



New records of land-snail species from caves of Mato Grosso state, Midwest Brazil (Gastropoda, Neritimorpha and Stylommatophora)

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Abstract

Recent collection efforts in caves of Mato Grosso state, Brazilian Midwest, have brought to light specimens of four Neritimorpha and Stylommatophora land-snail species previously unrecorded from that state: *Helicina fulva* d'Orbigny, 1835 (Family Helicinidae), *Streptartemon abunaensis* (F. Baker, 1914) and *Streptartemon decipiens* (Crosse, 1865) (family Streptaxidae), and *Systrophia alcidiana* Ancey, 1892 (family Scolodontidae). These records are not only the first from that state, but also represent large extensions to those species' known distributions, as well as their first records from a cave habitat.

Keywords

Cave dwellers, Cerrado, Helicinidae, Scolodontidae, Streptaxidae

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Introduction

Information on the diversity and geographic distribution of terrestrial gastropods in Brazil remains scarce for a large portion of the country, in particular in the Amazon and the Midwest region (Salvador 2019). Multiple collection efforts in caves in the third largest state, Mato Grosso in the Brazilian Midwest, have been undertaken in the past years. While they focused primarily on other animal groups, a reasonable number of specimens of land snails were collected in limestone

caves across the region of Nobres, Mirassol do Oeste, and Curvelândia municipalities.

In the present study, we investigate that material and report new records of four Neritimorpha and Stylommatophora land-snail species that are not only the first for Mato Grosso state, but also represent large extensions to the species' known distributions. These records are also the first reports of these species inhabiting cave habitats.

Methods

Multiple collection expeditions to caves in Mato Grosso state were conducted during the years of 2015, 2017 and 2018 by the Laboratório de Estudos Subterrâneos of the Universidade Federal de São Carlos (LES/UFSCar, São Carlos, Brazil) and the Laboratório de Sistemática e Taxonomia de Artrópodes Terrestres da Universidade Federal do Mato Grosso (LABART/UFMT, Cuiabá, Brazil). The collected gastropod specimens are housed in the collection of the LES. Those comprise mostly empty shells, preserved dry, with only a few animals collected alive and preserved in 96% ethanol. A juvenile specimen of *Systrophia alcidiana* was used for DNA extraction in a (failed) attempt of barcoding (see Salvador and Cunha 2020 for protocol).

The gastropods available for the present study stem mainly from the following caves in the region of Nobres (names in Portuguese): Caverna Ciputa, Caverna do Jabuti, Caverna Lagoa Azul, Gruta da Cerquinha, Toca do Sorvete (Fig. 1). Two caves in the other municipalities, Caverna do Jabuti in Curvelândia and Caverna do Isopoda in Mirassol do Oeste (Fig. 1), provided almost no specimens.

The caves are inserted in the Araras Group, dated from the Neoproterozoic, with a predominance of limestone sediments (Fig. 2A; Nogueira 2003). Due to their karst landscape, the municipalities have many limestone

caves and subterranean rivers (Santos et al. 2011). The region (Fig. 2B) belongs to the Cerrado domain (i.e., savanna-like vegetation), which is the second largest domain in Brazil and considered one of the most important terrestrial biodiversity hotspots (Ratter et al. 1997; Myers et al. 2000). Nobres municipality has a hot and humid equatorial climate (mean annual temperature 24 °C; mean annual precipitation 2,000 mm), with a 5-month dry season from May to September (IBGE 2022).

Species identification was conducted with the aid of the catalog of Simone (2006) and the study of Salvador et al. (2018), which has detailed descriptions of the species treated herein. The type material of these species (housed in the Natural History Museum, London, UK), as well as additional voucher specimens, had been consulted and photographed by one of us (RBS) on a previous occasion (see Salvador et al. 2018 for a full list of available specimens of each species).

The four species that represent new records for Mato Grosso state are discussed in more detail below, arranged systematically (Bouchet et al. 2017). Further specimens, belonging to species widespread in South America (Salvador et al. 2018; Silva et al. 2021), were also found in the material from the caves in Nobres municipality: *Aperostoma inca* (d'Orbigny, 1835) (family Neocyclotidae), *Leptinaria unilamellata* (d'Orbigny,

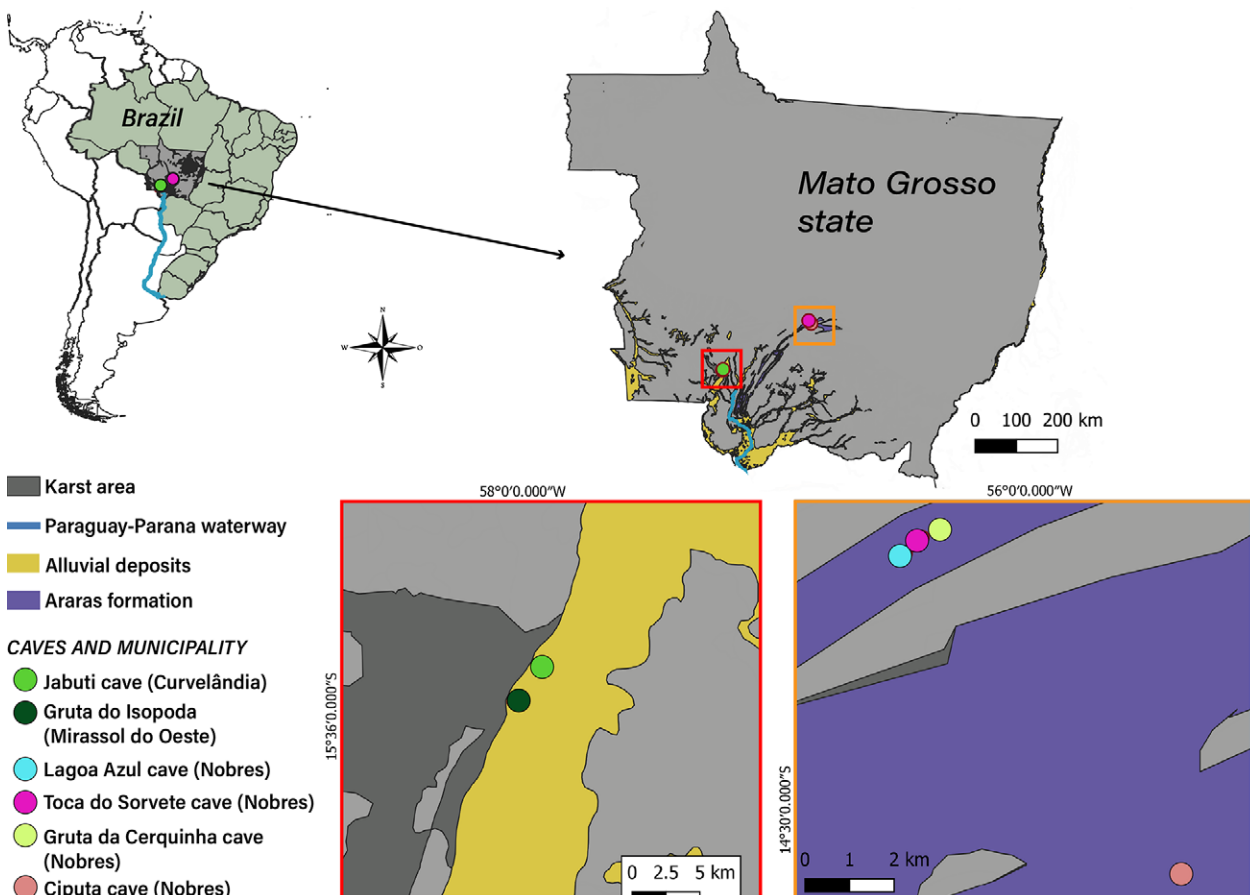


Figure 1. Map showing the location of the studied caves in Mato Grosso state, Brazil.

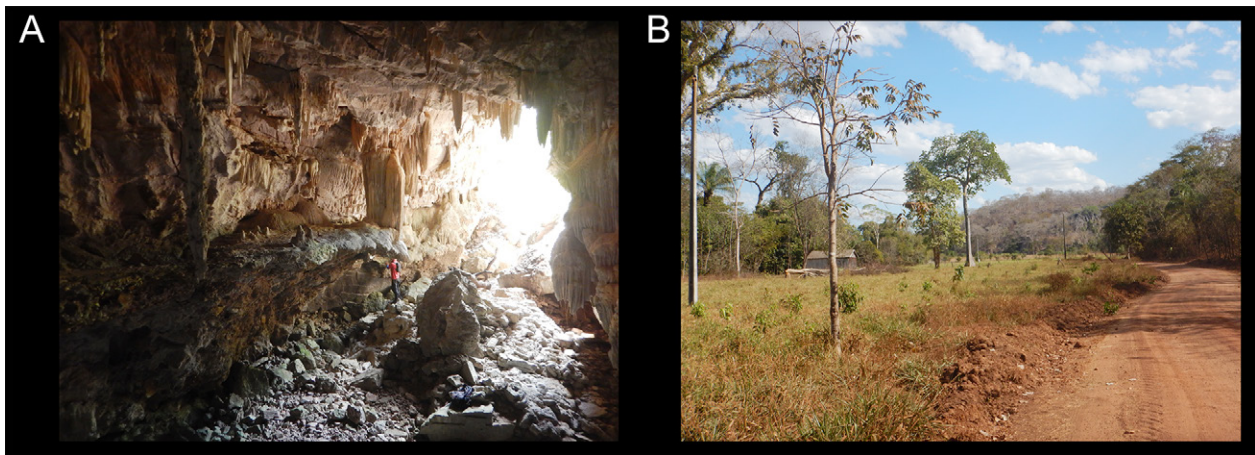


Figure 2. A. Entrance of Gruta da Cerquinha. B. Cerrado domain in the vicinities of the caves, also showing an example of deforestation in the area.

1838) and *Stenogyra octogyra* (L. Pfeiffer, 1856) (family Achatinidae, subfamily Subulininae). These will not be discussed here since they do not represent new records for Mato Grosso state. Further material comprised juvenile or fragmentary shells of Subulininae that could not be identified to species level. Only a few specimens of *Leptinaria unilamellata* and unidentifiable juvenile Subulininae were collected in the caves in Curvelândia and Mirassol do Oeste municipalities.

Results

Family Helicinidae

Helicina fulva d'Orbigny, 1835

Figure 3A–C

New record. BRAZIL • Mato Grosso, Nobres, Gruta da Cerquinha; 29.VII.2018; J.E. Gallão, A. Chagas-Jr. leg.; 1 shell, LES 27955.

This species was previously known from eastern Bolivia and from Maciço do Urucum (Urucum Massif) in Brazil, close to the border with Bolivia (Salvador et al. 2018). The present record extends the species distribution circa 500 km north-northeast.

Identification. The present specimen can be identified by its yellowish helicinid shell (with a white peristome), which has a rounded profile, albeit with a relatively tall spire for the genus, and the spiral sculpture of the teleoconch (Salvador et al. 2018).

Family Streptaxidae

Streptartemon abunaensis (F. Baker, 1914)

Figure 3D–F

New record. BRAZIL • Mato Grosso, Nobres, Toca do Sorvete; 06.V.2015; M.E. Bichuette, A. Chagas-Jr., G.A. Nunes leg.; 2 specimens, LES 27960.

This species has previously been known only known from its type locality in Abunã (Porto Velho municipality, Rondônia state), in the western Amazon (Baker 1914). The report from the city of Abunã, in Mato Grosso

state (Simone 2006) is erroneous, and it should refer to Abunã, likely a confusion regarding the accent in the final letter A of the localities' names. As such, the present record is the actual first one from Mato Grosso, extending the species distribution in Brazil circa 1,050 km southeast and to the Cerrado biome.

Identification. This species can be identified by the faint axial sculpture of the teleoconch and the apertural barriers consisting of a prominent parietal tooth, a palatal tooth close to the aperture's angulation, and a basal tooth (Baker 1914).

Streptartemon decipiens (Crosse, 1865)

Figure 3G–I

New record. BRAZIL • Mato Grosso, Nobres, Caverna Ciputa; 24.IX.2015; M.E. Bichuette, A. Chagas-Jr., D.M. von Schimonsky leg.; 1 shell, LES 27962.

The only previous occurrence records of this species are from the shared border between Bolivia and Brazil (Corumbá municipality, Mato Grosso do Sul state). Salvador et al. (2018) argued that reports from Chile stem from a mistaken type locality and reports from northeastern Brazil could not be confirmed by specimens (thus, likely being misidentifications). The present record, therefore, extends the species distribution circa 500 km north-northeast.

Identification. This species is distinguished (in particular from *S. abunaensis* above) by the slightly larger size of the shell, which has a larger number of whorls, a spire with a step-like profile, and a wider body whorl that is less “displaced” in relation to the columellar axis of the shell (Salvador et al. 2018).

Family Scolodontidae

Systrophia alcidiana Ancy, 1892

Figure 3J–L

New record. BRAZIL • Mato Grosso, Nobres, Caverna Lagoa Azul; 05.V.2015; M.E. Bichuette, A. Chagas-Jr., G.A. Nunes leg.; 4 specimens, LES 27958, 3 shells, LES 27957.



Figure 3. Terrestrial gastropods newly recorded from caves in the region of Nobres municipality, Mato Grosso state, Brazil. **A–C.** *Helicina fulva* d’Orbigny, 1835 (shell height = 3.9 mm, width = 4.7 mm); scale bar = 1 mm. **D–F.** *Streptartemon abunaensis* (F. Baker, 1914) (shell height = 7.4 mm, width = 7.9 mm); scale bar = 2 mm. **G–I.** *Streptartemon decipiens* (Crosse, 1865) (shell height = 8.0 mm, width = 11.4 mm); scale bar = 2 mm. **J–L.** *Systrophia alcidiana* Ancey, 1892 (shell height = 2.0 mm, width = 4.9 mm); scale bar = 1 mm.

Previously, this species was known only from its type locality, Corumbá municipality in Mato Grosso do Sul state (Salvador et al. 2018). Thus, the present record extends the species distribution circa 500 km north-northeast.

Identification. This species can be identified by the delicate axial sculpture of the shell, and the D-shaped aperture bearing small palatal and basal tooth-like protuberances and a prominent parietal fold (albeit less pronounced than in most congeners) (Ancey 1892; Simone 2006).

Discussion

Three of the four species reported here were previously known from the region of Corumbá and Urucum Massif in the state of Mato Grosso do Sul, while *S. abunaensis* was known from the Amazon region in Rondônia state. As such, the present report represents large increments in these species’ geographic distributions, of circa 500 km to the north-northeast in the former cases and over 1,000 km southeast in the latter.

None of the previous records belonged to cave environments, so the present reports are a first for these

species. The fact that *Streptartemon abunaensis* and *Systrophia alcidiana* were collected alive means that these animals actually inhabit caves in the region. The well-preserved shells of the other two species indicate that there was little to no transport involved, so it is reasonable to expect that they too inhabit those caves. Other members of these genera have also been found in caves in other localities in Brazil (Simone and Casati 2013; Salvador et al. 2016, 2017, 2021); *Streptartemon molaris* Simone & Casati, 2013, in particular, is so far only known from a single cave and might be an exclusive troglobitic species (Salvador et al. 2022).

The present report contributes to the knowledge of the geographic distribution and troglomorphic habits of land snails in the Brazilian Midwest (Salvador et al. 2022). Constant improvement of information on species ranges is key to enabling informed protection measures and legislation (Salvador 2019). The study area in Nobres (and beyond) is an important region of limestone caves and is partly protected through the existence of conservation units. However, mining activities, deforestation for livestock farming, and the disorganized growth of ecotourism in the region have been considered threats to animal biodiversity, including in cave environments (Fig. 2B; Guimarães and Zavala 2009; Santos et al. 2011; Gallão and Bichuette 2018). Even so, espeleotourism, as it is called in Brazil, has been singled out as a useful tool for sustainable growth and nature conservation (Guimarães and Zavala 2009; Santos et al. 2018).

The caves of Mato Grosso harbor a singular troglobitic fauna, such as the ground beetle *Coarazuphium auleri* Pellegrini & Vieira, 2021, the spelaeogriphacean *Potiticoara brasiliensis* Pires, 1987 (a relict crustacean clade), and the freshwater planarian *Girardia nobresis* Moraes & Leal-Zanchet, 2021. Besides the cave-restricted (troglobitic) species, several others cave dwellers, troglomorphic and troglomorphic, are currently under study (MEB unpublished data). The new records reported herein, when allied to those previously known, are thus an important piece of information for the protection of these unique habitats.

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Authors' Contributions

Conceptualization: RBS, MEB. Investigation: MEB. Formal analysis: RBS, FSS. Writing – original draft: RBS. Writing – review and editing: FSS, MEB.

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