



Two new species of *Hydraena* Kugelann, 1794 from Brazil (Coleoptera: Hydraenidae)

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Abstract

Hydraena (*Hydraenopsis*) *josefinae* **sp. nov.** and *H.* (*H.*) *pernambucana* **sp. nov.** are described respectively from Amapá and Pernambuco States, Brazil. *Hydraena* (*H.*) *josefinae* **sp. nov.** is a member of the *scintillabella* subgroup of the *leechi* group, while *H.* (*H.*) *pernambucana* **sp. nov.** belongs to the *orcula* complex in the *marginicollis* subgroup of the *marginicollis* group. Descriptions and diagnostic characters for both new species are offered; habitus photographs and line drawings of male genitalia of the two new species, as well as drawings of female genitalia of *H. josefinae* **sp. n.**, are provided. Male genitalia of *H. alterra* Perkins, 1980 is illustrated and compared with that of the closely related *H. josefinae* **sp. nov.** Habitat and distributional data of the two new species are also included.

Key words: Aquatic Coleoptera, aquatic insects, minute moss beetles, Amapá, Pernambuco

Introduction

Most Neotropical invertebrate biodiversity, aquatic insects included, remains undescribed and undocumented (Bowles & Courtney 2018). Considering the small number and scattered distribution of the collecting localities studied for beetle family Hydraenidae in South America, Perkins (2011) suggested that many species of this family remain undiscovered. In Brazil the list of known species of Hydraenidae contains only 30 species arranged in three genera: *Ochthebius* Leach, 1815 (three species; see Perkins 1980), *Parhydraenida* Balfour-Browne, 1975 (11 species; see Perkins 1980; Jäch & Delgado 2018) and *Hydraena* Kugelann, 1794 (16 species; see Perkins 1980; Delgado *et al.* 2018; Benetti 2019; Villastrigo *et al.* 2019).

The South American fauna of the speciose and worldwide genus *Hydraena* currently comprises 82 species (Perkins 2011), most of which are in the subgenus *Hydraenopsis* Janssens, 1972. The six species of the *H. paeminosa* group are included in *H. (Dnahydnædna)* (Perkins 2017). For some other species the subgeneric classification remains unknown (Jäch *et al.* 2000; Trizzino *et al.* 2013). The genus *Hydraena* was revised in South America by Perkins (1980), who added 22 new species to the four previously described by Orchymont (1923, 1937) and Janssens (1972). Delgado & Collantes (1996) described a new species from Colombia. Makhan (2008) described a new species supposedly collected in Surinam, which turned out to be the widespread Palearctic species *Hydraena riparia* Kugelann, 1794 (Jäch & Short 2009). Two years later Perkins (2011) published a new comprehensive revision of *Hydraena* from South America in which 54 additional species were described.

Recently, we analyzed specimens of *Hydraena* collected in Brazil and realized that they belong to two new species, which are described here.

Materials and methods

We studied specimens collected in northern and northeast Brazil in 2011 and 2014, respectively. A male paratype of *Hydraena alterra* Perkins, 1980 deposited at USNM (Smithsonian Institution, Washington D.C.) was also examined for comparison. Specimens were studied using an Olympus SZX12 stereomicroscope with a LED ring light attached. Line drawings were prepared using a camera lucida attached to a Nikon Eclipse E600 microscope. Genitalia were temporarily mounted on glass slides using Hoyer's mounting medium. Habitus photographs were taken with a Nikon DS-U2 camera unit attached to a Leica MZ9S stereomicroscope and assembled using the Combine ZP freeware program.

For the pairs of foveae on the pronotum we follow the nomenclature of Perkins (2011). Exact label data of the type specimens are cited as follows: / indicates a new line in the same label and // indicates a different label. The distribution map was generated using SimpleMappr (Shorthouse 2010). The type material is deposited in the Invertebrate Collection of the National Institute of Amazonian Research (INPA), Manaus, Amazonas, Brazil.

Abbreviations

BL	Body length (front anterior margin of labrum to elytral apex)
EL	Elytral length (from outer angle of shoulder to apex)
EW	Elytral width at widest point
PF1	Anteromedial foveae on the pronotum
PF2	Posteromedial foveae on the pronotum
PF3	Anterolateral foveae on the pronotum
PF4	Posterolateral foveae on the pronotum
INPA	Instituto Nacional de Pesquisas da Amazônia, Manaus, Brazil
USNM	National Museum of Natural History, Washington D.C., USA

Taxonomy

Hydraena (Hydraenopsis) josefinae sp. n.

(Figs 1, 2, 5, 8)

Type locality. BRAZIL, Amapá State, Laranjal do Jari municipality (county), Cerrado, stream (Igarapé), 00°27'36.1"N; 52°07'52.7"W, 36 m.

Type material. Holotype (male): "BRAZIL: Amapá state, Laranjal do Jari. / Cerrado, stream, 36 m.a.s.l. / 00°27'36.1"N; W 52°07'52.7" W; 6/viii/2011 / A. Pes, P. Cruz, A. Fernandes, & N. Hamada, leg. // ♂ // HOLO-TYPUS [red label] // *Hydraena (Hydraenopsis) josefinae* sp.n." (genitalia extracted and mounted on same card) (INPA). **Paratype:** 1 female. Same data of holotype except: // ♀ // PARATYPUS [red label] (genitalia extracted and mounted on same card) (INPA).

Type depository. Instituto Nacional de Pesquisas da Amazônia, Manaus, Brazil

Description. *Habitus* as in Fig. 1. *Size:* Holotype: Male BL 1.35 mm; EL 0.82 mm; EW 0.60 mm. Paratype: Female BL 1.44 mm; EL 0.86 mm; EW 0.66 mm.

Color (Fig. 1): Head (dorsal) dark brown, labrum brown. Pronotum dark brown on the disc, paler at the sides. Elytra dark brown. Antennae, maxillary palps and legs pale brown, apex of last palpomere of maxillary palps yellowish.

Head: Labrum with a wide apicomedian emargination, with subrectangular lobes and the anterior margin weakly convex. Clypeus with small punctures sparsely arranged, each associated to a small white seta. Frons with dense, coarse punctures and shiny interstices, and a pair of small foveae on posterolateral edge of eyes.

Pronotum: Wider than long, maximum width slightly after the median region. Anterior margin straight behind eyes and slightly arcuate behind frons. Scintilla barely perceptible. Sides weakly convex with margins serrate. Posterior margin straight. Punctures on disc much larger and deeper than those on the frons; interstices wide and shiny. PF1 shallow, PF3 moderately deep, PF2 oval, broad and deep, PF4 broad and deep.



FIGURE 1. Dorsal habitus of *Hydraena josefinae* sp. n., holotype male. Scale bar = 0.5 mm.

Elytra: Moderate arcuate laterally. Lateral margins widely explanate, especially in the elytra middle length. 9 rows of impressed punctures between suture and shoulder, punctures in rows 1–4 (counting from suture) slightly irregular; size of punctures similar to those of the pronotum or slightly larger. Punctures becoming slightly smaller toward posterior and lateral sides. Intervals not raised, shiny.

Mesoventrite: With a straight carina extended to base of intercoxal process.

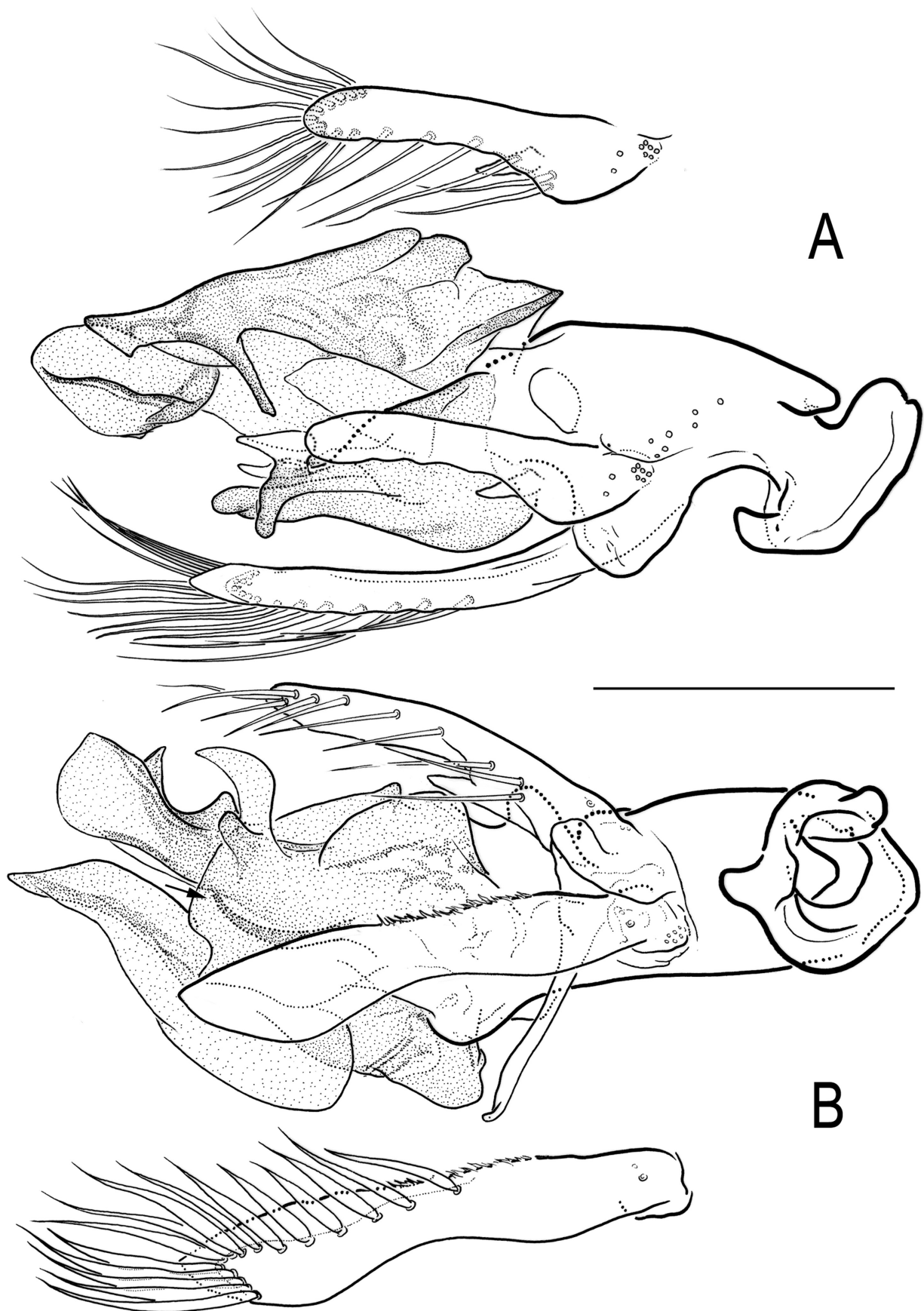


FIGURE 2. *Hydraena josefinae* sp. n., holotype male. Aedeagus in (A) lateral and (B) ventral view. Gonopore indicated by black arrow. Scale bar = 0.1 mm.

Metaventricle: Without plaques.

Legs: of normal shape. Tibiae not enlarged or modified.

Abdomen: Apex symmetrical. Terminal sternite (Fig. 5E) subquadrate. Spiculum gastrale lost, apparently with a laminar, basal expansion, probably similar to that of the male of the closely related *H. alterra* (see Fig. 5F).



FIGURE 3. Dorsal habitus of *Hydraena alterra* Perkins, 1980, paratype male. Scale bar = 0.5 mm.

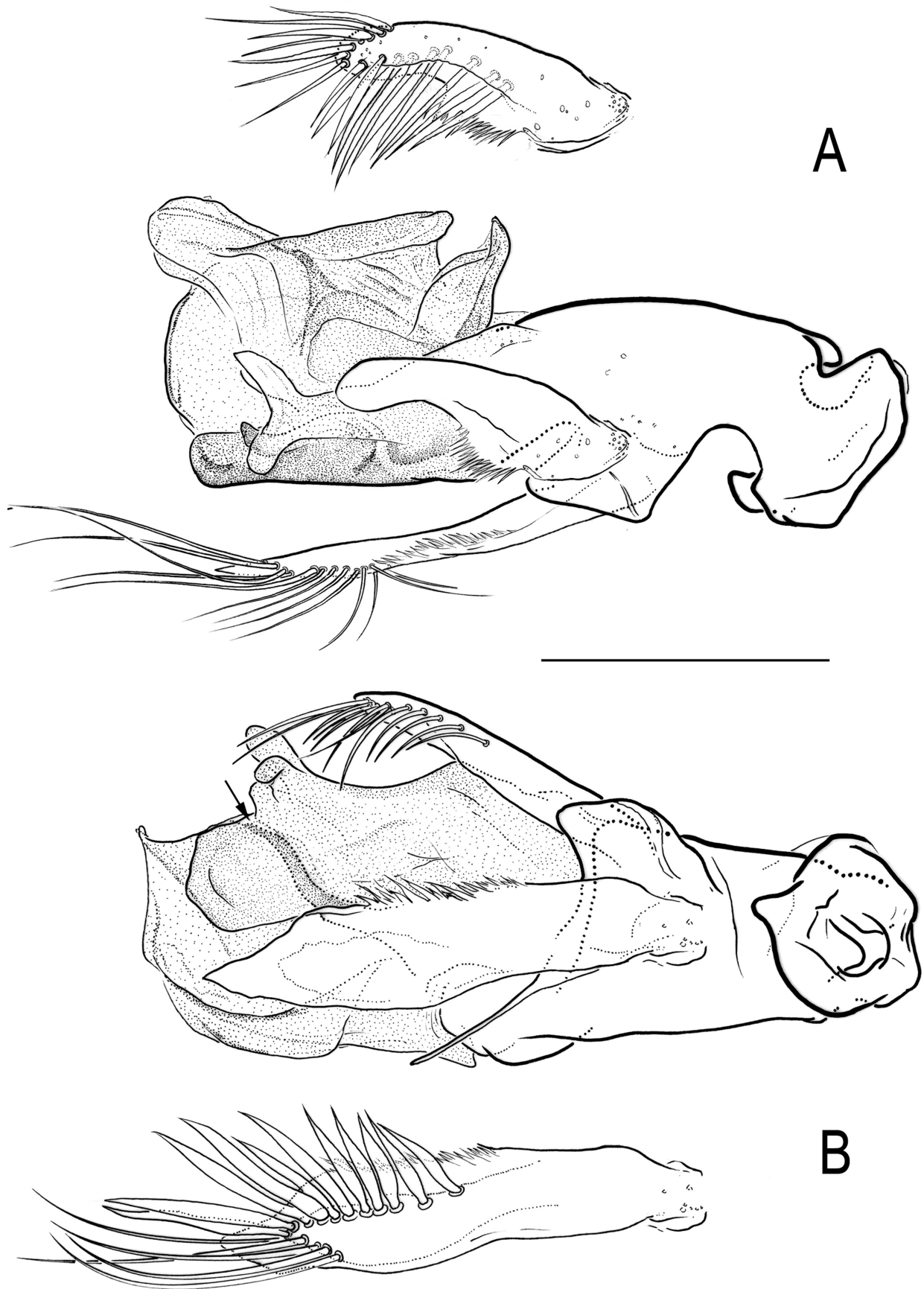


FIGURE 4. *Hydraena alterra* Perkins, 1980, paratype male. Aedeagus in (A) lateral and (B) ventral view. Gonopore indicated by black arrow. Scale bar = 0.1 mm.

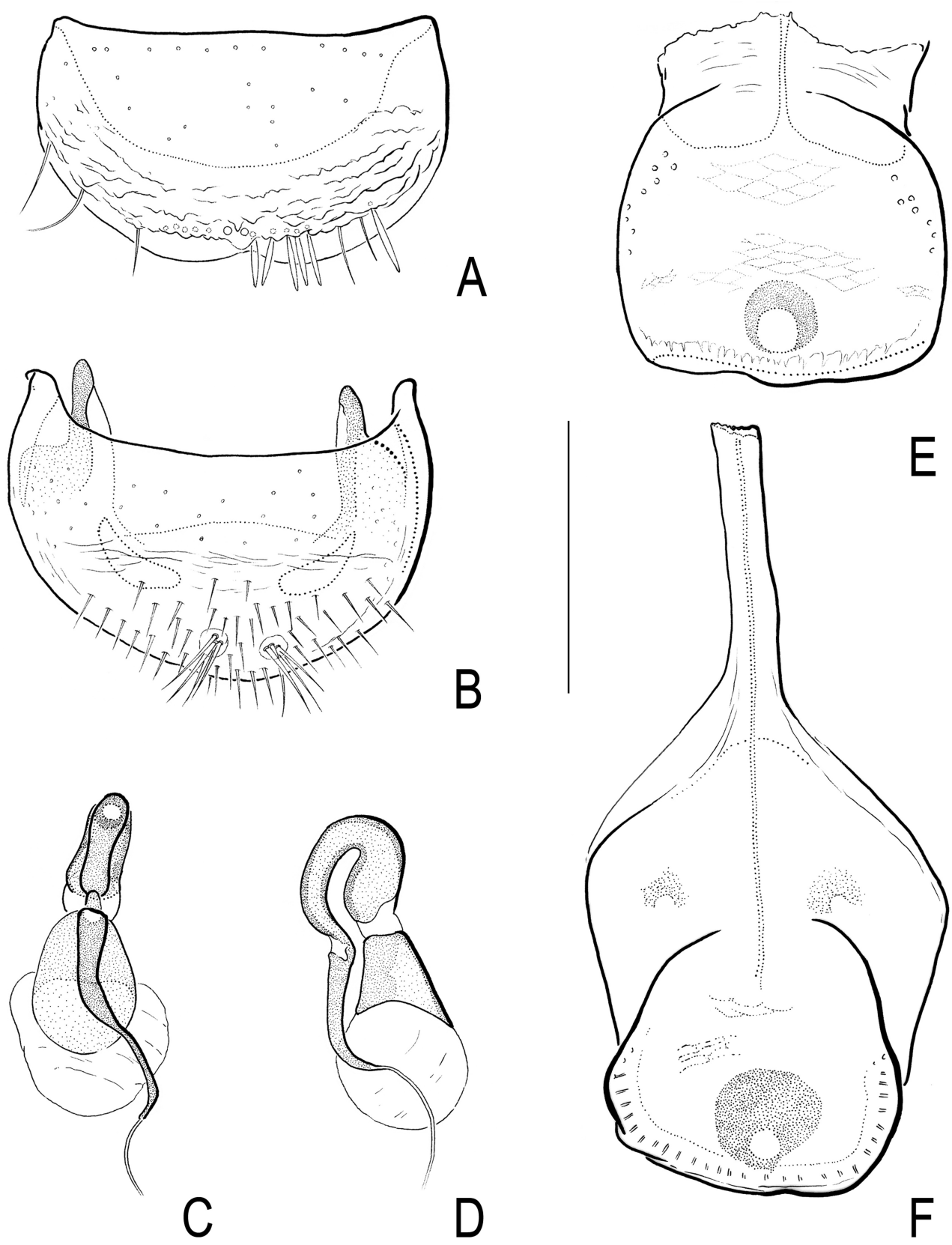


FIGURE 5. *Hydraena josefinae* sp. n., paratype female: (A) tergite X, (B) gonocoxite and (C, D) spermatheca, two views. *Hydraena josefinae* sp. n., holotype male: (E) sternite X. *Hydraena alterra* Perkins, 1980, paratype male: (F) sternite X and spiculum gastrale (broken). Scale bar = 0.1 mm.

Aedeagus: As in Fig. 2. Main piece stout distinctly dilated in lateral view. With a medially basal tubercle with rounded contour when observed in lateral view (Fig. 2A) and a semi-membranous projection directed to the left in ventral view (Fig. 2B); distal lobe robust in ventral (Fig. 2B) and lateral (Fig. 2A) views, with several very complex lobes surrounding a short flagellum, which bears the gonopore; phallobase asymmetrical. Parameres divergent from main piece in ventral view; left paramere, in lateral view (Fig. 2A), spatuliform, basally dilated and with a subtriangular laminar projection. Right paramere, in ventral view, with distal and anterior inner margins laminar, fringed basally (Fig. 2B).

Female: Size, shape and color similar to male. Pronotum similar to male; PF1 deep, PF3 very deep with the anterior area widened, PF2 similar to PF3, PF4 deep. Protibiae with the outer edge slightly curved, meso and metatibiae straight.

Female genitalia: Female tergite X (Fig. 5A) transverse, with a fringe of bristles moderately developed and a few trichoid lateral setae. Disc glabrous. Basal margin medially pointed. Apical margin narrow and distinctly emarginated medially. Gonocoxite (Fig. 5B) semicircular. Ventral plate with two subapical tufts of setae. Dorsal plate symmetrical, slightly surpassing the proximal rim of ventral plate, with two slightly marked, concave, small impressions. Spermatheca as in Figs 5C–D. Distal portion cup-shaped; central portion c-shaped in lateral view.

Differential diagnosis. The new species is a member of the *scintillabella* subgroup of the *leechi* group (Perkins 2011). Externally this subgroup is quite variable in shape and coloration. Most of these species are medium sized and have a distinct scintilla (Perkins 2011), which is hardly perceptible in *H. josefinae* sp. n. Compared to the other species in the *scintillabella* subgroup, the new species resembles some Amazonian species from Venezuela: *H. toboogan* Perkins, 2011 (Perkins 2011, fig. 51) and *H. reverberata* Perkins, 2011 (Perkins 2011, fig. 54), but the aedeagus differs markedly from these two species, especially in the case of *H. reverberata*. The aedeagus of the new species is very similar to that of several species in the *costiniceps* complex in the *scintillabella* subgroup, in which the main piece is stout and the assemblage of the main piece, distal lobe and parameres form a “cup set” surrounding a short flagellum bearing the gonopore (Perkins 2011). In addition, the main piece has a pronounced ventral projection or heel and the right paramere has a laminar border, which resembles a razor edge, especially well observed in ventral view (Fig. 2B). Considering the aedeagus, *H. josefinae* sp. n. is closely related to all these species and especially to *H. alterra* Perkins, 1980 (see Perkins 1980, fig. 38C) from southeast Brazil. Although this species was not studied in the revision by Perkins (2011), it seems to also be related to the *costiniceps* complex as it shares the described aedeagal ground plan and the pronotal scintilla (Fig. 3). The main piece of both species is stout and has a moderately developed ventral heel (distally rounded in *H. josefinae* sp. n. and truncated in *H. alterra*). These heels have a lateral sticky structure directed to the right in ventral view (Figs 2B, 4B), long and slender in *H. alterra* and slightly wider in the new species. As in other members of the *costiniceps* complex, these two species have the right paramere with a laminar edge, basally fimbriate. The left paramere is spatuliform in lateral view, again basally fimbriate in *H. alterra* (Fig. 4A) and with a subtriangular projection in *H. josefinae* sp. n. (Fig. 2A). Externally the new species differs from *H. alterra* in having shorter elytra and in the general shape of the pronotum, with a well-developed scintilla in *H. alterra*.

Distribution. Currently only known from the type locality (Laranjal do Jari, Amapá State), northern Brazil, near French Guiana (Fig. 8).

Etymology. This species is named after Josefina Garrido, a good friend and colleague, in gratitude for all the shared moments during our long friendship and in recognition of her contribution to the knowledge of aquatic Coleoptera.

Habitat. The type material was collected in a small stream (1.5–2.0 m wide, 5–15 cm deep) that flows through a savanna landscape in the Amazon Biome at 36 m a.s.l. The recorded water parameters were: temperature 29.6 °C, pH 6.0 and conductivity 8.0 µS/cm. The stream has a bed of gravel, bedrock and stones with frequent riparian roots and associated algae.

***Hydraena (Hydraenopsis) pernambucana* sp. n.**
(Figs 6–8)

Type locality. Brazil: Pernambuco State, Bonito Municipality, Stream (Igarapé) das Orquídeas, 08°31'01.1"S; 35°43'36.2" W, 741 m a.s.l.

Type material. Holotype (male): “BRAZIL: Pernambuco State, Bonito. / Igarapé (stream) das orquídeas; 741 m.a.s.l. / 08°31’01.1”S; 35°43’36.2” W; 3/v/2014. / N. Hamada, J. M. Nascimento & J. O. Silva, leg. // ♂ // HOLO-TYPUS [red label] // *Hydraena* (*Hydraenopsis*) *pernambucana* sp. n.” (genitalia extracted and mounted on same card) (INPA).

Type depository. Instituto Nacional de Pesquisas da Amazônia, Manaus, Brazil

Description. *Habitus* as in Fig. 6. *Size:* Holotype: Male BL 1.38 mm; EL 0.84 mm; EW 0.60 mm.

Color (Fig. 6): Dorsum of head dark, labrum dark brown; pronotum with disc dark brown and lateral sides yellowish brown, especially in anterior angles; elytra dark brown, lateral margins and apex yellowish brown. Antennae and maxillary palps testaceous, apex of last palpomere yellowish; legs brown, tibiae testaceous. Ventral surface and epipleura dark brown.



FIGURE 6. Dorsal habitus of *Hydraena pernambucana* sp. n., holotype male. Scale bar = 0.5 mm.

Head: Labrum micropunctured, with an open v-shaped apicomedian emargination, external margins of lobes convex. Clypeus with small punctures very sparsely arranged and with only a few, small white setae. Punctures on frons slightly smaller and sparse on median area, interstices between punctures smooth and shiny.

Pronotum: Wider than long, maximum width at the middle length. Anterior margin weakly emarginate behind frons, with disc shiny and punctate. Scintilla absent. Sides weakly convex with margins serrate. Posterior margin slightly convex. Punctures on disc much larger and deeper than those on frons, interstices wide and shiny. Disc with a flat median area. PF1 absent, PF3 broad and shallow deep, PF2 shallow deep, PF4 absent.

Elytra: Arcuate laterally, short and wide, with marked shoulders. Lateral explanate margins moderate, wider in the elytra apical half, absent on apex. With 8 rows of regular impressed punctures between suture and shoulder; size of punctures similar to those of the pronotum or slightly larger. Intervals not raised, shiny. Apex rounded with a small sutural echancure.

Mesoventrite: With a wide straight short carina.

Metaventrte: Plaques sparsely marked, at sides of a deep median area, densely punctured.

Legs: Protibia slightly expanded towards apex. Mesotibia and metatibia straight and slender.

Abdomen: Apex symmetrical.

Aedeagus: As in Fig. 7. Phallobase symmetrical in ventral view (Fig. 7A) and wide in lateral view (Fig. 7B). Main piece geniculate in lateral view, with a distinct, apical, long curled flagellum. Parameres long, moderately slender and starting at basal sides of main piece. Left paramere distally enlarged in lateral view.

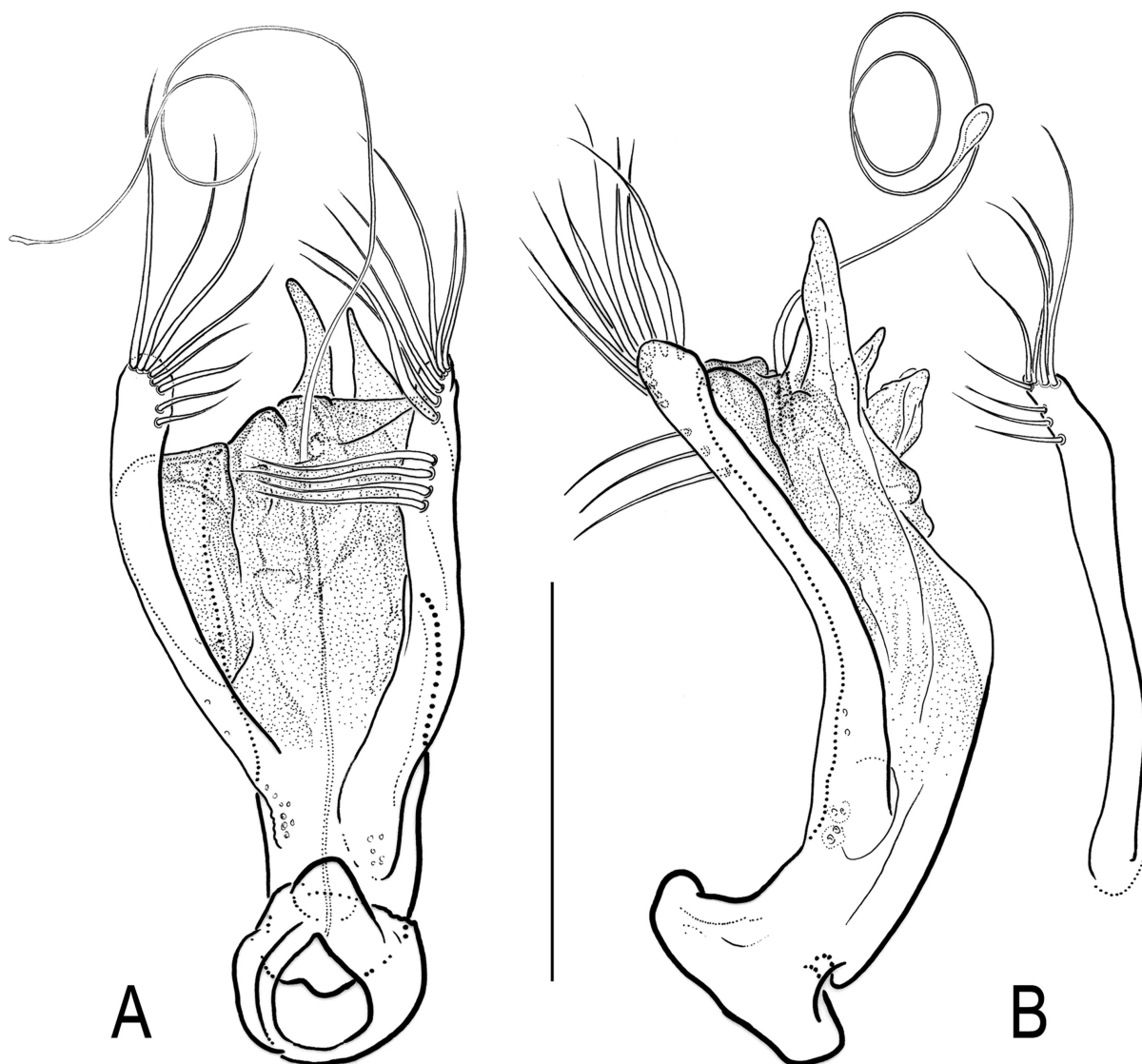


FIGURE 7. *Hydraena pernambucana* sp. n., holotype male. Aedeagus in (A) ventral and (B) lateral view. Scale bar = 0.1 mm.

Female: Not yet known.

Differential diagnosis. The new species is a member of the *steineri* complex in the *marginicollis* group, *sensu* Perkins (2011), which includes two medium-sized species, without pronotal scintilla and aedeagi with main piece distally enlarged, parameres attached at basal half of main piece and a long flexible flagellum. *Hydraena pernambucana* **sp. n.** is close to *H. steineri* Perkins, 2011 (see Perkins 2011, fig. 120), but it differs mainly in the aedeagus morphology, having a geniculate main piece in lateral view and a distal lobe with a projected acute dorsal area (Fig. 7).

Distribution. Currently known from the type locality (Bonito, Pernambuco State), northeast Brazil, near Atlantic coast (Fig. 8).

Etymology. This species is named after the State of Pernambuco in Brazil, where the type locality is located. The name is in apposition in the adjective case.

Habitat. The type material was collected in a stream at 741 m a.s.l., located in a semideciduous seasonal forest in the Atlantic Forest biome. The measured water pH was 8.0 and conductivity was 57.3 $\mu\text{S}/\text{cm}$.



FIGURE 8. Map with type localities of *H. josefinae* **sp. n.** (red circle) and *H. pernambucana* **sp. n.** (red star).

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