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Two new species of *Cyclocephala* Dejean, 1821 (Coleoptera, Melolonthidae, Dynastinae) with remarkably long antennal lamellae

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Abstract. *Cyclocephala everardoi* Grossi, Santos & Almeida, 2016 and *Cyclocephala machadoi* Grossi, Santos & Almeida, 2016 comprise a distinct species group within *Cyclocephala* Dejean, 1821. This group was previously characterized by species with subtrapezoidal or parabolic clypeus, large eyes, antennae with long lamellae and parameres with a spine-like process on each lateroventral region. Here, two new species of the group are described from Brazil: *Cyclocephala catimbauensis* sp. nov., from the Caatinga biome in Pernambuco state, and *Cyclocephala nhumirim* sp. nov., from the Pantanal biome in Mato Grosso do Sul state. The new species are illustrated along with their differential diagnoses. An identification key and a distribution map for species of the group are provided. Additionally, a brief discussion on the characters that define the “*machadoi*” group is also presented.

Keywords. Cyclocephalini, Neotropical Region, semi-arid, South America, wetlands.

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Introduction

Cyclocephala Dejean, 1821 is the most speciose genus of Dynastinae MacLeay, 1819 (Coleoptera: Melolonthidae [sensu Cherman & Morón 2014]), containing over 350 valid species (Endrödi 1985; Moore *et al.* 2018b). The genus is distributed across the Neotropical and Nearctic regions, with its highest species diversity occurring in the former (Moore *et al.* 2018a). However, *Cyclocephala pasadenae*

(Casey, 1915) and *Cyclocephala signaticollis* Burmeister, 1847 have invasive status in Hawaii (Jameson *et al.* 2009) and Australia (Allsopp & Hutchinson 2019), respectively.

Larvae of *Cyclocephala* feed on plant roots, and some species are considered of economic importance for damaging commercial crops (Morón *et al.* 1997; Ratcliffe *et al.* 2020). Adults are usually attracted to artificial lights at night (Ratcliffe *et al.* 2023), and some are anthophilous, acting as floral visitors of many species of angiosperms, thus playing a key role in pollination services (Maia *et al.* 2012; Moore & Jameson 2013).

Species of *Cyclocephala* can be recognized by a clypeus with subparallel to convergent sides (not divergent as in *Aspidolea* Bates, 1888) towards a rounded, parabolic, subtruncate or emarginate apex; 8–10 antennomeres; and male protarsi distinctly enlarged, with the inner claw incised or broader than the outer one (Endrödi 1985; Ratcliffe *et al.* 2020). Some species, such as *Cyclocephala macrophylla* Erichson, 1847 and *Cyclocephala megalophylla* (Endrödi, 1966), possess antennae with notably long antennal club lamellae (Ratcliffe *et al.* 2020, 2023).

Grossi *et al.* (2016) described two species of *Cyclocephala* from Brazil with remarkably long lamellae: *Cyclocephala everardoi* Grossi, Santos & Almeida, 2016 and *Cyclocephala machadoi* Grossi, Santos & Almeida, 2016. According to Grossi *et al.* (2016), these species form a distinct group within *Cyclocephala*, characterized by a long antennal club; elongated, truncated, subquadrate clypeus; large eyes; and inner protarsal claw with a wide incision in the male.

Here, two new species of *Cyclocephala* of the group are described from the Caatinga and Pantanal biomes. Illustrations, diagnostic characters, an identification key, and a geographical distribution map are provided for the species of the group. This species-group is here treated under the name “*machadoi*”.

Material and methods

The specimens were analyzed using a LEICA EZ4 Model stereo microscope with 35× magnification and LED light. The aedeagus was dissected for extraction and examination. For this procedure, each specimen was placed in hot water containing two drops of liquid detergent for ten minutes to soften the musculature. Posteriorly, a transversal incision was made on tergite 7 for the aedeagus removal using forceps. The extracted structure was mounted on card point and pinned below its corresponding specimen. Photographs were taken using a LEICA M205C automontage and ZEISS Stemi 508 DOC stereo microscope equipped with a Nikon D90 Digital camera. The distribution map was based on data from labels, with geographical coordinates obtained through Google Earth Pro. The coordinates were subsequently imported to QGIS software ver. 3.16.16 to create the final map. Terminology follows Lawrence *et al.* (2011) for the overall body aspects and Endrödi (1985) for the aedeagus.

All specimens examined are housed the following collections:

- CEMT = Coleção Entomológica de Mato Grosso Eurides Furtado, Universidade Federal de Mato Grosso, Cuiabá, Mato Grosso, Brazil
CERPE = Coleção Entomológica da Universidade Federal Rural de Pernambuco, Recife, Pernambuco, Brazil

Results

Taxonomy

Class Insecta Linnaeus, 1758
 Order Coleoptera Linnaeus, 1758
 Family Melolonthidae Leach, 1819
 Subfamily Dynastinae McLeay, 1819
 Tribe Cyclocephalini Castelnau, 1840

 Genus *Cyclocephala* Dejean, 1821

Diagnosis

The *machadoi* group comprises species of *Cyclocephala* distinct from others by the following characters: long antennal club (about three times as long as antennomeres 2–7) with its respective distal lamella entirely covered by dense sensorial spots.

Key to species of *Cyclocephala* of the *machadoi* group

1. Antennal club about 2–3 times as long as antennomeres 2–7 combined *Cyclocephala* species with long antennal club ... 2
 – Antennal club subequal in length to antennomeres 2–7 *Cyclocephala* species with short antennal club
2. Distal antennal lamella entirely covered by dense sensorial spots visible at low magnifications under stereo microscope *Cyclocephala machadoi* species group. ... 3
 – Distal lamella lacking visible sensorial spots ... other *Cyclocephala* species with long antennal club
3. Body dorsal surface testaceous with dark head; clypeus constricted laterally close to ocular canthus 4
 – Body dorsal surface entirely brownish; clypeus subparallel laterally close to ocular canthus *C. everardoi* Grossi, Santos & Almeida, 2016
4. Tridentate protibia; both outer sides of parameres with a middle process visible in caudal view ... 5
 – Bidentate protibia; parameres lacking middle process produced on outer sides, only with a subapical process visible in caudal view *C. nhumirim* sp. nov.
5. Frontoclypeal suture indistinct; parameres not hook-shaped apically *C. machadoi* Grossi, Santos & Almeida, 2016
 – Frontoclypeal suture distinct; apex of parameres distinctly hook-shaped *C. catimbauensis* sp. nov.

Cyclocephala catimbauensis sp. nov.

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Figs 1, 4–5

Diagnosis

At first glance, *C. catimbauensis* sp. nov. resembles *C. machadoi* and *C. nhumirim* sp. nov. by the testaceous body. However, the former is separated by the following characters: distinct frontoclypeal suture; protibia with tridentate outer margin, bearing a distinct basal tooth; apical lobes of parameres hook-shaped in caudal view; middle process of parameres strong and produced basally; apex of parameres rounded and not deflexed in lateral view. The parameres configuration of *C. catimbauensis*

is similar to those of *C. everardoi*. Nonetheless, *C. catimbauensis* is separated by a testaceous colour, complete frontoclypeal suture, minute and scarce head punctures, clypeus constricted close to ocular canthus.

Etymology

The specific epithet is a toponym referring to the type locality: “Catimbau”, of uncertain origin and meaning.

Type material

Holotype

BRAZIL • ♂; Pernambuco, Buíque, Catimbau National Park; 8°34'35.07" S, 37°14'45.23" W; 15–25 Mar. 2024; P.E.S. Costa leg.; CERPE.

Paratypes

BRAZIL • 12 ♂♂; Pernambuco, Buíque, Catimbau National Park; 8.587161° S, 37.245233° W; 7–18 Mar. 2025; A.W. Araujo leg.; light trap; CERPE • 1 ♂; same data as for preceding; CEMT.

Description

Holotype male

MEASUREMENTS. Length: 9.3 mm; width between elytral humeri: 4.6 mm.

OVERALL BODY ASPECT. Body oval-shaped in dorsal view, dorsally convex in lateral view; dorsal surface glabrous; ventral surface bearing sparse, yellowish setae.

COLOUR. Testaceous except for black frons; clypeus, pronotum, and scutellar plate with dark brown colour.

HEAD. Clypeus subtrapezoidal, transverse (about 1.6 times as wide as long), shorter than frons, reflexed and slightly rounded anteriorly, constrict close to ocular canthus; surface covered with small, sparse punctures. Frontoclypeal suture distinct, complete. Frontal surface smooth; width between eyes about 2.6 times as wide as transverse diameter of one eye. Ocular canthus transverse, subtriangular, bearing a dorsal sulcus on outer corner.

MOUTHPARTS. Mentum subtriangular, narrow.

ANTENNA. Ten-segmented; club long (about 3.0 times as long as antennomeres 1–7); lamellae flattened with a subapical, small constriction on inner margin, surface densely covered by small, sensorial spots.

THORAX. Pronotum transverse (basis about 1.7 times as wide as mid-line length); punctures small, shallow, irregularly scattered. Prosternal anterior margin slightly sinuous on sides, bearing a subtrapezoidal-shaped projection at middle. Scutellar plate subtriangular, smooth. Elytral surface without distinct striae, bearing four double rows of parallel punctures; punctures small, deep, separated from each other by the diameter of three punctures; sutural row with punctures separated from each other by the diameter of two punctures; interstriae with sparse punctures irregularly scattered.

ABDOMEN. Tergite 8 glabrous, covered with small, dense, shallow punctures, scattered about one puncture diameter apart. Ventrites 2–5 transversely covered with a complete row of setigerous punctures; ventrite 5 longer compared to 4; ventrite 6 bearing a glabrous disc, with setae transversely arranged on posterior margin.

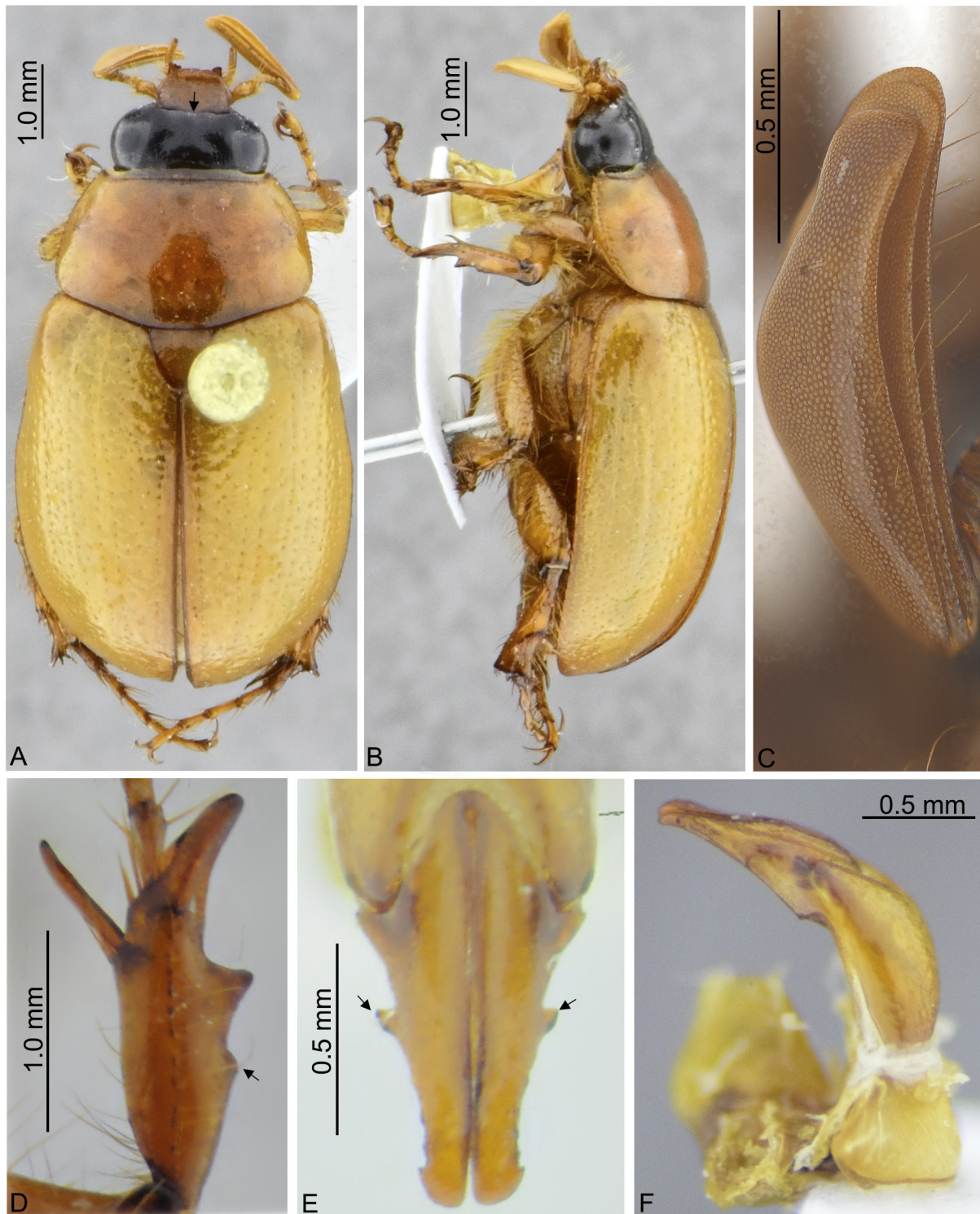


Fig. 1. *Cyclocephala catimbauensis* sp. nov., holotype, ♂ (CERPE). **A.** Dorsal view. **B.** Lateral view. **C.** Antennal club. **D.** Right protibia, in dorsal view (basal tooth indicated by an arrow). **E.** Parameres, in caudal view (each lateroventral middle process indicated by an arrow). **F.** Aedeagus, in lateral view.

LEGS. Inner protarsal claw thickened, widely incised, with inner branch distinctly broader than outer one. Protarsomere 5 cylindrical, slightly curved, longer than protarsomere 4; protarsomeres 2–4 beaker-shaped, subequal in length; protarsomere 4 with a ventroapical lobe, covered with longitudinal striae; protarsomere 1 subequal in length to protarsomeres 2–3 combined. Protibia bearing three teeth projected on outer margin (one apical, one medial, one basal); apical tooth obliquely curved, about two times as long as medial one; medial and basal teeth subtriangular, basal tooth smaller than previous ones.

AEDEAGUS. Parameres, in cauda view, symmetrical, rhomboid-shaped, elongate, with each outer margin bearing three subtriangular processes lateroventrally projected (one at basis larger than subsequent ones, one at middle and one on apex, smaller than previous ones); apex slightly divergent, hooked-shaped. Parameres, in lateral view, subtriangular, about 2.2 times as short as phallobase, bearing a rounded, convergent apex.

Variation

Paratypes with no perceptible variation in relation to holotype.

Distribution

Cyclocephala catimbauensis sp. nov. is known only from its type locality, a landscape composed of xerophilic vegetation, rocky outcrops, and sandstone walls. The Catimbau National Park is the only one entirely circumscribed by the semi-arid climate within the Caatinga biome in the northeast region of Brazil (Corrêa *et al.* 2015).

Cyclocephala everardoi Grossi, Santos & Almeida, 2016
Figs 2A–C, 4

Cyclocephala everardoi Grossi *et al.*, 2016: 249–250 (original description).

Diagnosis

Cyclocephala everardoi is easily separated by the following combination of characters, unique within the group: Brownish body colour; clypeus parabolic and subparallel lateroposteriorly close to ocular canthus; clypeal surface with dense and deep punctures; prosternal anterior margin bearing a prominent lobe on each side; presence of a spine-like process on each outer margin of parameres (at middle and at apex); apical lobes of parameres transverse. Other species within the *machadoi* group bear a testaceous colour, clypeus subtrapezoidal and lateroposteriorly constricted close to ocular canthus, clypeal surface with sparse and shallow punctures, prosternum only with a weak lobe on each side.

Type material

Holotype

BRAZIL • ♂; Minas Gerais [8 km from Northward of Cristália]; 16°39' S, 42°53' W; elev. 720 m; 16 Feb. 2010; Grossi, Parizotto and Melo leg.; light; CERPE.

Distribution

Cyclocephala everardoi is known only from its type locality, a landscape dominated by a xeric savannah vegetation within the Espinhaço formation.

Remarks

Only the holotype is known.

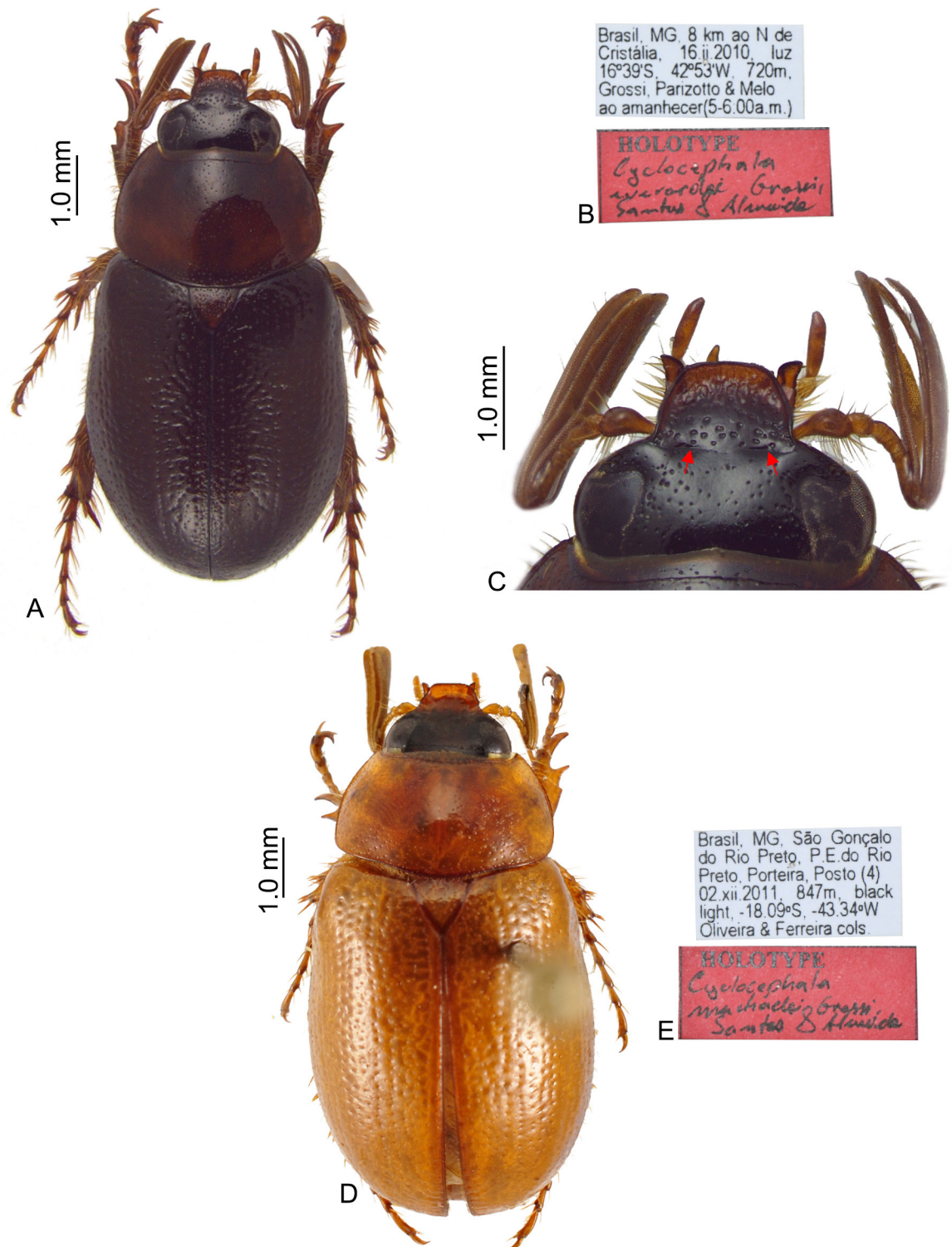


Fig. 2. A–C. *Cyclocephala everardoi* Grossi, Santos & Almeida, 2016, holotype, ♂ (CERPE). A. Dorsal view. B. Labels. C. Head and antennae (frontoclypeal suture is indicated by two red arrows). D–E. *Cyclocephala machadoi* Grossi, Santos & Almeida, 2016, holotype, ♂ (CERPE). D. Dorsal view. E. Labels.

Cyclocephala machadoi Grossi, Santos & Almeida, 2016
Figs 2D–E, 4

Cyclocephala machadoi Grossi *et al.*, 2016: 246 (original description).

Diagnosis

Cyclocephala machadoi has a testaceous colour but is separated by the following combination of characters: indistinct frontoclypeal suture; protibia with three teeth, being the basal one distinct; process on outer margin of parameres weak and produced at middle; parameres with hook-shaped apical lobes.

Type material

Holotype

Brazil • ♂; Minas Gerais, São Gonçalo do Rio Preto, P.E. do Rio Preto, Porteira, Posto; 18.09° S, 43.34° W; elev. 847 m; 2 Dec. 2011; Oliveira and Ferreira leg.; black light; CERPE.

Distribution

Cyclocephala machadoi is known only from its type locality. *Cyclocephalus machadoi* was collected in an area dominated by rupestrian Cerrado (Grossi *et al.* 2016).

Remarks

Only the holotype is known

Cyclocephala nhumirim sp. nov.

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Figs 3–5

Diagnosis

Cyclocephala nhumirim sp. nov. is similar to the species of group with testaceous colour. However, *C. nhumirim* is separated by the following combination of characters: Indistinct frontoclypeal suture; protibia bearing two distinct teeth on outer margin; parameres only with a subapical outer process, with hook-shaped apex in caudal view; apex of parameres deflexed in lateral view.

Etymology

The specific epithet is a toponym referring to the type locality: Nhumirim. The word ‘nhumirim’ means ‘small field’ in the Tupi and Guarani language complexes (Masucci 1979).

Type material

Holotype

BRAZIL • ♂; Mato Grosso do Sul, Corumbá, Faz. Nhumirim; 23–24 Sep. 1992; CEMT.

Paratype

BRAZIL • 1 ♂; same collection data as for holotype; 20–21 Sep. 1992; CERPE.

Description

Holotype male (not dissected)

MEASUREMENTS. Length: 7.7 mm; width between elytral humeri: 3.3 mm.

OVERALL BODY ASPECT. Dorsal surface glabrous, except elytral epipleura covered with a row of setae; ventral surface bearing sparse, yellowish setae.

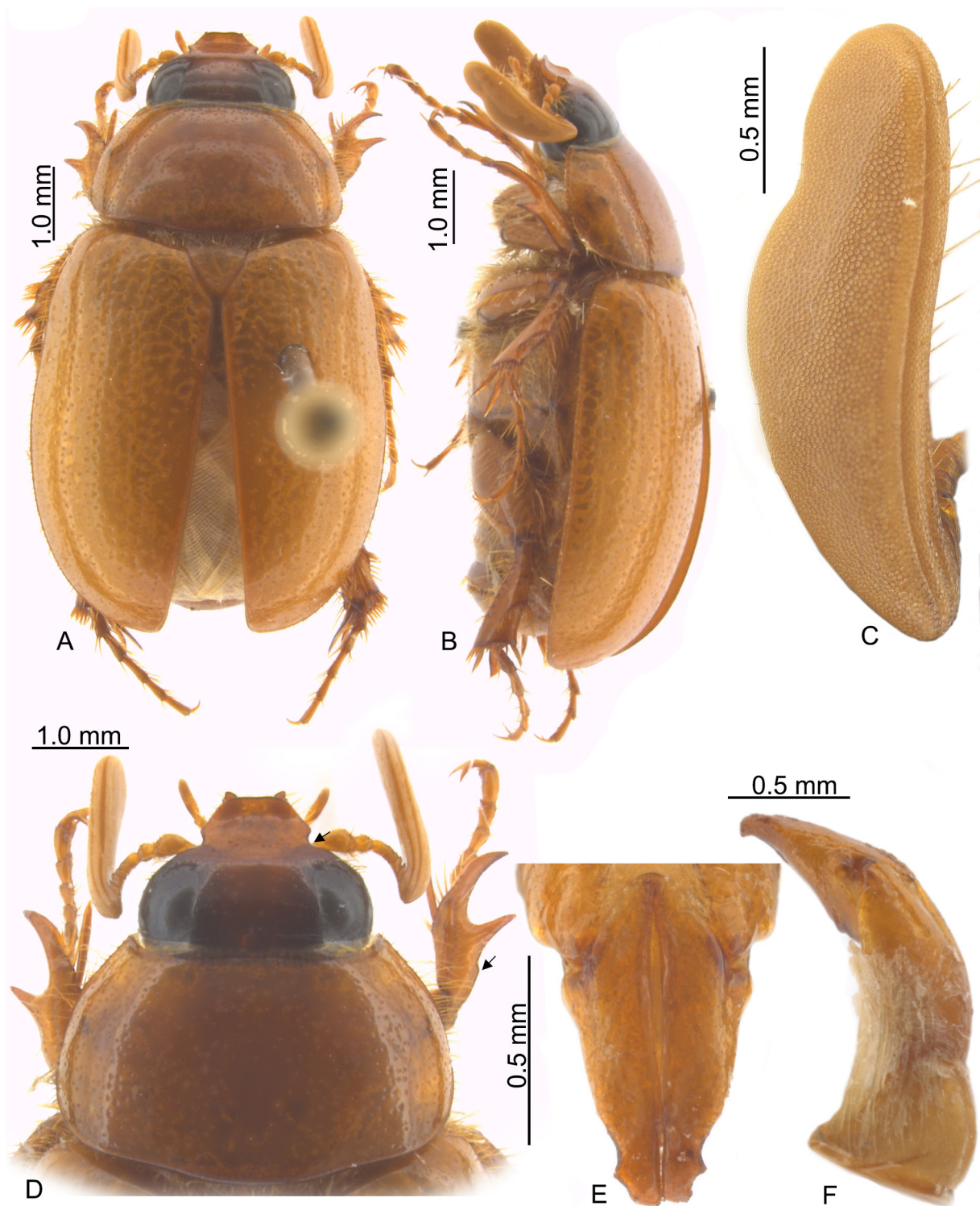


Fig. 3. *Cyclocephala nhumirim* sp. nov. A–B, D–F. Holotype, ♂ (CEMT). C. Paratype, ♂ (CERPE). A. Dorsal view. B. Lateral view. C. Antennal club. D. Head and pronotum with its respective associated appendices, in dorsal view (arrows points to lateral constriction of clypeus and obsolete basal tooth of protibial). E. Parameres, in caudal view. F. aedeagus, in lateral view.

COLOUR. Nearly entirely testaceous except for dark brown frons and pale antennal club.

HEAD. Clypeus subtrapezoidal, transverse (two times as wide as long), 1.5 times as short as frons; margins reflexed (anterior stronger than lateral ones), slightly bilobed anteriorly in frontal view; lateroposterior margins constricted close to ocular canthus, forming an oblique angle; discal surface concave, glabrous, nearly entirely impunctate, except by few small, shallow punctures, observed only under $35\times$ magnification. Frontoclypeal suture indistinct. Frons slightly convex in lateral view; punctures sparse, small, shallow, irregularly arranged on sides; width between eyes two times as wide as the transverse diameter of an eye. Ocular canthus flattened dorsoventrally, produced obliquely backward, subrectangular, rounded on outer margin, bearing five erect setae dorsally inserted in a transversal sulcus.

MOUTHPARTS. Mandibular outer margin with dense setae. Mentum subtriangular, narrow, nearly five times as long as width basis, rounded apically. Maxillary palpomere 4 oval-shaped, subequal in length to palpomere 2, and twice as long as palpomere 3; palpomeres 2–3 imbricate in shape.

ANTENNA. Club long (about 3.0 times as long as head length); lamellae flattened, with a small, subapical constriction on inner margin; setae sparse, longitudinally arranged along an area close to outer margin; distal lamella densely covered by sensorial spots.

THORAX. Pronotum transverse, weakly convex in lateral view; surface with weak, shallow, small punctures; lateral punctures larger compared to discal ones. Prosternal anterior margin slightly sinuous, weakly crenulated. Prosternal process columnar, long, produced between procoxae, oval-shaped apically. Scutellar plate narrowly parabolic, covered with large, contiguous punctures on posterior half. Elytral surface with indistinct striae; punctures ocellated, larger, deep, and denser those on pronotum; epipleura gradually narrowing from basis toward apex.

ABDOMEN. Tergite 8 convex in lateral view; each corner with a weak excavation; punctures small, dense, shallow, scattered about one puncture diameter apart. Ventrites 2–5 transversely covered with a row of sparse, setigerous punctures; ventrite 6 impunctate, setae confined on posterior margin.

LEGS. Protarsal claw deeply, widely incised, with inner ramus distinctly broader and shorter than outer one. Protarsomere 5 with a small, acute, apical process; protarsomere 4 angularly projected ventroapically, bearing longitudinal striae; protarsomere 1 long, subequal in length to protarsomeres 2–3 combined. Protibia bearing two obliquely pointed, subtriangular teeth on outer side; apical tooth almost two times as long as subapical one; subapical inner spur long, subequal in length to protarsomeres 1–2 combined; protibial dorsal surface with two longitudinal carinae (one well-marked at middle, one barely-marked close to inner margin); middle carina produced from basis to protibial apex, inner carina confined to basal half. Mesotarsomeres 1–4 gradually decreasing in length; mesotarsomere 5 subequal to mesotarsomere 3 in length; mesotarsomere 1 subtriangular with wide apex. Mesotibia with smooth ventral surface; outer surface with an oblique carina produced at middle, covered with long, spine-like setae, stout compared to metaventral setae; apex bordered with spine-like setae similar to those arranged on outer carina; inner apical spur subequal in length to tarsomeres 1–2 combined, outer apical spur shorter than inner one. Mesofemur subcylindrical, ventrally bearing a longitudinal carina produced from basis to apex covered with setae. Metatarsi similar to mesotarsi. Metatibia subtriangular, shorter, and stout compared to mesotibia; ventral surface with a longitudinal row of seven, setigerous punctures; inner apical spur wider compared to outer one. Mesofemur oval-shaped, wider compared to mesofemur.

Variation

The paratype varies from holotype only in the following characters: anterior margin of clypeus distinctly bilobed in dorsal view. Parameres, in caudal view, rhomboid-shaped smooth, symmetrical, long (nearly

three times as long as middle width), basal half wider than posterior half, lateroventrally convergent toward an apical half with a small, subapical process projected on outer margin, apex divergent. Parameres, in ventral view, with a carina produced at basis. Parameres, in lateral view, subtriangular, about half the length of phallobase, bearing a small subapical process, and deflexed apex.

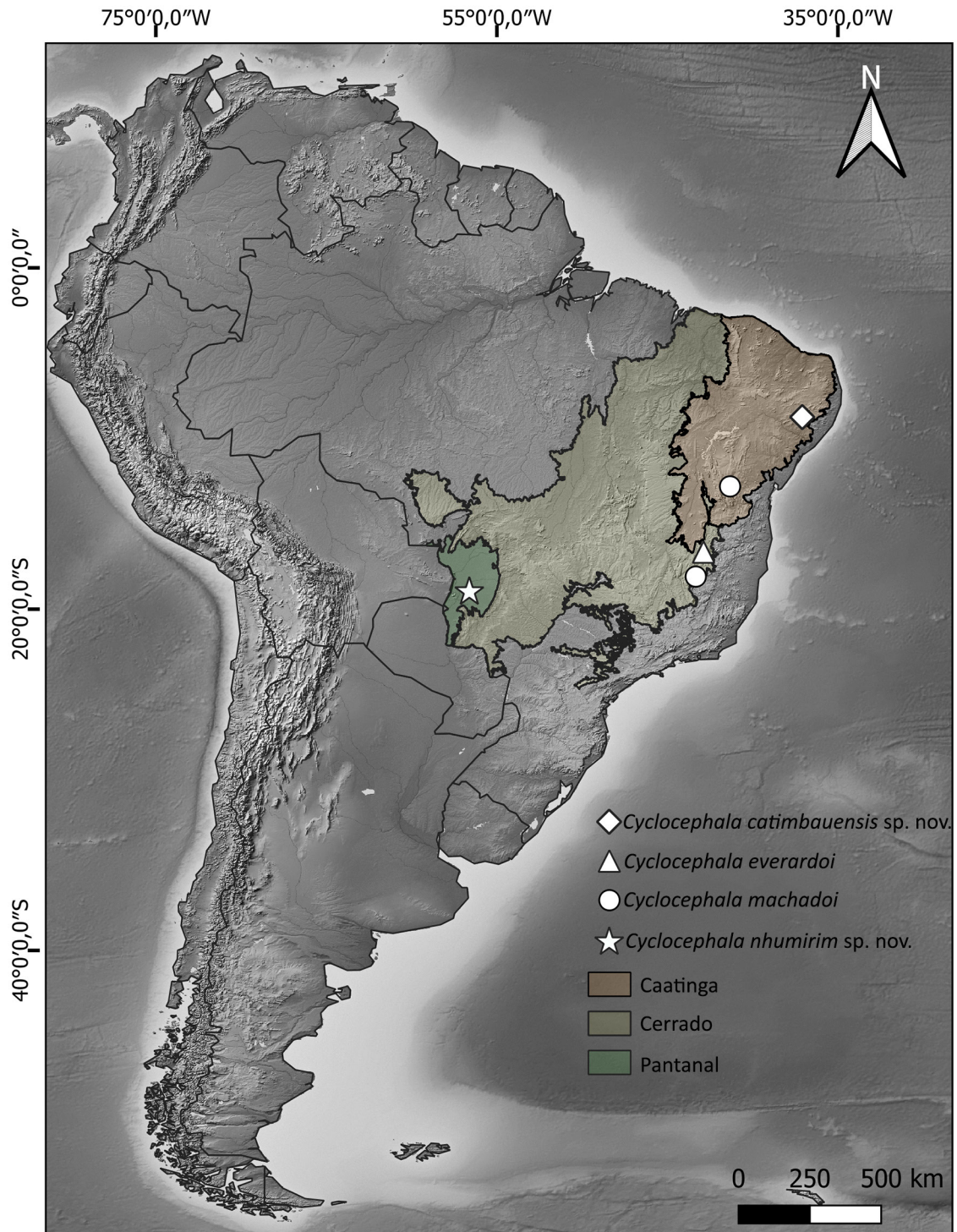


Fig. 4. Known distribution of the *Cyclocephala machadoi* species group.

Distribution

Cyclocephala nhumirim sp. nov. is known only from its type locality, within the “Pantanal da Nhecolândia”, a subregion limited by the Taquari (northward) and Negro (southward) rivers (Nunes da Cunha & Junk 2014). The Nhecolândia landscape is composed of brackish lakes and has a predominance of grassland vegetation (Costa & Diener 2022).

Discussion

The species of *Cyclocephala* belonging to the *machadoi* group are known from the Caatinga, Cerrado and Pantanal areas of Brazil. The group’s distribution indicates an affinity with semi-arid and seasonally flooded environments, which are influenced by defined rainfall within the South American dry diagonal (Luebert 2021). A single female with characteristics of the group was collected in the Caatinga areas, specifically in the locality of Andaraí, Bahia State, Brazil. However, its specific determination was not possible due to sexual dimorphism between this specimen and the examined males, compounded by

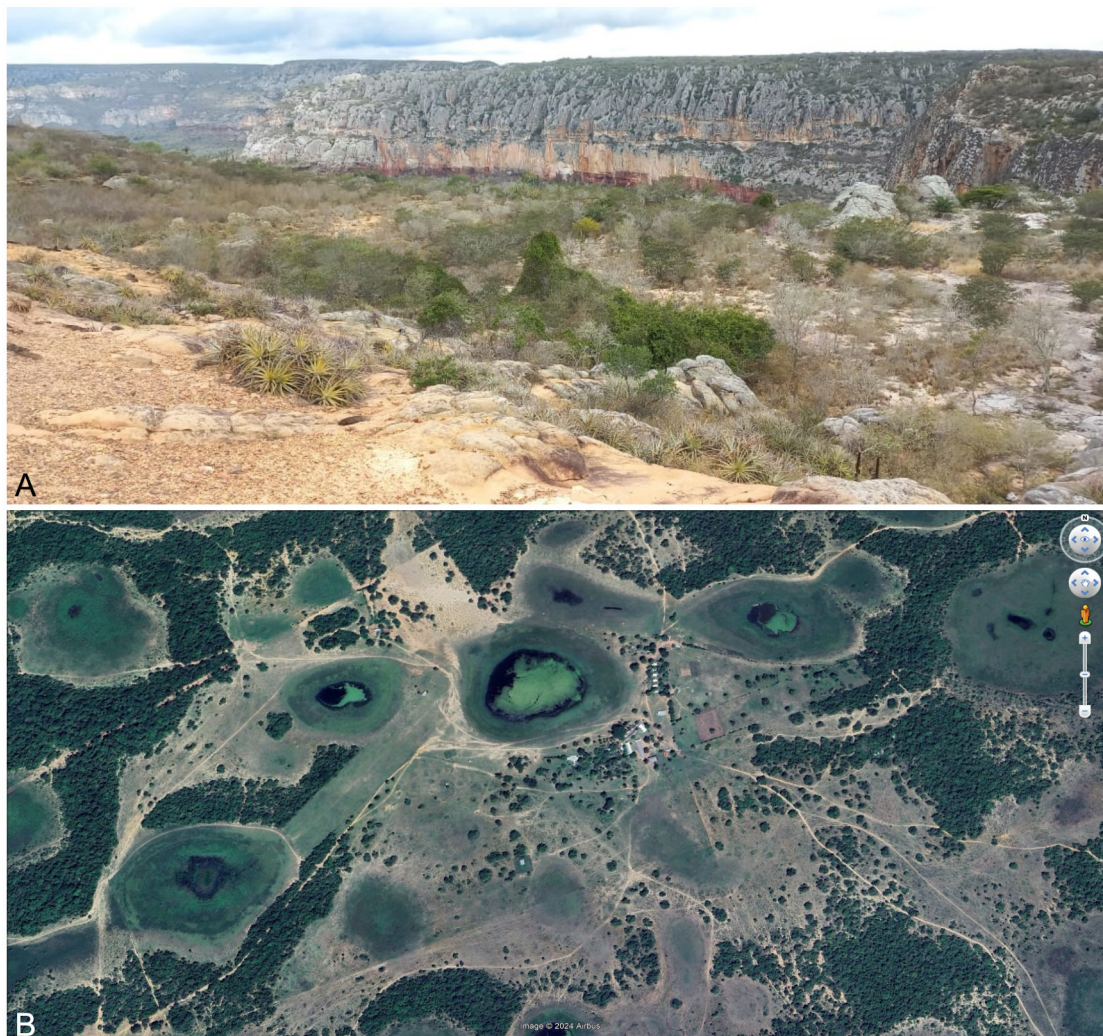


Fig. 5. A. Landscape of the Catimbau National Park, where *Cyclocephala catimbauensis* sp. nov. was collected (photograph Daniele R. Parizotto). B. Aero view of “Nhumirim”, within the Nhecolândia subregion of Pantanal, where *Cyclocephala nhumirim* sp. nov. was collected, showing details of some brackish lakes (image obtained from Google Earth Pro).

differences in their respective collection localities. Recent collections were conducted in March 2024 and 2025 in the Caatinga areas, but only males were captured using light traps. Nothing more is known about the natural history of the species in the group.

Regarding the long antennal club presented by the *machadoi* species group, there are at least nine other species of *Cyclocephala* with the same character: four restricted to North America (*Cyclocephala arenosa* Howden & Endrödi, 1966; *C. barreirai* Martínez, 1969; *C. halfpeteriana* Martínez, 1968; *C. longula* LeConte, 1863) and five in South America (*Cyclocephala longa* Endrödi, 1963; *C. macrophylla* Erichson, 1847; *C. megalophylla*; *C. minuta* Burmeister, 1847; *C. tucumana* Bréthes, 1905) (Moore *et al.* 2018b). However, the *machadoi* group is defined by species where the distal antennal lamella is completely covered with sensorial spots easily visible even under the stereo microscope at low magnification (see also Grossi *et al.* 2016: figs 1c, 2c). Intriguingly, this morphological trait was neither described nor mentioned in the original descriptions or recent taxonomic studies concerning Mexican (Ratcliffe *et al.* 2013; Delgado & Mora-Aguilar 2020) or South American species (Dupuis & Perrin 2020; Ratcliffe *et al.* 2020, 2023) of *Cyclocephala* with a long antennal club, suggesting a possible absence of these spots. Antennal ultrastructural analyses were performed by Rodrigues & Cocco (2024) and Sanchez-Cruz *et al.* (2024) for *C. tucumana* and *C. barreirai*, respectively. Nonetheless, these species display distal antennal lamella lacking white spots on the outer surface and is therefore distinct from that of the *machadoi* group, further reinforcing the latter as a distinct species group within *Cyclocephala*.

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