honor of INBio, the Instituto Nacional de Biodiversidad in Costa Rica. The case is genitive.

**Distribution.** Nicaragua, Costa Rica, Panama and Ecuador, based on adult and larval specimens.



**FIGURE 26.** *Neoeubria inbionis*, ovipositor, A—dorsal view, B—left lateral view.

**Habitat.** The type locality in Parque Nacional Rincón de la Vieja at an 780 m is a series of seeps in a small basin connected by a spring run to a narrow, slow-flowing forest stream which is a tributary of the Río Colorado. The entire area around the seeps and both streams is heavily forested and generally heavily shaded. In the seep basin the water is only about 2–3 cm deep over a substrate composed of a thick deposit of silt and fine detritus on which lie sticks and larger pieces of rotting, waterlogged wood (Fig. 27). In the basin the water is extremely slow-moving but in a couple of meters it begins to flow downhill in a narrow spring run which is crossed by the Las Pailas Trail between Stops 3 and 4.





**FIGURE 27.** Shallow, seep pool with waterlogged wood at Parque Nacional Rincón de la Vieja, type locality of *Neoeubria inbionis*.

Larvae and pupae of *N. inbionis* were collected on pieces of decomposing wood found in the seep basin. Larvae were positioned below the water's surface and pupae were above. The water is likely hypoxic because of the fine organic detritus substrate, coupled with the lack of sunlight for aquatic photosynthesizers due to the heavily-shaded nature of the site. Possession of a plastron facilitates larval survival in this water. *Neoeubria* was the only psephenid present in the seep area, and the only other co-occurring aquatic byrrhoid Coleoptera was an unidentified ptilodactylid larva. Other arthropods present in the seep area included aquatic Hemiptera, *Belostoma* (Belostomatidae) and *Ambrysus* (Naucoridae), and the crustacean *Hyallela* (Amphipoda). No specimens were collected from the spring run formed by the seeps. A single larva was collected in a second, larger stream, Quebrada Pailas, a tributary of the Río Colorado, which is also located along the Las Pailas Trail.

The other sites at which larvae were collected by the senior author are also forest streams, although with rocky substrates and faster flow. Although the particular microhabitat of the larvae at these sites is unknown, at all of them submerged wood was common. *Neoeubria inbionis* has been collected at elevations ranging from as low as 40+ m in Nicaragua, to as high as 780 m in Costa Rica.

The Ecuadorian adults were all taken in Malaise traps which were set in a forested area to catch flies. Although we could obtain no further information beyond the label data, collection of adults via Malaise traps indicates that *N. inbionis* adults behave like other eubriine adults and fly near the aquatic habitat in which the larvae occur.

**Phylogeny.** In the recent phylogeny of the Psephenidae by Lee et al. (2007), *Neoeubria* is included as "Genus A." In the most parsimonious tree *Neoeubria* is placed in a basal trichotomy within the subfamily Eubriinae. The trichotomy positions *Neoeubria* in one branch, *Sclerocyphon* + *Tychepephus* in another branch, and the remainder of the eubriine genera in a third branch.

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