

## Taxonomical study on a sample of land snails from Alto Ribeira State Park (São Paulo, Brazil), with description of a new species

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### Abstract

A sample of land snails, mainly pulmonates, was recently collected in caves in the Alto Ribeira State and Tourist Park (“Parque Estadual Turístico do Alto Ribeira” [PETAR], in Portuguese), an important tourism spot in São Paulo state, Brazil. Overall, twenty-one species were found, the following being reported for the first time for São Paulo state: *Alcudia iheringi* (Helicinidae); *Lamel-laxis mizius* (Subulinidae); *Zilchogyra* (*Trochogyra*) *superba* and *Radiodiscus promatensis* (Charopidae); *Entodina gionensis* and *Scolodonta interrupta* (Systrophiiidae). A new species, *Bahiensis ribeirensis* sp. nov. (Odontostomidae), is described herein. The new records and species addressed here constitute important findings, improving distributional maps and the knowledge of the local molluscan fauna. This is an essential step for future conservation efforts, especially of the poorly studied Brazilian troglifauna.

**Key words:** caves, Gastropoda, Neritimorpha, PETAR, Pulmonata, troglifauna.

### Introduction

The Brazilian Atlantic Forest is a uniquely heterogeneous and incredibly diverse biome with high endemism rates (FONSECA 1985, TABARELLI et al. 2005). Though it includes numerous strictly protected areas (parks and reserves, among others), and still harbors at least 8,000 endemic species (MYERS et al. 2005, but some studies report fairly higher numbers), the Atlantic Forest has been continuously degraded over the recent years (TABARELLI et al. 2005, RIBEIRO et al. 2009). Caves found along the forest, albeit remarkably poorly known, are no exception to this rule (TRAJANO 2000).

Land snails are considered the most threatened group of animals, sporting high extinction rates (LYDEARD et al. 2004, RÉGNIER et al. 2008). Many of them inhabit, and could probably be endemic to, caves and surrounding ar-

eas, but remain scarcely studied (SIMONE & MORACCHIOLI 1994, SIMONE 2013, SIMONE & CASATI 2013, WEIGAND 2013).

A recent expedition (September–October/2012) by Dr. M. E. BICHUETTE (Universidade Federal de São Carlos; São Carlos, Brazil) and her team to the cave systems of the Alto Ribeira State and Tourist Park (“Parque Estadual Turístico do Alto Ribeira” [PETAR], in Portuguese), Iporanga municipality, southern São Paulo state, Brazil (Fig. 1), recovered many land snails. All the material was deposited in the malacological collection of the Museu de Zoologia da Universidade de São Paulo (MZSP, São Paulo, Brazil) and is studied here. This work presents a formal description of a new species and reports the occurrence of twenty others.

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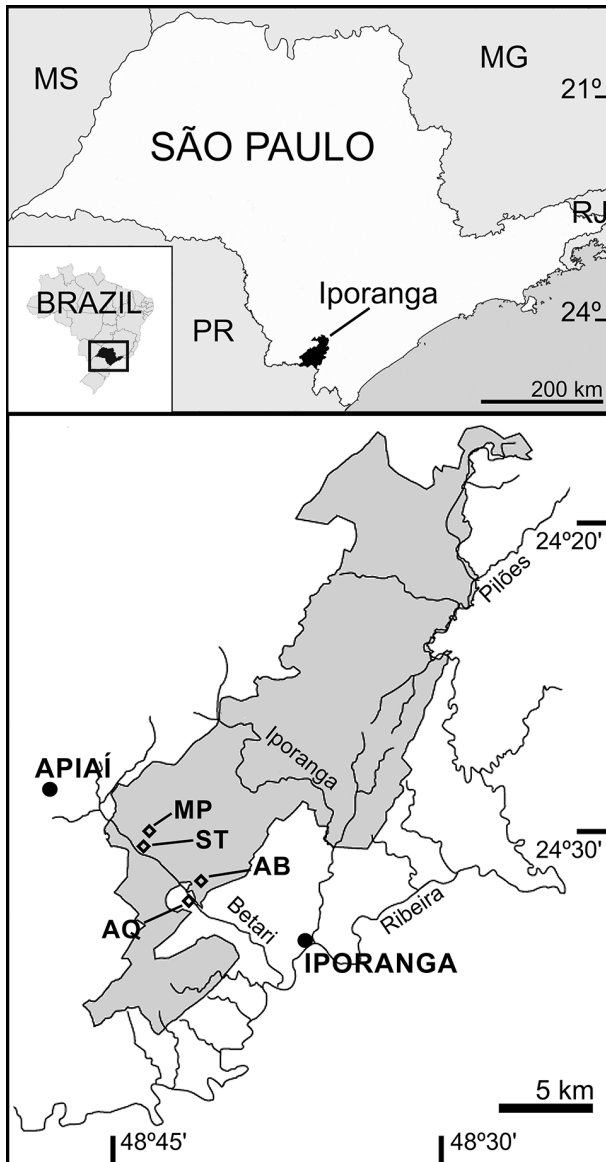


Figure 1. Map showing the location of the Alto Ribeira State and Tourist Park (São Paulo state), indicated by the gray area between the cities of Iporanga and Apiaí, alongside the main rivers in the region. The four caverns studied here are indicated as: AB, Alambari de Baixo Cave; AQ, Águas Quentes Cave; MP, Morro Preto Cave; SA, Santana Cave. Figure modified from Karmann & Ferrari (2002) and Wikimedia Commons.

#### Material and methods

All the material studied here was collected by M. E. Bichuette and her team in the Alto Ribeira State and Tourist Park (PETAR), located in southernmost São Pau-

lo state (Fig. 1), and deposited in the MZSP. Specimens were collected in caves and comprise both empty shells and living animals. For those species for which only empty shells were found, it is hard to tell whether they actually inhabit the caves or if their shells were carried there *post-mortem*.

The PETAR, with an area over 35,000 hectare, is one of the oldest parks in São Paulo (dating from 1958). Created for the conservation of the Atlantic Forest, it is well-known for its more than 200 caves and as an ecotourism hotspot (Karmann & Ferrari 2002). The park is crossed by three main rivers, the Pilões, the Iporanga and the Betari, and the region's climate is subtropical, hot and very humid, with no dry season (Nimer 1977). The vegetation is composed mainly of a dense evergreen hygrophilous forest with high trees, while more open areas are rare (Alonso 1977, Ivanauskas et al. 2012).

The material studied here was collected in the following caves of the PETAR: Alambari de Baixo Cave (entrance coordinates: 24°33'15"S 48°39'55"W; altitude 191 m; length 755 m; gap 40 m; collected on 02/Oct/2012); Morro Preto Cave (entrance coordinates: 24°31'14" 48°41'43"; altitude 290 m; length 832 m; gap 61 m; collected on 30/Sep/2012); Santana Cave (entrance coordinates: 24°31'51"S 48°42'06"W; altitude 258 m; length 5040 m; gap 61 m; collected on 01/Oct/2012). A single cave where gastropods were collected is located immediately outside the park, namely the Águas Quentes Cave (also known as "Ressurgências das Areias de Águas Quentes" or "Ressurgência das Areias"; entrance coordinates: 24°33'42"S 48°40'15"W; collected on 29/Sep/2012). The collectors for all the material are: M.E. BICHUETTE, J.E. GALLÃO and D.M. VON SCHIMONSKY.

Species identification was based on the catalogue by Simone (2006), original descriptions and additional material housed in the collection of the MZSP. Unfortunately, some species could not be identified beyond genus level, either due to poor preservation of the shells or to very young age. The complete list of species as well as a relation of all the studied material and collection localities can be found on Table 1. Species that deserve further notice (*i.e.*, those with new records for São Paulo state) are figured and discussed in the Systematics section below. Measurements were made with a digital caliper or with the aid of the Zeiss Axiovision SE64 Rel 4.8 imaging software. The following abbreviations are used throughout the text: sh, shell; spc, specimen; H, shell length; D, shell greatest width; h, aperture height; d, aperture width.

## Systematics

## Neritimorpha

## Family Helicinidae

Genus *Alcadia* GRAY 1840*Alcadia iheringi* WAGNER 1910

Figs. 2–4

- 1910 *Alcadia iheringi* WAGNER: 354, pl. 70, figs. 7–8.  
 1949 *Alcadia iheringi* – MORRETES: 63.  
 1959 *Alcadia (Alcadia) iheringi* – HAAS: 365  
 2003 *Alcadia iheringi* – SALGADO & COELHO: 151.  
 2006 *Alcadia iheringi* – SIMONE: 42, fig. 36.  
 2008 *Alcadia iheringi* – AGUDO-PADRÓN: 151.  
 2012 *Alcadia iheringi* – AGUDO-PADRÓN: 40.

Type locality: Nova Teutônia, Santa Catarina state, Brazil.

Previously known distribution: Known only from type locality (SIMONE 2006).

Material examined: **Brazil**: São Paulo state: Iporanga Municipality; Morro Preto Cave, sta. PET00267, MZSP 120798 (1 spc); Alambari de Baixo Cave, sta. PET00320, MZSP 120797 (1 spc).

Remarks: The present record extends the species range ca. 500 km to the northeast.

## Pulmonata

## Stylommatophora

## Family Charopidae

Genus *Zilchogyra* WEYRAUCH 1965Subgenus *Trochogyra* WEYRAUCH 1965*Zilchogyra (Trochogyra) superba* (THIELE 1927)

Figs. 5–7

- 1927 *Endodonta superba* THIELE: 322, fig. 23.  
 1949 *Endodonta superba* – MORRETES: 135.  
 1952a *Amphidoxa superba* – JAECKEL: 330.  
 1952b *Amphidoxa superba* – JAECKEL: 7.  
 1965 *Zilchogyra (Trochogyra) superba* – WEYRAUCH: 126.  
 1987 *Austrodiscus (Zilchogyra) superba* – VAZ: 12.  
 1993 *Trochogyra superba* – FONSECA & THOMÉ: 103.  
 2003 *Trochogyra superba* – SALGADO & COELHO: 154.  
 2006 *Lilloiconcha superba* – SIMONE: 234, fig. 895.

Type locality: Teresópolis, Rio de Janeiro state, Brazil.

Previously known distribution: Known from Rio de Janeiro state and the Brazilian northeastern region, except for Bahia state (JAECKEL 1952a, 1952b, SIMONE 2006).

Material examined: **Brazil**: São Paulo state: Iporanga Municipality; Águas Quentes Cave, sta. PET001, MZSP 121361 (1 sh); Morro Preto Cave, sta. PET00254, MZSP 121358 (1 spc); sta. PET00239, MZSP 121359 (1 spc); sta. PET00238, MZSP 121362 (1 sh); Alambari de Baixo Cave, sta. PET00403 MZSP 121360 (1 spc).

Remarks: The present record extends the species range ca. 250 km to the south. Nevertheless, SIMONE (2006) cites a personal communication from S. Miquel stating that *Lilloiconcha tucumana* (SCOTT 1963) is a synonym of *Z. superba*. In this case, *Z. superba* would have a broader distribution, from the Brazilian Northeast to northern Argentina. It is also worthwhile to note that *T. superba* is the type species of *Trochogyra*, while *L. tucumana* is the type species of *Lilloiconcha*; the former genus-level name has priority over the latter (WEYRAUCH 1965).

Genus *Radiodiscus* PILSBRY & FERRIS 1906*Radiodiscus promatensis* MIQUEL, RAMÍREZ & THOMÉ 2004

Figs. 8–10

- 2004 *Radiodiscus promatensis* MIQUEL, RAMÍREZ & THOMÉ: 929, figs. 5–7.  
 2006 *Radiodiscus promatensis* – SIMONE: 231, fig. 883.  
 2007 *Radiodiscus promatensis* – MIQUEL *et al.*: 214.

Type locality: São Francisco de Paula, Rio Grande do Sul state, Brazil.

Previously known distribution: Known only from type locality (SIMONE 2006, MIQUEL *et al.* 2007).

Material examined: **Brazil**: São Paulo state: Iporanga Municipality; Morro Preto Cave, sta. PET00237, MZSP 120779 (1 sh); Alambari de Baixo Cave, sta. PET00327, MZSP 120782 (1 spc); sta. PET00408, MZSP 120784 (1 spc).

Remarks: The present record extends the species range ca. 600 km to the north.

## Family Odontostomidae

Genus *Bahiensis* JOUSSEAUME 1877*Bahiensis ribeirensis* sp. nov.

Figs. 11–14

Holotype: MZSP 120774 (col. M.E. Bichuette, J.E. Gallão and D.M. von Schimonsky; 02/x/2012).

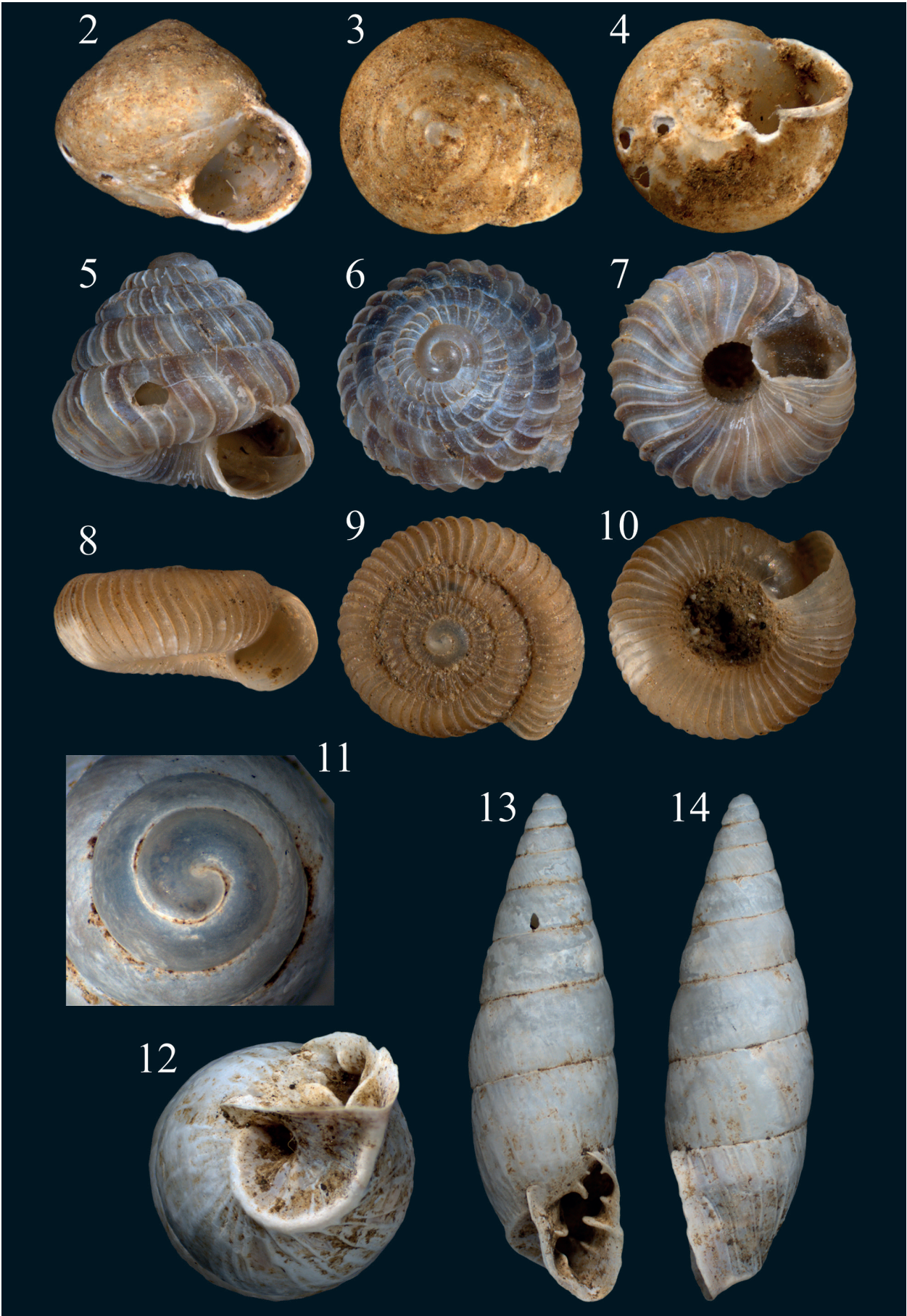
Type locality: **Brazil**. São Paulo state: Alto Ribeira State and Tourist Park (“Parque Estadual Turístico do Alto Ribeira” [PETAR], in Portuguese), Alambari de Baixo Cave (entrance coordinates: 24°33'25.8"S 48°39'52.0"W; altitude 191 m).

Distribution: Known only from type locality.

Etymology: The specific epithet refers to the type locality, the Alto Ribeira Park.

Diagnosis: Shell conical-elongated. Teleoconch sculptured by irregular and slightly prosocline anastomosing rib-like markings. Suture nearly perpendicular to shell axis. Strong cord-like keel on basal portion of body





whorl. Aperture narrow and vertically elongated; eight apertural teeth.

**Description:** Shell large, multispiral, conical-elongated to fusiform; shell width  $\sim 1/4$  of shell length; greatest width on penultimate whorl. Spire angle  $\sim 25^\circ$ . Protoconch ( $1\frac{1}{4}$  whorl) smooth, round, not prominent; transition to teleoconch clear (Fig. 11). Teleoconch sculptured by irregular and slightly prosocline anastomosing rib-like markings. Whorl profile slightly convex. Suture well-marked, but not deep, running nearly perpendicular to shell axis. Body whorl  $\sim 2/5$  shell length. Strong cord-like keel on basal portion of body whorl (Fig. 12). Aperture oval, elongated; aperture width  $\sim 2/5$  its height; aperture  $\sim 1/4$  shell length. Aperture with eight teeth (nomenclature *sensu* GITTENBERGER 1973): columellar lamella, parietal tooth, faint supraparietal denticle, weak suprapalatal denticle, upper palatal tooth, median palatal tooth, lower palatal (starting a few millimeters from the interior of aperture) and basal tooth (apparently extending itself towards interior of shell). Median palatal tooth is stronger apertural barrier. Peristome sharp, reflected. Umbilicus narrow, deep.

**Holotype dimensions** (in mm):  $8\frac{3}{4}$  whorls; H = 21.3; D = 5.0; h = 4.9; d = 2.1.

**Differential diagnosis:** Despite being a single (and not optimally preserved) specimen, the shell is so different from any other species of *Bahiensis*, and the Odontostomidae as a whole, that we are strongly convinced that it belongs to a new species.

*Bahiensis ribeirensis* sp. nov. can be easily distinguished from all its congeners by the strong cord-like keel present on the basal region of the body whorl (a feature very rare in Brazilian odontostomids) and by the large number of apertural teeth, most of which are very large. The species that most resemble *Bahiensis ribeirensis* in overall shell and aperture shape, *i.e.*, a conical-elongated shell and a narrow and vertically elongated aperture, are (distribution according to SIMONE 2006): *B. miliola* (D'ORBIGNY 1835) (Fig. 15), known from Bolivia and the Brazilian states of Minas Gerais, Rio de Janeiro and São Paulo; *B. occultus* (REEVE 1849) (Fig. 16), known only from Santa Catarina state; and *B. ringens* (DUNKER 1847) (Fig. 17), known from the states of Ceará, Minas Gerais, Espírito Santo and Rio de Janeiro. Their differences are explored below.

Besides the keel and apertural teeth, *Bahiensis ribeirensis* further differs from *B. miliola* by its smaller size, a stronger teleoconch sculpture, a narrower and more elongated aperture and wider umbilicus. It differs from *B. occultus* and *B. ringens* by a proportionately broader body whorl (of nearly the same width as the penultimate

whorl) and a wider umbilicus. *B. miliola* is the only species that shares with *B. ribeirensis* the sculpture pattern and the suture nearly perpendicular to the shell's columellar axis. *Bahiensis occultus* and *B. ringens* show the three stronger apertural teeth seen in *B. ribeirensis*: the columellar lamella, the median palatal tooth and the lower palatal (which starts a few millimeters from the interior of the aperture).

A curious species is *B. punctatissimus* (LESSON 1830) (Fig. 18), known from São Paulo, Paraná and Santa Catarina states (SIMONE 2006), for it bears an aperture with similar dentition to *B. ribeirensis* (with the same eight barriers, but comparatively very faint) and also a very faint proto-keel on the basal portion of the body whorl. Nevertheless, *B. ribeirensis* is easily diagnosed from *B. punctatissimus* by its smaller size, conical-elongated shell (*B. punctatissimus* has a broad fusiform shell), teleoconch sculpture, much narrower aperture, much stronger apertural barriers and wider umbilicus.

The irregular teleoconch sculpture pattern that *B. ribeirensis* shares with *B. occultus* is rather unusual in the family, but occurs in other, supposedly distantly related, Brazilian species, such as: *Clessinia neglecta* (PFEIFFER 1847), *Cyclodontina fusiformis* (MENKE 1828), *Cyclodontina tudiculata* (MARTENS 1868) and the genus *Burringtonia* PARODIZ 1944.

#### Family Subulinidae

Genus *Lamellaxis* STREBEL & PFEIFFER 1882

*Lamellaxis mizius* MARCUS & MARCUS 1968

Fig. 15

- 1968 *Lamellaxis (Leptopeas) mizius* MARCUS & MARCUS: 196, figs. 27–36.  
 2006 *Lamellaxis (Leptopeas) mizius* – SIMONE: 185, fig. 672.  
 2011 *Lamellaxis mizius* – DORNELLAS & SIMONE: 28.

**Type locality:** Cananéia, São Paulo state, Brazil.

**Previously known distribution:** Known only from type locality (SIMONE 2006).

**Material examined:** **Brazil:** São Paulo state: Iporanga Municipality, Águas Quentes Cave, sta. PET0017, MZSP 120811 (1 sp.).

**Remarks:** The present record extends the species range ca. 70 km to the northwest. Despite being a very close locality, this record is noteworthy for the species was previously known only from its type locality. AGUDO-PADRÓN et al. (2014) lists possible records, as *Lamellaxis* cf. *mizius*, from two localities in Santa Catarina state, southern Brazil.

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Figures 2–4. *Alcadia iheringi* (MZSP 120797; H = 2.7 mm, D = 3.3 mm), from Morro Preto Cave. Figures 5–7. *Zilchogyra (Trochogyra) superba* (MZSP 121361; H = 2.5 mm, D = 2.5 mm), from Águas Quentes Cave. Figures 8–10. *Radiodiscus promatensis* (MZSP 120779; H = 1.0 mm, D = 2.0 mm), Morro Preto Cave. Figures 11–14. *Bahiensis ribeirensis* sp. nov. (holotype, MZSP 120774; H = 21.3 mm), from Alambari de Baixo Cave.





Figure 15. *Bahiensis miliola*, from São Paulo state (ANSP 73453; H = 32 mm). Figure 16. *Bahiensis occultus*, lectotype (NHMUK 1975258; H = 24 mm). Figure 17. *Bahiensis ringens*, from Brazil (unspecified locality; ANSP 26006; H = 21 mm). 18. *Bahiensis punctatissimus*, from Brazil (unspecified locality; ANSP 26010; H = 27 mm). Figure 19. *Lamellaxis mizius* (MZSP 120811; H = 9.2 mm, D = 3.0 mm), from Águas Quentes Cave. Figures 20–22. *Entodina gionensis* (MZSP 120812; H = 2.3 mm, D = 5.3 mm), from Águas Quentes Cave. Figures 23–25. *Scolodonta interrupta* (MZSP 120801; H = 3.0 mm, D = 5.1 mm), from Alambari de Baixo Cave.

Family Systrophiidae

Genus *Entodina* ANCEY 1887

*Entodina gionensis* MORRETES 1940

Figs. 16–18

1940 *Entodina gionensis* MORRETES: 257, pl. 1, figs. 1–4.

1949 *Entodina gionensis* – MORRETES: 138.

2006 *Entodina gionensis* – SIMONE: 223, fig. 849.

2008 *Entodina gionensis* – AGUDO-PADRÓN: 164.

Type locality: Vamiranga Shell Mound, Iguape, São Paulo state, Brazil.

Previously known distribution: Known only from type locality in São Paulo state (SIMONE 2006). Outside of São Paulo, it has been reported from various municipalities in Santa Catarina state (AGUDO-PADRÓN 2008).

Table 1. List of all species found on the present material, with information on whether it is a new occurrence (either the first occurrence from São Paulo state or the first outside the type locality), the cave(s) where the material was collected and the record number of the MZSP collection. Abbreviations: AB, Alambari de Baixo Cave; AQ, Águas Quentes Cave; MP, Morro Preto Cave; SA, Santana Cave.

Species	Family	New occurrence?	Cave(s)	Collection Nr. (MZSP)
<b>Neritimorpha</b>				
<i>Alcudia iheringi</i> WAGNER 1910	Helicinidae	yes	AB, MP	120797 (1 spc), 120798 (1 spc)
<i>Helicina iguapensis</i> PILSBRY 1900	Helicinidae	-	AB	120773 (1 sh), 120776 (1sh), 120807 (1 sh)
<i>Helicina inaequistriata</i> PILSBRY 1900	Helicinidae	-	AB	116325 (1 spc)
<b>Caenogastropoda</b>				
<i>Neocyclotus prominulus</i> (D'ORBIGNY 1840)	Neocyclotidae	-	MP	120771 (1 sh)
<b>Pulmonata: Stylommatophora</b>				
<i>Allopeas micra</i> (D'ORBIGNY 1835)	Subulinidae	-	AQ	120777 (2 spc)
<i>Bahiensis ribeirensis</i> sp. nov.	Odontostomidae	yes	AB	120774 (holotype)
<i>Corona</i> sp.	Orthalicidae	-	AB	120764 (1 sh)
<i>Entodina gionensis</i> MORRETES 1940	Systrophiidae	yes	AQ	120812 (2 spc)
<i>Happia iheringi</i> (CLESSIN 1888)	Systrophiidae	-	AB, AQ, MP, SA	120788 (1 spc), 120789 (2 spc), 120790 (1 sh), 120791 (1 spc), 120792 (1 spc), 120793 (1 spc), 120794 (1 sh), 120795 (1 spc)
<i>Happia</i> sp.	Systrophiidae	-	AB, AQ	120815 (1 spc), 120816 (1 spc)
<i>Lamellaxis mizius</i> MARCUS & MARCUS 1968	Subulinidae	yes	AQ	120811 (1 spc)
<i>Leptinaria anomala</i> (PFEIFFER 1846)	Subulinidae	-	AQ, MP	120785 (1 sh), 120786 (1 spc), 120787 (1 spc)
<i>Zilchogyra (Trochogyra) superba</i> (THIELE 1927)	Charopidae	yes	AB, AQ, MP	121358 (1 spc), 121359 (1 spc), 121360 (1 spc), 121361 (1 sh), 121362 (1 sh)
<i>Obeliscus</i> sp.	Subulinidae	-	AQ, AS	120803 (11 spc), 120809 (1 spc)
<i>Pseudoguppya semenlini</i> (MORICAND 1846)	Euconulidae	-	AQ	120808 (1 spc)
<i>Radiodiscus promatensis</i> MIQUEL, RAMÍREZ & THOMÉ 2004	Charopidae	yes	AB, MP	120779 (1 sh), 120782 (1 spc), 120784 (1 spc)
<i>Restartemon iguapensis</i> (PILSBRY 1930)	Streptaxidae	-	AB, AQ	120767 (1 sh), 120769 (1 sh)
<i>Rhinus</i> sp.	Bulimulidae	-	AB	120805 (1 spc)
<i>Scolodonta interrupta</i> (SUTER 1900)	Systrophiidae	yes	AB	120801 (2 spc)
<i>Stenogyra</i> sp.	Subulinidae	-	AQ	120810 (1 spc)
Subulinidae indet.	Subulinidae	-	AQ	120813 (1 spc)

Material examined: **Brazil:** São Paulo state: Iporanga Municipality, Águas Quentes Cave, sta. PETØØ16, MZSP 120812 (2 spc).

Remarks: The present record extends the species range ca. 90 km to the west. Despite being a close locality, this record is noteworthy since the species was previously known only from its type locality in São Paulo state.

#### Genus *Scolodonta* DOERING 1875

#### *Scolodonta interrupta* (SUTER 1900)

Figs. 19–21

1900 *Streptaxis interruptus* SUTER: 331, pl. 3, figs. 5a–b.

1900 *Scolodonta interrupta* – PILSBRY: 385, pl. 12, figs. 6–8.

1902 *Scolodonta interrupta* – GUDE: 240.

1949 *Scolodonta interrupta* – MORRETES: 166.

2003 *Scolodonta interrupta* – SALGADO & COELHO: 170.

2006 *Scolodonta interrupta* – SIMONE: 225, fig. 856.

Type locality: Perus, São Paulo state, Brazil.

Previously known distribution: Known only from type locality (SIMONE 2006).

Material examined: **Brazil:** São Paulo state: Iporanga Municipality, Alambari de Baixo Cave, sta. PETØØ325, MZSP 120801 (2 spc).

Remarks: The present record extends the species range ca. 230 km to the southwest. This record is noteworthy for the species was previously known only from its type locality. SIMONE (2006) also reports a record from Pará state, on the north of Brazil, but highlights it as dubious.

## Discussion

Orthalicoids are predominantly diverse in the overall molluscan faunal account in Brazil, summing up more than 40% of land snail diversity (SIMONE 2006, SALVADOR & SIMONE 2013, although the country's microgastropods remain scarcely sampled). Nevertheless, troglobiont molluscan diversity might be different from that of above-surface environments, at least if the PETAR fauna is any indication. In the present sample, the orthalicoids count with only three species, being outnumbered by the subulinids and systrophiiids, with six and four species, respectively (Table 1). This is a very curious matter and this difference in faunal composition between surface and underground environments is worth of being the target of more systematical studies in the future.

Many records reported here are the first for São Paulo state, greatly extending the geographical distribution of seven species (Table 1; see also the Systematic session above). In fact, a fair number of species were previously known only from their type localities: *Alcadia iheringi*, *Radiodiscus promatensis*, *Lamellaxis mizius* and *Scolodonta interrupta*. The present records are among the few dealing with molluscan troglobiont species. The Brazilian troglofauna in general is scarcely studied and new discoveries are made whenever there is a new study (e.g., FIŠER et al. 2013, for freshwater crustaceans; SIMONE & MORACCHIOLI 1994, SIMONE 2013, SIMONE & CASATI 2013, for gastropods; CAMPOS-FILHO et al. 2014, for isopods; SCHIMONSKY et al. 2014, for arachnids). Caverns are known to be fragile ecosystems, usually harboring unique faunas; nevertheless, most caves in Brazil receive scarce protective attention.

The caves in the PETAR are an exception to this rule, since they are inside the park, which is an Atlantic Forest conservation unit. Even so, the native fauna and flora in the PETAR are vulnerable to harmful effects of the largely uncontrolled ecotourism. It may also suffer from

poor use of natural resources, like, for instance, the lack of a defined tourism carrying capacity and proper environmental education (LOBO 2008, RIBEIRO et al. 2009, IVANAUSKAS et al. 2012, SARFATI & SANO 2012). The park receives over 30,000 visitors per year and more restrictive measures to visit the caverns were taken in 2008 (LOBO 2008, BORSANELLI & LOBO 2013). Furthermore, the Águas Quentes Cave is a special case, since it is located in an area that lies just outside the park. It should also be important for preservation, but still lacks effective protection (KARMANN & FERRARI 2002). Many non-molluscan invertebrate species are protected inside the park, but endangered in the immediate vicinity (MACHADO et al. 2008).

According to the Brazilian legislation, a cave must be protected if there are rare or endemic species inhabiting it (CAMPOS-FILHO et al. 2014). Therefore, the first step towards legal protection is to describe the troglofauna. Many authors have already claimed the importance of troglofaunal inventories, since delays might result in irreparable biodiversity loss (e.g., TRAJANO 2000, BICHUETTE & TRAJANO 2010, SIMONE 2013, CAMPOS-FILHO et al. 2014).

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