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Drymaeus ribeiroi (Ihering, 1915) (Gastropoda: Bulimulidae) is a synonym of *Drymaeus nigrogularis* (Dohrn, 1882): reassessment of a poorly known species set in motion by in situ records

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Abstract. Numerous recent records on the citizen-science platform iNaturalist, initially identified by us as *Drymaeus ribeiroi*, prompted a re-evaluation of its taxonomic status and geographic range. A mid-western species from Brazil, *D. ribeiroi* was originally described as a subspecies of the poorly known Amazonian *D. nigrogularis* and later elevated to species rank without stated justification. We reassessed its status through examination of type material, additional museum specimens, and new photographic evidence. Our analysis shows that both nominal taxa are sympatric, share key diagnostic features, particularly the dark-brown pigmentation on the parietal peristome, supporting the treatment of *ribeiroi* as a junior synonym of *nigrogularis*. The iNaturalist records also expand the known distribution of the species across the southern and eastern margins of the Amazon rainforest. The observations of living individuals reveal a distinctly yellow head-foot with potential phylogenetic relevance. The occurrence of the species in both forested and urbanised habitats, and its prevalence within the Amazon "deforestation arc", shows that improved sampling and assessment of its conservation status should be urgently undertaken.

Key words. Amazon, citizen science, Orthalicoidea, taxonomy

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Introduction

Tree snails of the genus *Drymaeus* Albers, 1850 have been a frequent target of taxonomic revisions in recent years (e.g. Breure & Borrero 2019; Macedo *et al.* 2023, 2025; Salvador *et al.* 2023; Breure *et al.* 2024a; Rosa & Salvador 2025; Rosa *et al.* 2025). Encompassing over 300 species, *Drymaeus* has been largely used as a "wastebasket genus" for most of its history, with several species being superficially described and hastily classified into it, often being relegated to taxonomic oblivion afterwards (Rosa & Salvador 2025; Rosa *et al.* 2025). In this context, revisiting the taxonomy of older species of *Drymaeus* is sorely needed to improve our understanding of this genus, as recent examples have shown that many species are riddled with cases of neglected synonymies or require redescription (Rosa & Salvador 2025; Rosa *et al.* 2025; Macedo *et al.* 2025).

Land snails from the Brazilian Amazon are exceptionally poorly known in comparison to the rest of the country (Salvador 2019; Salvador *et al.* 2024). The tree snail *Drymaeus nigrogularis* (Dohrn, 1882) is one such species, known only from its original description and brief mentions in a few catalogues and lists of species (Salgado & Coelho 2003; Simone 2006; Salvador *et al.* 2024). The description was based on a series of specimens, four of which were illustrated, collected in Juruti, state of Pará, northern Brazil (Köhler 2007). A closely related species, *Drymaeus ribeiroi* (Ihering, 1915), was originally described as a subspecies of *D. nigrogularis*

from a more southern location in the Jaurú River valley, Mato Grosso state (Ihering, 1915), and was later reinterpreted as a distinct species (Salgado & Coelho 2003). Only two specimens of the type series of *D. nigrogularis* have been located, and the description of *D. ribeiroi* was based on a single specimen; all these specimens are empty shells (Ihering 1915; Köhler 2007; Pimenta *et al.* 2014).

The examination of several in situ records available on the citizen-science platform iNaturalist, an increasingly consolidated tool for supporting biodiversity research, including studies on terrestrial gastropods (Rosa *et al.* 2022, 2025; Rosa & Salvador 2025), allowed us to identify numerous new occurrences of specimens that we initially identified as *D. ribeiroi*. In addition to providing new biological and geographical information for this species, which we report here, these findings, along with the examination of collection specimens, prompted us to investigate its taxonomy. This ultimately led to a reassessment of its status and relation to *D. nigrogularis*, as discussed below.

Materials and Methods

Specimens studied herein are housed in the collections of the Coleção Malacológica de Ribeirão Preto (Ribeirão Preto, SP, Brazil; **CMRP**), Museu de Zoologia da Universidade de São Paulo (São Paulo, SP, Brazil; **MZSP**), Museu Nacional do Rio de Janeiro (Rio de Janeiro, RJ, Brazil; **MNRJ**), Senckenberg Natural History Museum (Frankfurt, Germany; **SMF**), and Museum für Naturkunde (Berlin, Germany; **ZMB**). Specimens were photographed using a Leica M205C stereomicroscope coupled with a Leica MC170 HD digital camera at the Centro para Documentação da Biodiversidade (Universidade de São Paulo, Brazil). Autofocus images and specimen measurements were obtained digitally and processed with Leica Application Suite X 4.12 imaging software. Measurements are based on mostly undamaged adult specimens. Photographs were edited using Adobe Photoshop CS3.

The geographic range of *D. nigrogularis* was reassessed through the integration of data obtained from the collections cited above, published sources, and records available on the iNaturalist platform (https://www.inaturalist.org/), which provides georeferenced observations supported by photographs of live specimens or empty shells. The iNaturalist observations were independently evaluated by the authors, applying the same validation criteria and procedures adopted by Rosa *et al.* (2022).

The following abbreviations are used throughout the text and figures: **L** = shell length; **sh** = shell; **spm** = specimen (whole animal).

Results

Superfamily Orthalicoidea

Family Bulimulidae

Genus *Drymaeus* Albers, 1850

***Drymaeus nigrogularis* (Dohrn, 1882)**

Figures 1–3

Otostomus nigrogularis Dohrn 1882: 107, pl. 3, figs 10–13.
Bulimulus nigrogularis—Paetel 1883: 144.
Drymaeus nigrogularis—Pilsbry 1898: 225, pl. 42 figs 56–59; Salgado & Coelho 2003: 114; Simone 2006: 140, fig. 464B (fig. 464A in error, see below); Neubert & Janssen 2004: 219, pl. 14 fig. 170; Köhler 2007: 147, fig. 103; Salvador *et al.* 2024: 158.
Drymaeus nigrogularis ribeiroi Ihering 1915: 6. [Syn. nov.]
Drymaeus (*Drymaeus*) *nigrogularis*—Breure 1979: 112.
Drymaeus (*Drymaeus*) *nigrogularis ribeiroi*—Breure 1979: 113.
Drymaeus ribeiroi—Salgado & Coelho 2003: 162; Simone 2006: 142, fig. 470; Nomura 2010: 101; Pimenta *et al.* 2014: 77; Salvador *et al.* 2020: 509.
Drymaeus riberoi [sic]—Salvador *et al.* 2024: 158.

Types. *Drymaeus nigrogularis*: lectotype ZMB 34305; paralectotype SMF 10060. *Drymaeus nigrogularis ribeiroi*: holotype MNRJ 3454.

Type locality. Juruti, Pará state, Brazil; "Juraty", as reported in the original description, was a misspelling according to Ihering (1915).

Material examined. Types. *Additional material*: BRAZIL, Pará: Belém municipality, 01°27′S, 048°29′W, locals col. (ii/2016), MZSP 156020, 3 spm; Jacareacanga municipality, 09°05′46.49″S, 056°37′10.61″W, 0.5 and 3 m high on thick (7–10 cm in diameter) bamboo, A. de Luca col. (23/x/2017), CMRP 860, 12 spm, CMRP 863, 6 sh. Rondônia: Guarajá Mirim municipality, Rio Cabixi, Seringal Barracão do Jorge, 36 km from Foz do Guaporé, 10° 48′S, 065°25′W, S. A. Vanin col. (15–17/v/1976), MZSP 29977, 4 spm. Mato Grosso: Rondonópolis municipality, 16°41′S, 055°43′W, L.C. Silva col. (03/i/1970), MZSP 26438, 1 sh, L.C. Silva col. (07/i/1970), MZSP 26437, 1 sh.

Diagnosis. Shell outline bulimoid, with distinctly laterally dislocated aperture and slightly reflected peristome; sculpture consisting of prosocline axial growth marks, with a slight subsutural constriction; parietal region of peristome invariably dark-brown pigmented; peri-umbilical area demarcated by continuous dark-brown stripe; aperture cream to yellowish (Fig. 1). Head–foot uniformly yellow, transitioning gradually at foot margin to pale grey-beige, sometimes yellowish;

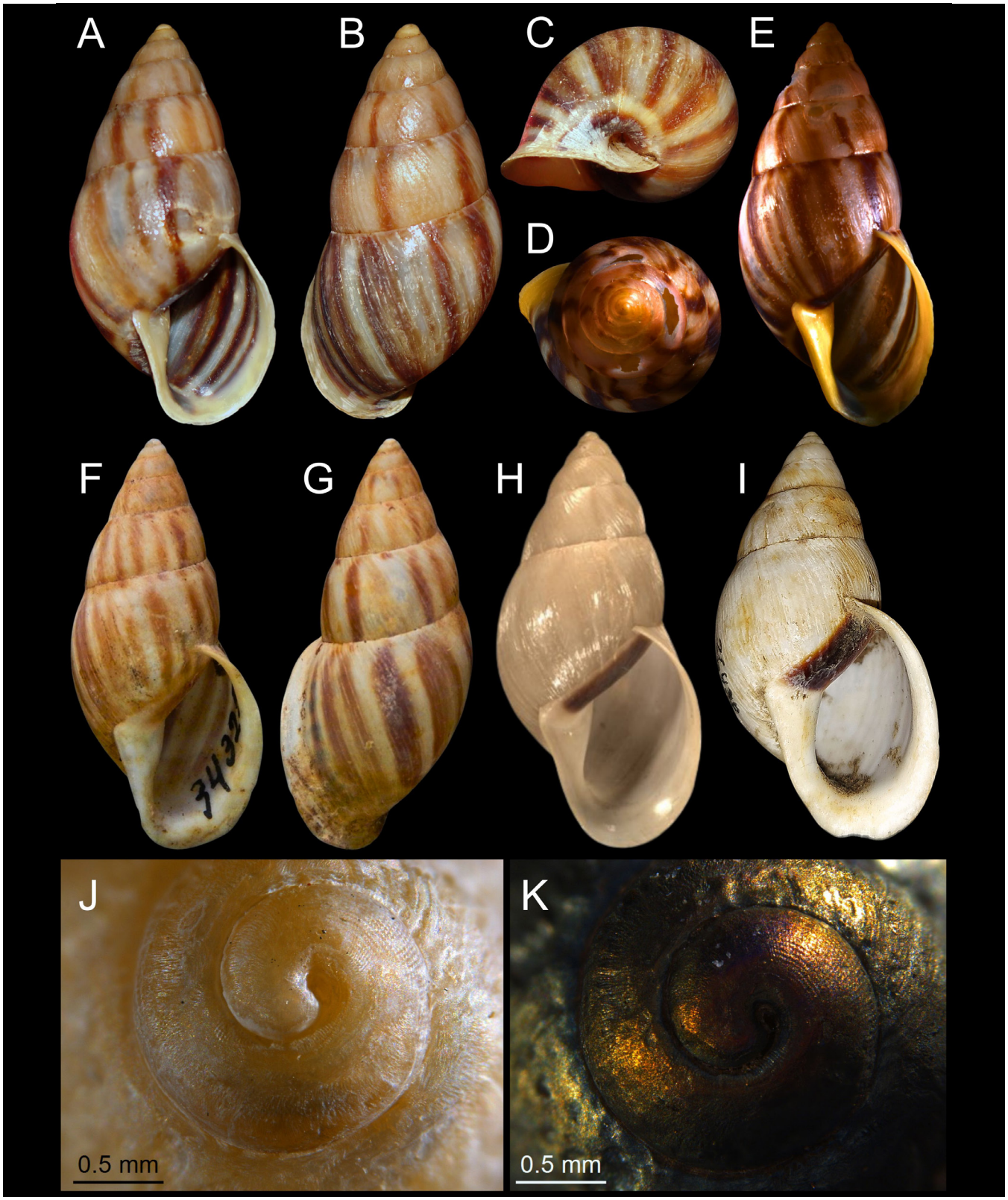

Figure 1. *Drymaeus nigrogularis* shells and type. **A**–**C**, CMRP 860 spm #1, from Jacareacanga: (**A**) apertural view, (**B**) abapertural view, (**C**) umbilical view. **D**, **E**, CMRP 860 spm #2 (L = 31 mm): (**D**) apical view, (**E**) apertural view. **F**, **G**, holotype of *D. ribeiroi*, MNRJ 3454 (L = 35 mm): (**F**) apertural view, (**G**) abapertural view. **H**, syntype SMF 10060, apertural view (L = 31 mm). **I**, MZSP 26438, from Rondonópolis (L = 38.9 mm). **J**, **K**, CMRP 860, spm #3: (**J**) protonch, (**K**) protoconch sputter-coated with gold.

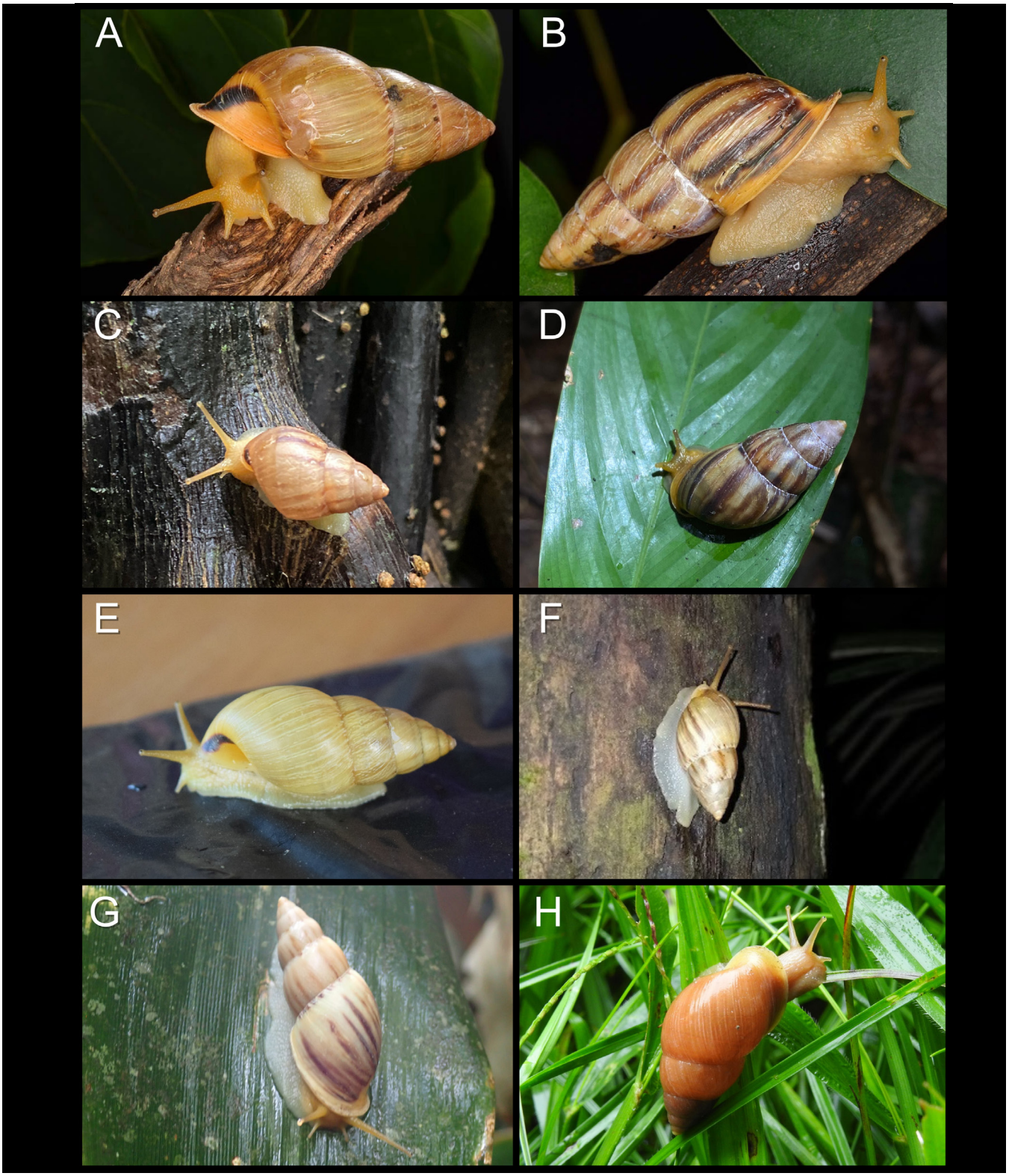

Figure 2. *Drymaeus nigrogularis* specimens in situ, recorded on the iNaturalist platform. **A**, **B**, from Novo Mundo municipality, Mato Grosso (photos by Maurício Uhle). **C**, from Alta Floresta municipality, Mato Grosso (photo by Marysa Machado). **D**, **E**, from Paranaíta municipality, Mato Grosso: (**D**) photo by Esteban Diego Koch, (**E**) photo by Fábio Luis dos Santos. **F**, from Aripuanã municipality, Mato Grosso (photo by Franciele Xingu). **G**, from Ariquemes municipality, Rondônia (photo by Mauro Hoffmann). **H**, from Cacoal municipality, Rondônia (photo by Glauko Corrêa).

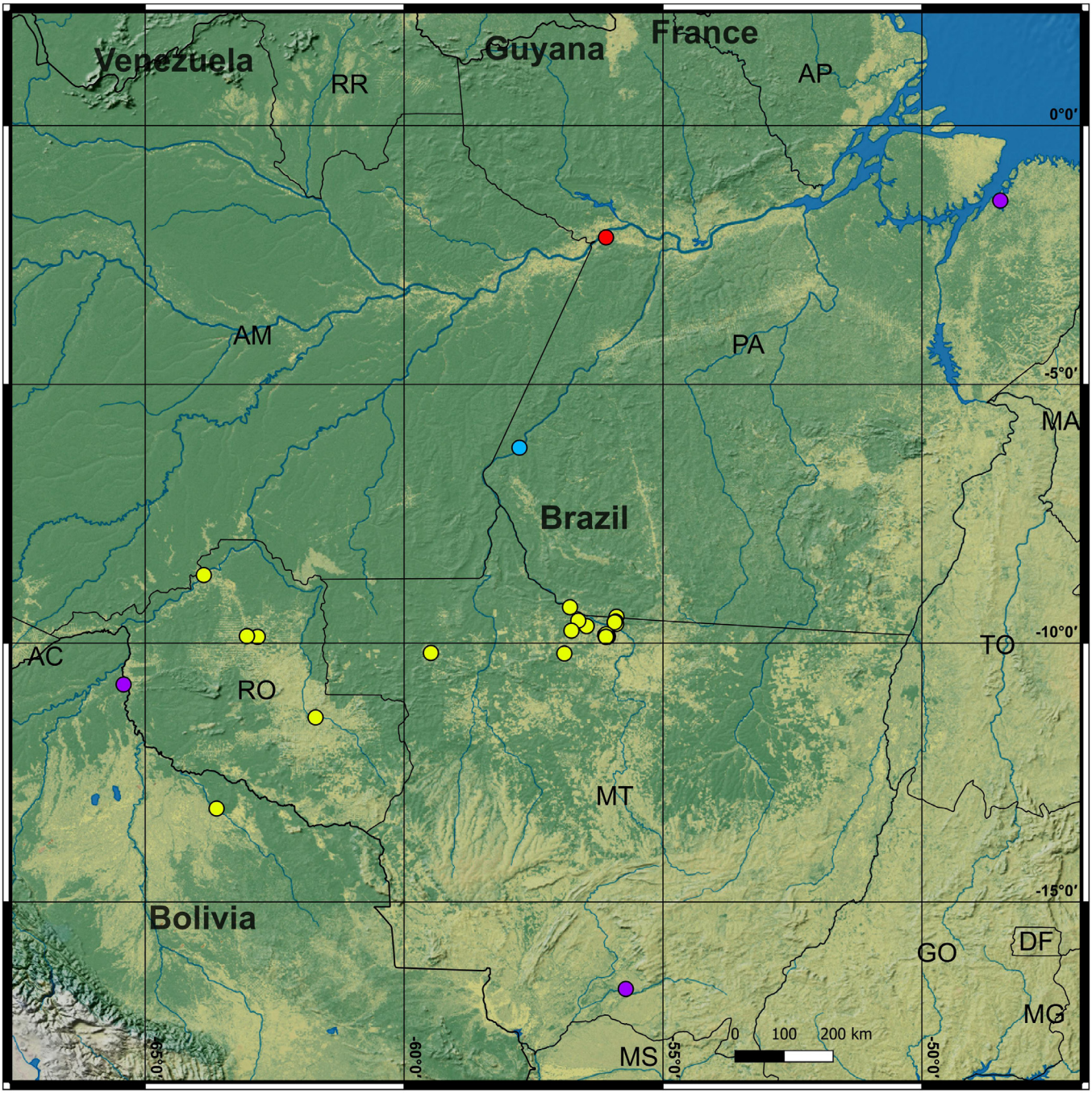

Figure 3. Records of *Drymaeus nigrogularis*. The red dot represents its type locality (Juruti, PA), blue is the record from Salvador *et al.* (2020), purple are the specimens from the MZSP collection, and yellow are the records from iNaturalist analysed herein. The type locality of the synonym *Drymaeus ribeiroi* ("Salto Alegre" at the Jauru river, MT) was not included since it is too vague and matches no current location. State abbreviations: AC: Acre; AM: Amazonas; AP: Amapá; DF: Distrito Federal; GO: Goiás; MA: Maranhão; MG: Minas Gerais; MS: Mato Grosso do Sul; MT: Mato Grosso; PA: Pará; RO: Rondônia; RR: Roraima; TO: Tocantins.

tentacles similar in colour to head (Fig. 2).

Distribution. Widely distributed along the southern and eastern margins of the Amazon rainforest, with records in the states of Pará, Mato Grosso, and Rondônia in Brazil, and El Beni, Bolivia (Fig. 3).

Habitat and ecology. In most observations recorded on

iNaturalist (55% of 88 records), specimens were found active on tree trunks, very often on or near lichens and mosses, which are likely components of their diet, as suggested by observations of related species such as *D. papyraceus* (Mawe, 1823) (Rezende 1975). Individuals were active during both nighttime and daytime, and were recorded in relatively remote and densely vegetated, as well as urbanised areas. Although the ecology of Neotropical land snails is very poorly documented, these observations are consistent with previous studies suggesting that species of *Drymaeus* are typically arboreal (Breure 1979; Rosa *et al.* 2025), but the observations of active snails at daytime are puzzling considering that most land snails are nocturnal (Salvador & Tomotani 2024).

Remarks. The specimen illustrated by Simone (2006: fig. 464A) does not correspond to *D. nigrogularis* but most likely represents *D. germaini* (see Macedo *et al.* 2025). Unfortunately, aside from the material listed herein, the remaining specimens from Dohrn's type series are presumably lost (Köhler 2007). We were unable to locate the type locality of the synonym *D. ribeiroi*, described by Ihering (1915) as "Salto Alegre do Rio Jauru" in the state of Mato Grosso, Brazil. The closest match identified is the Salto Jauru hydroelectric power plant, situated along the Jauru River in the same state, although it remains uncertain whether this site corresponds to Ihering's original "Salto Alegre".

The irregular brown axial stripes frequently observed on the shell whorls, as seen in the typical form of *D. ribeiroi* (Figs 1F, G), appear to vary widely in number and intensity, even among individuals from the same population (e.g. Fig. 2A, B from Novo Mundo; Fig. 2D, E from Paranaíta). Some shells lack these stripes entirely (Figs 1H, I, 2E, H), yet brown pigmentation on the parietal region of the peristome is consistently present, and a brown stripe delimiting the periumbilical area is very commonly observed (Fig. 2C).

The suggested vernacular name for the species is Black-throated Treesnail, which represents a translation of its Latin epithet. In Portuguese, the translated vernacular name would be "caracol-de-garganta-preta".

Discussion

In the original description of *Drymaeus nigrogularis* (as *Otostomus nigrogularis*), Dohrn (1882) commented on intraspecific variation in shell morphology, particularly the slenderness of the spire and the corresponding lateral displacement of the aperture. He also noted the similarity with species such as *Drymaeus geometricus* (L. Pfeiffer, 1846) from Colombia and *Drymaeus xanthostoma* (d'Orbigny, 1835) from Bolivia, which he primarily attributed to the dark pigmentation on the parietal region of the inner lip. The relocation to the genus *Drymaeus* was proposed by Pilsbry (1898), who, beyond this taxonomic reassessment, merely reproduced the information from the original description; this classification has remained the accepted combination ever since.

Drymaeus ribeiroi was originally described by Hermann von Ihering (1915) as a subspecies of *D. nigrogularis*, based on a single empty shell collected during an expedition of the Rondon Commission. The epithet *ribeiroi* honours the Brazilian herpetologist Alípio de Miranda-Ribeiro. In proposing the taxon, Ihering noted its provenance from a locality considerably farther south than Juruti, and he pointed to a slight difference in shell size and the paler pigmentation of the parietal wall of the peristome as characters supporting its subspecific status (Ihering 1915).

Nevertheless, from a conchological perspective, there are no significant distinctions between *Drymaeus nigrogularis* and *D. ribeiroi*. The slight difference in shell length and the purportedly paler parietal pigmentation noted by Ihering (1915) fall within the range commonly observed in other congeners, which may even exhibit far more pronounced variation in outline and colour (e.g. *D. magus*, Rosa *et al.* 2025 and *D. poecilus*, Salvador *et al.* 2018). Examination of the type material of both species, whether the physical specimens or the illustrations provided by Dohrn and more recent catalogues, reveals evident similarities in colouration, shell outline, and, notably, the consistent dark-brown pigmentation on the parietal region of the peristome, which we perceive as diagnostic. Considering the distributional data obtained from iNaturalist records and the specimens examined herein, the status of *D. ribeiroi* as conspecific with *D. nigrogularis* becomes even clearer, and thus, through priority, *D. ribeiroi* should be treated as a junior synonym of *D. nigrogularis* (ICZN 1999; International Code of Zoological Nomenclature, Article 23).

Beyond its shell, the yellowish head-foot of *D. nigrogularis* is a remarkable feature that is also shared by a few other species from the same region, such as *Drymaeus branneri* Baker, 1914 (Breure *et al.* 2024a). Most species of *Drymaeus* and related genera are known only from their shells. Still, recent analysis of the head-foot of living specimens has indicated that characters such as colouration could be diagnostic of certain clades (Breure *et al.* 2024b). Collecting data on the external soft anatomy of land snails is often difficult without living specimens. Nevertheless, data from photography-based citizen science platforms has proven quite useful for this purpose (Rosa *et al.* 2025).

Regarding its distribution, most records of *D. nigrogularis* originate from the peripheral areas of the Amazon rainforest, with iNaturalist observations largely concentrated in anthropized environments (Fig. 3). The scarcity of records from the interior of the forest is likely attributable to insufficient sampling, as land-snail surveys in the Amazon remain markedly incipient (Salvador 2019; Salvador *et al.* 2024). Importantly, the species' currently known range coincides with the most heavily impacted portion of the basin, the so-called "deforestation arc", which has been extensively affected by deforestation and mining activities (Chen *et al.* 2024; Haddad *et al.* 2024). Although the frequent occurrence of some *Drymaeus* species in urbanised areas may indicate a degree of resilience to anthropogenic disturbance (Rosa *et al.* 2025), this pattern cannot yet be generalised to *D. nigrogularis*. At present, it remains unclear how far into the forest the species occurs, and any inference regarding its broader distribution will require substantially more sampling efforts. Given current knowledge, the scenario raises legitimate concerns about the conservation status of *D. nigrogularis*, and targeted ecological and biogeographical studies should be carried out in the future.

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