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## Description of the female of *Colocharis hungi* Torrén (Hymenoptera, Eucharitidae) and identification key for the species of *Colocharis*

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### Abstract

The female of *Colocharis hungi* Torrén (Hymenoptera: Eucharitidae) is newly described, detailing the characters that distinguish this species. In addition, we provide images and comments for *C. hungi*, diagnoses for all species of *Colocharis* Heraty, a key to species, and a distribution map for the species.

**Key words:** ant parasitoids, chalcidoid wasps, Eucharitinae, *Kapala* clade, taxonomy

### Introduction

*Colocharis* Heraty is a small genus of chalcidoid wasps belonging to Eucharitidae (Hymenoptera: Chalcidoidea) (Heraty 2002). It is one of thirteen genera that currently comprise the *Kapala* clade, which are parasitoids of Ponerinae and Ectatomminae ants (Murray *et al.* 2013; Torrén & Heraty 2013). There are currently three described species (Heraty 2002; Torrén 2012) and possibly three more undescribed species at the University of California, Riverside, USA (Heraty 2002). The genus is recorded, so far, from Argentina, Brazil, Ecuador, Peru, and Venezuela (Torrén 2012). Individuals are morphologically distinct from those of other genera in the clade by having comparatively small and widely spaced frenal processes, supraclypeal area delimited laterally by a crenulate sulcus, and rounded propodeal spiracles (Torrén 2012). Males have eight flagellomeres, the basal ones of which are small with long and thin branches, and females have six flagellomeres, the basal ones weakly serrate (Torrén 2012).

Two species were described based on both sexes (*Colocharis elongata* Heraty and *Colocharis napoana* Heraty), and one was known only from the male (*Colocharis hungi* Torrén) (Heraty 2002; Torrén 2012). In recent collecting events, additional specimens were sampled and females and males of *C. hungi* were obtained. Due to the lack of a description for females of this species and the necessity to properly associate sexes, we describe the female of *C. hungi*, provide new distribution records for the species, and provide a key for the described species of *Colocharis*.

### Material and methods

Males and females were collected through Malaise traps. Heraty (2002) and Torrén (2012) were used for the identification of these. Subsequently, the identification was confirmed with the specialists. The material is deposited at the Instituto Nacional de Pesquisas da Amazônia (INPA) and Universidade Federal do Espírito Santo (UFES).

The anatomical data is consistent with the Hymenoptera Anatomy Ontology project (Yoder *et al.* 2010; Seltmann *et al.* 2012), determined using the proofing tool available through the Hymenoptera Glossary (HAO) and the literature that addresses the specific morphology of Eucharitidae (Heraty & Woolley 1993; Heraty 2002). The basal flagellomere is counted as FL<sub>2</sub> following Heraty (2002). The funiculars include FL<sub>2</sub> and the following unfused flagellomeres before the clava, which is defined by 1–3 fused flagellomeres.

The specimens were photographed using a Leica Z16 APO stereomicroscope with a magnifying glass coupled to a Leica DFC 295 video camera by Leica Microsystems (Switzerland). The software Helicon Focus (©HeliconSoft) was used to combine the images, using the parameters C method, 100% full resolution and 600 DPI. The illumination of all specimens was performed according to Kawada & Buffington (2016). The final images and plates were improved with Adobe Photoshop and Adobe Illustrator (version CS6) for image edition and vectorization.

Coordinates of localities were obtained from specimen labels, using Google Earth® application; distribution maps were generated by QuantumGis 2.6.1 (Quantum GIS Development Team 2015). To map the *Colocharis* species records, we adopted the regionalization of the Neotropical region proposed by Morrone (2014), using the corresponding shape file provided by Löwenberg-Neto (2014) to plot the data.

All measurements are given in millimeters, and the abbreviations used (Fig. 1) are:

- MSL** Mesosoma length: the longitudinal length of the mesosoma in lateral view from the anterior margin of the midlobe of the mesoscutum to the apex of the frenal process.
- C3L** Metacoxa length: the maximum length, measured in lateral view, in an oblique line from the dorsal margin of the coxa to the articulation point with the femur.
- C3W** Metacoxa width: the maximum width, measured in lateral view.
- EYH** Eye height: vertical height of eye.
- FL<sub>2</sub>** Length of basal flagellomere (female) or FL<sub>2</sub> ramus (male, not shown in Fig. 1): length of the basal flagellomere from lateral margin at pedicel to apex.
- FL<sub>2</sub>W** Basal flagellomere width: width of flagellomere at apex, female only.
- FLG** Flagellum length: the maximum length of the flagellum, in a straight line from the midpoint of the insertion of FL<sub>2</sub> with the pedicel to the apex of the most distal flagellomere.
- FPL** Frenal process length: dorsal length of apical frenal process, from medial point of “spine” base on frenal line to apex.
- FPW** Frenal process width: dorsal width across the frenal process, taken after frenum fully merges into a cylindrical “spine”.
- FWL** Fore wing length: the maximum length of the fore wing, measured in a straight line from the wing insertion to the apex of the wing.
- FWW** Fore wing width: the maximum width of the fore wing, measured in a straight line from the costal margin to the posterior margin.
- HDH** Head height: height measured from dorsal margin of the median ocellus to the median apex of the clypeus.
- HDW** Head width: distance across face at widest point from outer margin of eyes.
- IOD** Interocular distance: distance between eyes measured across dorsal margin of eyes.
- MSP** Malar space length: length measured from ventral margin of eye to the base of a mandible.
- PTL** Petiole length: lateral length of petiole from flange at the base to the apex.
- PTW** Petiole width: width of petiole across median region, in lateral view.
- SPL** Scape length: measured from the base to the apical margin.
- SPW** Scape width: width measured at apex.

## Taxonomic treatment

### *Colocharis* Heraty 2002

*Colocharis* Heraty, 2002:121–123. Type species: *Colocharis elongata* Heraty, 2002, original designation.

**Diagnosis.** *Colocharis* is differentiated from the most related genera by having short blunt spines, each spine not

more than 4× as long as broad and widely separated basally, a distinct supraclypeal area demarked by a crenulate sulcus laterally, maxillary palpi 2-segmented and long, labial palpi absent or rarely present as a single minute palpomere, a circular propodeal spiracle (without an emarginate margin), and the ovipositor sheath extending beyond the apex of the gaster. The flagellum of the female has only 6 segments and is weakly serrate basally with basal flagellomere 7–8× as long as its basal width. The flagellum of the male has 8 segments, with a short basal flagellomere and long thin funicular branches that are much longer than the height of the head.

### Key to species of *Colocharis*

- 1 Female (flagellum 6-segmented; PL 1.3–1.8× as long as metacoxa; posterior margin of Gt<sub>1</sub> with 1 line of weakness) . . . . . 2
- Male (flagellum 8-segmented, with FL<sub>2</sub> with long thin funicular ramus; PL 2–2.5× as long as metacoxa; posterior margin of Gt<sub>1</sub> with 2 closely spaced lines of weakness) . . . . . 4
- 2 Propodeal disc evenly sculptured, areolate. Petiole approximately 7.1× as long as broad, without basal carina. Flagellum with FL<sub>2</sub> elongate (4.7× as long as greatest width) . . . . . *C. elongata* Heraty
- Propodeal disc weakly sculptured, relatively smooth/colliculate or areolate. Petiole less than 4.9× as long as broad, with basal carina. Flagellum with FL<sub>2</sub> short (less than 3.7× as long as greatest width) . . . . . 3
- 3 Flagellum with FL<sub>2</sub> 3.3–3.7× as long as greatest width. Frenal process approximately 3.7× as long as broad. Propodeal disc relatively smooth/colliculate . . . . . *C. napoana* Heraty
- Flagellum with FL<sub>2</sub> 2.7–3.3× as long as greatest width. Frenal process 2.1–3.3× as long as broad. Propodeal disc weakly areolate . . . . . *C. hungi* Torrén
- 4 Flagellum with ramus of FL<sub>2</sub> 1.6–1.8× height of head. Fore wing 2.1–2.3× as long as broad, slightly infusate . . . . .
- . . . . . *C. elongata* Heraty
- Flagellum with ramus of FL<sub>2</sub> less than 1.6× height of head. Fore wing 1.9–2.4× as long as broad, hyaline . . . . . 5
- 5 Flagellum with ramus of FL<sub>2</sub> 1.5–1.6× height of head. Fore wing 1.9–2.1× as long as broad . . . . . *C. napoana* Heraty
- Flagellum with ramus of FL<sub>2</sub> 1.3× height of head. Fore wing 2.4× as long as broad . . . . . *C. hungi* Torrén

### *Colocharis elongata* Heraty 2002

(Fig. 3A)

**Diagnosis.** The female is distinguished by an evenly sculptured areolate propodeum, petiole without a basal carina, and an elongate basal flagellomere (FL<sub>2</sub> 4.7× as long as greatest width) and petiole (7.1× as long as broad) (Fig. 3A). The male has a relatively long flagellum (1.6–1.8× height of head), a slightly infusate elongate fore wing (2.1–2.3× as long as broad), and a long and thin petiole (8.6–14.0× as long as broad). The propodeum is rugose-areolate and the basal carina is very weak or absent.

**Distribution.** Venezuela

### *Colocharis napoana* Heraty 2002

(Fig. 3B)

**Diagnosis.** The female is distinguished by an evenly colliculate or smooth propodeal disc with a prominent bordering propodeal carina, presence of a sharp basal carina on the petiole, and a relatively short basal flagellomere (3.0–3.7× as long as greatest breadth) and petiole (4.2–4.9× as long as broad) (Fig. 3B). The fore wings are hyaline rather than infusate. The male has a relatively short flagellum (1.5–1.6× height of head), a rounded hyaline fore wing (1.9–2.1× as long as broad), and relatively short petiole (4.7–9.1× as long as broad) with a distinct basal carina. The propodeal disc is bordered by a carina and is relatively smooth (colliculate) or weakly and irregularly striate medially with a distinct median channel.

**Distribution.** Ecuador

### *Colocharis hungi* Torrén 2012

(Fig. 1A–E)

**Diagnosis.** The female is distinguished by a short FL<sub>2</sub>, 2.7× as long as greatest width and 1.3× as long as following

flagellar segment (Fig. 2B); propodeal disc with weak, broadly areolate sculpture and petiole with rough surface (Fig. 2C) and two weak longitudinal carinae and a weak basal carina. The male has a shorter flagellum than *C. napoana* (1.3× height of head), a long fore wing (2.4× as long as broad), and the propodeal disc is sharply areolate.

**Description.** *Female.* Length 1.9–2.3 mm (Fig. 2E). Head, mesosoma, and petiole black; gaster dark brown; antennal flagellum, pedicel, scape, and legs white; wings hyaline; fore wing venation light brown.

*Head.* 1.3–1.4× as broad as high. Face, including genae, smooth and shining, with sparse, fine appressed hairs (Fig. 2A); vertex slightly rugose. Eyes separated by 1.9–2.0× their height. Malar space 0.6–0.9– height of eye. Scape 3.3–4.7– as long as wide, elongate and smooth, with scattered semierect hairs in dorsal region; flagellum with 6 segments (Fig. 2B), length of flagellum 1.3–1.5× height of head, FL<sub>2</sub> 2.7–3.3× as long as greatest width, 1.3–1.7× as long as greatest length of following flagellar segment; FL<sub>2</sub> swollen in apical half; clava elongate, about as long as previous two segments combined (Fig. 2B).

*Mesosoma.* Mesoscutum midlobe with irregular carinae radiating from midpoint to posterior margins, evenly covered with fine appressed hairs; lateral lobes smooth and shining, with sparse setae. Axillae and scutellar disc with parallel longitudinal carinae dorsally, lateral face of axilla with some irregular striae, axillula with oblique carinae; frenal process 2.1–3.3× as long as broad. Propodeal disc with weak, broadly areolate sculpture, bordered by propodeal carina (Fig. 2C). Metacoxa 2.0–2.1× as long as broad, smooth, shining, and bare. Metafemur smooth with semi-appressed setae (Fig. 2D). Fore wing 2.4–2.5× as long as broad, stigmal vein subquadrate, 1.2–1.4× as long as broad; postmarginal vein indistinct, but apparently a little longer than stigmal vein; entire wing pilose except for basal area.

*Metasoma.* Petiole 4.7–5.1× as long as broad and 1.5× as long as metacoxa, cylindrical in cross section with rough surface, with two weak longitudinal carinae and weak basal carina. First gastral segment smooth and bare. Hypopygium with one seta on each side of mucro. Ovipositor sheath extending beyond cerci (and metasoma) by much more than one diameter of the cercus.

**Distribution.** Argentina and Brazil (Mato Grosso do Sul and Roraima).

**Material examined.** **BRAZIL:** *Roraima:* Amajari, Serra do Tepequém, 1–15.i.2016, Malaise Gressit-Gressit, Rafael *et al.* col., 1♀ and 2♂, INPA; *Mato Grosso do Sul:* Dourados, 22°13'16''S / 54°48'20''W, 26.v.2015, Calhau, Kawada & Coelho col., 3♀ and 14♂ UFES.

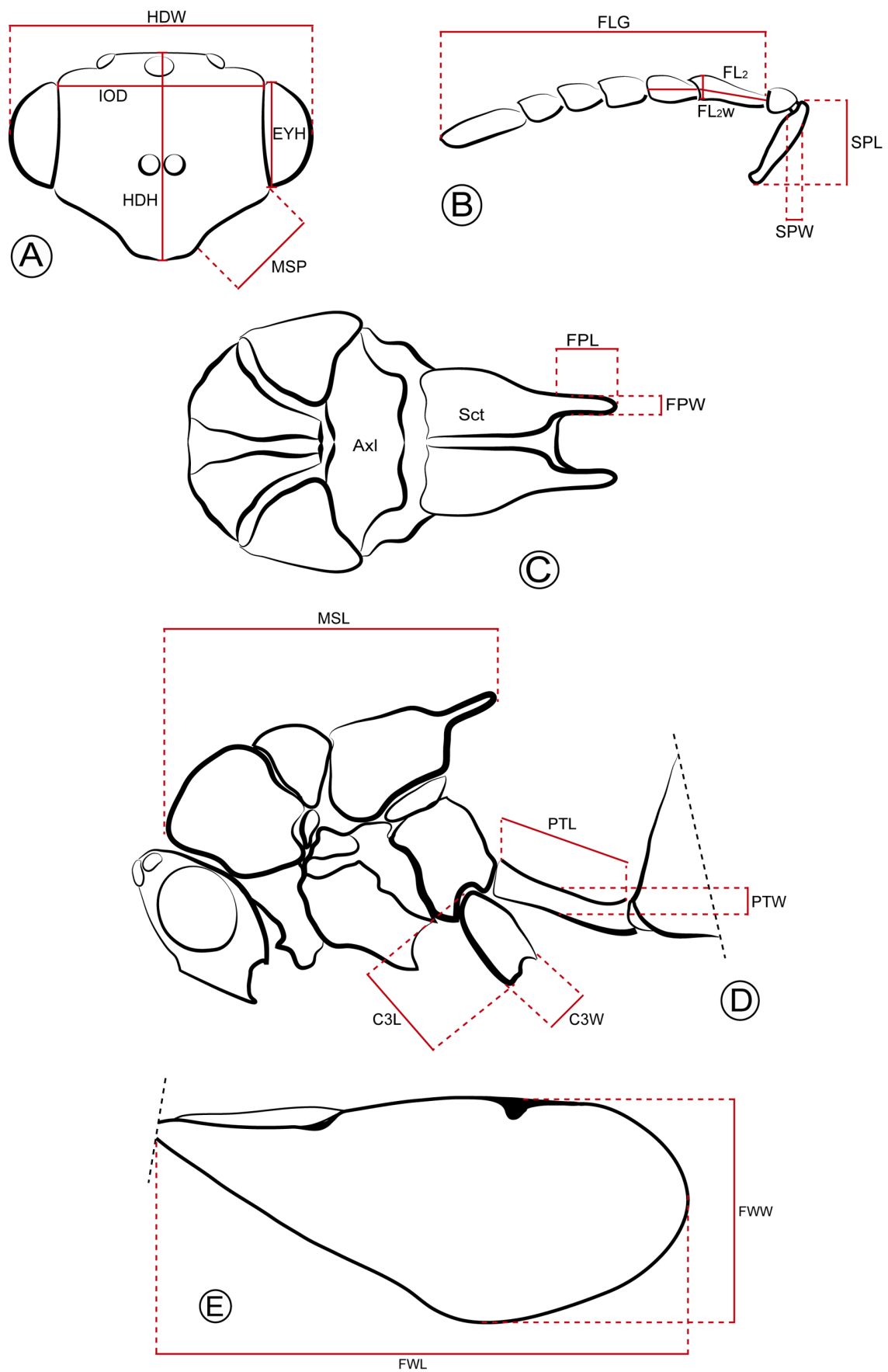
**Remarks.** *Colocharis hungi* is recorded, so far, from two distinct biogeographic provinces, Paraná Forest and Pantepui provinces (Fig. 4). Both provinces are structurally dissimilar, with a transition between savannas and humid forests in northern Brazil, with characteristic sandstone plateaus, representing the Pantepui province (Morrone 2000), and humid and seasonal forests representing the Paraná Forest province (Morrone 2001). Although both provinces present little similarity in fauna and flora (Morrone 2000, 2001, 2014), we cannot properly infer if historical events and regional characteristics shape eucharitid distribution, since their presence in a specific location could be constrained by other factors, such as host availability and preference for oviposition sites. As long as our knowledge on the biology of this group remains scant we will not fully comprehend the processes that explain their distribution.

According to Heraty (2002), there are specimens of *Cholocharis* collected in Peru, but not for the described species, indicating that the diversity of this genus remains largely unexplored.

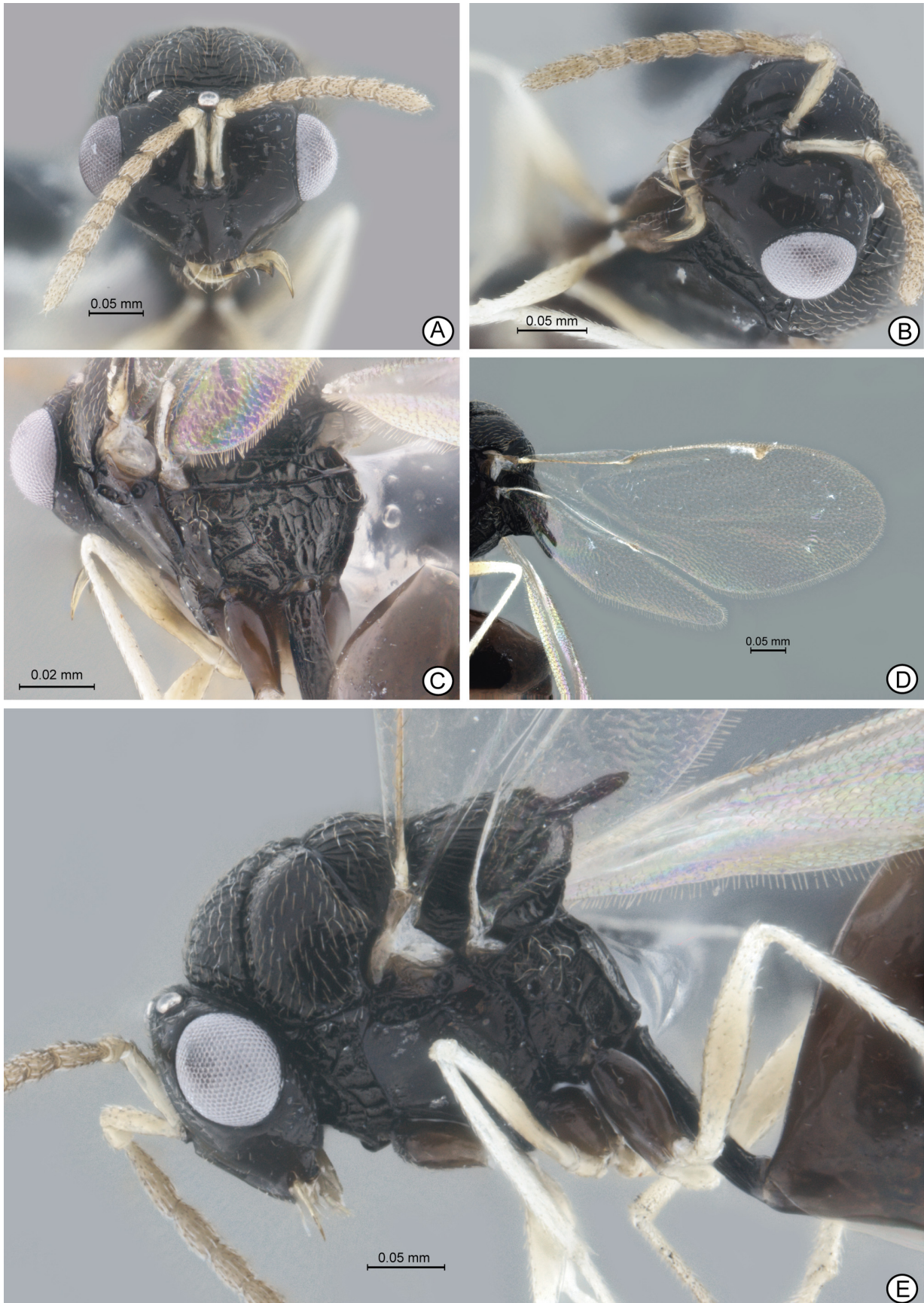
Undersampling can inhibit our ability to understand the species distribution in many genera of Eucharitidae. Sadly, we do not have standard procedures to enhance eucharitid sampling in poorly studied areas. We still do not have enough phylogenetic and taxonomic support to accurately establish causal relations between biogeographic events and current distribution in most eucharitid genera.

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**FIGURE 1.** Specimen measurements. A, frontal view of head; B, antenna, female; C, mesosoma in dorsal view; D, head to petiole in lateral view; E, fore wing.



**FIGURE 2.** Specimen from Mato Grosso do Sul, Dourados. A–E, *Colocharis hungi* (female). A, head and antennae, frontal view; B, head, frontolateral view, and antenna, lateral view; C, propodeum and petiole; D, wings; E, head and mesosoma, lateral view.



FIGURE 3. A. *Colocharis elongata* (female) lateral habitus; B, *Colocharis napoana* (female) lateral habitus.

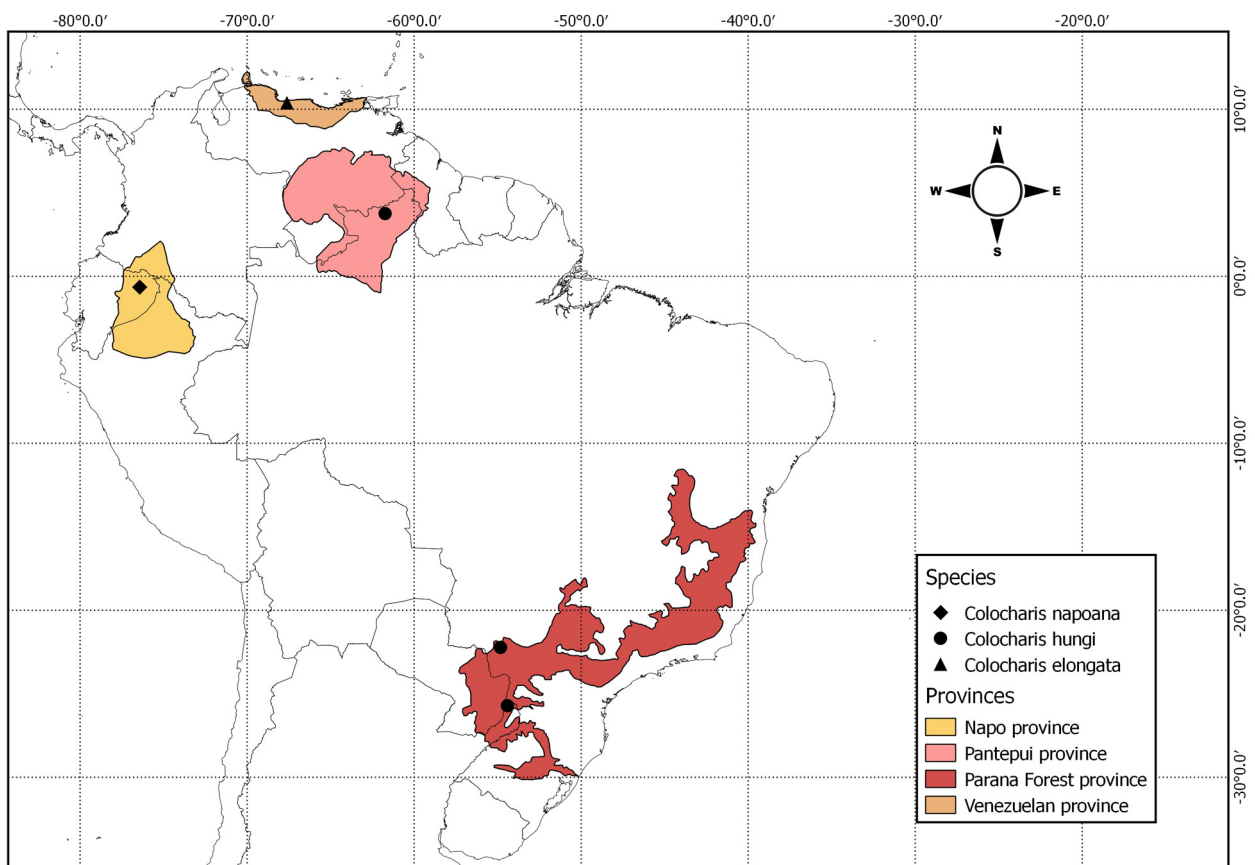


FIGURE 4. Distribution map with records for species of *Colocharis*.

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