

Stapafurdus, a new genus of Bulimulidae (Mollusca, Eupulmonata) from Bahia, Brazil, with two new species

Luiz Ricardo L. Simone¹

¹ Universidade de São Paulo (USP), Museu de Zoologia (MZUSP). São Paulo, SP, Brasil.
ORCID: <http://orcid.org/0000-0002-1397-9823>. E-mail: lrsimone@usp.br

Abstract. The new genus *Stapafurdus* **gen. nov.** is introduced collected from Bahia, Brazil, including two new species: *S. glaber* **sp. nov.**, the type species, occurs in Ibicoara; and *S. costiferus* **sp. nov.**, from Andaraí regions. The new genus includes species of about 10 mm, elongated shell, reticulated protoconch, elongated peristome, and wide umbilicus. Both species differ mainly by the sculpture, as *S. glaber* **sp. nov.** is smooth, while *S. costiferus* **sp. nov.** has strong axial sculpture.
<http://zoobank.org/C851695E-6BF1-4418-8D8A-8BC7D10CC2FE>.

Keywords. Taxonomy; Faunistic survey; Morphology; Malacology.

INTRODUCTION

Recent expedition of the collection team of the naturalist José Coltro in calcareous regions from Minas Gerais and Northeast Brazil has brought to light a quantity of new samples, promoting expansions on the geographic distribution of known species, as well as several new taxa (e.g., Simone, *in press*). This operation is presently facilitated by complete inventories of the Brazilian continental malacofauna (Simone, 2006; Birckolz *et al.*, 2016), in which new taxa can easily be detected.

The present paper refers to samples collected in the central Bahia region, in a semi-dry environment, for which the analysis revealed to belong to a new genus, formally described herein. Two new species are easily detected, one from the Andaraí, and the other from the Ibicoara municipalities.

As the samples are composed only of shells, no information on the internal anatomy is so far possible. However, the shells are informative enough to base the taxonomical analysis. Some doubt, however, remains in the family attribution, an issue stressed in the Discussion section.

MATERIAL AND METHODS

The samples were donated dry and deposited in the malacological collection of the Museu de Zoologia da Universidade de São Paulo (MZSP). The specimens were carefully examined under stereomicroscopes and digitally photographed by Nikon

and Canon cameras, as well as by AxioCam ERc5s coupled in the microscope. All images were processed in the Corel software, mainly PhotoPaint®, and by AxioVision multifocal software. A pair of young specimens were selected for Scanning Electron Microscopy; they were covered by gold and examined by ordinary methods, with main concern to the protoconch sculpture. The list of material examined is the type material mentioned in each species description. Most of the generic definition used in the Discussion was based on Pilsbry (1897-1898), beyond the indicated references.

RESULTS

Systematics

Stapafurdus, new genus

<http://zoobank.org/62317493-2B7C-47F5-B55B-3EAA45EA79E4>

Diagnosis: Shell of ~ 10 mm, relatively elongated, length ~ 3 times width. Color beige with irregular brown spots. Suture well marked. Protoconch mostly sculptured by with delicate net of spiral and axial lines forming aligned squared concave pits, ~ 2.5 whorls. Teleoconch ~ 4-5 whorls. Peristome weakly dislocated externally, weakly deflected, antero-posteriorly elongated (~ twice longer than wide). Umbilicus opened, flanked by middle region of inner lip.

Gender: Masculine.

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<http://www.revistas.usp.br/paz>

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Etymology: The name is the Latinization of the Portuguese word “estapafúrdio”, meaning something weird, strange or nonsense, an allusion to the strange shape of the shell.

List of included taxa: *Stapafurdus glaber* sp. nov. (type species); *S. costiferus* sp. nov.

***Stapafurdus glaber* sp. nov.**
(Figs. 1-12, 24-26)

<http://zoobank.org/B21ABE18-E5FE-4B08-AC63-FA4B51085F64>

Types: Holotype MZSP 154048 (Figs. 1-6). Paratypes MZSP 153803, 5 shells, MZSP 154047, 9 shells (Figs. 7-8, 11-12), from type locality.

Type locality: BRAZIL. **Bahia:** Ibicoara; Ituaçu, Tanhaçu, 13°55'23"S, 41°16'35"W [Wesley Vailant col., iii/2021] (Fig. 30).

Etymology: The specific epithet is from Latin *glaber*, meaning smooth, an allusion to the lack of the shell sculpture.

Diagnosis: Shell rather conic, sculpture missing except for growth lines.

Description

Shell: About 10 mm, elongated, slightly turritiform; width ~ 36% of length. Spire angle ~ 30°, growth increasing relatively uniformly, except for peristome slightly dislocated externally. Color pale beige, with small, punctiform brown spot, of apparent random distribution, coalescent in some regions forming irregular axial bands (Figs. 1, 3, 7, 11). Protoconch (Figs. 5, 12, 25, 26) of 2.2 whorls, width 1.2 mm; whorls relatively rounded, suture deep; sculpture delicate net of spiral and axial lines, equally predominating, uniform, easily eroded (Fig. 5); ~ 45% of shell width, ~ 8% of shell length; transition with teleoconch relatively clear, prosocline, ~ 20° in relation of longitudinal axis (Figs. 25, 26). Teleoconch of ~ 4 whorls, suture relatively shallow, but well-marked; transverse section rounded (Fig. 6); growth relatively uniform, except for peristome, slightly dislocated externally to right. Sculpture missing, except for growth lines and scanty axial undulations (Fig. 26); surface relatively glossy, small regions of dark spots with weak depression (Figs. 3, 8, 10). Aperture antero-posteriorly elongated, width ~ 40% of length (Figs. 1, 7, 9); peristome slightly prosocline, ~ 10% in relation to longitudinal axis (Figs. 2, 4); outer lip straight in middle, curved in both ends; anterior edge rounded; inner lip relatively similar to outer lip, attached to last whorl only in its superior third, sometimes producing low callus (Figs. 1, 9), sometimes planar (Fig. 7). Umbilicus opened (Fig. 4), protected on right side by middle region of inner lip (Figs. 1, 7, 9). Immature specimen bulimuliform (Figs. 11, 24).

Habitat: Caatinga and dry Atlantic Rainforest, ~ 500 h high.

Distribution: Only known from type locality.

Measurements (in mm): Holotype MZSP 154048 (Figs. 1-6): 10.5 by 4.1; MZSP 154047 #1 (Figs. 7-8): 10.2 by 4.6; #2: 11.3 by 4.0; #3 (Figs. 11-12): 7.5 by 3.9; Paratype MZSP 153803 #1 (Figs. 9-10): 11.0 by 4.1.

Material examined: Types.

***Stapafurdus costiferus* sp. nov.**
(Figs. 13-23, 27-29)

<http://zoobank.org/4AEDCA60-4A2A-4F04-9CC4-6517F1303B78>

Types: Holotype MZSP 154046 (Figs. 13-18, 21). Paratypes MZSP 153882, 3 shells from type locality (Figs. 19-20, 22-23).

Type locality: BRAZIL. **Bahia:** Andaraí, Ubiraitá, 12°35'23"S, 41°00'26"W [Wesley Vailant col., iii/2021] (Fig. 30).

Etymology: The specific epithet means “bearing ribs” in Latin, an allusion to the shell axial sculpture.

Diagnosis: Shell rather cylindrical, sculpture strong axial cords.

Description

Shell: About 12 mm, elongated, slightly turritiform; width ~ 30% of length. Spire angle initially ~ 25°, becoming almost cylindrical in two last whorls, *i.e.*, growth increasing relatively uniformly in first 3-4 whorls, gradually becoming same-sized in two last whorls, except for peristome slightly dislocated externally. Color pale beige, with relatively wide, sparse, brown spots, of apparent random distribution (Figs. 13-15, 22). Protoconch (Figs. 18, 23, 28, 29) of 2.5 whorls, width 1.1 mm; whorls relatively rounded, suture deep; sculpture delicate net of spiral and axial lines, equally predominating, uniform, easily eroded (Fig. 18); ~ 30% of shell width, ~ 5% of shell length; transition with teleoconch relatively clear, prosocline, ~ 20° in relation of longitudinal axis (Figs. 28, 29). Teleoconch of ~ 5 whorls, suture relatively shallow, but well-marked; transverse section rounded (Fig. 17); peristome dislocated externally to right, from slightly (Figs. 19-20) to well-dislocated (Figs. 13, 15). Sculpture uniform axial cords, ~ 20 in penultimate whorl; each cord well-marked, from suture to suture (except for short region preceding superior suture) (Fig. 27); cords interspaces equivalent to double of cords width; interspaces with aligned minute dots parallel to cords (Figs. 21, 28); in last whorl sculpture similar to other regions, contouring inferior last whorl region, fading inside umbilicus (Figs. 13, 16, 20). Aperture antero-posteriorly elongated, width ~ 40% of length (Figs. 13, 20); peristome slightly prosocline, ~ 10% in relation to longitudinal axis (Fig. 14); outer lip straight in middle, curved in both ends; anterior edge rounded; inner lip relatively similar to outer lip,

attached to last whorl only in its superior third, sometimes producing low callus (Figs. 20), sometimes planar (Fig. 13). Umbilicus opened (Fig. 16), protected on right side by middle region of inner lip (Figs. 13, 20). Immature specimen subulniform (Figs. 22, 27).

Habitat: Caatinga and dry Atlantic Rainforest, ~ 575 h high.

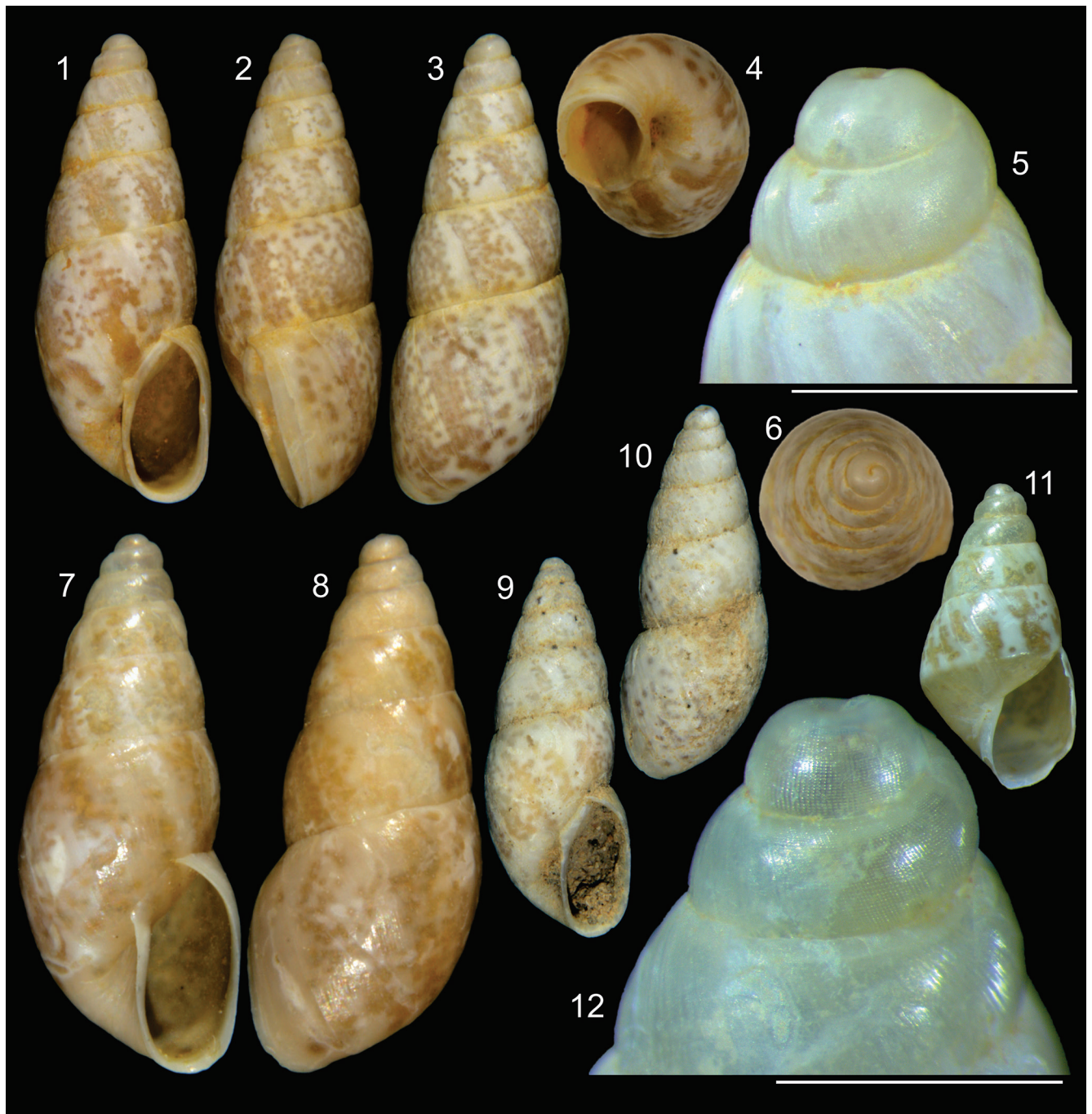
Distribution: Only know from type locality.

Material examined: Types.

Measurements (in mm): Holotype MZSP 154046 (Figs. 13-18, 21): 12.0 by 3.6; Paratypes MZSP 153882 #1 (Figs. 19-20): 11.1 by 3.5; #3 (Figs. 22-23): 9.8 by 3.0 mm.

DISCUSSION

There is almost no doubt that *Stapafurdius* **gen. nov.** is a new genus, as nothing similar exists in South America. The most similar genera are discussed below. The main problem is, however, to attribute a family to the new



Figures 1-12. *Stapafurdius glaber* **sp. nov.**, shell of types. (1-6) Holotype MZSP 154048 (L 10.5 mm). (1) frontal view. (2) right view. (3) dorsal view. (4) inferior view. (5) protoconch and first teleoconch, profile, scale = 1 mm. (6) apical view. (7-8) paratype MZSP 154047#1 (L 10.2 mm), frontal and dorsal views. (9-10) paratype MZSP 153803#1 (L 11.0 mm): frontal and dorsal views. (11-12) paratype MZSP 154047#3, immature shell (L 7.5 mm), (11) frontal view. (12) detail of protoconch and first teleoconch whorl, profile, scale = 1 mm.

genus. Tentatively it has been considered Bulimulidae. However, this family has recently suffered radical changes, mostly based on molecular approaches (e.g., Breure *et al.*, 2010; Breure & Romero, 2012; Bouchet *et al.*, 2017). However, these changes have not been accompanied by efforts to provide visible diagnostic features to the taxa, precluding the analyses of taxa lacking molecular known sequences. Those papers (and references therein), however, are good bases for showing how weak is the orthalicoidan systematics, that some of considered genera are clearly polyphyletic, and they need to be divided. The introduction of new genera appears inevitable. The general bulimuloid shape of *Stapafurdus* **gen. nov.**, and the

peristome lacking teeth are the main reasons for considering it a bulimulid. However, as reported below, some of the genera that need to be compared by their conchological similarity belong to other orthalicoidan families.

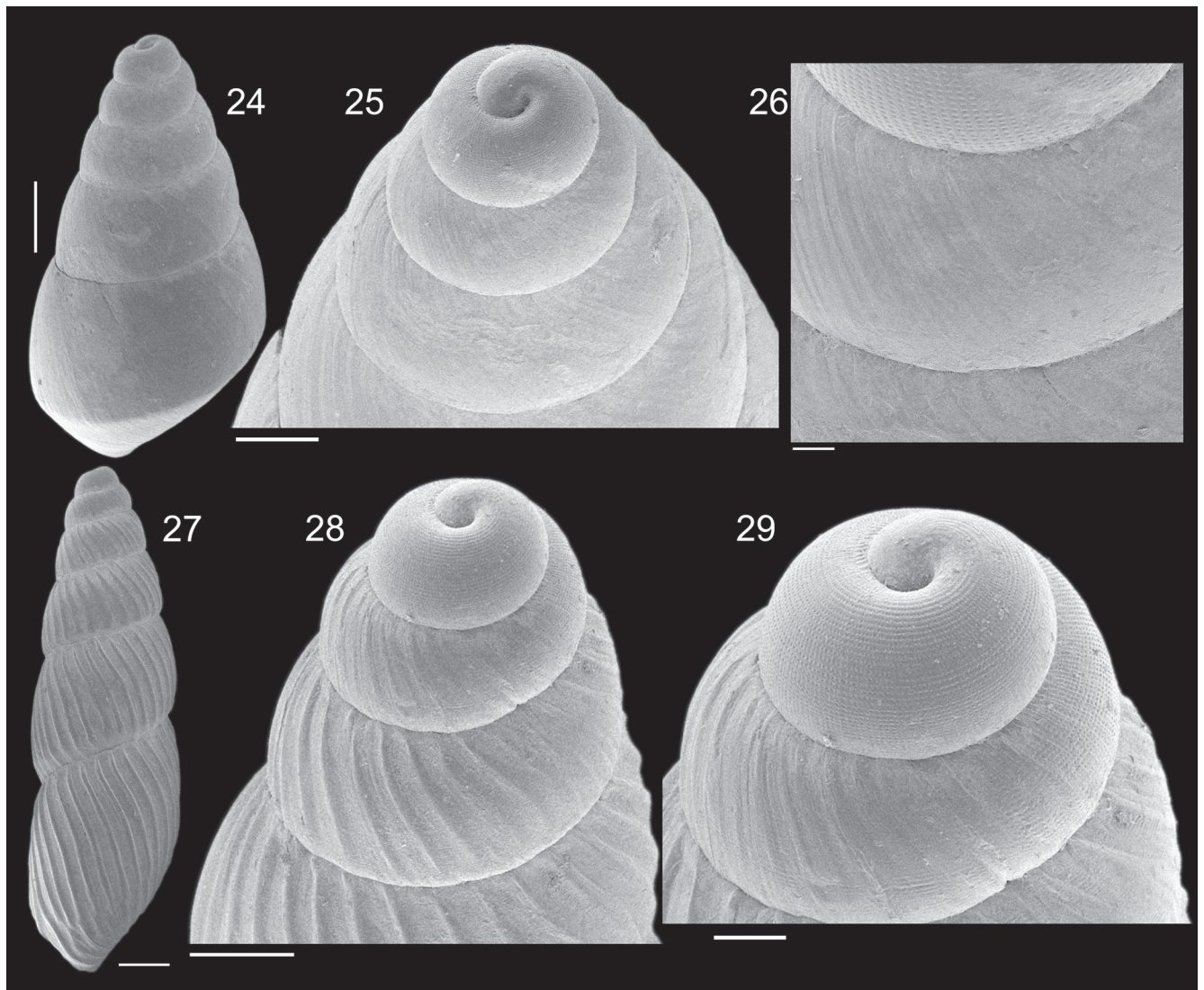
The last whorl of *Stapafurdus* **gen. nov.**, having an umbilicus and antero-posteriorly elongated peristome, is similar to *Anctus* Martens, 1860 (Simone, 2006: 173), considered a bulimulid or orthalicid, but it differs by the elongated spire and outline, and pale protoconch, as *Anctus* has obese shell, with dark, not-sculptured protoconch. Elongated peristomes are also found in some species of *Moricandia* Pilsbry & Vanatta, 1898 (Simone, 2006: 171-172), odontostomid, from which *Stapafurdus*



Figures 13-23. *Stapafurdus costiferus* **sp. nov.**, shell of types. (13-17) Holotype MZSP 154046 (L 12.0 mm). (13) frontal view. (14) right view. (15) dorsal view. (16) inferior-slightly left view. (17) apical view. (18) protoconch and first teleoconch, profile, scale = 1 mm. (19-20) Paratype MZSP 153882#1 (L 11.1 mm): dorsal and frontal views. (21) holotype, detail of sculpture of penultimate whorl, scale = 1 mm. (22-23) paratype MZSP 153882#3 (L 9.8 mm). (22) frontal view. (23) protoconch and first teleoconch, profile, scale = 1 mm.

gen. nov. differs in being much smaller, less elongated, and by the opened umbilicus; the elongated peristome of *Moricandia* actually is oblique, while that of *Stapafurdus gen. nov.* is longitudinal; the protoconch of *Moricandia* has a similar sculpture as *Stapafurdus gen. nov.*, but *Stapafurdus gen. nov.* differs in having the sculpture still more delicate, and in having rounded whorls, while *Moricandia* has a blunt middle carina, keeping the apex rather umbilicated. The tall spire, the elongated peristome, the opened umbilicus, and the pigmentation also differ *Stapafurdus gen. nov.* from *Bulimulus* Leach, 1814, *Protoglyptus* Pilsbry, 1897, both bulimulid, and from *Rhinus* Martens, 1860, simpulopsid (Simone, 2006, and references therein; Breure & Romero, 2012). *Rhinus* and *Bulimulus* also have reticulated protoconchs, however their sculpture is rougher and slightly more irregular. The odontostomid subgenus *Ventania* Parodiz, 1940, also has species with elongated outline, and peristome lacking teeth, however, the elongated peristome and the opened umbilicus differ *Stapafurdus*

gen. nov. from it. From the odontostomid *Clessinia* Döring, 1875, *Stapafurdus gen. nov.* differs in having the elongated peristome, the opened umbilicus, lack of palatal tooth in the peristome, and by more delicate protoconch sculpture, as *Clessinia* has clear predominance of strong axial cords. From the odontostomid *Spixia* Pilsbry & Vanatta, 1898, *Stapafurdus gen. nov.* differs by the elongated peristome (*Spixia* has a rounded one), in lacking peristome teeth (all *Spixia* have strong teeth in the aperture), by the cylindric anterior portion (*Spixia* has a continuous shell increment), and by the reticulated protoconch (*Spixia* has only strong axial cords as protoconch sculpture). From the odontostomid *Bahiensis* Jousseau, 1877, *Stapafurdus gen. nov.* mainly differs by the external position of the peristome, dislocated because of the ample umbilicus, while *Bahiensis* has the peristome centrally positioned, practically lacking umbilicus; besides, *Bahiensis* has the peristome widely expanded, while *Stapafurdus gen. nov.* almost lack expansions; similarly, *Stapafurdus gen. nov.* has resem-



Figures 24-29. *Stapafurdus gen. nov.* young shell SEM images. (24) *S. glaber* sp. nov. paratype MZSP 154047, whole dorsal view, scale = 1 mm. (25) same, detail of apical region, dorsal-slightly apical view, scale = 500 μm. (26) same, detail of transition protoconch-teleoconch, scale = 100 μm. (27) *S. costiferus* sp. nov. paratype MZSP 153882, whole dorsal view, scale = 1 mm. (28) same, detail of apical region, dorsal-slightly apical view, scale = 500 μm. (29) same, detail of protoconch and first teleoconch whorl, scale = 200 μm.



Figure 30. Map of Brazil with states outlined. Bahia indicated by "BA", with indication of places of occurrence of *Stapafurdus glaber* **sp. nov.** (1 = Ituaçu) and of *S. costiferus* **sp. nov.** (2 = Ubitaitá).

blance of the protoconch sculpture of *Bahiensis*, despite being really more delicate; also, some *Bahiensis* have tooth-lacking peristome, but the peristome is always expanded, mainly anteriorly, which is not observed in *Stapafurdus* **gen. nov.** Two other bulimulid genera looks closer to *Stapafurdus* **gen. nov.**: *Drymaeus* Albers, 1850 and *Bostryx* Troschel, 1847. *Stapafurdus* **gen. nov.** differs from *Drymaeus* in having much smaller size (typical *Drymaeus* are ~ 30 mm), elongated outline (while *Drymaeus* have a clear bulimuloid shape), and elongated peristome; the protoconch of *Stapafurdus* **gen. nov.** differs in being much smaller and by the delicate sculpture, the protoconch of *Drymaeus* also has reticulate sculpture, but more robust, with stronger axial and spiral lines; additionally, typical *Drymaeus* lack or have pressed umbilicus. *Bostryx* is a genus occurring in the Andean region and near the Pacific coast of South America (no *Bostryx* occurs in Brazil – Pilsbry, 1898; Simone, 2006), and has a wider range of shapes and protoconchs; some species also have elongated shape, and some are even slightly cylindrical, however, their peristome are never elongated; their protoconchs vary from smooth to reticulated, however, even the reticulated forms do not have a so delicate sculpture like that of *Stapafurdus* **gen. nov.**; the elongated forms of *Bostryx* usually have deep suture, so much that some species have scalariform last whorl. No other orthalicoidean genus can be somehow confused with *Stapafurdus* **gen. nov.** Focusing the protoconch of *Stapafurdus* **gen. nov.**, it looks the single genus with so delicate sculpture, constituted of squared aligned pits, instead of being composed of minute axial and spiral lines like the other orthalicoideans that possess reticulated protoconchs.

The elongated peristome, based on the experience in collecting *Anctus*, is related to the habit of the snail to dovetail it in narrow dry bushes, very common in

Northeast Brazilian region. The animal can, thus, hibernate during the dry season. The elongated peristome does not appear a defense mechanism, which more usually is the presence of teeth (Simone, 2018).

The protoconch of *Stapafurdus* **gen. nov.** is similar to most bulimulid and allied genera, in having the delicate net of spiral and axial lines equally predominating. The main exclusivity is the paucispiral condition (slightly more than 2 whorls) while most genera have more than 3 whorls.

Both *Stapafurdus* **gen. nov.** species easily differ from each other by the shell sculpture, as *S. glaber* **sp. nov.** is smooth (Figs. 1-3), while *S. costiferus* **sp. nov.** has strong axial sculpture (Figs. 13-15). Additionally, *S. costiferus* **sp. nov.** has slightly more elongated outline (width ~ 30% of length, against ~ 36% of *S. glaber* **sp. nov.**), and its protoconch is slightly longer, 2.5 whorls (against 2.2 of *S. glaber*), despite being slightly smaller (1.1 mm, against 1.2 mm of *S. glaber* **sp. nov.**).

The genus *Stapafurdus* **gen. nov.** so far appears to be endemic to the central Bahia dry region (Fig. 30). This present discovery joins several recent ones describing new species and even new genera (e.g., Simone, 2013, *in press*; Simone & Oliveira, 2021; Simone & Salvador, 2021), showing how weak is the knowledge on the Brazilian malacofauna. Possibly protective efforts must be implemented to preserve such species and environments. The proper description of the fauna is a first step.

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