An Acad Bras Cienc (2022) 94(Suppl. 3): e20201846 DOI 10.1590/0001-3765202220201846
Anais da Academia Brasileira de Ciências | *Annals of the Brazilian Academy of Sciences*
Printed ISSN 0001-3765 I Online ISSN 1678-2690
www.scielo.br/aabc | www.fb.com/aabcjournal

ANIMAL SCIENCE

A new genus and species of Neotropical Hybosorinae Erichson, 1847 (Coleoptera: Hybosoridae)

DANIEL S. BASÍLIO, FERNANDO Z. VAZ-DE-MELLO & LÚCIA M. ALMEIDA

Abstract: Among the 26 Hybosorinae genera, seven are present exclusively in the Neotropical region. However, Hybosorinae from the New World have been less studied. One new genus and new species collected in Brazil is herein described to this subfamily. The genus is recognizable by the following combination of characters: labium with semicircular mentum; mandibles with lateral projection excavated, separated in the middle by longitudinal carina, inner side sheltering the labrum; antennae with nine antenomeres; scutellar shield with strong punctures at the proximal half; elytra with single rows formed by punctures; and protibia without well-defined denticles.

Key words: Biodiversity, description, morphology, New World, Scarabaeoidea.

INTRODUCTION

Hybosorinae Erichson, 1847 is the second most diverse subfamily of Hybosoridae Erichson, 1847. They group 26 described genera (Ocampo & Ballerio 2006, Ocampo 2010, Frolov et al. 2017) until now. The species of this subfamily could have necrophagous, coprophagous, mycophagous and/or xylophagous habits. They could also live in association with termites or ants and usually have the habit of burying themselves (Jameson 2002, Casari & Ide 2012, Ocampo 2006). The Hybosorinae were recognized by the presence of a 3-articulated antennal club with the club basal antennomer cupuliform, mandibles protruding beyond the apex of labrum, elytra punctate and asymmetrical male genitalia (Ocampo 2006).

Until now, among the 26 valid genera of Hybosorinae, seven have exclusively neotropical distribution: *Apalonychus* Westwood, 1845; *Aporolaus* Bates, 1887; *Coilodes* Westwood, 1846; *Dicraeodon* Erichson, 1847; *Hapalonychoides* Martínez, 1994; *Metachaetodus* Preudhomme de Borre, 1886 and *Taisia* Frolov, Ocampo, Akhmetova & Vaz-de-Mello, 2017.

During an extensive analysis of *Coilodes* Westwood, 1846, the most diverse Hybosorinae genus in the New World (Ocampo & Ballerio 2006), more than 1.300 specimens from all species (including the type material) were studied. A different species from Cuiabá, Mato Grosso (Brazil) that does not belong to *Coilodes* was found among them. This species has been carefully analyzed and despite the fact that it has some similarities with *Coilodes*, neither does it have the diagnostic characters of it nor of any other genus of Hybosorinae. In addition, it has a unique character combination. Thus, this species belongs to a new genus in Hybosorinae. Therefore, this work aimed to describe a new genus and a new species of Hybosorinae collected in the Neotropical Region.

MATERIALS AND METHODS

Three pinned and dry adult specimens provided by the Entomology Sector of UFMT Zoological Collection, Cuiabá, Mato Grosso, Brazil (CEMT) were analyzed in the Laboratório de Sistemática e Bioecologia de Coleoptera, Department of Zoology, Universidade Federal do Paraná.

The morphological study of the material was made with stereomicroscope ZEISS SteREO Discovery.V20. In order to obtain photographs, a stereomicroscope Leica M205C with coupled digital camera Leica DMC 2900 was used. In addition, the Leica LAS Multifocus software was used to self-assembly. To the plate confection, CorelDRAW® and Corel PHOTO-PAINT® Home & Student 2018 were used.

Due to the convex shape of the body, the length measurements refer to the sum of the head (frons and Clypeus), pronotum and elytra length and the width refer to the largest distance between the outer margins of the elytra. The terminology used for descriptions follows Grebennikov et al. (2004), Ocampo (2006), Bai et al. (2015) and Ballerio & Grebennikov (2016).

The labels of the examined material were transcribed from top to bottom, and left to right. The data of each label was between double quotes (“ ”) and each line was separated by a backslash (\). Additional details are between brackets ([ ]). When there were more than one label to a specimen, they were separated by a vertical bar (|).

RESULTS

Frolovius Basílio, Vaz-de-Mello & Almeida, gen. nov.

Type Species

Frolovius mandibulocarinatus Basílio, Vaz-de-Mello & Almeida, **gen. nov.** and **sp. nov.** (by monotypy).

Description

Body surface with sparse and weak punctures. Labrum subrectangular and flat with irregular margins. Mandibles strongly produced laterally, angulated anteriorly. Labium with mentum semicircular. Antenna 9-articulated, antennal club rounded 3-articulated, basal antennomer cupuliform. Pronotum uniformly convex with smooth margins. Scutellar shield subtriangular, surface with strong punctures in proximal half (the region covered by the pronotum). Elytra with single longitudinal rows of thick punctures, elytral disc glabrous; external margins with large sparse setae. Protibia without denticles. Abdomen with five ventrites with decumbent setae.

http://www.zoobank.org/urn:lsid:zoobank.org:act:CD9923A3-5CD4-4896-A9EB-1B58E64FED81

Diagnosis

Frolovius, **gen. nov.** is similar to *Coilodes* Westwood, 1846 and different from the other Hybosorinae by the following character combination: labrum flat, mandible without dentiform projection, antennal club rounded, pronotum with smooth margin, elytral punctures weak and not very dense, elytra with sparse bristles on the lateral margin. It is distinguished [*Coilodes* characteristics between brackets for comparison] by the presence of labium with semicircular mentum (Fig. 1e) [labium with

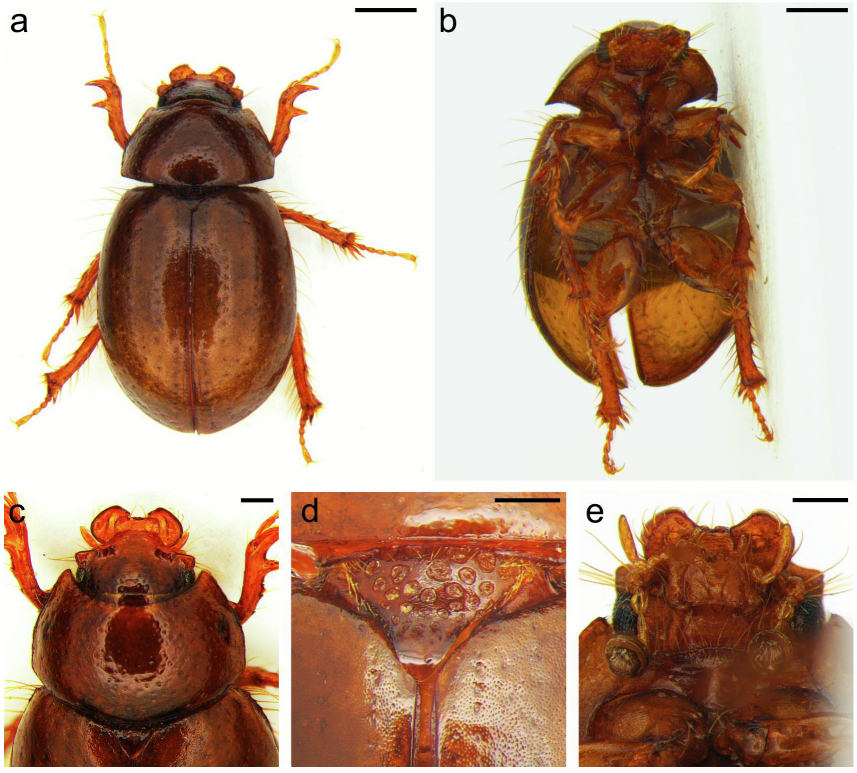

Figure 1. ***Frolovius mandibulocarinatus*** **Basílio, Vaz-de-Mello & Almeida, gen. nov. and sp. nov.: Body (a–b): dorsal (a) and ventral (b); Head and pronotum in dorsal view (c); Scutellar shield (d) and; Head in ventral view (e). Scale Bar: 0,5mm (a–b); 0,2mm (c–e).**

square or rectangular mentum]; mandibles laterally produced, dorsally excavated separated in the middle by a strong longitudinal carina, inner region sheltering the labrum (Fig. 1c) [mandibles not produced laterally]; antennae 9-articulated [antennae 10-articulated]; strong punctures at the scutellar shield proximal half (Fig. 1d), usually covered by pronotum [without punctures at the scutellar shield]; single rows of punctures on elytra (Fig. 1a) [double rows of punctures]; absence of well-defined denticles on protibial [protibia with well-defined denticles].

Geographic distribution

Only one species known collected in Mato Grosso, Brazil.

Etymology

Noun in the genitive singular. *Frolovius* **gen. nov.** is nominated after Andrey Frolov, collector of all specimens known so far and who first recognized its originality. The gender is masculine.

Frolovius mandibulocarinatus Basílio, Vaz-de-Mello & Almeida, gen. and sp. nov.

Description

Female holotype. Length 3.1 mm. Width 1.8 mm. Body (Figs. 1 a and b) convex, oval and shiny. *Color*: yellowish brown. *Head* (Figs. 1 c and d): Surface, sparse punctate. Frons, in dorsal view, subtrapezoidal; proximal border rounded; posterior margin as wide as the anterior one; anterior margin straight, elevated over the antennae and mandible insertion; lateral margin curved; surface without punctures. Eye visible dorsally. Canthus strong; distinct expanded down area with erect bristle. Clypeus subtrapezoidal, slightly excavated, medially; anterior and lateral margins straight; setae and punctures sparse; frontoclypeal suture absent. Labrum subrectangular; irregular margins; setae sparse, spreading along the entire dorsal border; surface without punctures. Mandibles, protruding beyond the apex of labrum; laterally

produced; lateral margin smooth with setae at the basal half; dorsally excavated, with strong longitudinal carina medially, inner region sheltering the labrum. Labium with mentum semicircular; superior and lateral margins rounded and inferior arched; disc strigulate, large setae; labial palps with three palpomeres; basal and second palpomeres subglobose; distal palpomere barrel-shaped, length equivalent to the sum of the previous two. Maxilla subtriangular; large setae throughout surface; maxillary palp with four palpomeres; basal palpomere curved; second and third palpomeres longer than wide; distal palpomere barrel-shaped, length equivalent to the sum of the previous three. Antenna 9-articulated; large and erect setae in basal antennomere (scape); antennal club 3-articulated; club with basal antennomere cupuliform, pubescent distally, sparse, small setae on its base. *Pronotum* (Fig. 1e): uniformly convex; posterior margin as wide as the anterior one; anterior margin straight, angles subacute; posterior margin rounded, angles obtuse; lateral margin convex; sparse punctures; setae absent. *Scutellar shield:* subtriangular, twice as long as wide; apex punctate; punctures absent in distal half surface and strong punctures in proximal half surface (in the region covered by the pronotum). *Elytra:* single longitudinal rows of thick punctures, complete sutural striae formed by punctures; elytral disc glabrous; external margins with large setae on the base decreasing in size towards the apex; elytral epipleuron complete, wider at the apex; posterior margin of elytra covering the pygidium. *Venter* (Fig. 1b): hypomeral surface strigulate, setose; prosternum (Figs. 1b and d), midlength elevated, anterior margin straight and jagged, meso- and metaventrite smooth. *Legs:* procoxa conical; disc smooth. Protrochanter, joint with the procoxa rounded, distally angled. Profemur, disc smooth, sparse setae. Protibia inner margin convex; disc with large setae; single spur; external margin, two well-defined teeth next to apex and small tooth below the other two. Protarsi, tarsal insertion beneath the protibial second tooth. Meso- and metathoracic legs smooth. Meso- and metatrocanther subtriagular. Meso- and metatibia with erect setae; apex weakly expanded; pair of spurs with pointed apex; both on inner margin; same size of the protibial spur. Tarsi, five tarsomeres twice longer than wide, distal tarsomere twice as wide as the previous; simple and curved tarsal claws. *Abdomen:* five ventrites with decumbent setae.

http://www.zoobank.org/urn:lsid:zoobank.org:act:B26A2F53-94E7-4F0A-96D2-98415D3300D3

Variation. Length ranging from 3.1 to 3.3 mm. Width ranging from 1.8 to 1.9 mm. Color varies from yellowish brown to dark brown; legs could be lighter than the other parts of the body. Lateral margin of pronotum could have an angulated projection in the middle. Punctures on the scutellar shield are always present at its proximal half, but may vary from strongly to slightly marked or almost invisible at distal half. Protibia with two or three teeth.

Male. Unknown.

Type material

Holotype (♀)**:** "BRASIL Mato Grosso, \ Cuiabá, Flor do Cerrado, \ 15° 29' 38"S, 56° 4' 36"W, \ FIT, 8-12.x.2016, A. Frolov. | HOLOTYPE \ *Frolovius mandibulocarinatus* \ Basílio, Almeida \ & Vaz-de-Mello, 2022." [Deposited in Coleção Zoológica do Instituto de Biociências da UFMT, Mato Grosso, Brazil - CEMT].

Paratypes (2♀): "BRASIL Mato Grosso, \ Cuiabá, Flor do Cerrado, \ 15° 29' 38"S, 56° 4' 36"W, \ FIT, 8-12.x.2016, A. Frolov. | PARATYPE \ *Frolovius mandibulocarinatus* \ Basílio, Almeida \ & Vaz-de-Mello, 2022." [Deposited in CEMT (1); and in Coleção Entomológica Pe. Jesus Santiago

Moure, Universidade Federal do Paraná, Paraná, Brazil – DZUP (1)].

Etymology

Adjective in the nominative singular. The name of this species is composed by joining two Latin terms: "*mandibula*" (mandible) and "*carina*" (keel, ridge). The name refers to the strong longitudinal carina present on the dorsal region of the mandible.

Biological data

All specimens have been collected in a flight interception trap, in October.

Key to New World genera of Hybosorinae Erichson, 1847

1. Antennal club elongated, longer than funicle (Fig. 2a). Dominican Republic, Cuba, Brazil, Paraguay and Argentina. ... ***Apalonychus* Westwood, 1845**

1'. Antennal club rounded, equal to or shorter than funicle (Figs 1e and 2b). ... **2**

2. Labrum with external margin strongly serrated (Fig. 2c). Cosmopolitan. ... ***Hybosorus* MacLeay, 1819**

2'. Labrum with external margin smooth (Fig. 2d) or slightly irregular (Fig. 1c). ... **3**

3. Pronotum without marked punctures (Fig. 2e); elytra with short bristles on external margin, only on the basal half. Nicaragua, Costa Rica, Panama, St Vincent and Grenadines, Trinidad and Tobago, Colombia, Venezuela, French Guiana, Brazil, Ecuador, Peru, Bolivia, Paraguay and Argentina. ... ***Coilodes* Westwood, 1846**

3'. Pronotum with marked punctures (Figs 1 c and 2 f); with long bristles on entire external margin. ... **4**

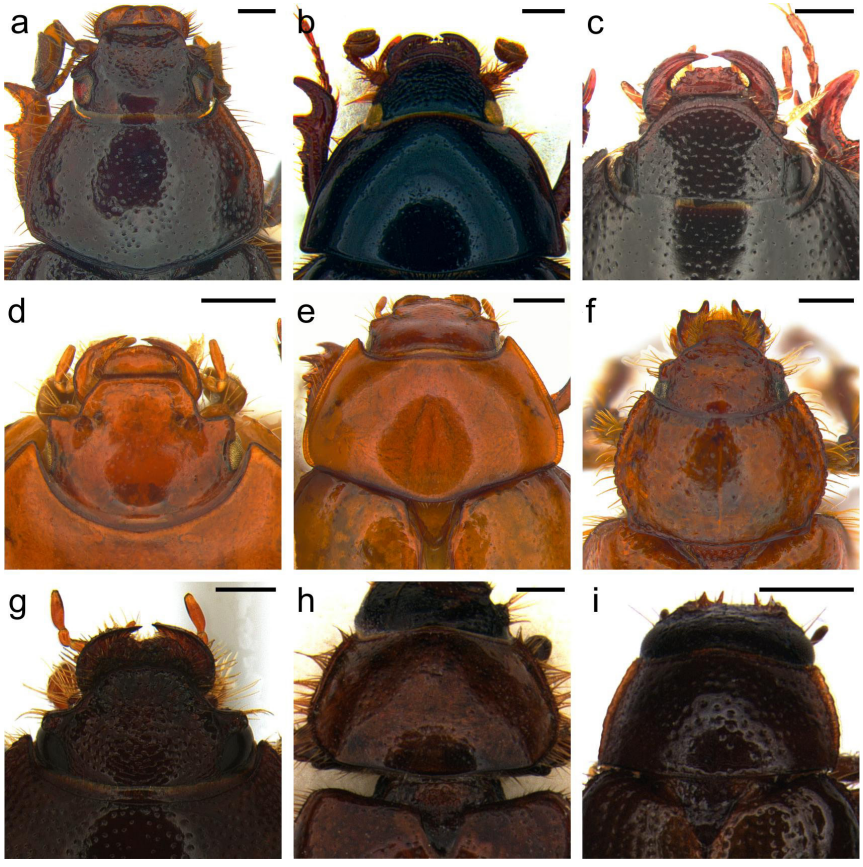

Figure 2. ***Apalonychus pusillus* Arrow, 1911 (a) *Hybosorus illigeri* Reiche, 1853 (b–c) *Coilodes castaneus* Westwood, 1846 (d–e) *Taisia cornitermitis* Frolov, Ocampo, Akhmetova & Vaz-de-Mello, 2017 (f) *Metachaetodus discus* Preudhomme de Borre, 1886 (g) *Aporolaus fimbriatus* Bates, 1887 (h) *Dicraeodon* sp. (i). Scale Bar: 0,5mm.**

4. Mandible laterally projected with medial carina (Fig 1c). Brazil. ... ***Frolovius* Basílio, Vaz-de-Mello & Almeida, gen. nov.**

4'. Mandible not laterally projected and without medial carina (Figs 2f and g). ... **5**

5. Mandible without vertical dentiform projection (Fig. 2g). Argentina and Uruguay ... ***Metachaetodus* Preudhomme de Borre, 1886**

5'. Mandible with vertical dentiform projection (Fig. 2f). ... **6**

6. Pronotum with posterior angles distinctly rounded (Fig 2h). Panama. ... ***Aporolaus* Bates, 1887**

6'. Pronotum with posterior angles straight or weakly rounded (Figs 2f and i). ... **7**

7. Pronotum with lateral margin distinctly serrated (Fig. 2f). Brazil. ... ***Taisia* Frolov, Ocampo, Akhmetova & Vaz-de-Mello, 2017**

7'. Pronotum with lateral margin smooth or weakly irregular (Fig. 2i). Guatemala, Colombia, Ecuador and French Guiana. ... ***Dicraeodon* Erichson, 1847**

DISCUSSION

Frolovius mandibulocarinatus **gen. nov.** and **sp. nov.** is probably a rare species, with only three known specimens. This low sampling cannot be attributed to the absence of collection effort, since this species shares the same type locality with *Taisia cornitermitis* Frolov, Ocampo, Akhmetova & Vaz-de-Mello, 2017 (species well sampled). *T. cornitermitis* (other monotypic genus) was described based on 185 specimens collected between October and November 2015 and 2016 using FIT (Frolov et al. 2017), the same methodology used to collect *Frolovius mandibulocarinatus* **sp. nov.**.

Other Hybosorinae monotypic genera composed by rare species are known, mainly among the small size species, as are the cases of Asian genera *Microphaeolodes* Kuijten, 1985 and *Mimocoelodes* Pic, 1930, both with only one specimen known. In addition to monotypy and rarity, another similarity between *Mimocoelodes* and *Frolovius* **gen. nov.** is in the fact that both were described based only on females (Kuijten 1985).

However, this decision related to Hybosorinae needs to be taken very carefully, because many genera present sexual dimorphism, although subtle in the known cases (Westwood 1846, Ocampo 2010, Frolov et al. 2017). Therefore, this genus was proposed only after thorough morphological and bibliographical analysis of all Hybosorinae genera. This analysis showed that neither Hybosorinae extant genera has the same character combination presented here. About the character cited as diagnostic, the mandibles laterally well produced with an angulation in the anterior margin is known in Hybosorinae. In some genera, the mandible could be produced vertically with dentiform projections, as it occurs in *Taisia*, *Aporolaus* Bates, 1887 and *Dicraeodon* Erichson, 1847; or poorly laterally produced with external margin evenly curved as it occurs in *Apalonychus* Westwood, 1845 (Basílio et al. In Press).

Another evidence that corroborates this decision was observed in a preliminary phylogenetic analysis based on morphological evidence. That study recovered *Frolovius* **gen. nov.** as the sister group of the Neotropical genus *Coilodes* in a separate branch from the other Neotropical genera (Basílio et al. In Press). The morphological difference between *Coilodes* and *Frolovius* **gen. nov.**, on the other hand, cannot be considered as a sexual dimorphism, for the reason that the females of all *Coilodes* species were analyzed and all presented the same dimorphism, different from *Frolovius* **gen. nov.** diagnostic characters presented here.

This genus cannot be considered any other New World Hybosorinae known genera either,

because although the differences with *Coilodes* (more related genus), *Frolovius* **gen. nov.** presents evident differences from the other genera, such as labrum with margin flat and irregular, but not serrated (elevated on *Apalonychus* and strongly serrated on *Hybosorus* MacLeay, 1819); mandible without dentiform projection (with dentiform projection in *Aporolaus*, *Dicraeodon* and *Taisia*); antennal club rounded (elongated in *Apalonhychus*); Pronotum margin smooth (distinctly serrated in *Taisia*); elytral punctures weak and not dense (strong and dense in all other New Word Hybosorinae genera, except in *Coilodes*); elytral margin with sparse bristles (dense in *Apalonychus*, *Metachaetodus* Preudhomme de Borre, 1886 and *Taisia*; and very dense in *Aporolaus*). All of those evidences strengthen the decision to describe *Frolovius* as a new genus.

Acknowledgments

We thank Andrey V. Frolov for collecting the material, John Fiorese for revising the text in English, and Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) for grants: DSB 140255/2015-0, FZVM 306745/2016-0 and 431760/2018-7, and LMA 311151/2021-3.

REFERENCES

BAI M, ZHANG W, REN D, SHIH C & YANG X. 2015. *Hybosorus ocampoi*: the first hybosorid from the Cretaceous Myanmar amber (Coleoptera: Scarabaeoidea). Org Divers Evol 16(1): 233-240.

BALLERIO A & GREBENNIKOV VV. 2016. Rolling into a ball: phylogeny of the Ceratocanthinae (Coleoptera: Hybosoridae) inferred from adult morphology and origin of a unique body enrollment coaptation in terrestrial arthropods. Arthropod Syst Phylo 74(1): 23-52.

CASARI AS & IDE S. 2012. Coleoptera. In: Insetos do Brasil. Rafael JA, Melo GAR, Carvalho CJB, Casari SA & Constantino R (Eds), Holos Editora. Ribeirão Preto. P. 452-535.

FROLOV AV, OCAMPO FC, AKHMETOVA LA & VAZ-DE-MELLO F. 2017. A new genus and species of the termitophilous Neotropical Hybosorinae (Coleoptera: Scarabaeoidea: Hybosoridae) associated with Cornitermes (Isoptera: Termitidae) in the Cerrado ecoregion in Brazil. J Nat Hist 51(29-30): 1759-1765.

GREBENNIKOV VV, BALLERIO A, OCAMPO FC & SCHOLTZ CH. 2004. Larvae of Ceratocanthidae and Hybosoridae (Coleoptera: Scarabaeoidea): study of morphology, phylogenetic analysis and evidence of paraphyly of Hybosoridae. Syst Entomol 29(4): 524-543.

JAMESON ML. 2002. Hybosoridae. In: Arnett RH & Thomas MC (Eds), American Beetles. Vol. 2. Polyphaga: Scarabaeoidea through Curculionoidea. CRC Press. Boca Raton, p. 32-33.

KUIJTEN PJ. 1985. Revision of some Hybosorine genera from the Indo-Malayan subregion: *Microphaeochroops*, *Microphaeolodes*, *Mimocoelodes*, *Pantolasius* and *Phaeochridius* (Coleoptera: Scarabaeidae: Hybosorinae). Rijksmuseum van Natuurlijke Historie 222: 1-39.

OCAMPO FC. 2006. Phylogenetic analysis of the scarab family Hybosoridae and monographic revision of the New World subfamily Anaidinae 3. Phylogenetic analysis of the subfamily Anaidinae. Bull Univ Nebr State Mus 19: 13-177.

OCAMPO FC. 2010. The Central American genus Aporolaus, new status and taxonomic revision (Coleoptera: Scarabaeoidea: Hybosoridae: Hybosorinae). Rev Mex Biodivers 81(3): 701-704.

OCAMPO FC & BALLERIO A. 2006. Phylogenetic analysis of the scarab family Hybosoridae and monographic revision of the of the NewWorld subfamily Anaidinae (Coleoptera: Scarabaeoidea). 4. Catalog of the subfamilies Anaidinae, Ceratocanthinae, Hybosorinae, Liparochrinae, and Pachyplectrinae (Hybosoridae). Bull Univ Nebr State Mus 19: 178-209.

WESTWOOD JO. 1846. XXVI. On the Lamellicorn Beetles which possess exserted Mandibles and Labrum, and 10-jointed Antenae. Trans R Entomol Soc Lond: 155-180.

How to cite
BASÍLIO DS, VAZ-DE-MELLO FZ & ALMEIDA LM. 2022. A new genus and species of Neotropical Hybosorinae Erichson, 1847 (Coleoptera: Hybosoridae). An Acad Bras Cienc 94: e20201846. DOI 10.1590/0001-3765202220201846.

Manuscript received on November 29, 2020;
accepted for publication on January 27, 2022

DANIEL S. BASÍLIO[1]
https://orcid.org/0000-0003-3556-5880

FERNANDO Z. VAZ-DE-MELLO[2]
http://orcid.org/0000-0001-9697-320X

LÚCIA M. ALMEIDA[1]
http://orcid.org/0000-0003-4277-711X

[1]Universidade Federal do Paraná, Laboratório de Sistemática e Bioecologia de Coleoptera, Departamento de Zoologia, Caixa Postal 19020, 81531-980 Curitiba, PR, Brazil

[2]Universidade Federal de Mato Grosso, Laboratório de Scarabaeiodologia, Instituto de Biociências, Departamento de Biologia e Zoologia, Av. Fernando Corrêa da Costa, 2367, Boa Esperança, 78060-900 Cuiabá, MT, Brazil

Correspondence to: **Daniel Silva Basílio**
E-mail: basilio.dsb@gmail.com

Author contributions

The first author (DSB) was responsible for coining the names. Concerning the other parts (conceptualization, descriptions, decisions, acquisition of the examined material, photos, confections of plates, writing, and editing) all coauthors contributed equally for this manuscript.