A new species of laraine elmid from French Guiana (Coleoptera, Elmidae, Larainae)

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Abstract. – The genus *Phanocerus* is briefly reviewed. *Phanocerus* currently contains six species. An additional species, *Phanocerus queneyi* n. sp., is here described from French Guiana. Comments on its biology and morphology are provided. Secretions that potentially form a predator-avoidance mechanism are described.

Résumé. – **Une nouvelle espèce de Larainae de Guyane (Coleoptera, Elmidae, Larainae)**. Le genre *Phanocerus* est brièvement révisé. *Phanocerus* contient actuellement six espèces. Une espèce supplémentaire, *Phanocerus queneyi* n. sp., est décrite ici de Guyane française. Des commentaires sur sa biologie et sa morphologie sont fournis. Sont également décrites les sécrétions pouvant constituer un mécanisme d'évitement des prédateurs.

Keywords. – Neotropical, riffle beetles, survey, description, distribution, taxonomy, morphology.

The genus *Phanocerus* Sharp was described by Sharp (1882) with *P. clavicornis* Sharp, 1882, as the type species. Five other species are now included as valid species (Jäch *et al.*, 2016): *P. bugnioni* Grouvelle, 1902, *P. charopus* Spangler, 1966, *P. congener* Grouvelle, 1898, *P. rufus* Maier, 2013, and *P. sharpi* Grouvelle, 1896. Spangler & Santiago-Fragoso (1992) synonymized two other species with *P. clavicornis*: *P. hubbardi* Schaeffer, 1911, and *P. helmoides* Darlington, 1936. *Phanocerus guaquira* Leal-Duarte, Briceño-Santos & Rincón-Ramírez, 2021, was recently described (Leal-Duarte *et al.*, 2021) but the description lacks an adequate diagnosis in that there is no comparison to other species in the genus, a requirement stated in Article 13 of the International Code of Zoological Nomenclature. Plus the character states cited in the description are of a generic-level, not a species-level.

The species in *Phanocerus* all have fairly monomorphic morphology, including the genitalia (Hinton, 1940). This has made species-level identifications difficult at best. Characters used by previous authors to define species all overlap, except for the length of the mesal setose patch on the base of the male mesotibiae. However, four species have short setose patches, one has a long patch (*P. congener*) and one lacks that patch (*P. bugnioni*) (unpublished information).

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The distribution of the genus extends from the southern USA (Texas) throughout the Caribbean Islands, Central America and through all of South America except Chile, where they have not yet been collected despite extensive surveys (unpublished information). Three species are currently each known from a single South American country: *P. bugnioni* from Colombia, *P. charopus* from Peru and *P. rufus* from Venezuela. These distributions reflect both lack of collecting in much of South America and lack of description of known but not yet described populations. There is one record of *Phanocerus* from South Africa that is obviously a misidentification as *Phanocerus* is a strictly New World genus (Jäch *et al.* 2016).

French Guiana has been surveyed for Elmidae and related families for several years. Pierre Queney made surveys of all aquatic beetles during the period 2003–2010 and William Shepard and Cheryl Barr surveyed during 2016 and 2022 for all aquatic Dryopoidea. These surveys have resulted in several publications on Elmidae and Dryopidae (QUENEY, 2012; BARR, 2018; SHEPARD & BARR, 2018; SHEPARD, 2019b; SHEPARD *et al*., 2020; BARR *et al*., 2021; CLAVIER *et al*., 2021; SHEPARD & QUENEY, 2021; CLAVIER *et al*., 2022), with more in preparation.

The purpose of this paper is to describe a new species of *Phanocerus* from French Guiana with notes on its reproductive biology and morphology, and to comment on a potential predator-avoidance mechanism in *Phanocerus* and other dryopoids.

METHODS AND MATERIALS

Survey methods included aquatic netting and using light sheets at night. Specimens for this study were collected in 2016 and 2022 in French Guiana by William Shepard along with Cheryl B. Barr, Simon Clavier, Douglas L. Post and Robert W. Sites. Additional specimens were photographed or collected by Simon Clavier in 2018 and 2020.

Specimens were examined with a dissecting microscope and measured with a calibrated ocular grid. Measurements of body length include the prothorax and elytra. Not all specimens could be measured due to minor damage. Specimens were examined from or deposited in the following collections: **EMEC**, Essig Museum of Entomology, University of California, Berkeley, CA, USA; **MNHN**, Muséum national d'Histoire naturelle, Paris, France.

Label data are reported verbatim with "/" indicating new lines on one label and "//" indicating separate labels. Some dates were presented in a uniform style for clarity.

Three alcohol-preserved adults were dissected to examine the internal structure of the posterolateral pronotum and the abdominal ventrites. The three specimens chosen for dissection had the pronotal posterolateral margin 1) almost straight, 2) slightly explanate, and 3) strongly explanate. To expose the internal morphology, the body was bisected with a sagittal cut and examined under alcohol. Sixty-seven alcohol-preserved specimens were examined for the glandular material extruded externally between the abdominal ventrites III and IV (SPANGLER & SANTIAGO-FRAGOSO, 1992).

Underwater photographs of live adults were made using an Olympus Tough TG5 digital camera.

TAXONOMY

Genus ***Phanocerus*** Sharp, 1882

Type species. – *P. clavicornis* Sharp, 1882.

Generic diagnosis. – *Phanocerus* is a member of the elmid subfamily Larainae, members of which are characterized by the body covered with hydrofuge setation (tomentum), by clubbed antennae and by macropterous flight wings (Shepard, 2019a).

Phanocerus species have a length of 2.0–4.0 mm, short clubbed antennae, and the pronotum has sublateral grooves but no anterior transverse groove. The antennae are often hidden below the eyes. The pronotal sublateral grooves are sometimes faint and often there is a narrow median longitudinal groove present. The sides of the pronotum are straight to sinuate.

Spangler & Santiago-Fragoso (1992) diagnose *Phanocerus* with "Length of 4.5 mm or less. Pronotum with sublateral impressions only." Maier (2013) separates *Phanocerus* from other Venezuelan Larainae "… by its small size and pronotum which lacks a transverse groove."

Secondary sexual variation. – No external sexual variation has been described except for females averaging a little larger than males. However, the female size range almost completely overlaps that of the males.

Distribution. – Southern USA (Texas) south to Argentina.

Habitat and habits. – *Phanocerus* adults are most often collected from streams where they are found, sometimes in large numbers, associated with organic debris such as leaf packs, emergent sticks and logs, and on streamside vegetation that hangs over and into the water. Some have been collected at lights (Maier, 2013). Hinton (1940) notes that they feed on "algae (diatoms, etc.)." Larvae are most commonly found in leaf packs.

Immature stages. – Eggs, larvae and pupae have been described by Hinton (1940). Spangler (1966) and Spangler & Santiago-Fragoso (1992) also have described and illustrated larvae.

Remarks. – When disturbed, adults will quickly leave the organic material they occupy and drop onto the water's surface to escape. When collected into a net they are also very quick to fly, and can be mistaken for adult staphylinids or flies.

Phanocerus queneyi **n. sp.** (fig. 1-11)

https://zoobank.org/NomenclaturalActs/A8286431-5C3E-4C21-B249-E7159830732F

Type locality. – French Guiana: Chutes de Cascades Voltaire, 5.0314, -54.0877, 32 m (fig. 12).

Type material. – Holotype: ♂, "FRENCH GUIANA / Chutes de / Cascades Voltaire / 09.III.2019 / Doug L. Post" (MNHN).

Paratypes (16 ex.): 5 ♂, 5 ♀, same data as holotype (MNHN); 3 ♂, 3 ♀, "FRENCH GUIANA / Crique Aya 106 m / Saut Aya 11.XI.18 / N4°36'11" W53°24'52" // Simon / Clavier" (MNHN).

Other specimens examined. – 9 ♂, 8 ♀, "FRENCH GUIANA / Chutes de / Cascades Voltaire / 09.III.2019 / Doug L. Post" (EMEC); 1♂, "FRENCH GUIANA / Carbet Grillon / 12.III.2019 82 m / Crique Grillon / N4°16.80' W52° 27.08' / WDS-A-2148 (on reverse) // William D. / Shepard, leg." (EMEC); 4♂, 8♀, "FRENCH GUIANA: Crique Grillon / at Chutes / 13.III.2019 / Doug L. Post" (EMEC); 17 ♂, 3 ♀, "FRENCH GUIANA / Chute Grillon / 13.III.2019 / stream with waterfall / N4.2820° W52°.4517° / WDS-A-2149 (on reverse) // William D. / Shepard, leg." (EMEC); 1♂, "FRENCH GUIANA: Carbet / Grillon – ONF / 13.III.2019 82 m / N4°16.798' W52° 27.077' / MV & BL light sheets / WDS-T-235 (on reverse) // William D. / Shepard, leg." (EMEC); 1 ♂, "FRENCH GUIANA / 6 km N Petit Saut / 29.X.2019 32 m / Crique Gregoire // William D. / Shepard, leg." (EMEC); 1 ♂, "FRENCH GUIANA: 8 km NNW of Saül / 10.X.2016 156 m / Crique à l'Est / WDS-A-2051 (on reverse) // William D. / Shepard, leg." (EMEC); 1 ♀,

"FRENCH GUIANA / ca. 8 km NNW of Saül / Crique a' l'Est; 156 m / 10.XI.2016 / R. W. Sites; L-1956 // 03° 39' 46.04"N / 53° 13' 24.78"W / gravel riffles & / vegetated margin" (EMEC); 3 ♂, 1 ♀, "FRENCH GUIANA / Montagne de Fer / 5.III.2019 41 m / Crique Petit Laussat / N5° 24.459' W53° 53.29' // Simon / Clavier" (EMEC); 1 ♀, "FRENCH GUIANA / Cacao / 14.III.2019 11 m / Crique Cacao / N4° 34.267' W52° 27.99' / WDS-A-2151 (on reverse) // William D. / Shepard, leg." (EMEC); 1 ♂, 2 ♀, "FRENCH GUIANA: trib to / Crique Cascades / 7.III.2019 54 m / N5° 20.79' W54° 06.33' / WDS-A-2143 (on reverse) // William D. / Shepard, leg." (EMEC); 1 ♂, "FRENCH GUIANA / nr. Montagne de Fer / 5.III.2019 21 m Crique / Maman Valentin / N5° 20.33' W53° 39.36' / WDS-A-2139 (on reverse) // William D. / Shepard, leg." (EMEC); 1 ♂, "FRENCH GUIANA: 8.III.2019 73 m / Crique Portal / N5° 15.45' W53° 57.84' / WDS-A-2146 (on reverse) // William D. / Shepard, leg." (EMEC); 8 ex., "FRENCH GUIANA / unnamed creek / trib. Sinnamary River / 04.64840, -52.94082 / 3.XI.2016, C.B.Barr // trib Lake Petit / Saut N of / Saut Takari Tanté" (EMEC); 8 ex., "FRENCH GUIANA / Sinnamary River at / Saut Takari Tanté / 04.62175, -52.92645 / 4.XI.2016, C.B.Barr" (EMEC); 7 ex., "FRENCH GUIANA / Sinnamary R. at Saut / Takari Tanté, MV lt. / 04.62256m -52.92819 / 4.XI.2016, C.B.Barr" (EMEC); 2 ex., "FRENCH GUIANA / Cr. Nouvelle France / 03.60631, -53.17616 / 8.XI.2016, C.B.Barr // Parc Amazonien / de Guyane / at Point Chaud" (EMEC); 1 ex., "FRENCH GUIANA / ca. 4.5 km SE Saül / Cr. Nouvelle France / 03.59718, -53.17790 / 9.XI.2016, C.B.Barr // Parc Amazonien / de Guyane at / Courant Doublé" (EMEC); 1 ex., "FRENCH GUIANA / trib. Crique Grand / Laussat at Rte. N1 / 05.4167, -53.6130 / 6.III.2019, C.B.Barr" (EMEC); 1 ex., "FRENCH GUIANA / trib. Cr. Petit Laussat / Montagne de Fer / 05.4077, -53.5816 / 6.III.2019, C.B.Barr" (EMEC); 1 ex., "FRENCH GUIANA / Crique Cariacou at / Rte. De Paul Isnard / 05.2983, -53.9615/ 8.III.2019, C.B.Barr" (EMEC). 3 ex., "FRENCH GUIANA: Reserve la Trinité / 9.XII.2022 133 m / Crique Aya / N4.60297º W53.41490º WDS-A-2196 [on reverse] // William D. / Shepard, leg." (EMEC); 2 ex., "FRENCH GUIANA: Reserve la Trinité / 7.XI.2022 126 m / Crique Aya cascade / N4.60290º W53.41439º WDS-A-2196 [on reverse] // William D. / Shepard, leg." (EMEC).

Diagnosis. – *Phanocerus queneyi* n. sp. is characterized by a short mesal setose patch on the base of the male mesotibiae, a wider than long pronotum with a non-explanate anterolateral pronotal angle (fig. 1), and a black body.

Phanocerus queneyi n. sp. has a short mesal setose patch on the base of the male mesotibiae (fig. 8) (as does *P. clavicornis*, *P. charopus*, *P. rufus*, and *P. sharpi*) while *P. congener* has a long setose patch and *P. bugnioni* lacks the patch. The pronotum of *P. queneyi* n. sp. is wider than long (as in *P. congener*, *P. rufus* and *P. bugnioni*) while the pronotum of *P. clavicornis* is longer than wide. The anterolateral pronotal angle of *P. queneyi* n. sp. is not explanate (as in *P. bugnioni*, *P. charopus*, *P. sharpi*) while the anterolateral pronotal angle of *P. congener* is explanate. The color of *P. queneyi* n. sp. is black while *P. rufus* is reddish and *P. bugnioni*, *P. charopus*, and *P. sharpi* are black to red. The size range of the species are as follows: *P. queneyi* n. sp. 2.3–3.0 mm; *P. bugnioni* 2.0–3.0 mm; *P. charopus* 2.6–3.4 mm; *P. clavicornis* 2.0–3.3 mm; *P. congener* 2.1–2.5 mm; *P. rufus* 2.7–3.5; and *P. sharpi* 3.0–3.3 mm.

Description. – *Body* size small, 2.3–3.0 mm long, 0.8–1.4 mm wide (n=61); males 2.4–2.7 mm long, 1.0–1.2 mm wide (n=31), females 2.5–3.0 mm long, 0.8–1.4 mm wide (n=30). Body color black (fig. 1-2), basal two antennomeres and claws yellow-brown to red.

Head with frons black, setose with golden setae; clypeus transversely rectangular, basal and apical margins straight; labrum transverse, basal margin straight, apical margin slightly emarginated, golden setae on disc. Eyes round, not protruding, finely faceted, dorsal margin with stiff, curved setae. Antennae with 11 antennomeres; antennomere 1 longest, anterior surface heavily setose with strong stiff curved black setae, posterior surface with short golden setae; antennomere 2 globular, with setation as on antenomere 1; antennomeres 3–6 very short; antennomeres 7–11 forming short club. Maxillary palpi longest; terminal palpomere apically

obliquely excavate with circular white sensory area. Labial palpi short; terminal palpomere apically with white elliptical sensory area.

Pronotum convex dorsally; anterior margin curved; lateral margins straight to sinuate; posterior margin bisinuate; disc with sublateral grooves in basal half that then curve to lateral

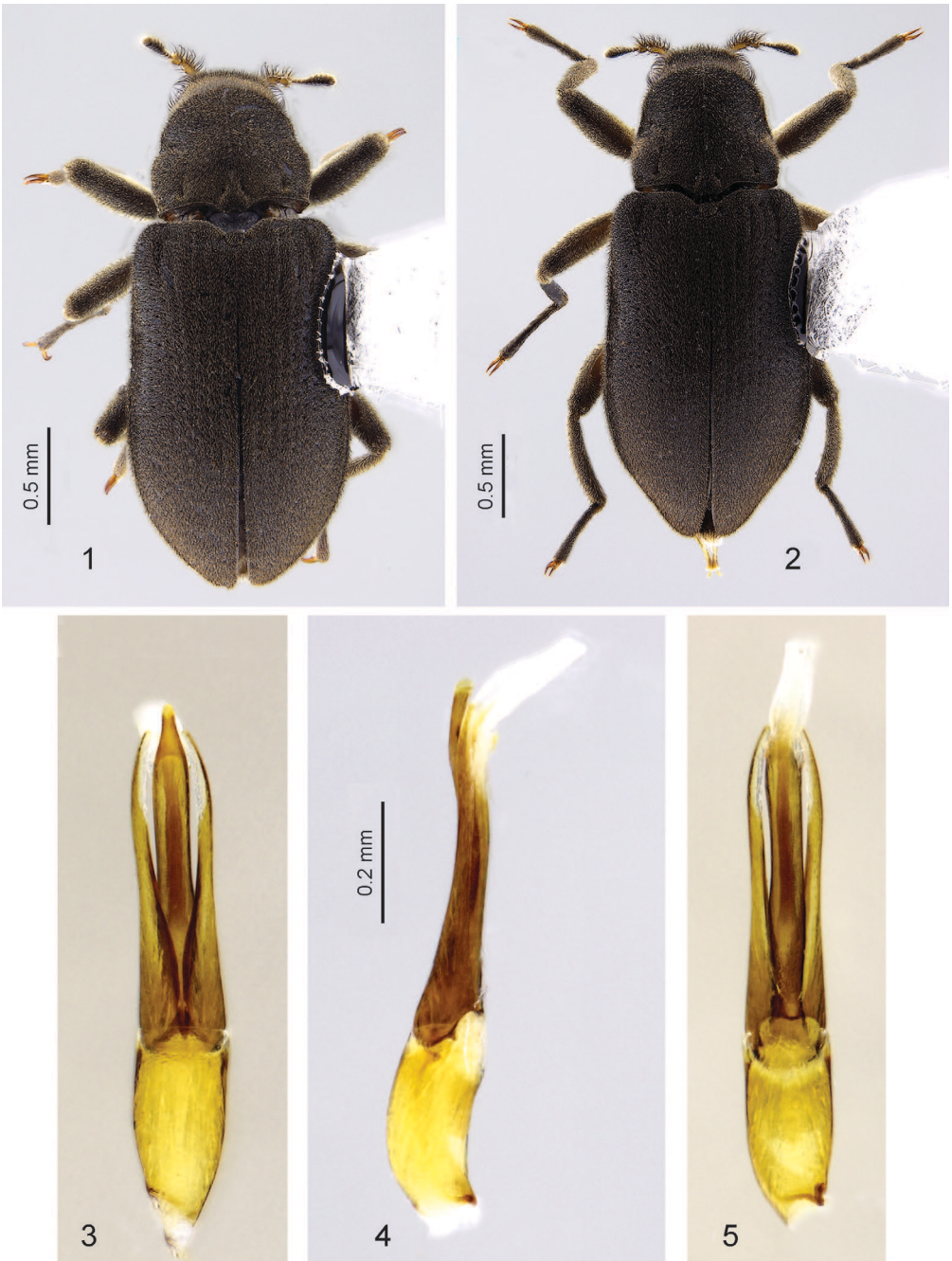

Fig. 1-5. – *Phanocerus queneyi* n. sp. – **1-2**, Dorsal habitus: **1**, ♂; **2**, ♀. – **3-5**, Aedeagus: **3**, dorsal; **4**, lateral; **5**, ventral.

margins, grooves may be faint or obsolete, some individuals with narrow median longitudinal groove, two antescutellar pits which may be obsolete, disc covered with short golden setae. Scutellum with anterior margin straight, posterior margins evenly curved; disc flat with short golden setae.

Elytra with basal margin sinuate; lateral margins straight and evenly curved apically; disc with punctate striae, punctae coarser basally then fainter near apex; surface covered with short golden setae. Metathoracic wings macropterous.

Prosternum flat, with golden setae; prosternal spine narrowing gradually to apex, low median longitudinal carina extends to tip. Mesoventrite short, transversally rectangular; middle depressed to receive tip of prosternal spine. Metaventrite with distinct discrimen and faint transverse line; disc covered with short golden setae. Legs short, stout; pro- and metacoxae transverse, mescoxae globular; femora widest at middle; tibiae as long as femur, straight, base of mesotibiae on mesal side with short setose patch; tarsi stout, tarsomere 5 as long as 1–4, apex with tuft of white setae surrounding base of claws; claws short, slender, red.

Abdomen with five visible ventrites, ventrite 4 shortest, ventrite 5 curved to apex.

Aedeagus (fig. 3-5) 6.0–7.8 × longer than wide; median piece 2.1× longer than basal piece; basal piece tubular, closed dorsally and ventrally, parallel-sided; parameres meeting only basally dorsally, long, very slender, lateral margin slightly sinuate, mesial margin slightly arcuate, apex strongly acute, apices partially wrapping around median piece, in lateral view widest basally then increasingly slender to apex, with short tooth laterally on base, ventrally

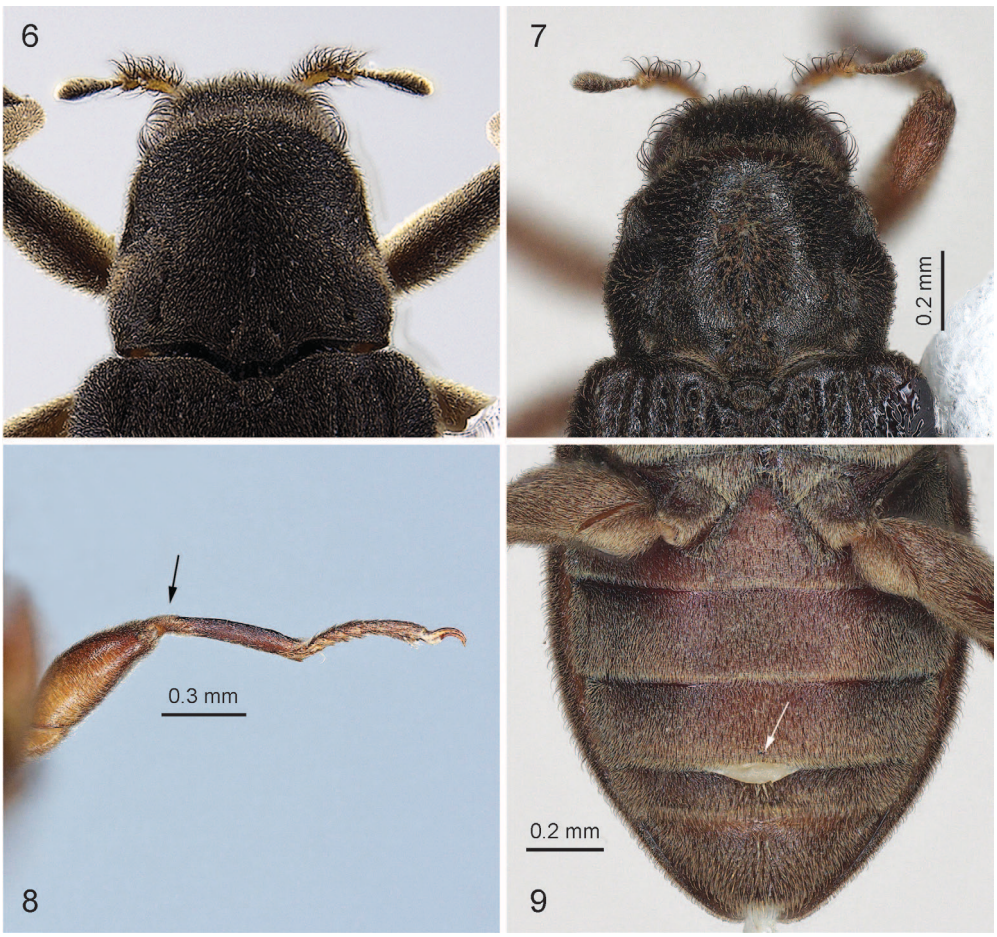

Fig. 6-9. – *Phanocerus queneyi* n. sp. – **6**, Straight-sided pronotum. – **7**, Swollen lateral side of pronotum. – **8**, Short mesal setose patch (indicated by arrow). – **9**, Ventrite 3 with extruded glandular material (arrow).

shorter than dorsally, with rectangular opening at base; median piece very long, slender, parallel-sided, extending beyond parameres, apically constricted, apex acute and rounded.

Ovipositor 0.7 mm long, 0.3 mm wide; paraprocts long and slender, bases slightly convergent; gonocoxites widest basally and transverse, elongate apical portions with arcuate margins both laterally and basally, apices touching apically; gonostyli short, slanted laterally.

Variation. – Females similar to males, slightly larger on average, but size ranges overlap, see above.

Etymology. – This species is named after Pierre Queney, the first surveyor of French Guiana Elmidae. The name is genitive singular.

Distribution and habitat. – All of our collections are from the northern half of French Guiana due to limited access elsewhere. All but nine specimens (see Biology below) were collected on organic matter in streams. Associated dryopoids in the streams include: Dryopidae — *Dryops* Olivier, 1791, *Platyparnus frater* (Hinton, 1939), *Microparnus*

Fig. 10-12. – *Phanocerus queneyi* n. sp. – **10**, Submerged adult enveloped in a bubble; water current is from left to right. – **9**, Submerged adults *in copula*. – 10, Type locality: Chutes de Cascades Voltaire.

pusillus (Hinton, 1939); Elmidae —*Cylloepus* sp., *Gyrelmis brunnea* Hinton, 1940, *G. maculata* Hinton, 1940, *G. nubila* Hinton, 1940, *G. pulchella* Hinton, 1940, *G. simplex* Hinton, 1940, *G. thoracica* Hinton, 1940, *Heterelmis* sp., *Hexacylloepus heterelmoides* Hinton, 1939, *Hintonelmis delevei* Hinton, 1971, *H. perfecta* (Grouvelle, 1908), *Macrelmis tereus* (Hinton, 1946), *Microcylloepus nomia* Hinton, 1945, *Neoelmis maculata* Hinton, 1940, *N. nana* Hinton, 1940, *N. nelo* Hinton, 1972, *Potamophilops bostrychophallus* Maier, 2013, *Stegoelmis geayi* (Grouvelle, 1908), *S. verrucata* Hinton, 1939, *Xenelmis tarsalis* Hinton, 1940; Lutrochidae —*Lutrochus wao* Maier & Short, 2014.

The specimens collected at Réserve naturelle nationale de la Trinité, Crique Aya, in 2018, were in water that had following physical/chemical parameters: turbidity 1.13 NTU, conductivity 35.2 µS/cm, dissolved oxygen 82.8 % saturation and 6.75 mg/l and temperature 25.1°C. Additional specimens collected in 2018 were from streams with the following ranges of physical/chemical parameters: turbidity 0.89–2.45 NTU, conductivity 33.2–35.2 µS /cm, dissolved oxygen 83.7–88.8 % saturation and 6.81–7.26 mg/l and temperature 24.3–25.4°C.

Biology. – Eight females had eggs in the abdomen when the genitalia were dissected. Two had one egg, one had five eggs, one had seven eggs, one had eight eggs, one had ten eggs, one had 12 eggs and one had 14 eggs. The specimens were collected in March or November so these months are within the reproductive period. Nine adults were collected at stream-side lights.

The tomentum retains a bubble of air around the entire body when underwater (fig. 10) similar to the dryopid *Dryops rufipes* (Özdamar *et al.*, 2023). The bubble gives a fuzzy appearance and silver color to submerged specimens. The bubble also envelopes both adults while mating (fig. 11). This bubble surrounding the adult(s) is commonly seen in other Larainae.

Remarks. – The internal area of the posterolateral pronotum is the attachment area for the muscle that moves the procoxa. In those specimens with the posterolateral swelling, the muscle is larger.

The extruded glandular material noted by Spangler & Santiago-Fragoso (1992) on the abdomen of *P. clavicornis* was found in 18 of 38 males (47%) and 5 of 23 females (22%) of *P. queneyi* n. sp. In a sagittal bisection, the intersegmental membrane between ventrites 3 and 4 was found to be more in-pocketed than other intersegmental membranes. No larvae examined had any extruded material anywhere on their bodies.

The genus was first reported from French Guiana, Mana, Crique Grand Laussat, 15.II.2004 (Queney, 2012).

Other species examined. – *Phanocerus bugnioni* – 4 ♂, 1 ♀, "COLOMBIA: Antioquia / Mp. Retiro La Pradera / 24.III.2016 2106 m / unnamed stream / N0.6°00.28′ W75°29.80′ (WDS-A-2036 on reverse) // William D. / Shepard, leg." (EMEC); 5 ♂, 2 ♀, "COLOMBIA: Antioquia / San Luis/Puerto Triunfo / 15.III.2016 671 m / Rio Claro / N05°53.59′ W74°51.35′ (WDS-A-2013 on reverse) // William D. / Shepard, leg." (EMEC); 1 ♂, "COLOMBIA, Valle de Cauca / upper Rio Bitaco / near Chicoral, Municipio / La Cumbre, 1970 m, / 28.VII.1989 CL2426 / D. A. & J. T. Polhemus" (EMEC); 1 ♂, "COLOMBIA: Quindio / Mpio. Pueblo Ta Pado / 22.III.2016 1232 m / Quebrada La Ceiba / N0.4°30.21′ W75°49.90′ (WDS–A-2030 on reverse) // William D. / Shepard, leg." (EMEC).

Phanocerus charopus – 5 ♂, 3 ♀, "PERU: Madre de Dios / Manu/ VII.2005 547 m / Rio Salvacion / 12°50′S 71°21′W / F. Montes & J. Chaves" (EMEC); 1 ♀, "PERU: Dept. Cuzco / Rio Pacchac Chico / 6 km N of Quillabamba / 975 m, 195C, pH 5.5 / 2.VIII. 1989 CL2447 / DA & JT Polhemus" (EMEC).

Phanocerus sharpi – 1 ♀, "ARGENTINA N / S of Salta (50 km) / E of Coronel Moldes / 23.1.2009 Snižek lgt." (EMEC); 1 ♀, "PARAGUAY: Concepcion / Cororo / XII.1999 / A. Ugarte, leg." (EMEC).

Discussion

Phanocerus is a genus highly in need of revision, and the use of molecular techniques should prove especially valuable. Four species were described more than 100 years ago (*P. bugnioni*, *P. clavicornis*, *P. congener* and *P. sharpi*), one 54 years ago (*P. charopus*), and one nine years ago (*P. rufus*). Some of the older species were likely considered distinct species only because, at the time of description, no other populations were known that linked them with known species. That is no longer the case as *Phanocerus* is now known from almost all counties in South America. However, many of those populations remain unstudied although ample specimens have been collected. It is possible that *Phanocerus congener* may be an ecomorph of *P. clavicornis* that develops where specimens encounter warmer environmental temperatures. More recently, coincident with global warming, *P. congener* has been collected far more widely than where it was originally thought to be restricted. Because of an inadequate description and comparison, *Phanocerus guaquira* should be considered a *species inquirenda* until it is further analyzed.

There is considerable variation in the shape of the pronotum in *Phanocerus* (W. D. Shepard, unpublished information). Some have the lateral margins almost straight (fig. 6) while many have varying degrees of swelling in the middle (fig. 7). Those with the lateral swelling can have it at the midpoint of the pronotum while others have it further back. The anterolateral angle of the pronotum is rather explanate in *P. congener*, but this is variable as well when enough specimens are examined. Additionally, the mesotibial mesal setose patch varies in size and shape within any one population if one looks at enough specimens. But if one looks at only a few specimens from a population, one can get a false view of this character.

The muscle that attaches internally to the swollen posterolateral area of the pronotum perhaps helps hold the proleg's grip on the substrate when the adult lives in faster water flow. In the future, collections made from faster flow areas should be kept separate from those made in slower flow areas to consider this possibility. Maybe this will help elucidate the function of the muscle/pronotum morphology in specimens with different pronotal shapes. A hypothesis to be examined is that the more swollen the posterolateral areas of the pronotum, the more likely the adult lives in faster flow, or, the less swollen the posterolateral pronotal area, the more likely the adult is restricted to slower flow conditions. Alternatively, the enlarged muscle may increase the proleg's grip as a way to offset the buoyancy produced by the bubble held by the hydrofuge setation (= tomentum).

The whitish glandular material extruded between abdominal ventrites 3 and 4 (fig. 9) is not a structure because when touched with a probe it breaks into irregularly shaped particles. Thus it is likely a secretion that hardens, or precipitates, on contact with alcohol. These areas of secretion that precipitate on contact with alcohol have been seen in adults of the dryopids *Platyparnus* Shepard & Barr, 2018, and *Dryops* although in different locations, in *Lutrochus* Erichson, 1847 (Lutrochidae) and *Byrrhinus plenus* Wooldridge, 1987 (Limnichidae) (W. D. Shepard, unpublished data). The secretion evaporates upon exposure to air. Because the secretion occurs in both genders of *Phanocerus queneyi* n. sp., and only in adults, the function is likely a predator-avoidance chemical. Chemical defenses have been demonstrated in adults of several genera of elmids and lutrochids (White, 1989). In these cases, the potential predators were fish and turtles. But the same might be effective in French Guiana against the various fishes (Heptateridae: *Hepaterus* sp., *Chasmocranus* sp.; Loriicaridae: *Harttiella* sp., *Lithoxus* sp., *Guyanancistrus*; and Rivulidae: *Rivulus* sp.) that occur in the streams.

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