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Taxonomy/Taxinomie

Grossicis, a new genus of Neotropical minute tree-fungus beetles (Coleoptera: Ciidae), with a detailed discussion on its systematic position in the family

Grossicis, *un nouveau genre neotropical de mini-coléoptères de champignons d'arbre (Coleoptera : Ciidae), avec une discussion détaillée sur sa position systématique dans la famille*

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ABSTRACT

Grossicis gen. nov. is described based on *G. diadematus* (Mellié, 1849) comb. nov., the type species, and *G. laminicornis* sp. nov. from Brazil. Diagnostic characters of the genus include the apical maxillary palpomere abruptly expanded with sensilla distributed along the apical margin, dual elytral punctation, elytral sutural flange diverging near apex, prosternum carinate, protibial apex bearing a row of spines and outer apical angle with a conspicuous tooth, ovipositor bearing well developed gonostyli with almost half the length of gonocoxites, baculum of each proximal gonocoxite oblique, and anterior apex of each paraproctal baculum contiguous and joined to each proctigeral baculum, their limits being barely discernible, forming an arc anteriorly. Comparisons were made with other 37 ciid genera, and the new genus is provisionally placed in Ciini. A key to species of *Grossicis* gen. nov. is provided, together with the description of external morphology of adults, as well as the morphology of male and female terminalia of both species.

Mots clés :
Ciinae
Tenebrionoidea
Forêt amazonienne
Forêt atlantique brésilienne
Brésil

RÉSUMÉ

Grossicis gen. nov. est décrit selon *G. diadematus* (Mellié, 1849) comb. nov., l'espèce type, et *G. laminicornis* sp. nov. du Brésil. Les caractères diagnostiques du genre comprennent le palpomère maxillaire apicale très agrandi avec des sensilles distribuées tout au long de la marge apicale, la ponctuation élytrale double, les sutures élytrales divergentes près de l'apex, le prosternum rebordé, le protibial apex qui porte une ligne d'épines et son angle extérieur apicale qui a le format d'une dent remarcable, l'ovipositeur féminin avec les gonostyli bien développés avec presque la moitié de la longueur des gonocoxites, le baculum de chaque gonocoxite proximale est oblique, et l'apex antérieur de chaque baculum du paraprocte est lié au baculum du proctiger, leurs limites sont peu perceptibles et forment un arc vers l'avant. Des comparaisons ont été faites avec 37 genres de Ciidae, et le nouveau genre est provisoirement placé dans Ciini. Une clé pour les espèces de *Grossicis*

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gen. nov. a été fournie avec la description de la morphologie externe des adultes et la morphologie de la terminalia des mâles et des femmes des deux espèces.

1. Introduction

Ciidae comprises about 650 described species grouped in 42 genera [1]. Ciids occur in almost all continental and insular lands of the planet [2]. Larvae and adults of most species live in or around a polypore basidiome and they depend entirely on it for food, shelter and breeding [3–5].

Recent studies have revealed a high number of new Ciidae taxa described from the Neotropical and Andean region, in a total of two genera and 34 species between 2002 and 2011 [6–19]. Nevertheless, the current knowledge on tropical, subtropical and austral temperate ciid faunas is still incipient and undoubtedly there are many undescribed taxa deposited in museums or in the wild waiting to be discovered.

In this work, we describe a new genus of Ciini (Ciidae: Ciinae) based on two Neotropical species: *Grossicis diadematus* (Mellié, 1849) comb. nov., type species, from the Brazilian Atlantic Forest and *Grossicis laminicornis* sp. nov. from the Brazilian Amazon Forest. A key to species of *Grossicis* gen. nov. is provided, together with the description of external morphology of adults, morphology of male and female abdominal terminalia of both species, and diagnostic characteristics for these taxa.

2. Materials and methods

Whole mount preparations followed the protocol described by Lopes-Andrade [17], and photographs were taken under a Zeiss Axioskop 40 compound microscope equipped with a Canon A640 digital camera. Measurements of specimens, final comparisons and descriptions of general external morphology were made under a Zeiss Stemi 2000-C stereomicroscope, and digital photomicrographs were taken with a Canon EOS 1000D attached thereto. Final images of adult specimens were the result of joining 20 to 40 photomicrographs at different depths using the image stacking freeware CombineZP [20].

Scanning Electron Microscope (SEM) images followed the protocol described by Sandoval-Gómez et al. [21]. The holotype of *G. laminicornis* sp. nov. and the plesiotype (specimen used for a redescription, supplementary description, or illustration published subsequent to the original description; sensu Evenhuis [22]) of *G. diadematus* comb. nov. were not dissected. Terms for external morphology and male terminalia of ciids are explained and discussed by Lopes-Andrade and Lawrence [11]. Here the term "female terminalia" refers to the combination of pregenital segments (including the spiculum ventrale), ovipositor proper, genitalia and proctiger. Measurements provided in the redescription of *G. diadematus* are those of the plesiotype, and in the description of *G. laminicornis* sp. nov. are those of the holotype. All specimens available from each locality were measured. Range, mean and standard deviation values are given for measurements (in millimeters) and ratios.

The following abbreviations are used in this work: BW, basal width of the scutellum; CL, length of the antennal club (corresponding to antennomeres eight to ten); EL, elytral length (median length from base of scutellum to elytral apex); EW, greatest elytral width; FL, length of the antennal funicle (corresponding to antennomeres three to seven); GD, greatest depth of the body (from elytra to metaventrite); GW, greatest width of the eye; PL, pronotal length along midline; PW, greatest pronotal width; TL, total length (EL + PL; head not included). The ratio GD/EW was taken as an indication of degree of convexity; TL/EW indicates degree of body elongation. Differences among the specimens are given in the section on "Variation", together with standard measurements and ratios.

We have compared species of this new genus with named specimens of most Ciidae genera, except for *Anoplocis* Kawanabe, *Dimerapterocis* Scott, *Paratrichapus* Scott, *Paraxestocis* Miyatake and *Polynesicis* Zimmerman. For these exceptions, we relied on literature data only.

A distribution map (Fig. 7, discussed in Sections 3.2 and 3.3) was created using latitude and longitude coordinates estimated by tracking localities in the online database GeoNames [23] and plotting them using the freeware DIVA-GIS 7.3.0.1 [24]. Specimens were deposited in Lopes-Andrade Private Collection (LAPC) housed at the Federal University of Viçosa (Viçosa, MG, Brazil).

3. Systematics

Order COLEOPTERA Linnaeus, 1758.
Suborder POLYPHAGA Emery, 1886.
Superfamily TENEBRIONOIDEA Latreille, 1802.
Family CIIDAE Leach, 1819.
Subfamily CIINAE Leach, 1819.
Tribe CIINI Leach, 1819.
Genus **Grossicis** gen. nov. (Figs. 1–7).

3.1. Diagnosis of the new genus

Members of this genus may be distinguished from other Ciidae by the combination of the following features: apical maxillary palpomere abruptly expanded (Fig. 3E,F) with sensilla distributed along the apical margin (arrows in Fig. 2E, Fig. 3F), dual elytral punctation (Fig. 2C), sutural flange of elytra diverging near apex, prosternum carinate (Fig. 2A), protibial apex bearing a row of spines and outer apical angle with a conspicuous tooth (arrow in Fig. 3A), female terminalia very small (length of gonostyli + gonocoxites + paraprocts: 0.18–0.22 mm; Fig. 4C, Fig. 6C) bearing well developed gonostyli with almost half the length of gonocoxites, baculum of each proximal gonocoxite oblique, and anterior apex of each paraproctal baculum

Fig. 1. Habitus of *Grossicis diadematus* (Mellié, 1849). Plesiotype male (A–C). A. Dorsal view. B. Lateral view. C. Ventral view. Female (D–F). D. Dorsal view. E. Lateral view. F. Ventral view. All figures are in the same scale.

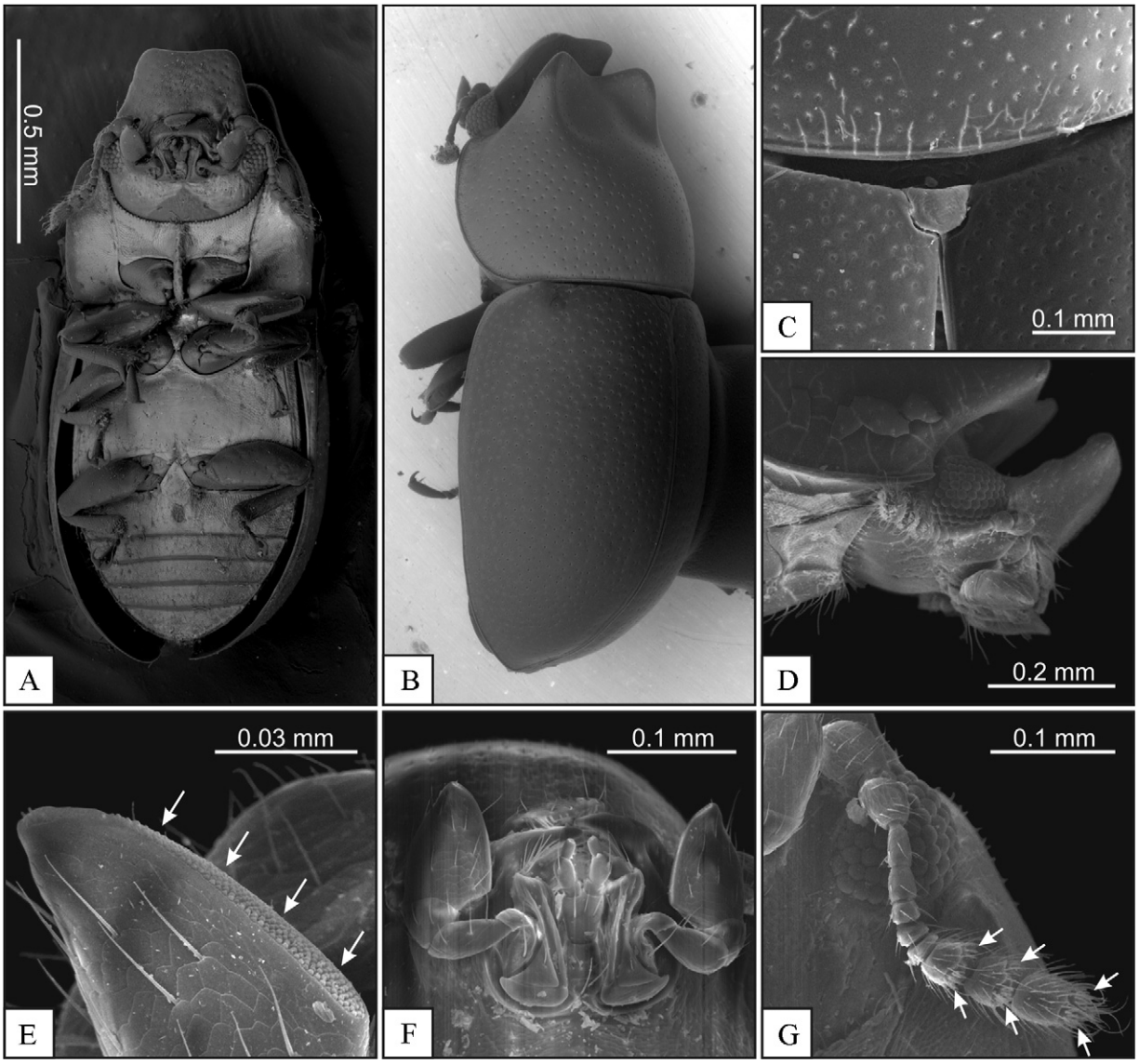

Fig. 2. *Grossicis diadematus* (Mellié, 1849), SEM of male specimens from Nova Friburgo, in the state of Rio de Janeiro, Brazil. A. Ventral view. B. Dorsolateral view. C. Dorsal view of part of pronotum, scutellum and part of elytra. D. Lateral view of head. E. Apical maxillary palpomere (in part), showing the sensilla along its outer margin (arrows). F. Mouthparts. G. Ventrolateral view of the head showing an antenna. Note the sensillifers at the upper portion of each antennomere of the club (arrows). A and B are shown in the same scale.

contiguous and joined to each proctigeral baculum with their limits being barely discernible and forming an arc anteriorly (Fig. 4C, Fig. 6C).

Etymology: the new genus-group name is a patronymic dedicated to the coleopterists Everardo J. Grossi and Paschoal C. Grossi, to acknowledge their continued help as great collectors of Ciidae. They have collected several of the known *Grossicis diadematus* comb. nov., type species of the genus. "*Cis*" is derived from the Greek *kis*, masculine noun which means worm that bores into wood. It corresponds to the type genus of the family, a classical genus-group name ending in minute tree-fungus beetles.

Type species: *Cis diadematus* Mellié, 1849.

Description: length 1.00–1.63 mm. Body elongate, between twice and 2.2 times as long as wide, moderately convex (GD/EW = 0.76–0.91), subglabrous, dorsal vestiture consisting of minute hairs not visible at lower magnifications (less than 30 times). Head barely visible from above; frontoclypeal ridge in males forming a quadrangular (Fig. 1A,B) to elongate (Figs. 5A,B) lamina strongly produced forwards, dorsally concave, with its apex slightly emarginated. Antennae inserted beyond eyes, with ten antennomeres (Fig. 3D); funicle subglabrous; club with three antennomeres, transverse, more setose than funicle, each antennomere bearing several sparse slender setae (Fig. 2G) and four conspicuous sensillifers symmetrically

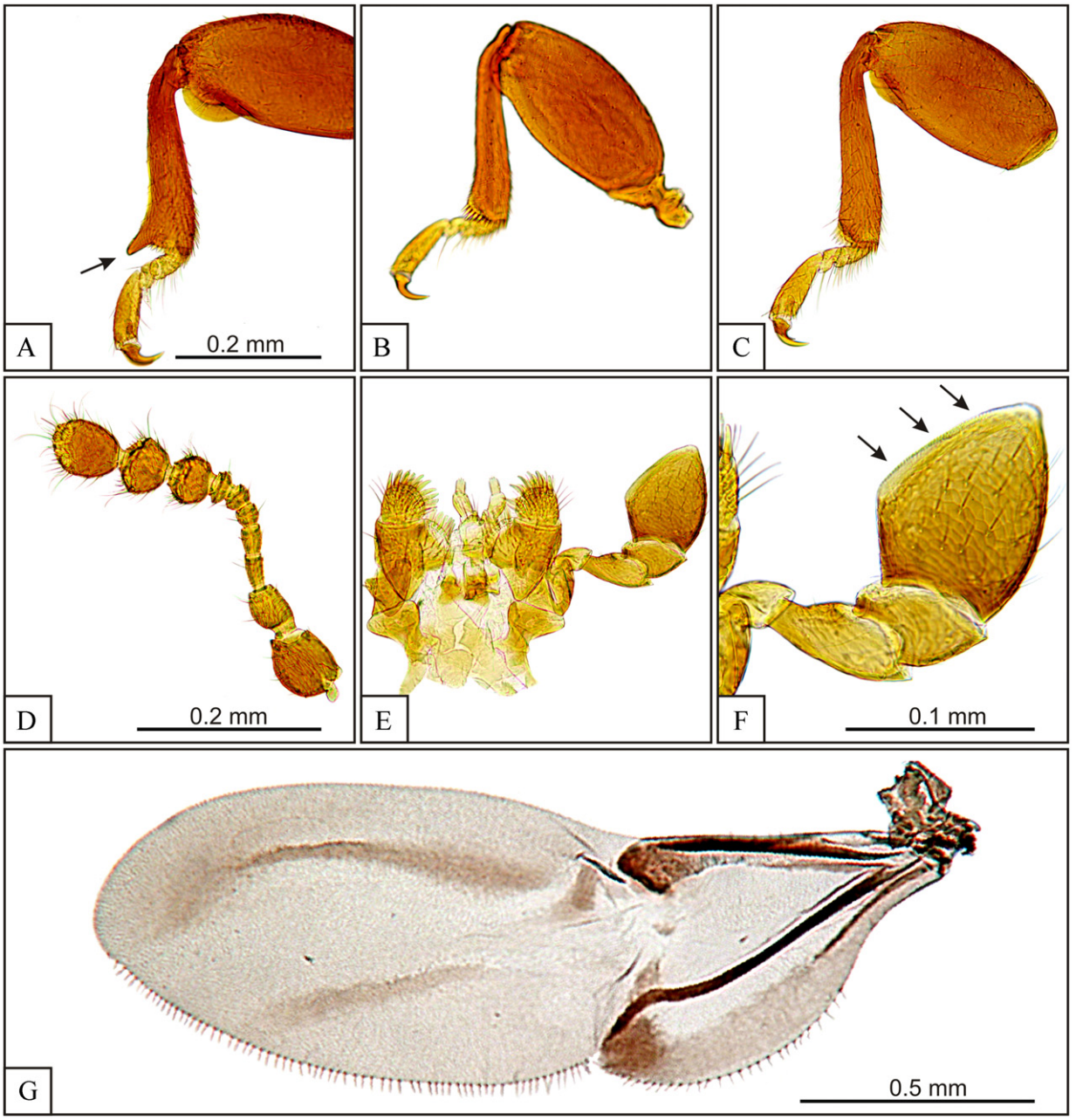

Fig. 3. Whole mount preparations of male *Grossicis diadematus* (Mellié, 1849) from Nova Friburgo, in the state of Rio de Janeiro, Brazil. A. Protibia with outer apical angle projected forming a conspicuous tooth (arrow). B. Mesotibia. C. Metatibia. D. Antenna. E. Mouthparts (not including mandibles). F. Maxillary palpomere showing the sensilla along its outer margin (arrows). G. Hindwing. The scale shown in A applies to A, B and C. The scale shown in D applies to both D and E.

positioned at its upper portion (arrows in Fig. 2G). Mouthparts (Fig. 3E) with galea and lacinia subcircular; prementum longer than wide, with labial palpi inserted at its apex; labial palpi (Fig. 2F) small, cylindrical, with basal palpomere reduced, second palpomere longer than the others and apical palpomere smaller and slightly narrower than the second one. Maxillary palpi with four palpomeres, the apical one being longer than the others and abruptly expanded, cultriform (Fig. 2F, Fig. 3F), with sensilla distributed along its apical margin (arrows in Fig. 2E, Fig. 3F). Eyes coarsely facetted, each one bearing more than 70 ommatidia. Males with anterior edge of pronotum projected forwards and slightly upwards, forming a curved raised plate with subtriangular rounded angles, transversally biconcave (Fig. 2B); disc punctation relatively fine, single, uniformly distributed, each puncture bearing a fine yellowish decumbent minute seta. Scutellum well developed (Fig. 2C). Elytra with regular distributed dual punctation (Fig. 2B), the large punctures devoid of seta and each small puncture with a minute decumbent

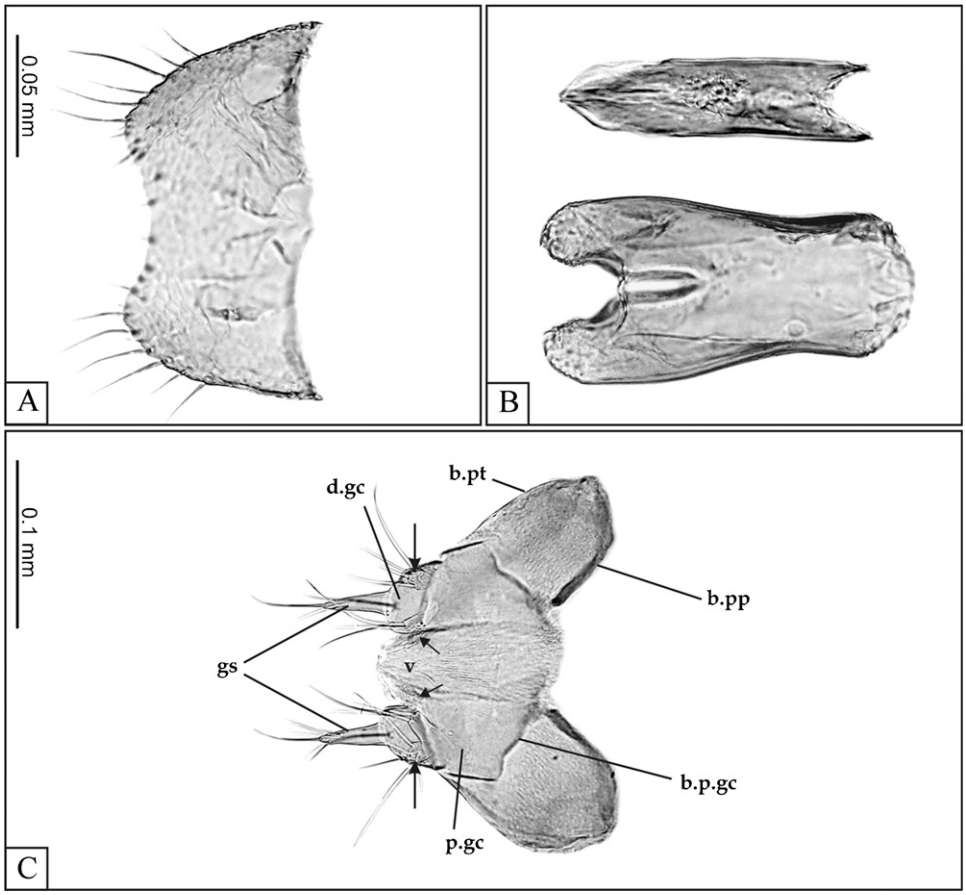

Fig. 4. Whole mount preparations of male genitalia and female terminalia of *Grossicis diadematus* (Mellié, 1849) from Nova Friburgo, in the state of Rio de Janeiro, Brazil. A. Eighth sternite. B. Penis (above) and tegmen (below). C. Female terminalia showing two tufts of long setae (large arrows) and two prominences close to the vagina bearing a group of sensilla (small arrows). Abbreviations: b.p.gc, baculum of the proximal gonocoxite; b.pp, baculum of the paraproct; b.pt, baculum of the proctiger; d.gc, distal gonocoxites; gs, gonostyli; p.gc, proximal gonocoxites; v, vagina. A and B are shown in the same scale.

yellowish seta; sutural flange diverging near apex. Hind wings developed (Fig. 3G). Prosternum carinate (Fig. 2A), on different plane than prosternal process, which is elevated reaching almost the apex of coxae. Procoxae subconical (Fig. 1C, Fig. 5C), slightly projecting below the plane of the prosternal process. Meso- and metacoxae contiguous. Each tibia with apex bearing a row of spines (Fig. 3A–C); protibia with outer apical angle forming a conspicuous tooth (Fig. 3A, arrow); long slender setae concentrated at the apical portion of tibiae. Each tarsus with four tarsomeres. Metaventrite moderately convex. First abdominal ventrite in males bearing a circular sex patch located at middle (Fig. 2A). Male terminalia with ninth segment (=genital ring) U–shaped; eighth sternite with posterior margin weakly curved inwards at middle (Fig. 4A); aedeagus twice as long as its greatest width (Fig. 4B, Fig. 6B); basal piece membranous; tegmen slightly longer than and at least twice as wide as penis, apical portion with a sinuous Y-shaped emargination at middle, almost reaching the centre of the tegmen and forming two rounded apical lobes; penis elongate, subcylindrical (Fig. 4B, Fig. 6B); sides subparallel at the basal three-fourths of their lengths, with apical one-fourth subtriangular and weakly sclerotized. Female terminalia bearing well developed gonostyli with almost half the length of gonocoxites, baculum of each proximal gonocoxite oblique, and anterior apex of each paraproctal baculum contiguous and joined to each proctigeral baculum, their limits being barely discernible, forming an arc anteriorly (Fig. 4C, Fig. 6C). The ovipositor has two tufts of long setae (large arrows in Fig. 4C, Fig. 6C) and two prominences close to the vagina bearing a group of sensilla (small arrows in Fig. 4C, Fig. 6C).

Distribution: Neotropical Region, From Northern To Southern Brazil.

Biology: all specimens were collected in basidiomes of Polyporaceae species *Pycnoporus sanguineus* (L.) Murill, *Trametes membranacea* (Sw.) Kreisel, *Trametes villosa* (Sw.) Kreisel [25] and *Trametes* sp.

3.2. Redescription of the species

Grossicis diadematus (Mellié, 1849) new combination (Figs. 1–4).

Plesiotype: male, Brasil, Rio de Janeiro, Nova Friburgo, 1100 m, VI.2004, P.C. Grossi leg.

Fig. 5. Habitus of *Grossicis laminicornis* Antunes-Carvalho, Sandoval-Gómez & Lopes-Andrade sp. nov. Holotype (A–C). A. Dorsal view. B. Lateral view. C. Ventral view. Female (D–F). D. Dorsal view. E. Lateral view. F. Ventral view. All figures are in the same scale.

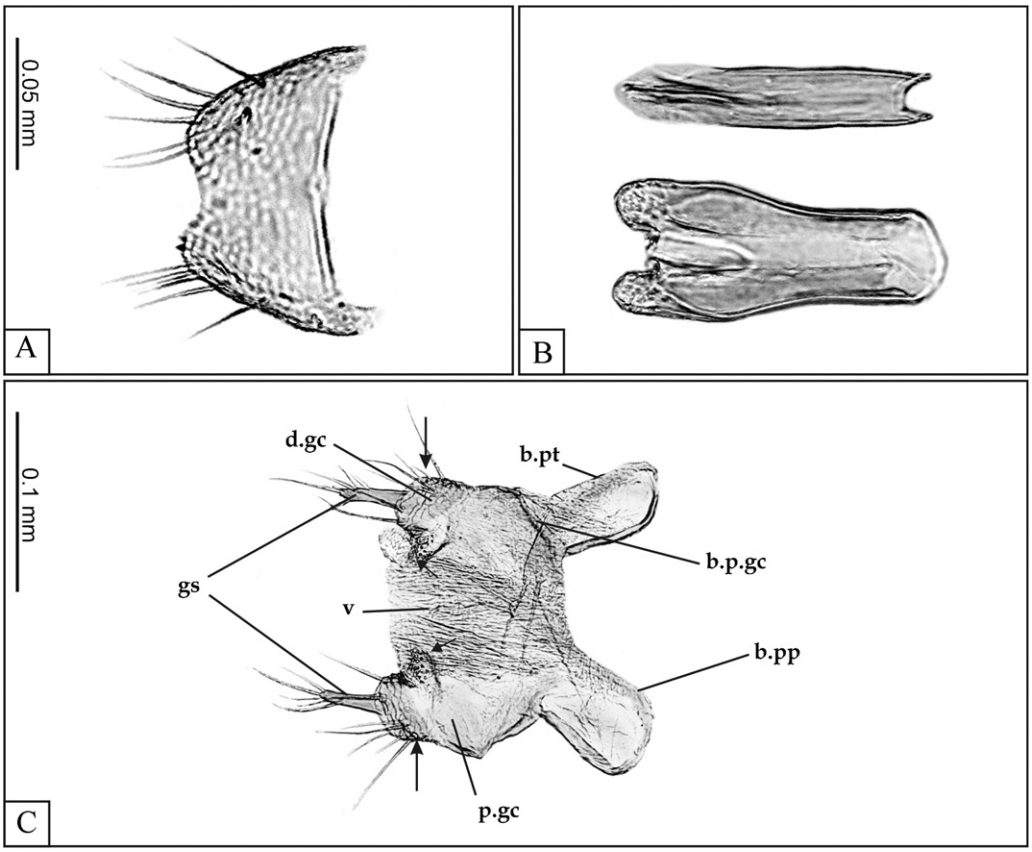

Fig. 6. Whole mount preparations of male genitalia and female terminalia of *Grossicis laminicornis* Antunes-Carvalho, Sandoval-Gómez & Lopes-Andrade sp. nov., paratype. A. Eighth sternite. B. Penis (above) and tegmen (below) C. Female terminalia showing two tufts of long setae (large arrows) and two prominences close to the vagina bearing a group of sensilla (small arrows). Abbreviations: b.p.gc, baculum of the proximal gonocoxite; b.pp, baculum of the paraproct; b.pt, baculum of the proctiger; d.gc, distal gonocoxites; gs, gonostyli; p.gc, proximal gonocoxites; v, vagina. A and B are shown in the same scale.

Diagnosis: pronotum with lateral margins completely visible from above. Males of this species differ from its congener in the frontoclypeal ridge strongly produced forwards to form a quadrangular lamina and its apex slightly emarginated; anterior edge of pronotum projected forwards and slightly upwards, forming a raised plate with small subtriangular rounded angles. *Grossicis diadematus* also differs from males of *G. laminicornis* in the smaller frontoclypeal lamina and smaller pronotal subtriangular angles.

Redescription: male plesiotype (Fig. 1A–C). Measurements in mm: TL 1.38; PL 0.50; PW 0.61; EL 0.88; EW 0.66; GD 0.56. Ratios: PL/PW 0.82; EL/EW 1.33; EL/PL 1.75; GD/EW 0.86; TL/EW 2.10. Body elongate, subcylindrical, moderately convex (Fig. 2A,B); dorsal and ventral surfaces mostly reddish-brown, but elytra somewhat darker; frontoclypeal ridge, legs, ventral mouthparts and antennae yellowish-brown. Head barely visible from above; dorsal surface glabrous, with a small concavity at middle between eyes; punctation irregular, consisting of shallow punctures; frontoclypeal ridge forming a quadrangular lamina (Fig. 2D) strongly produced forwards, slightly curved upwards, dorsally concave, with its apex slightly emarginated and its ventral surface microreticulated, bearing short slender yellowish setae equally distributed. Eyes with GW of 0.07 mm; some minute slender yellowish setae emerging from the intersection between ommatidia. Antenna (Fig. 2G, Fig. 3D) (left antenna measured; FL 0.13 mm; CL 0.14 mm; CL/FL 1.12) with length of antennomeres (in mm) as follows: 0.06; 0.05; 0.04; 0.03; 0.02; 0.02; 0.02; 0.03; 0.04; 0.06. Pronotum with subparallel sides, widest at middle; lateral margins completely visible from above; anterior edge projected forwards forming a raised plate transversally biconcave and slightly emarginated at middle but not forming conspicuous lateral lobes; punctation of disc relatively fine, single, uniformly distributed, the posterior half of the median longitudinal surface devoid of punctures; distance between punctures from 1.5 to 2.25 puncture widths; in between punctures smooth and shiny; each puncture bearing a yellowish decumbent minute seta. Scutellum with a small circular impression at middle, posterior margin broadly rounded, so that the entire structure resembles a half-circle (subpentagonal under SEM); surface smooth and shiny; BW of 0.08 mm (Fig. 2 C). Elytra with lateral margins subparallel at the basal first third, then gradually converging to the apex; only the anterior angles visible from above; punctation dual and

Fig. 7. Distribution map for species of *Grossicis* gen. nov. *Grossicis diadematus* (Mellié, 1849) (full circles) and *G. laminicornis* sp. nov. (open circle). The question mark indicates imprecise location of *G. diadematus* in the state of Bahia, Brazil.

regularly distributed, denser than pronotal punctation, the large punctures devoid of seta and at least twice as long as the small ones; vestiture consisting of minute fine decumbent yellowish setae; surface between punctures smooth and shiny; sutural flange diverging near apex. Hind wings developed (Fig. 3G). Ventral sclerites with most of their surfaces microreticulate. Prosternum carinate, area in front of coxae longitudinally concave and on different plane than prosternal process, which is elevated and almost reaching the apex of procoxae. Each protibia with the apex bearing a row of spines (Figs. 3A–C); outer apical angle produced forming a conspicuous tooth (arrow in Fig. 3A); long slender setae concentrated at the basal portion of tarsi. Metaventrite moderately convex, subglabrous, with sparse slender setae; punctation fine, sparse almost imperceptible; discrimen indiscernible. Abdominal ventrites bearing several slender setae, longer than those on dorsal surface; punctures shallow, sparse; lengths of the abdominal ventrites (from base to apex, taken by the longitudinal midline) as follows (in mm): 0.17; 0.05; 0.05; 0.06; 0.08; abdominal length 0.41 mm, basal width of the first abdominal ventrite 0.52 mm; first abdominal ventrite bearing a circular sex patch located at middle, with a transverse diameter of 0.03 mm.

Male terminalia in paratypes (Fig. 4A,B). Ninth segment (=genital ring) U-shaped. Eighth sternite (Figs. 4A) with posterior margin weakly curved inwards at middle; posterior angles angulate, slightly produced and bearing some bristles; anterior margin biconcave. Aedeagus almost twice as long as its greatest width; basal piece not observed, possibly membranous. Tegmen (Fig. 4B) slightly longer than and twice as wide as penis; sides slightly curved inwards at the basal third, then curved outward at the median portion and converging toward apex from the beginning of the apical third; apical portion with a deep Y-shaped emargination at middle, almost reaching the centre of the tegmen and forming two rounded apical lobes. Penis (Fig. 4B) elongate, subcylindrical; sides subparallel at the basal three-fourths of their lengths, with apical one-fourth subtriangular and weakly sclerotized.

Females (Figs 1D–F): similar to males, but frontoclypeal ridge and anterior edge of pronotum rounded, not produced. Abdominal sex patch absent. Ovipositor (Fig. 4C) very small (length: 0.22 mm) with a distinct pair of subconical gonostyli with almost half of the length of gonocoxites together and each with a long bristle at apex; gonocoxites transversely divided into two parts; distal gonocoxites subquadrate with a pair of protuberances expanded toward the sides, bearing some bristles; proximal gonocoxites each with an oblique baculum; gonostyli and gonocoxites around 1.25 times the length of paraproct and proctiger; apex of each baculum of the paraprocts contiguous with the baculum of the proctiger, being barely discernible and distinctly curved downwards; proctiger short and broad, with its opening near the dorsal rim of the distal gonocoxite; spiculum ventrale longer than gonostyli,

gonocoxites and paraprocts together; vagina well developed but membranous.

Variation: males, measurements in mm ($n = 48$, including the plesiotype): TL 1.17–1.63 (1.41 ± 0.10); PL 0.42–0.69 (0.54 ± 0.05); PW 0.53–0.75 (0.63 ± 0.05); EL 0.75–0.96 (0.87 ± 0.05); EW 0.56–0.76 (0.67 ± 0.05); GD 0.48–0.66 (0.56 ± 0.04). Ratios: PL/PW 0.79–0.94 (0.86 ± 0.04); EL/EW 1.17–1.40 (1.29 ± 0.05); EL/PL 1.35–1.93 (1.60 ± 0.12); GD/EW 0.72–0.91 (0.83 ± 0.04); TL/EW 1.97–2.30 (2.10 ± 0.07). Body varying from brown to dark reddish-brown, almost black; pronotum and elytra sometimes with the same coloration, but the latter being often darkest. Frontoclypeal ridge and anterior edge of pronotum slightly produced forward in small and strongly projected forward in large males. Females, measurements in mm ($n = 37$): TL 1.09–1.47 (1.36 ± 0.09); PL 0.42–0.53 (0.49 ± 0.03); PW 0.52–0.66 (0.60 ± 0.04); EL 0.61–0.97 (0.87 ± 0.07); EW 0.59–0.73 (0.67 ± 0.04); GD 0.50–0.63 (0.56 ± 0.03). Ratios: PL/PW 0.75–0.91 (0.82 ± 0.03); EL/EW 0.89–1.42 (1.30 ± 0.08); EL/PL 1.26–1.94 (1.78 ± 0.13); GD/EW 0.77–0.90 (0.84 ± 0.03); TL/EW 1.59–2.16 (2.04 ± 0.10).

Material examined: male plesiotype. (LAPC) BRASIL: \RJ Nova Friburgo; 1100 m, vi.2004, leg. P.C. Grossi \ *Grossicis diadematus* (Mellié, 1849) PLESIOTYPUS Antunes-Carvalho, Sandoval-Gómez & Lopes-Andrade [printed on gray paper] \; 20 males and 20 females (LAPC) BRASIL; same locality and data as plesiotype \; 3 males and 1 female (LAPC) BRASIL: \RJ Nova Friburgo, XI.2003, leg. E.J. Grossi\; 1 male (LAPC) BRASIL: \ES Atílio Vivacqua "Mata Zé"; 16.IV.2007, K.S. Furieri leg., ex *Phellinus* sp.\; 1 male and 1 female (LAPC) BRASIL: \ES Domingos Martins; "Parque Estadual da Pedra Azul", 03.IX.2003, leg. K.S. Furieri \; 1 male (LAPC) BRASIL: \ES Conceição da Barra. "REBIO Córrego Grande"; 14-19.XII.2005, K.S. Furieri, G.R. Loiola, AF van de Koken \; one female (LAPC) BRASIL: \MG Viçosa; "Belvedere",11\IX\1999, leg. F. Gumier-Costa & C. Lopes-Andrade \; one male (LAPC) BRASIL: \RJ São Francisco de Paula "FLONA SFP"; 2006, leg. L.V. Graf \; six males and five females (LAPC) BRASIL: \RJ Paraty; Ponta Negra; 5-6.III.2011, leg. V.E. Sandoval & J. Idrobo; nine males and five females (LAPC) BRASIL: \MG São Sebastião do Sacramento; Manhuaçu; 21.VII.2010, leg. C. Antunes-Carvalho & Alves, M.C. \; five males and four females (LAPC) BRASIL: \SP São José dos Campos. Parque da cidade; 09.X.2004, S.S.P. Almeida & G.S.P. Almeida\.

Host fungi: all specimens were collected in basidiomes of *Pycnoporus sanguineus*, *Trametes membranacea*, *Trametes villosa* [25] and *Trametes* sp. (Hymenomycetes: Polyporales: Polyporaceae).

Distribution: known from northeastern (unknown locality in the state of Bahia) to southern Brazil (Fig. 7).

3.3. Description of the new species

Grossicis laminicornis Antunes-Carvalho, Sandoval-Gómez & Lopes-Andrade sp. nov. (Figs. 5,6).

Type locality: Manaus, in the state of Amazonas, northern Brazil (2°55.981′S, 59°58.144′W).

Etymology: the Latin specific epithet "*lamina*" and "*cornus*" means "plate" and "horns", respectively, and refers to the distinct secondary sexual features of the frontoclypeal ridge and pronotum of males.

Diagnosis: this species differs from its congener in the pronotum with lateral margins not visible from above, except for the posterior angles. Males with the frontoclypeal ridge forming an elongated lamina strongly produced forwards, tapering at middle, with its apex slightly emarginated; anterior edge of pronotum strongly projected forwards and slightly upwards, forming a raised plate with conspicuous subtriangular rounded angles with an emargination at middle. Males of the new species also differs from the ones of *G. diadematus* in the elongated frontoclypeal lamina and most prominent subtriangular lobes of pronotum.

Description: male holotype (Fig. 5A–C). Measurements in mm: TL 1.45; PL 0.69; PW 0.63; EL 0.77; EW 0.64; GD 0.53. Ratios: PL/PW 1.10; EL/EW 1.20; EL/PL 1.11; GD/EW 0.83; TL/EW 2.27.

Body elongate, subcylindrical, moderately convex; dorsal surfaces dark-brown; ventral surfaces, frontoclypeal ridge, legs, ventral mouthparts and antennae yellowish-brown. Head barely visible from above, except for the frontoclypeal ridge; dorsal surface glabrous and shiny; area between eyes with an elevation at middle; punctation regular, consisting of fine punctures; distance between punctures from 1.5 to two puncture widths; frontoclypeal ridge strongly produced forwards in an elongated lamina, dorsally concave, tapering at middle, its apex emarginated and its ventral surface microreticulated, bearing short slender yellowish setae equally distributed. Eyes with GW of 0.12 mm; some minute slender yellowish setae emerging from the intersection between ommatidia. Antenna (left antenna measured; FL 0.11 mm; CL 0.12 mm; CL/FL 1.09) with length of antennomeres (in mm) as follows: 0.06; 0.04; 0.03; 0.03; 0.02; 0.02; 0.02; 0.03; 0.04; 0.05. Pronotum with subparallel sides, widest at middle; posterior angles visible from above; anterior edge strongly projected forwards in a biconcave raised plate, with a broad emargination at middle forming two conspicuous subtriangular lobes that are rounded at apex; punctation of disc relatively fine, single, uniformly distributed; distance between punctures from 1.5 to two puncture widths; in between punctures smooth and shiny; each puncture bearing a yellowish decumbent minute seta. Scutellum small, subtriangular, with few punctures; BW of 0.06 mm. Elytra with lateral margins subparallel at the basal half, then gradually converging to the apex; only the anterior corners visible from above; punctation dual, regularly distributed, the large punctures devoid of seta and at least twice as long as the small ones, denser than pronotal punctation; vestiture consisting of minute decumbent yellowish setae; in between punctures smooth and shiny; sutural flange diverging near apex. Hind wings developed. Ventral sclerites with most of their surfaces microreticulate. Each protibia with the apex bearing a row of spines; outer apical angle produced forming a conspicuous tooth; long slender setae concentrated at the basal portion of tarsi. Prosternum carinate, area in front of coxae longitudinally concave and on different plane than prosternal process, which is elevated reaching almost the apex of coxae. Metaventrite moderately convex, subglabrous, with sparse slender setae; punctation and discrimen (metasternal suture) indiscernible. Abdominal ventrites bearing

several slender setae, longer than those on dorsal surface; punctures shallow, fine, sparse; length of the abdominal ventrites (from base to apex, taken by the longitudinal midline) as follows (in mm): 0.18; 0.05; 0.05; 0.05; 0.08; abdominal length 0.41 mm, basal width of the first abdominal ventrite 0.55 mm; first abdominal ventrite bearing a circular sex patch located at middle, inconspicuously emarginated, with a transverse diameter of 0.03 mm.

Male terminalia in paratypes (Fig. 6): ninth segment (= genital ring) U-shaped. Eighth sternite (Fig. 6A) with posterior margin shallowly emarginated at middle; posterior angles angulate, slightly produced and bearing some bristles; anterior margin concave. Aedeagus twice as long as its greatest width; basal piece not observed, possibly membranous. Tegmen (Fig. 6B) slightly longer than and twice as wide as penis; sides slightly curved inwards at the basal third, then curved outward at the median portion and converging toward apex from the beginning of the apical third; apical portion with a deep emargination at middle, almost reaching the centre of the tegmen and forming two rounded apical lobes. Penis elongate, subcylindrical (Fig. 6B); sides subparallel at the basal three-fourths of their lengths, with apical one-fourth subtriangular and weakly sclerotized.

Females (Fig. 5D–F): similar to males, but frontoclypeal ridge and anterior edge of pronotum rounded, not projected forward. Abdominal sex patch absent. Ovipositor (Fig. 6C) very small (length: 0.18 mm) with a distinct pair of subconical gonostyli bearing a few bristles at apex, with almost half the length of gonocoxites together; gonocoxites transversely divided into two parts; distal gonocoxites subquadrate with a pair of well developed protuberances expanded toward the vagina, which bear a few bristles; baculum of the proximal gonocoxite less sclerotized and oblique; anterior portion of the ovipositor less developed, around half the length of paraproct and proctiger together; apex of each baculum of the paraprocts contiguous with the baculum of proctiger, being barely discernible and distinctly curved downwards; proctiger elongate and sclerotized, short and broad, with its opening near the dorsal rim of the proximal gonocoxites; spiculum ventrale 1.5 times longer than gonostyli, gonocoxites and paraprocts together; vagina broad, membranous, well developed.

Variation: males, measurements in mm ($n = 4$, including the holotype): TL 1.00–1.20 (1.13 ± 0.11); PL 0.41–0.52 (0.47 ± 0.06); PW 0.48–0.53 (0.52 ± 0.03); EL 0.59–0.69 (0.66 ± 0.05); EW 0.50–0.56 (0.54 ± 0.04); GD 0.44–0.50 (0.47 ± 0.03). Ratios: PL/PW 0.84–0.97 (0.92 ± 0.07); EL/EW 1.19–1.22 (1.21 ± 0.02); EL/PL 1.33–1.46 (1.39 ± 0.07); GD/EW 0.86–0.89 (0.88 ± 0.01); TL/EW 2.00–2.14 (2.08 ± 0.07). Females, measurements in mm ($n = 2$): TL 1.14–1.19 (1.16 ± 0.03); PL 0.42–0.44 (0.43 ± 0.01); PW 0.50–0.53 (0.52 ± 0.02); EL 0.72–0.75 (0.73 ± 0.02); EW 0.56–0.59 (0.58 ± 0.02); GD 0.47–0.50 (0.48 ± 0.02). Ratios: PL/PW 0.79–0.88 (0.83 ± 0.06); EL/EW 1.21–1.33 (1.27 ± 0.09); EL/PL 1.70–1.71 (1.71 ± 0.01); GD/EW 0.83–0.84 (0.84 ± 0.01); TL/EW 1.92–2.11 (2.02 ± 0.13).

Type series: male holotype. (LAPC) BRASIL: \Amazonas, Manaus, Reserva Florestal Adolpho Ducke, 12.VIII.2011, leg. Pereira M. R.\ *Grossicis laminicornis* Antunes-Carvalho, Sandoval-Gómez & Lopes-Andrade HOLOTYPUS [printed on red paper]\; 5 paratypes (three males and two females). (LAPC) same locality and data as holotype\ *Grossicis laminicornis* Antunes-Carvalho, Sandoval-Gómez & Lopes-Andrade PARATYPUS [printed on yellow paper]\.

Host fungi: all specimens were collected in basidiomes of *Trametes* sp. (Hymenomycetes: Polyporales: Polyporaceae).

Distribution: known from the Amazon Rainforest, northern Brazil (Fig. 7).

3.4. Key to species of Grossicis gen. nov.

Pronotum with lateral margins completely visible from above; males with anterior edge of pronotum projected forwards in a raised plate slightly emarginated at apex but not forming conspicuous lobes; males with frontoclypeal ridge projected as a quadrangular lamina; Brazilian Atlantic Forest. . . *Grossicis diadematus* (Mellié, 1849) comb. nov.

Pronotum with lateral margins not visible from above, except for the posterior angles; males with anterior edge of pronotum strongly projected forwards in a raised plate broadly emarginated at middle, forming two conspicuous subtriangular lobes rounded at apex; males with frontoclypeal ridge projected as an elongated lamina, tapering at middle; Amazon Rainforest. . . *Grossicis laminicornis* sp. nov.

4. Discussion

Grossicis gen. nov. is temporarily included in Ciini and is most similar to species of *Ceracis* Mellié, *Sulcacis* Dury, *Atlantocis* Israelson and other genera with reduced and modified female abdominal terminalia. This same type of female terminalia occurs in Orophiini and Xylographellini [12–14]. However, the suprageneric classification of *Grossicis* gen. nov. and other *Ceracis*–related genera will be treated in a separate work. *Grossicis* gen. nov. differs from all other ciid genera mainly by its peculiar and small female terminalia, which consists of the following combination of characteristics: (i) apex of each paraproctal baculum contiguous with apex of each proctigeral baculum forming an arc anteriorly, (ii) baculum of the proximal gonocoxites oblique, and (iii) gonostyli (not considering apical setae) half as long as gonocoxites. The (i) may be observed in species of the following genera: *Atlantocis*, *Malacocis* Gorham, *Phellinocis* Lopes-Andrade & Lawrence, *Octotemnus* Mellié, *Syncosmetus* Sharp, *Tropicis* Scott, *Ceracis*, *Cis* Latreille (*tricornis* group), *Cisarthron* Reitter, *Dichodontocis* Kawanabe, *Ropalodontus* Mellié, *Scolytocis* Blair, *Sulcacis*, *Wagaicis* Lohse, *Xylographella* Miyatake and *Xylographus* Mellié [2]. The former six genera have the baculum of both proximal gonocoxites transverse, which is oblique in the latter ten genera, but the ratio between the length of gonocoxites together and length of gonostyli is higher from those observed in species of *Grossicis* gen. nov. Additionally, the ovipositor in *Grossicis* gen. nov. has two tufts of long setae (large arrows in Fig. 4C, Fig. 6C) and two prominences close to the vagina

and bearing a group of sensilla (small arrows in Fig. 4C, Fig. 6C).

Morphologically, species of *Grossicis* gen. nov. are similar in some aspects to other Ciini. Members of *Ceracis*, *Wagaicis* and *Odontocis* Nakane & Nobuchi are subglabrous and have the protibial apex expanded, bearing a row of spines along the outer apical angle. Moreover, males of the majority of the species of *Ceracis* have pronotal and frontoclypeal lamina a bit similar to *Grossicis* gen. nov. In the species of *Grossicis* gen. nov., however, the apex of protibiae not only bears spines, but the outer apical angle forms a conspicuous tooth. Additionally, members of *Grossicis* gen. nov. have the apical maxillary palpomere distinctly subtriangular and expanded, but in others ciids it is usually cylindrical. Species of *Euxestocis* Miyatake and *Neoennearthron* Miyatake also bear a stout tooth at protibial apex and anterior pronotal projections in males. However, neither a subtriangular maxillary palpi nor a spinulose protibia are observed in these two genera, which have cylindrical maxillary palpi and serrate protibiae.

Cis is the most speciose genus of Ciidae. During more than two centuries since its description, the genus has increased substantially and nowadays includes about 370 described species and several waiting to be described. Part of the species was originally included in *Cis* and others were transferred to the genus due to the synonymization of *Cisdygma* Reitter, *Macrocis* Reitter, *Xestocis* Casey and other genera. However, it is a polyphyletic taxon with limits not clearly established, comprising species that do not share potential apomorphies [26]. *Cis* also includes a number of taxonomically problematic species, most with small type series, lost types, diagnosis based on females or males with weak secondary sexual features, and anecdotal descriptions [5]. Considering its wide geographical distribution and large number of species, a taxonomic revision of this genus would be an arduous task, but meaningful and urgent. The proposition of groups, each with morphologically similar species, has been a way to circumvent this impasse and establish the actual limits of *Cis*. These groups are smaller and more feasible to review than the genus as a whole, and new subgenera or genera would possibly emerge from them. It could be the case of the *Cis tricornis* group, one of the most distinctive groups, which comprises *C. delicatulus* (Jacquelin du Val), *C. miles* (Casey) and *C. tricornis* (Gorham). Species of this group are possibly the most similar to *Grossicis* gen. nov. and share the following features: carinate prosternum, subglabrous dorsal surface, dual elytral punctation consisting of fine and sparse punctures, elytra with diverging sutural flange near apex, protibia armed with spines at apex and with outer apical angle with a strong tooth, males with two lateral horns at the anterior pronotal margin and a long, forked or truncate lamina in the frontoclypeal ridge. Moreover, the aedeagus is similar in shape and size. However, in members of *Grossicis* gen. nov. the apical maxillary palpomere is expanded and subtriangular, and the ovipositor has gonocoxites transversely divided into two parts, with well developed gonostyli. In species of the *C. tricornis* group the ovipositor is much longer than in *Grossicis*, and structurally similar to the ones of *Falsocis* Pic, *Cis*, *Ennearthron* Mellié and other *Cis*-like genera, with gonocoxites transversely divided into four parts and bearing small gonostyli. It is early to elevate the *Cis tricornis* group to status of genus, but it would be inappropriate to include *G. diadematus* comb. nov. and *G. laminicornis* sp. nov. in the group rather than in a new genus.

As *Grossicis* gen. nov., there are others ciid genera entirely or partially based on species originally described in *Cis*, such as *Acanthocis* Miyatake, *Hadreule* Thomson, *Orthocis* Casey, *Ropalodontus* Mellié and *Eridaulus* Thomson. The last one, no longer valid, had led to much discussion in the taxonomy of Ciidae. *Eridaulus* was initially described as a genus, subsequently reduced to a subgenus of *Cis*, elevated again to genus-level and finally synonymized with *Cis* [27–29]. That situation depicts the enormous heterogeneity of *Cis* and the lack of consistent characters to take taxonomic decisions within this group. Recently, the female terminalia has shown to be useful in the taxonomy of Ciidae [2,14], being a parameter to elucidate and potentially correct further taxonomic problems. Although detailed descriptive data on the female terminalia of ciids are not available for most genera, the description of *Grossicis* reinforces the importance of this structure to diagnose supraspecific taxa of Ciidae and shed light on their relationships.

Considering the available data on their host fungi, *G. diadematus* shows a tendency to oligophaghy as it exploits basidiomes of Polyporaceae species only. Specimens from São Francisco de Paula, southern Brazil, were collected in *Pycnoporus sanguineus*, *Trametes membranacea* and *Trametes villosa*, with one occurrence in each fungus species [25]. Moreover, specimens from the other known localities were sampled in basidiomes of unidentified species of *Trametes*. Interestingly the species of the *Cis tricornis* group, the most similar species to *Grossicis* gen. nov. as discussed above, were already recorded in the same host fungi, with an additional record in *Trametes cubensis* (Sw.) Kreisel [25].

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

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