Cis amazonicus sp. nov. (Coleoptera: Ciidae) from North Brazil, with notes on the *Cis tricornis* species-group

Cis amazonicus sp. nov. (Coleoptera: Ciidae) do Norte do Brasil, com notas sobre o grupo de espécies *Cis tricornis*

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Abstract: *Cis amazonicus* sp. nov. is described based on specimens collected in Belém, in the state of Pará, and Manaus, in the state of Amazonas, North Brazil. The new species belongs to the *Cis tricornis* species-group and is characterized by a suboval body with total length of 0.94-1.20 mm, almost glabrous on dorsum, with single, confuse fine punctation on pronotum and elytra and smooth interspaces of punctures; males possess a cephalic horn projected upward, slightly bifurcated at apex, and two pronotal horns projected forward; tegmen bears a V-shaped emargination at apex; penis is elongate and about 1.4x as long as tegmen. Comments are provided on other species of the *Cis tricornis* group.

Keywords: Taxonomy. Minute tree-fungus beetle. Amazon rainforest.

Resumo: *Cis amazonicus* sp. nov. é descrita a partir de espécimes coletados em Belém, no estado do Pará, e Manaus, no estado do Amazonas, Norte do Brasil. A nova espécie pertence ao grupo *Cis tricornis* e é caracterizada pelo corpo subovoide, com comprimento de 0,94 a 1,20 mm, praticamente glabro no dorso, com pontoação simples, fina e confusa no pronoto e élitros e espaços lisos entre os pontos; machos possuem um corno cefálico projetado para cima, levemente bifurcado no ápice, e dois cornos pronotais projetados para frente; o tegmen possui uma emarginação apical em forma de V; o pênis é alongado, aproximadamente 1,4x tão longo quanto o tegmen. Comentários são feitos sobre outras espécies do grupo *Cis tricornis*.

Palavras-chave: Taxonomia. Besouros minúsculos de fungos arbóreos. Floresta amazônica.

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INTRODUCTION

The minute tree-fungus beetles (Coleoptera: Ciidae) comprise more than 700 species, with at least 410 included in the genus *Cis* Latreille, 1796 (Oliveira *et al*., 2013; Lawrence, 2016; Souza-Gonçalves & Lopes-Andrade, 2017). There are 56 ciid species reported from Brazil, of which 17 belong to *Cis* (Lopes-Andrade & Sandoval-Gómez, 2017). The knowledge on the Brazilian *Cis* is incipient, and dozens of undescribed species are known from museum collections, mainly of the *Cis taurus* and the *Cis tricornis* species-groups (Oliveira *et al*., 2013, personal observation).

Our aim in the present work is to describe *Cis amazonicus* sp. nov. based on specimens collected at *Parque Estadual do Utinga* (Utinga State Park) in Belém, state of Pará, and in Manaus, state of Amazonas, North Brazil. We provide information on the composition and diagnostic features of the *Cis tricornis* species-group, in which the new species is included, especially to distinguish these species from other Neotropical species of *Cis* and of genera with similar morphological features.

MATERIAL AND METHODS

Terms for external morphology, male and female terminalia of ciids follow Lopes-Andrade & Lawrence (2005, 2011), Lawrence & Lopes-Andrade (2010), Lawrence *et al*. (2011) and Lawrence (2016), but see also Oliveira *et al*. (2013) for an explanation on the use of 'tegmen'. The following abbreviations are used for measurements (in mm) and ratios: BW (basal width of scutellar shield), CL (length of antennal club measured from base of the eighth to apex of the tenth antennomere), EL (elytral length along the midline), EW (greatest width of both elytra), FL (length of antennal funicle measured from base of the third to apex of the seventh antennomere), GD (greatest depth of body measured in lateral view), GW (greatest diameter of eye), PL (pronotal length along midline), PW (greatest pronotal width), TL (total length counted as EL+PL, *i.e.* excluding head). The GD/EW and TL/EW ratios indicate the degree of body convexity and elongation, respectively.

Transcription of labels, dissection, photography and measurement of specimens follow the methods provided by Araujo & Lopes-Andrade (2016). We measured specimens from both localities and differences are given in 'Variation', together with standard measurements (mean and standard deviation) and ratios. Comparison of female terminalia of *Cis amazonicus* sp. nov. with that of other species of the *Cis tricornis* species-group were not possible due to lack of data in literature or availability of specimens for dissection, or the dissected structures were very membranous and information was not conclusive.

We examined all species of the *Cis tricornis* species-group, including specimens from the type series, named specimens compared to the types and others collected in the type-localities. The examined material belongs to the following scientific collections (followed by acronyms used in this paper): Natural History Museum (London, United Kingdom) (BMNH); *Coleção Entomológica do Laboratório de Sistemática e Biologia de Coleoptera da Universidade Federal de Viçosa* (Viçosa, Minas Gerais, Brazil) (CELC); *Muséum National d'Histoire Naturelle* (Paris, France) (MNHN); *Museu Paraense Emílio Goeldi* (Belém, Pará, Brazil) (MPEG).

TAXONOMY

THE *CIS TRICORNIS* SPECIES-GROUP

The species-groups of *Cis* are artificial agglomerations of morphological similar species intended to be taxonomic tools to deal with such diverse genus (Lawrence, 1971; Lopes-Andrade, 2008; Oliveira *et al*., 2013). Only part of the *Cis* species is organized in groups and there is evidence of monophyly for few of them (see examples in Lopes-Andrade & Grebennikov, 2015). The *Cis tricornis* species-group, which will be called simply '*tricornis* group' or '*tricornis* species' from now on in the text, was proposed by Lawrence (1971) to accommodate *C. miles* (Casey, 1898) from Eastern USA, and *C. delicatulus* Jacquelin-Duval, 1857 and *C. tricornis* (Gorham, 1883) from the Neotropical region (*sensu* Morrone, 2015). *Cis nasicornis* Reitter, 1878, described from

Colombia, and *Cis amazonicus* sp. nov. are here included in the *tricornis* group, due to their morphological resemblance with other *tricornis* species. The *tricornis* group is restricted to the southern Nearctic region and widespread in the Neotropical region, the latter housing plenty undescribed forms. They differ from other *Cis* by the combination of the following features: dorsum almost glabrous, each puncture bearing a very minute seta usually visible only in high optical magnification or under scanning electron microscope; pronotal and elytral punctation single and confuse; prosternum strongly elevated at middle, beyond the level of procoxae, with disc carinate; prosternal process narrow but not laminate, usually curved inward; males with a conspicuous cephalic horn directed upwards and bifurcated at apex (not bifurcated in *C. nasicornis*), two pronotal horns (absent in *C. nasicornis*) and a conspicuous, margined sex patch posterad of center at first abdominal ventrite.

As the *tricornis* group is essentially Neotropical, the subsequent comparison will be restricted to the Neotropical Ciidae fauna. The *tricornis* species may be confused with species in the *Cis bilamellatus* group (a group with at least three undescribed Neotropical species) in males bearing a cephalic horn and two pronotal projections; however, species in the latter group possess dual and seriate or subseriate elytral punctation, and male pronotal projections are very close to each other, and not spaced as in *tricornis* species. Species of *Strigocis* Dury, 1917 are different in possessing a prosternal process at the same level of the prosternum in front of coxae (not projected beyond procoxae). Species of *Ceracis* Mellié, 1849 usually bear eight or nine antennomeres, instead of ten, except for *Ceracis limai* Lopes-Andrade *et al*., 2002, with ten antennomeres; concave or slightly tumid prosternal disc in front of coxae and laminate prosternal process, except for the species in the *Ceracis furcifer* group, which have narrow prosternal process. Species of *Porculus* Lawrence, 1987 differ in the laminate prosternal process.

Species of *Grossicis* Antunes-Carvalho *et al*., 2012 are the most similar to *tricornis* species, but males differ in the tegmen with a comparatively wider apical emargination and in the anterior portion of pronotum projected as a lamina, being slightly emarginated forming two rounded, large subtriangular plates (Antunes-Carvalho *et al.*, 2012). Females of *Grossicis* bear long gonostyli (Antunes-Carvalho *et al*., 2012) but are almost indiscernible from those of *tricornis* species if not dissected. The *tricornis* species are not sustainable in *Cis* and may fit better in *Grossicis* or as a new genus. However, as the group comprises several new Neotropical species, we will treat this problem in a subsequent taxonomic revision.

Cis amazonicus Lopes-Andrade & Sandoval-Gómez, sp. nov. (Figures 1A-1H and 2A-2G)

http://zoobank.org/urn:lsid:zoobank.org:pub:D6722474-BE5B-4F7F-B8D6-8C6E61776F2B

Diagnosis

Cis amazonicus can be distinguished from other Neotropical *Cis*, except for those in the *tricornis* group, by the body almost glabrous on dorsum, with single and confuse punctation on pronotum and elytra; males possess a cephalic horn projected upward, slightly bifurcated at apex, and two pronotal horns projected forward. Among species in the *tricornis* group, males *C. nasicornis* are devoid of pronotal projections and the cephalic horn is not bifurcated at apex; *C. miles* has comparatively coarser pronotal punctation with microreticulate interspaces, as far as coarser and denser elytral punctation; in *C. delicatulus* and *C. miles*, the body is more elongated than in *C. amazonicus* and *C. tricornis*, and the penis is about as long as tegmen. *Cis amazonicus* is most similar to *C. tricornis*, differing in the shorter tegmen, 3x as long as wide, bearing a V-shaped emargination at apex (Figures 1F, 2B, arrows) and penis more sinuous in lateral view (Figure 1G). *Cis tricornis* has tegmen (Figure 2H) 3.8x as long as wide, with and U-shaped emargination at apex (Figure 2H, arrow); penis in lateral view is almost straight for most of its length (Figure 2I) and 9x as long as wide (Figures 2I-2J).

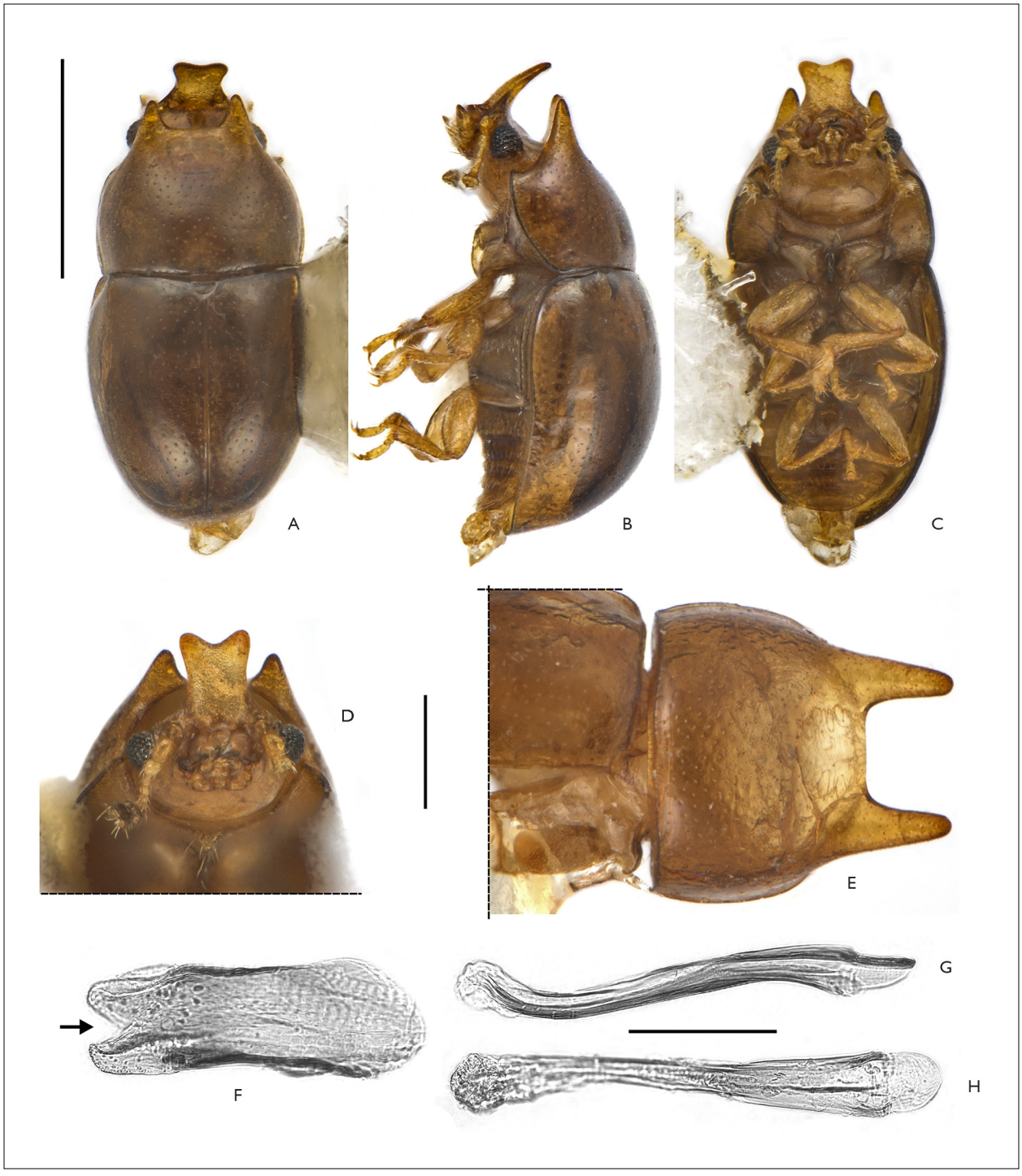

Figure 1. *Cis amazonicus* sp. nov.: A-D) holotype, male, from Belém (state of Pará, Brazil) – dorsal, lateral, ventral and frontal views, respectively; E) male paratype from Manaus (state of Amazonas, Brazil), dorsal view showing pronotum, scutellar shield and part of left elytron; F-H) dissected male genitalia of a paratype from Belém, showing tegmen in dorsal view (F) with a V-shaped emargination at apex (arrow), penis in lateral (G) and dorsal (H) views. Scale bars: 0.5 mm (A-C), 0.2 mm (D-E), 0.1 mm (F-H).

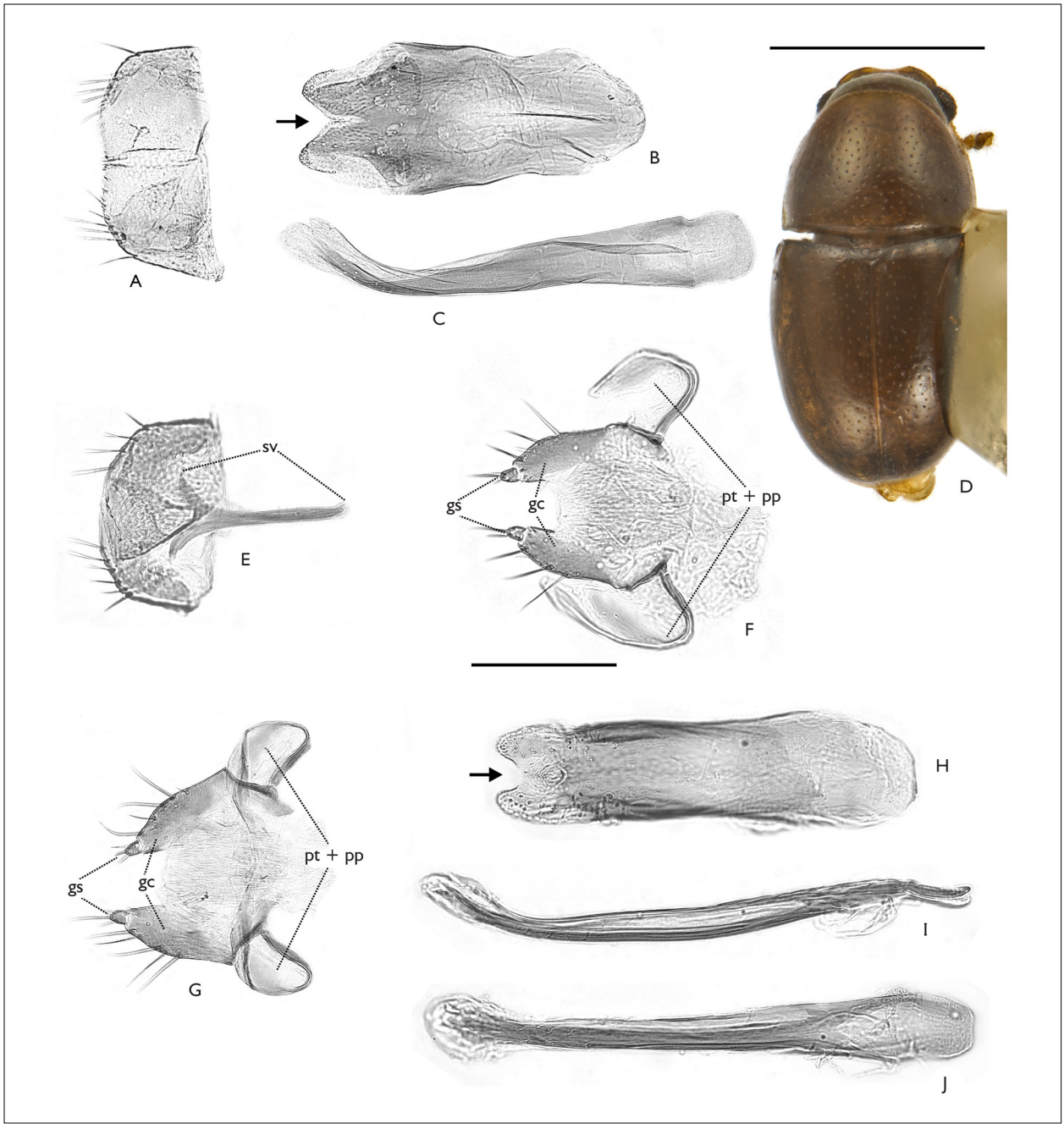

Figure 2. *Cis amazonicus* sp. nov. (A-G) and *Cis tricornis* (Gorham, 1883) (H-J): A-C) dissected male genitalia of a paratype from Manaus, showing sternite VIII (A), tegmen in dorsal view (B) with V-shaped emargination at apex (arrow) and penis in dorsal view (C). Tegmen and penis are very compressed between slide and cover slip, so that the laterals of tegmen are stretched and penis distorted; D) female paratype from Belém (state of Pará, Brazil), dorsal view; E-F) dissected female terminalia of a paratype from Belém, showing spiculum ventrale (sv) at the anterior portion of sternite VIII, gonostyli (gs), gonocoxites (gc) and proctiger plus paraprocts (pt + pp); G) part of dissected female terminalia of a paratype from Manaus. Due to the compression between slide and cover slip, the proctiger is displaced to the laterals (F-G); H-J) dissected genitalia of a male from Barro Colorado, Panama, showing tegmen in dorsal view (H) with a U-shaped emargination at apex (arrow), penis in lateral (I) and dorsal (J) views. Scale bars: 0.1 mm (A-C, E-J), 0.5 mm (D).

Description

Male holotype (Figures 1A-1D). Adult, fully pigmented and in good condition, except for lacking the left antenna. Measurements in mm: TL 0.99, PL 0.41, PW 0.48, EL 0.58, EW 0.53, GD 0.44. Ratios: PL/PW 0.87, EL/EW 1.10, EL/PL 1.39, GD/EW 0.83, TL/EW 1.88. Body convex, oval, dorsal surface dark yellowish brown; ventral surface light yellowish brown; antennae, palpi and tarsi light yellowish brown, except for dark antennal club; dorsal vestiture of very minute decumbent setae, smaller than a puncture width and barely visible even in high magnification (150x); ventral vestiture of decumbent slender setae, densest and most conspicuous on metaventrite and abdominal ventrites. Head with anterior edge and corners visible from above; dorsum concave, glabrous, bearing sparse minute punctures with smooth interspaces, disc a bit tumid; whole anterocephalic edge (between eyes) projected upwards into a long horn, laminate in lateral view, narrowed close to base, width at middle half the distance between eyes, apex emarginated forming two short, slightly divergent lobes with rounded apices (better in frontal view; Figure 1D); venter convex, gula 0.56 as wide as head, with gular sutures broadly bowed, submentum barely delimited, broadly rounded and about half as wide as gula. Antennae bearing ten antennomeres, as follow (in mm, right antenna measured): 0.05; 0.04; 0.02; 0.02; 0.01; 0.01; 0.01; 0.03; 0.03; 0.05 (FL 0.07, CL 0.11, CL/FL 1.57). Eyes with subcircular contour, coarsely facetted, bearing about 60 ommatidia; GW 0.08 mm. Pronotum with fine punctures, distanced from each other by three puncture-widths or more; interspaces of punctures smooth; anterior edge projected forward in a plate which is emarginated at middle, forming two lateral, narrow and short triangular horns separated from each other by a straight edge of about two BW's (Figure 1A); corners slightly projected forward and broadly rounded; lateral edges narrowly explanate, simple (not crenulate), visible for the entire lengths when seen from above (Figure 1A). Scutellar shield semicircular, apparently unpunctate and glabrous; BW 0.06 mm. Elytra suboval; punctation finer and sparser than that of pronotum; interspaces of punctures smooth; humeral calli conspicuous. Metathoracic wings fully developed. Hypomera microreticulate, glabrous, unpunctate. Prosternum in front of coxae short, carinate, microreticulate, unpunctate, with sparse slender setae at disc. Prosternal process narrow (but not laminate), 1.25x as long as prosternum in front of coxae; projected beyond procoxae, curved and bent inward in lateral view; bearing sparse slender setae; apex rounded. Protibiae expanded to apex, about 3x as long as wide; outer edge straight, devoid of spines; outer apical angle projected as an acute tooth; apical edge with a row of spines. Meso- and metatibiae barely expanded to apex, about 5x as long as wide; outer edge straight, devoid of spines; outer apical angle not projected; apical edge with a row of spines. Metaventrite apparently unpunctate; sides microreticulate, disc with transversely stretched reticulation; discrimen indiscernible. Abdominal ventrites microreticulate; length of ventrites (in mm, from base to apex at the longitudinal midline) as follows: 0.13, 0.04, 0.03, 0.04, 0.05; first abdominal ventrite bearing a large, margined sex patch with length of 0.07 mm and width of 0.05 mm. Male abdominal terminalia in paratypes (Figures 1F-1H, 2A-2C) with sternite VIII (Figure 2A) very membranous; posterior edge bearing a shallow concave emargination at middle and corners with slender setae. Tegmen (Figures 1F, 2B) 3x as long as wide and apex with a V-shaped emargination (Figures 1F, 2B, arrows). Basal piece not separated from tegmen during dissection and barely discernible in slide preparations. Penis (Figures 1G-1H, 2C) about 8x as long as wide, sinuous in lateral view (Figure 1G), larger at base and tapering to the posterior portion (Figures 1H, 2C), about 1.4x as long as tegmen; apex with a membranous, rounded expansion (Figure 1H).

Females (Figure 2D)

Devoid of cephalic and pronotal projections. Anterocephalic edge not projected, but slightly emarginated at middle forming two rounded and very short plates. Gula smaller than in males, 0.38x as wide as head; submentum narrow and long, about one-fourth as wide as gula. Anterior pronotal edge broadly rounded. First abdominal ventrite

devoid of sex patch. Female abdominal terminalia (Figures 2E-2G; Figures 2F-2G distorted after compression between slide and cover slip) with spiculum ventrale (Figure 2E) about as long as gonocoxites; paraprocts (Figures 2F-2G) very reduced, shorter than gonocoxites and barely discernible; each baculus of paraprocts bowed and completely fused to the respective proctigeral baculus (Figures 2F-2G); gonocoxites without discernible transverse division and with a pair of short gonostyli at apex (Figures 2F-2G).

Variation

Measurements in mm. Males (n = 6: five specimens from Belém, including the holotype, and one from Manaus): TL 0.94-1.20 (1.06 ± 0.09), PL 0.41-0.56 (0.49 ± 0.06), PW 0.46-0.55 (0.50 ± 0.03), EL 0.50-0.68 (0.60 ± 0.07), EW 0.50-0.58 (0.53 ± 0.03), GD 0.38-0.46 (0.42 ± 0.03), PL/PW 0.87-1.02 (0.97 ± 0.06), EL/EW 1.00-1.29 (1.12 ± 0.10), EL/PL 1.14-1.39 (1.24 ± 0.09), GD/EW 0.71-0.84 (0.79 ± 0.05), TL/EW 1.88-2.29 (2.00 ± 0.15). Females (n = 6: two from Belém and four from Manaus): TL 0.78-1.05 (0.95 ± 0.10), PL 0.33-0.38 (0.36 ± 0.03), PW 0.43-0.49 (0.45 ± 0.02), EL 0.45-0.68 (0.59 ± 0.08), EW 0.44-0.53 (0.49 ± 0.04), GD 0.34-0.44 (0.40 ± 0.04), PL/PW 0.76-0.85 (0.80 ± 0.03), EL/EW 1.03-1.36 (1.21 ± 0.13), EL/PL 1.38-1.86 (1.64 ± 0.18), GD/EW 0.75-0.87 (0.82 ± 0.04), TL/EW 1.77-2.12 (1.95 ± 0.14). Pronotal projections of males from Manaus (Figure 1E) are larger than those of males from Belém (Figure 1A).

Etymology

The species name '*amazonicus*' is a Latin adjective and means 'pertaining or belonging to the Amazon'. It refers to the Amazon rainforest, where the species was collected.

Type locality

Parque Estadual do Utinga (Belém, North Brazil), 1º 25' S, 48º 26' W.

Type series

Holotype (MPEG): \BR: PA, Belém P. E. Utinga, 20.x.2016 orelha-de-pau \ *Cis amazonicus* Lopes-Andrade & Sandoval-Gómez sp. nov. [red paper]\. Paratypes: 4 males (2 CELC, dissected; 2 MPEG) and 2 females (1 CELC, dissected; 1 MPEG) \BR: PA, Belém P. E. Utinga, 20.x.2016 orelha-de-pau\; 2 males (CELC, 1 dissected) and 6 females (CELC, 1 dissected) \BRASIL: AM, Manaus, 10.vii.2011, Pereira, M. R. leg.\ ex *Trametes* sp.\. All paratypes additionally labeled *Cis amazonicus* Lopes-Andrade & Sandoval-Gómez sp. nov. [yellow paper]\.

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