



A new species of *Megalobulimus* (Gastropoda, Strophocheilidae) from Brazilian shell mounds

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ABSTRACT

An interesting new species of pulmonate land snail was collected in two shell mounds, Figueirinha II and Jabuticabeira II, from Jaguaruna municipality, Santa Catarina, Brazil. It is described here as *Megalobulimus jaguarunensis* sp. nov., and can be identified by its small, slightly dorsoventrally compressed, slender shell, with an elongate outline, markedly prosocline aperture and conspicuous oblique fold, as well as a protoconch sculptured by a series of strong, moderately-spaced, prosocline axial ribs.

Keywords: Jaguaruna; *Megalobulimus jaguarunensis* sp. nov.; sambaqui; Santa Catarina.

INTRODUCTION

Megalobulimus Miller, 1878 is an endemic South American pulmonate snail genus that occurs in tropical and subtropical latitudes, from Colombia to Argentina (BEQUAERT 1948). It includes 83 described species, 62 of which can be found in Brazil (SIMONE 2006; SIMONE 2012; BORDA & RAMÍREZ 2013). *Megalobulimus* (while still a subgenus of *Strophocheilus* Spix, 1827) was characterized by Bequaert (1948) as having a nepionic shell sculpture composed of axial riblets. Subsequently, Leme (1973) defined diagnostic anatomical characters of Megalobuliminae, such as an intestine with a pre-rectal valve, absence of a primary ureter, pulmonary chamber bearing a septum, and presence of buccal fringes.

Several *Megalobulimus* species were used by Paleoamericans in a wide variety of ways, either by employing shells to fabricate ornaments and tools, or meat as a food source (LEME 1975; SOLÁ & JOKL 1978). Not by coincidence, *Megalobulimus* shells are commonly found in Brazilian archaeological sites, such as shell mounds, locally known as *sambaquis* (PROUS 1992; EGGERS *ET AL.* 2011). There are over a thousand documented shell mounds in Brazil, some of which may date back to 8,500 yBP. Most were discovered along coastal regions, where environmental conditions and local biodiversity probably favored such settlements (EGGERS *et al.* 2011).

In July 2014, an archaeological campaign of the Museu de Arqueologia e Etnologia da Universidade de São Paulo (MAE-USP) recovered empty shells of a new species of *Megalobulimus* from two southern Brazil shell mounds: Figueirinha II and Jabuticabeira II, both located in Jaguaruna municipality, Santa Catarina state. This new species is formally described and illustrated herein.

MATERIAL AND METHODS

The Figueirinha II shell mound belongs to a cluster of homonymous mounds built between the coastline and the paleolagoon at a time when the sea level was higher than today. The only dating was held in neighboring Figueirinha III, now destroyed, and was estimated at 4,240 yBP (DeBlasis *et al.* 2007). The Jabuticabeira II shell mound is situated on the flank of a paleodune, 1 km away from the southwest margin of Garopaba do Sul lagoon and ca. 6 km from the sea. Though the recent construction of a road that crosses the mound caused considerable damage, much of it still remains. It is one of the most studied Brazilian mounds, and data obtained so far indicate a continuous occupation between 2,880 and 1,800 yBP (Bianchini *et al.* 2011).

Specimens studied herein are dry adult shells found in two distinct locations: in the Jabuticabeira II mound, among debris along the edges of the recently build road, and in a lower portion of Figueirinha II, buried ca. 10 cm deep in the superficial substrate. Additional samplings aiming at finding live specimens or even recent empty shells were conducted in the neighboring areas by the senior author during the same expedition, but proved fruitless. All samples are deposited in the malacological collection of the Museu de Zoologia da Universidade de São Paulo (MZSP). Measurements were obtained with a digital caliper. Abbreviations used for shell measurements: H, shell height; D, shell greatest width; S, spire length (excluding aperture); S', spire length (excluding body whorl); h, aperture height; d, aperture width.

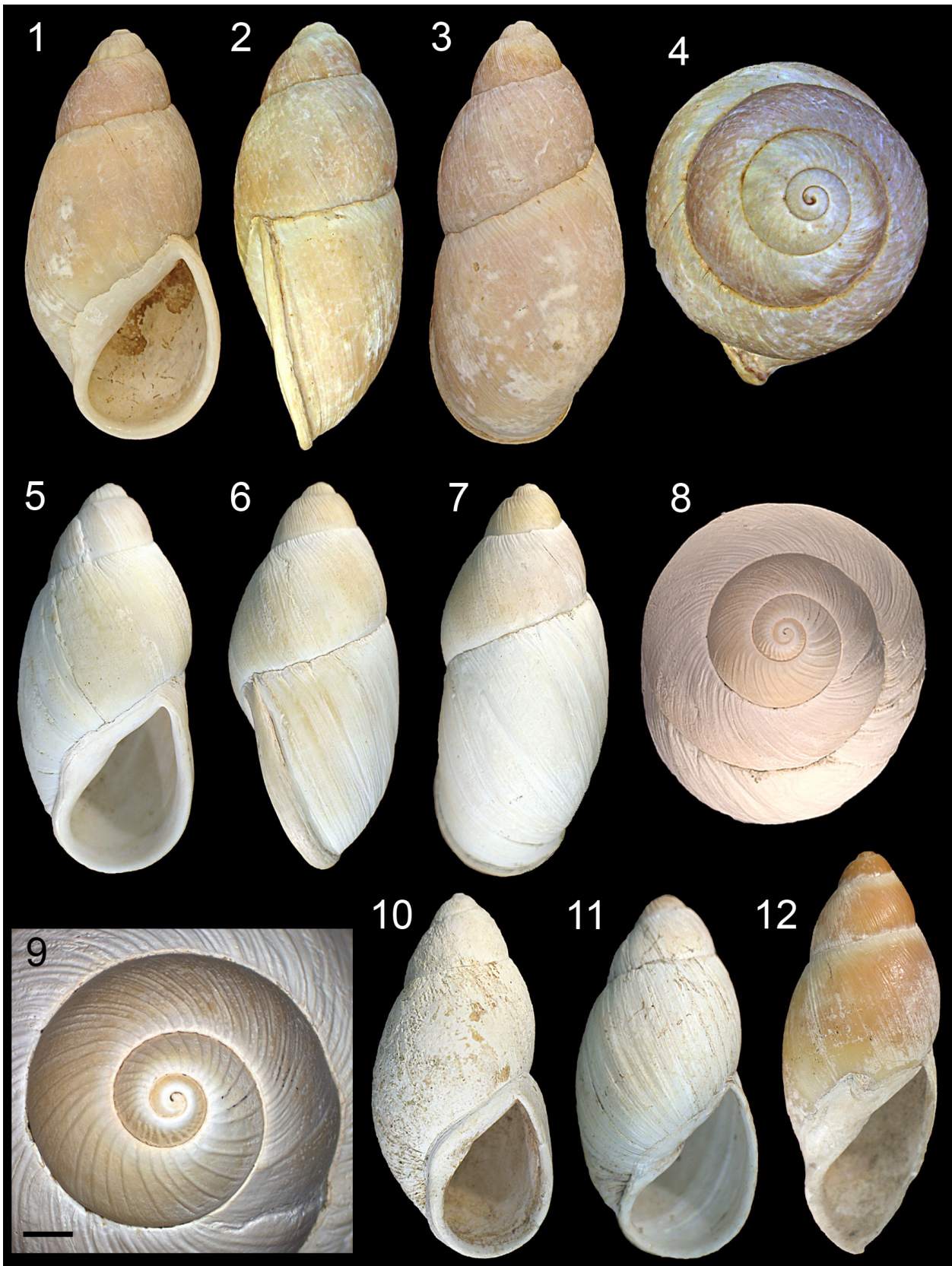
SYSTEMATICS

Megalobulimus jaguarunensis sp. nov.

(Figs 1–12, 20)

Type specimens: Holotype MZSP 118302. Paratypes: MZSP 117000, 1 shell, 117026, 1 shell, MZSP 118298, 1 shell, MZSP 118299, 1 shell, MZSP 118300, 1 shell, MZSP 118301, shell, all from type locality; MZSP 117027, 1 shell, from Jabuticabeira II shell mound, Jaguaruna municipality, Santa Catarina, 28°35'253 S 48°57'2363 W.

Material examined: Types. Additional material: *M. abbreviatus*: Paratype MZSP 14612, Brazil, Rio Grande do Sul, 1 shell; MZSP 118304, Brazil, Jaguaruna, Figueirinha I shell mound, 5 fragmented shells (J.H. Fontenelle col., vii/2014). *M. elongatus*: Paratype MZSP 14609, Paraguay, 1 shell. *M. globosus*: MZSP 56772, Brazil, Rio Grande do Sul. *M. granulatus*: MZSP 15729, Brazil, Santa Catarina, Blumenau, 2 shells (Luederwaldt col., vii/1919). *M. haemastomus*: MZSP 64511, Uruguay, 6 shells. *M. iheringi*: Topotype MZSP 1309, Rio Grande do Sul, Taquara do Novo Mundo, 1 shell (H. Ihering col.). *M. musculus*: Paratype MZSP 14611, Paraguay, Villarrica, 1 shell. *M. pygmaeus*: MZSP 29221, Brazil, São Paulo, Ourinhos, 10 shells (L. Takaku col., ii/1983). *M. sanctipauli*: MZSP 7980, Brazil, Paraná, (H. Ihering col., 1900). *M. toriii*: Holotype MZSP 16649, São Paulo, Iguape,



Figures 1–12: *Megalobulimus jaguarunensis* sp. nov. **1-4:** Holotype MZSP 118302, from Figueirinha II; **1.** apertural view (H = 60.3 mm); **2.** right view; **3.** dorsal view; **4.** apical view (D = 28.8 mm). **5-9:** Paratype MZSP 117000, from Figueirinha II; **5.** apertural view (H = 56.2 mm); **6.** right view; **7.** dorsal view; **8.** apical view (D = 26.4 mm); **9.** protoconch detail (bar = xx mm). **10:** Paratype MZSP 117026, from Figueirinha II, apertural view (H = H = 62.3 mm). **11:** Paratype MZSP 118298, from Figueirinha II, apertural view (H = H = 54.2 mm). **12:** Paratype MZSP 117027, from Jabuticabeira II, apertural view (H = 62.7 mm).

1 shell (F.L. Morretes col., iv/1937). *M. yporanganus*: Holotype MZSP 64144, Brazil, São Paulo, Iporanga, 1 shell (R. Ihering col., 1897).

Type locality: Brazil, Santa Catarina, Jaguaruna municipality, Figueirinha II shell mound, 28°39'23.33 S 48°58'21.63 W.

Etymology: The name is derived from Jaguaruna, a southern Brazilian municipality from Santa Catarina state close to several shell mounds, including Figueirinha II (the type locality).

Diagnosis: Shell small, slightly dorsoventrally compressed, slender and elongated. Aperture markedly prosocline, columella bearing conspicuous oblique fold. Protoconch sculptured by series of strong, moderately-spaced, prosocline axial ribs.

Description: Shell small (~54–63 mm), ellipsoid, slightly dorsoventrally compressed (Figs 4, 8) (dorso-ventral height ~85% of width), slender, elongated, ~2.1x as tall as wide. Color (Figs 1–4, 12) yellowish brown to orange, somewhat glossy, becoming yellowish-cream below suture and on basal portion of body whorl; peristome pale pink to white (Figs 1, 5). Spire angle ~40–45°. Protoconch (Fig. 9) of ~3 whorls, dome-like, sculptured by series of well-marked, moderately-spaced (space between ribs ca. 3–5x their own width), prosocline axial ribs extending from suture to suture, becoming thinner and more closely spaced after 2¼ whorls; protoconch-teleoconch limit as subtle axial depression. Teleoconch of two equally convex whorls, entirely sculptured by thin, closely-spaced axial riblets, randomly presenting well-marked axial depressions; each riblet extending from suture to suture in all whorls; region immediately below suture presenting a visible constriction. Suture well-marked, but not particularly deep. Peristome (Figs 1, 2, 5, 6, 10, 11) complete, thick, glossy, bearing conspicuous columellar fold; aperture drop-like, acuminate posteriorly, markedly prosocline, length ~40% of shell length, width ~75% of shell width. Outer lip thick, simple, rounded. Inner lip thick, somewhat convex; callus and parietal region not distinctly separated. Umbilicus absent.

Measurements (in mm): Holotype: 5.1 whorls, H = 60.3, D = 28.8, S = 31.5, S' = 12.5; h = 30.8, d = 21.2; Paratypes: MZSP 117000, 4.8 whorls, H = 56.2, D = 26.4, S = 29.6, S' = 16.5; h = 29.2, d = 19.4; MZSP 117026, 5 whorls, H = 62.3, D = 29.3, S = 32.1, S' = 13.9, h = 31.5, d = 21.4; MZSP 117027, ~5.25 whorls (aperture damaged), H = 62.7, D = 24.4, S = 32.2, S' = 13.2, h = ~30.1, d = ~21.5; MZSP 118298, 5 whorls, H = 54.2, D = 26.7, S = 30.5, S' = 12.2, h = 29.0, d = 20.0; MZSP 118299, 4.8 whorls, H = 54.5, D = 26.2, S = 28.5, S' = 11.8, h = 29.3, d = 19.9; MZSP 118300, 5 whorls, H = 58.9, D = 27.4, S = 32.2, S' = 14.5, h = 28.8, d = 19.8; MZSP 118301, 5 whorls, H = 60.3, D = 28.4, S = 32.5, S' = 14.6, h = 28.9, d = 21.9. Means values (± standard deviation, in mm): H = 58.7 ± 3.3, D = 27.2 ± 1.6, S = 31.1 ± 1.45, S' = 13.7 ± 1.55, h = 29.7 ± 1, d = 20.6 ± 0.95.

Distribution: Known only from Jabuticabeira II and Figueirinha II shell mounds (4200–1800 yBP).

DISCUSSION

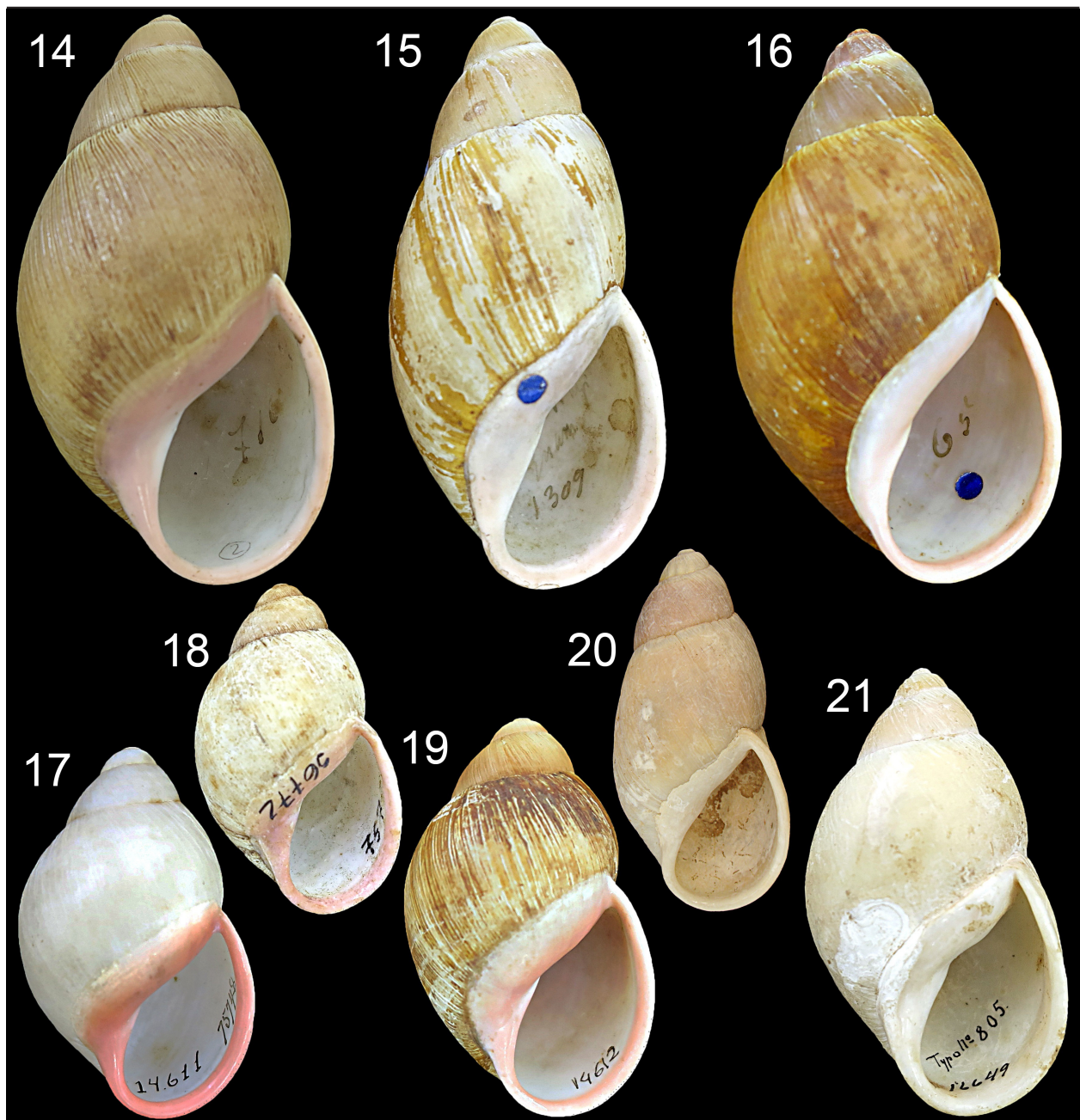
Shells of *Megalobulimus jaguarunensis* show an elongated shape with a large penultimate whorl found in other southern Brazilian congeners, such as *M. elongatus* (Bequaert, 1948), *M. sanctipauli* (Ihering & Pilsbry, 1900), *M. granulatus* (Rang, 1831), and *M. proclivis* (Martens, 1888) (= *M. iheringi* (Clessin, 1888)). However, *M. jaguarunensis* can be distinguished from the above-mentioned species by its much smaller size (Figures 14–16, 20), by having fewer, smoother and less convex whorls, protoconch with stronger, more widely spaced ribs, and overall sculpture lacking microgranulations. Additionally, the aperture in *M. jaguarunensis* is proportionally narrower than in *M. proclivis*, and proportionally shorter than in the remaining species.



Figure 13: Map showing the municipality of Jaguaruna, state of Santa Catarina, Brazil, the location of the shell mounds Figueirinha II (type locality of *Megalobulimus jaguarinensis* sp. nov.) and Jabuticabeira II. Abbreviations of neighboring states: PR, Paraná; RS, Rio Grande do Sul.

Among the smaller-sized species, *M. jaguarunensis* differs by having a much slender shell, proportionally taller spire with a more acute angle, and shorter aperture (Figures 17–21). Additionally, it can be distinguished from *M. abbreviatus* (Bequaert, 1948), which was observed in the neighbor mound Figueirinha I, by its proportionally smaller aperture, protoconch with more widely spaced ribs, by the smoother sculpture lacking strong axial grooves and microgranulations, more acuminate spire and much less convex whorls; from *M. globosus* (Martens, 1876) by its taller, more acuminate spire; from *M. haemastomus* (Scopoli, 1786) by having fewer, less convex whorls, strongly sculptured protoconch (not in a smooth pattern like *M. oblongus* (Müller, 1774)) and a less laterally dislocated aperture bearing a strong columellar fold. It differs from *M. musculus* (Bequaert, 1948) by having much less convex whorls and strongly sculptured protoconch; from *M. toriii* Morretes, 1937 by being smaller, having a proportionally smaller and shorter aperture, less convex whorls, less dorsoventrally compressed shell, less acuminate spire (though proportionally taller) and a non-granulated sculpture. It differs from *M. pygmaeus* (Bequaert, 1948) by having much less convex whorls, stronger and more widely spaced nepionic axial ribs, fewer whorls, and weaker axial sculpture on the teleoconch whorls.

Despite a single damaged specimen (MZSP 117027), all *M. jaguarunensis* shells studied here are reasonably well-preserved, except for some superficial erosion and bleaching, and do not show signs of predation or human use. However, it is important to note that specimens were found on damaged parts of the mounds. The shells were either mixed with debris along the recently built road in Jabuticabeira II or buried in the superficial substrate of the lower parts of Figueirinha II, which resulted from the erosion of the mound's upper levels. Unfortunately, both situations preclude a precise dating and further archaeological conclusions.



Figures 14–21: Apertural view of *Megalobulimus* shells with similar outline or comparable size, all in the same scale. **14:** *Megalobulimus sanctipauli* MZSP 7980 (H = 93 mm, D = 47 mm); **15:** *Megalobulimus iheringi* Topotype MZSP 1309; **16:** *Megalobulimus yporanganus* Holotype MZSP 64144 (H = 91.3 mm, D = 47.5 mm); **17:** *Megalobulimus musculus* Paratype MZSP 14611 (H = 63.2 mm, D = 39.5 mm); **18:** *Megalobulimus globosus* MZSP 56772 (H = 54.9 mm, D = 32.2 mm); **19:** *Megalobulimus abbreviatus* Paratype MZSP 14612 (H = 67.1 mm, D = 40.1 mm); **20:** *Megalobulimus jaguarunensis* Holotype (60.3 mm, D = 28.8 mm); **21:** *Megalobulimus torii* Holotype MZSP 16649 (H = 74.9 mm, D = 39 mm).

Nevertheless, discovering such a remarkable new species in millennia old shell mounds is a testimony of the importance and information richness of such archaeological sites. Wagner and colleagues (2011) had already pointed out the vulnerability of Brazilian shell mounds and the risk of information loss, which stresses the need to develop and maintain effective protection policies. Despite the extensive additional sampling efforts conducted by the senior author, not a single live specimen or

empty shell could be recovered in the neighboring regions. Moreover, the MZSP collection does not harbor any specimen remotely similar to *M. jaguarunensis* besides the present types. Both facts indicate that the species is possibly extinct, but further samplings are undoubtedly necessary to confirm this status.

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