

# Synopsis of the terrestrial and freshwater gastropod fauna of southern Bahia, Brazil

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**Abstract.** The terrestrial and freshwater malacofauna of southern Bahia is little known, especially in comparison to the well-studied eastern portion of the state covered by remnants of Atlantic Forest. We present here a synopsis of all gastropod species known from the central southern region of Bahia state, known as 'Centro-Sul Baiano', focusing on four municipalities: Condeúba, Cordeiros, Mortugaba, and Piripá. The list herein contains data from the literature, historical material deposited in museum collections, and two recent expeditions undertaken in the region. The survey resulted in 21 species of gastropods, with nearly 700 voucher specimens (mostly freshwater) deposited in the collection of the Museu de Zoologia da Universidade de São Paulo (São Paulo, Brazil). Circa 30% of the species are non-indigenous; previously, the only known exotic in the region was *Melanooides tuberculata* (Müller, 1774). The family Achatinidae was the most diverse group in number of native species, while the typically diverse superfamily Orthalicoidea was represented by only two species.

**Keywords.** Caatinga; Cerrado; Gastropoda; Mollusca; Taxonomy.

**Resumo. Sinopse da fauna gastrópode terrestre e de água doce do sul da Bahia, Brasil.** A malacofauna terrestre e de água doce do sul da Bahia é pouco conhecida, principalmente em comparação com a bem estudada porção leste do estado coberta por remanescentes de Mata Atlântica. Apresentamos aqui uma sinopse de todas as espécies de gastrópodes conhecidas da região centro-sul do estado da Bahia, conhecido como 'Centro-Sul Baiano', com foco em quatro municípios: Condeúba, Cordeiros, Mortugaba e Piripá. A lista aqui apresentada contém dados da literatura, material histórico depositado em coleções de museus e duas expedições recentes realizadas na região. O levantamento resultou em 21 espécies de gastrópodes, com cerca de 700 espécimes (principalmente de água doce) depositados na coleção do Museu de Zoologia da Universidade de São Paulo (São Paulo, Brasil). Cerca de 30% das espécies são não indígenas; anteriormente, o único exótico conhecido na região era *Melanooides tuberculata* (Müller, 1774). A família Achatinidae foi o grupo mais diverso em número de espécies nativas, enquanto a superfamília tipicamente diversa Orthalicoidea foi representada por apenas duas espécies.

**Palavras-Chave.** Caatinga; Cerrado; Gastropoda; Mollusca; Taxonomia.

## INTRODUCTION

The central southern region of Bahia state in Brazil (the 'Centro-Sul Baiano'; IBGE, 1990) is predominantly covered by the hypoxerophytic Caatinga, which is a diverse but still little-known biome (Silva *et al.*, 2003). Recent papers (*e.g.*, Salvador & Cavallari, 2012, 2014; Simone & Casati, 2013; Porto *et al.*, 2016; Salvador & Simone, 2016; Salvador, 2018; Silva *et al.*, 2019a; Simone & Salvador, 2021) have demonstrated a surprising number of new records and new taxa of mollusks in this region.

However, knowledge of the local malacofauna is still incipient and needs special attention, not only because it is possibly an area of high potential endemism (Cavallari *et al.*, 2016; Salvador, 2019), but also because non-marine gastropods have the highest extinction rates among invertebrates (Lydeard *et al.*, 2004; Régnier *et al.*, 2009). Thus, we present herein a synopsis of all known species of terrestrial and freshwater gastropods from the central southern portion of Bahia state based on literature records, museum collections, and new collection efforts, the latter focusing on the municipalities of Condeúba, Cordeiros, Mortugaba and Piripá.

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## MATERIAL AND METHODS

Specimens sampling were carried out in two instances: December/2017 to January/2018 (rainy season) and August/2018 (dry season). The expedition focused on four municipalities (Condeúba, Cordeiros, Mortugaba, and Piripá; Fig. 1), which are located on a transitional zone of mixed Cerrado and Caatinga biome features (Oliveira *et al.*, 2017). Given the paucity of records for the region, the sampling points were arbitrarily chosen (both in rural and urban areas) (Fig. 2), giving preference to areas where snails were more likely to be present, estimated from literature data and personal experience. Collection effort consisted of 10 minutes in each point (roughly 1 m<sup>2</sup>) and included visual search (dislodging substrate and litter), and sampling of leaf litter in a subset of the points. Voucher specimens were deposited in the malacological collection of the Museu de Zoologia da Universidade de São Paulo (MZSP, São Paulo, Brazil).

Additional records informations were gathered from the literature and specimens in the collection of the MZSP. Species identification was based on original descriptions, published catalogues (Simone, 2006; Birckolz *et al.*, 2016) and further taxonomic literature, as well as comparative specimens (including type material when necessary). The species are listed below following the arrangement of Bouchet *et al.* (2017), including data on their type localities, geographic distribution, a

list of analyzed material, and, when appropriate, further remarks.

Measurements were taken with a digital caliper (for larger specimens) and under stereomicroscope coupled with computer-assisted camera and software (Zeiss Axiovision SE64 Rel 4.8).

**Abbreviations used herein as follows:** col. = collector(s); colln. = collection; sh = empty shell(s); spm = whole specimen(s); H = shell height; D = shell greater diameter.

Given that the taxonomy of *Sarasinula* Grimpe & Hoffmann, 1924 and *Megalobulimus* Miller, 1878 still need revisionary work, we have sequenced the barcoding region of the mitochondrial COI marker (circa 650 bp) of our specimens for future reference. Selected adult specimens of these genera had a small section of their foot clipped for DNA extraction, which was achieved with DNeasy® Blood & Tissue Kit (QIAGEN N.V.), following standard protocol. The primers used were LCOI and HCOI (Folmer *et al.*, 1994). PCR protocol as follows: (1) initial denaturation, at 96°C (2 minutes); (2) 35 cycles of: (a) denaturation, at 95°C (30 seconds); (b) annealing, at 48°C (1 minute); (c) extension, at 72°C (2 minutes); (3) final extension, at 72°C (5 minutes). The PCR products were quantified via agarose gel electrophoresis, then cleaned following standard ExoSAP-IT™ protocol (Affymetrix Inc.), and finally Sanger sequenced. The resulting sequences



**Figure 1.** Map of Bahia state, showing the municipalities where the present specimens were collected. Abbreviations of states: MA = Maranhão; PI = Piauí; PE = Pernambuco; AL = Alagoas; SE = Sergipe; TO = Tocantins; GO = Goiás; MG = Minas Gerais.



**Figure 2.** Examples of locations where the 2017-2018 collections took place. (A) Mortugaba municipality, rural area, January/2018. (B) Mortugaba municipality, rural area, August/2018. (C) Cordeiros municipality, dam, January/2018. (D) Cordeiros municipality, dam, August/2018.

were assembled, and quality proofed using the software Geneious Prime (v. 2019.0.3, Biomatters Ltd.). The consensus sequences were then uploaded to NCBI GenBank; register numbers are presented below, under the entries of *Sarasinula* and *Megalobulimus* species.

## RESULTS

### Systematics

**Caenogastropoda**  
**Superfamily Ampullarioidea**  
**Family Ampullariidae**  
**Genus *Pomacea* Perry, 1810**  
***Pomacea canaliculata* (Lamarck, 1822)**  
**Figs. 3A-B**

Synonymy, see Scott (1957: 299); Castellanos & Fernandez (1976: 13); Simone (2004: 398). Complement:

*Ampullaria canaliculata*: Bertoni, 1925: 72; Pitoni, 1984: 247; Darrigran, 1991: 213; Cuezso & Drahg, 1995: 199.

*Pomacea canaliculata*: Solem, 1956: 2; Scott, 1957: 299; Lopes, 1957: 43; Shade, 1965: 219; Klappenbach,

1967: 42; Castellanos & Fernandez, 1976: 13; Thiengo *et al.*, 1998: 233; Cowie *et al.*, 2001: 13; Cowie & Thiengo, 2003: 58; Simone, 2004: 398, figs. 11-12, 88-89, 120-121, 199-205, 2006: 49, fig. 69; Thiengo *et al.*, 2005: 869; Estebenet *et al.*, 2006: 329; Gregoric *et al.*, 2006: 53; Agudo-Padrón, 2008: 151, 2014: 10; Martello *et al.*, 2008: 33; Agudo-Padrón & Lenhard, 2011: 165, figs. 3-6; Hayes *et al.*, 2012: 737, figs. 1, 4-8, 10, 11, 13, 14; Madella & Auricchio, 2014: 55; Birckolz *et al.*, 2016: 148.

*Pomacea (Pomacea) canaliculata canaliculata*: Quintana, 1982: 109.

**Type locality:** Guadeloupe.

**Occurrence:** Guyana, Trinidad, Bolivia, Brazil (Amazonas, Pará, Rondônia, Mato Grosso, Goiás, Mato Grosso do Sul, Bahia, Pernambuco, Rio de Janeiro, Rio Grande do Sul and Santa Catarina states), Paraguay, Uruguay and Argentina (Simone, 2006; Birckolz *et al.*, 2016).

**Material examined:** BRAZIL: Bahia; Condeúba, 14°54'02.39"S, 42°02'18.92"W, MZSP 136686, 1 sh (F.S. Silva col. 10/i/2018); MZSP 136654, 47 sh (F.S. Silva col. 10/i/2018); MZSP 139790, 7 sh (F.S. Silva col. 05/viii/2018); Piripá, 15°02'28.09"S, 41°42'17.78"W, MZSP 136684, 40 sh

(F.S. Silva col. 09/i/2018); MZSP 136681, 15 sh (2017); MZSP 139669, 3 sh (F.S. Silva col. 06/viii/2018).

**Remarks:** This species is native to Central and South America but is invasive in several parts of the world. It is unknown whether the species is native to Bahia or if it has been introduced there. Only empty shells were collected from dry areas and standing waters of the Gavião River and weirs in Piripá and Condeúba municipalities.

**Genus *Asolene* d'Orbigny, 1838**  
***Asolene meta* (Ihering, 1915)**  
**Figs. 3C-D**

*Ampullaria meta* Ihering, 1915: 12, figs. 6-7; Cowie & Thiengo, 2003: 69.

*Ampullarius (Ampullarius) meta*: Morretes, 1949: 67.

*Pomacea meta*: Simone, 2006: 55, fig. 92.

*Asolene meta*: Soares et al., 2006: 107.

**Type locality:** São Francisco River, Barra municipality, Bahia state, Brazil.

**Occurrence:** Known only from type locality (Simone, 2006).

**Material examined:** BRAZIL: Bahia; Guanambi, 14°13'09.86"S, 42°49'46.82"W, MZSP 26689, 2 sh (Giannotti col. 15/vii/1981).

**Remarks:** This species was only represented by historical specimens (from 1981) in the MZSP collection, which represents an expansion of range about 350 km southward. Since the species could not be found in our renewed collection efforts, it is unknown if it still inhabits the area.

**Superfamily Cerithioidea**  
**Family Thiaridae**  
**Genus *Melanoides* Oliver, 1804**  
***Melanoides tuberculata* (Müller, 1774)**  
**Figs. 3E-F**

Synonymy, see Starmühler (1969: 224); Brandt (1974: 164); and Simone (2001: 156). Complement:

*Nerita tuberculata* Müller, 1774: 191.

*Melania tuberculata*: Carvalho, 1986: 57; Souza et al., 1998: 451.

*Melanoides tuberculata*: Oliveira et al., 1981: 97; Freitas et al., 1987: 302; Silva et al., 1994: 439; Paz et al., 1995: 79; Thiengo et al., 1998: 233; Martins-Silva & Barros, 2001: 867; França et al., 2007: 42; Masseurin et al., 2009: 366; Strong et al., 2011: 54; Kotzian & Amaral, 2013: 302; Agudo-Padrón, 2014: 11; Paula et al., 2017: 829.

*Melanoides tuberculatus*: Fernandez et al., 2001: 280; Simone, 2001: 156, figs. 9, 10, 46, 47, 54, 55, 89, 169-188; Fernandez et al., 2003: 78; Vidigal et al., 2005: 69; Rocha-Miranda & Martins-Silva, 2006: 1109; Agudo-Padrón, 2008: 152, 2011: 56; Santos & Eskinazi-Sant'Anna, 2010: 1, fig. 2; Santos et al., 2010: 511; Silva & Gomes, 2014: 145.

**Type locality:** Coromandel Coast, India.

**Occurrence:** Naturally distributed in Asia and eastern Africa; introduced to the Americas and Polynesia (Rocha-Miranda & Martins-Silva, 2006).

**Material examined:** BRAZIL: Bahia; Andaraí, 12°39.54'32"S, 41°12.01'76"W, MZSP 121907, 25 sh (C.E.F. Rocha col. 14/iv/2014); Nova Redenção, 12°49'11.29"S, 41°04'13.18"W, MZSP 106217, 12 sh (DEBE-UFSCar col. 18/ix/2004); MZSP 135902, 6 sh (M.E. Bichuette col. 01/v/2004); MZSP 137069, 6 sh (M.E. Bichuette col. 01/v/2004); Jussiapé, 13°31'00.57"S, 41°35'31.73"W, MZSP 78758, 23 sh (L.S. Rocha col. 19/xii/1998); Condeúba, 14°54'02.39"S, 42°02'18.92"W, MZSP 136589, 28 sh (F.S. Silva col. 10/i/2018); MZSP 138591, 33 sh (F.S. Silva col. 10/i/2018); Piripá, 15°02'28.09"S, 41°42'17.78"W, MZSP 136587, 154 sh (F.S. Silva col. 09/i/2018); MZSP 136588, 172 sh (F.S. Silva col. 07/i/2018).

**Remarks:** Despite being a common and widespread invasive species, only empty shells were found in the new sampling efforts. The specimens were retrieved from dry ground and standing waters of Gavião River and weirs in Condeúba and Piripá municipalities.

**Família Hemisinidae**  
**Gênero *Aylacostoma* Spix, 1827**  
***Aylacostoma* sp.**  
**Figs. 3G-H**

**Material examined:** BRAZIL: Bahia; Condeúba, 14°54'02.39"S, 42°02'18.92"W, MZSP 136593, 1 sh (F.S. Silva col. 10/i/2018).

**Remarks:** A single deteriorated specimen was found in a weir in Condeúba municipality. Its last whorl was broken and the periostracum eroded, precluding identification to species level.

**Heterobranchia**  
**Superfamily Lymnaeoidea**  
**Family Physidae**  
**Genus *Stenophysa* Martens, 1898**  
***Stenophysa marmorata* (Guilding, 1828)**  
**Figs. 3I-J**

Synonymy, see Quintana (1982: 120). Complement:  
*Physa marmorata* Guilding, 1828: 534; Tillier, 1980: 38; Gómez et al., 1986: 131; Paraense, 1986: 459, figs. 1-33; Gnaspini & Trajano, 1994: 550; Lima, 1995a: 85, fig. 5; Thiengo et al., 1998: 233.

*Aplexa rivalis*: Beck, 1837: 116.

*Physa rivalis*: Gray, 1854: 25.

*Physa Braziliensis*: Clessin, 1888: 170.

*Physa (Physella?) marmorata*: Baker, 1930: 42.

*Aplexa marmorata*: Clench, 1936: 337; Aguayo, 1938: 213; Leme, 1966: 269; Oliveira et al., 1981: 307; Cuzzo & Drağ, 1995: 199; Agudo-Padrón, 2008: 155, 2014: 13.

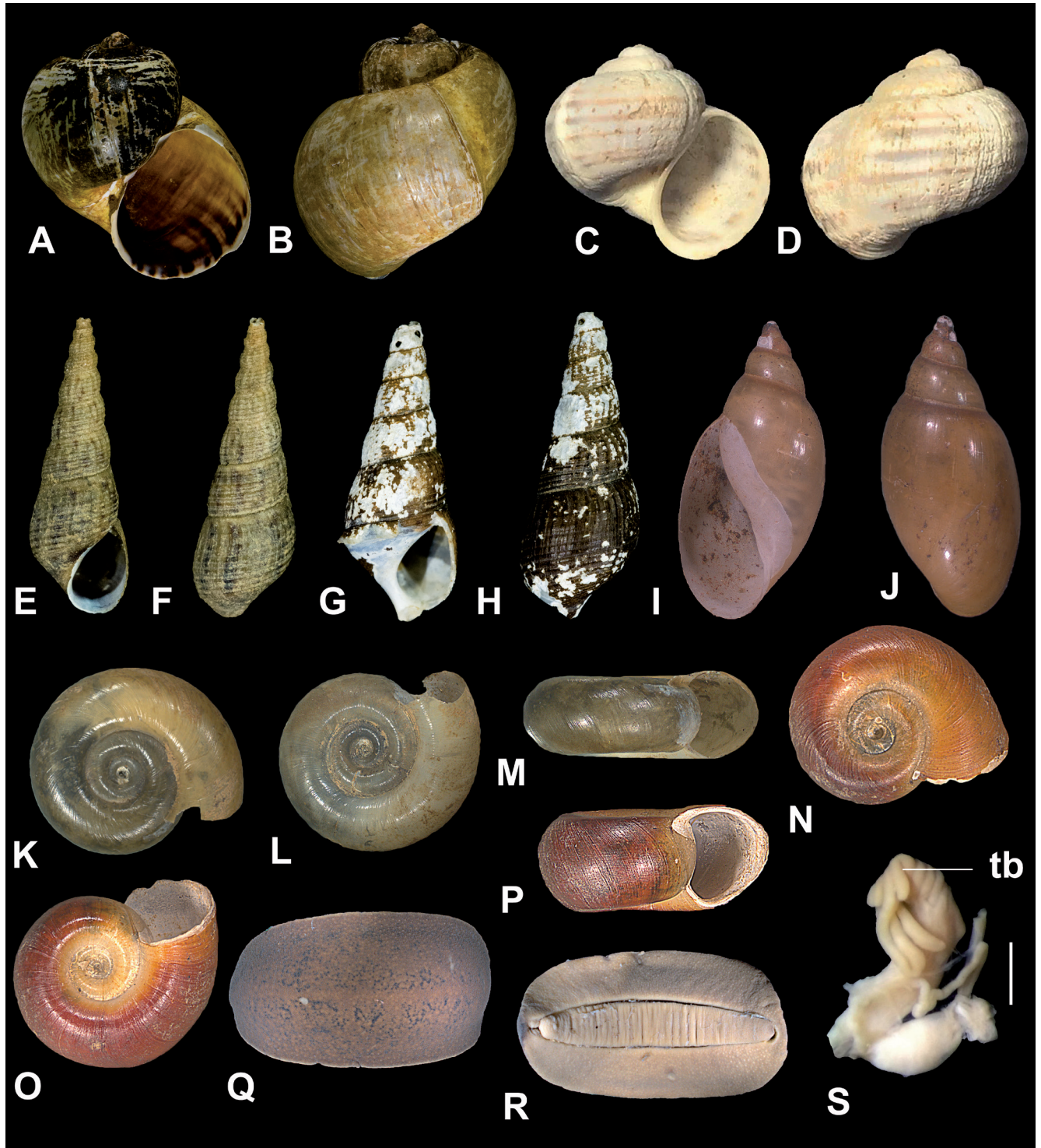
*Aplexa (Stenophysa) marmorata*: Quintana, 1982: 120; Simone, 2006: 101, fig. 301; Agudo-Padrón & Lenhard, 2011: 166.

*Stenophysa marmorata*: Coimbra-Jr. & Santos, 1986: 231; Darrigran, 1991: 213; Taylor, 2003: 113, figs. 95-108, pl. 5, fig. 3; Gregoric et al., 2006: 53; Martello et al., 2008: 33; Núñez, 2011: 98. Díaz & Martín, 2013: 26; Trouy et al., 2016: 121.

**Type locality:** Saint Vincent, Lesser Antilles.

**Occurrence:** Central and South America (Simone, 2006).

**Material examined:** BRAZIL: Bahia; Condeúba, 14°54'02.39"S, 42°02'18.92"W, MZSP 139670, 1 sh (F.S. Silva col. 05/viii/18). Cordeiros, 15°02'23,90"S, 41°56'02,07"W, MZSP 136604, 2 sh (F.S. Silva col. 02/i/18);



**Figure 3.** Shells from Bahia state. (A-B) *Pomacea canaliculata*, MZSP 136681, Piripá (H = 90,1 mm). (C-D) *Asolene meta*, MZSP 26689, Guanambi (H = 30.7 mm). (E-F) *Melanooides tuberculata*, MZSP 136589, Condeúba (H = 17.9 mm). (G-H) *Aylacostoma* sp., MZSP 136593, Condeúba (H = 26.7 mm). (I-J) *Stenophysa marmorata*, MZSP 139671, Piripá (H = 15.0 mm). (K-M) *Biomphalaria glabrata*, MZSP 136662, Piripá (D = 9.93 mm). (N-P) *Biomphalaria straminea*, MZSP 136659, Cordeiros (D = 9.25 mm). (Q-R) *Sarasinula plebeia*, MZSP 136616, Cordeiros (H = 36.7 mm). (S) Penial gland of *Sarasinula plebeia* (Scale bar: 2 mm; tb = tubules).

MZSP 139664, 7 sh (F.S. Silva col. 13/viii/18); Piripá, 15°02'28.09"S, 41°42'17.78"W, MZSP 139671, 1 sh (F.S. Silva col. 06/viii/18).

**Family Planorbidae**  
**Genus *Biomphalaria* Preston, 1910**  
***Biomphalaria glabrata* (Say, 1818)**  
**Figs. 3K-M**

Synonymy, see Arias (1952: 59). Complement:

*Planorbis glabratus* Say, 1818: 280.

*Planorbis olivaceus* Spix, 1827: 26, pl. 18, fig. 2; Lutz, 1918: 50.

*Planorbis ferrugineus* Spix, 1827: 26, pl. 18, fig. 1; d'Orbigny, 1835a: 544, 1835b: 26; Gray, 1854: 25; Lutz, 1918: 50.

*Planorbis guadeloupensis* Sowerby, 1820: 20; Martins, 1938: 33; Jay, 1839; Martens, 1873: 195; Lutz, 1918: 52; Baker, 1913: 661; Ernest, 1948: 79; Jaekel, 1952: 6.

*Australorbis olivaceus*: Morretes, 1953: 60.

*Planorbis bahiensis*: Martens, 1868: 187.

*Helisoma (Planorbina) guadeloupensis guadeloupensis*: Baker, 1930: 43.

*Helisoma (Planorbina) olivacea*: Haas, 1939: 266.

*Australorbis glabratus* Pilsbry, 1934: 43; Martins, 1938: 28; Baker, 1945a: 90, pl. 45, fig. 1; Morretes, 1949: 125; Barbosa & Dobbin-Jr., 1951: 2; Arias, 1952: 59; Morretes, 1953: 59; Olivier & Barbosa, 1955a: 79; Paraense & Deslandes, 1955: 87; Paraense, 1958: 66; Kloetzel, 1959: 280; Magalhães, 1964: 283.

*Australorbis glabratus olivaceus*: Lucena, 1951: 94, 1953: 246, 1956: 64.

*Biomphalaria glabrata*: Basch, 1968: 21; Barbosa & Figueiredo, 1969: 286; Sodeman-Jr., 1973: 103; Michelson & DuBois, 1974: 102; Paraense, 1975: 115, figs. 45-48, 2006: 21; Boffi, 1979: 30; Pieri et al., 1980: 83; Tillier, 1980: 39, pl. 3, fig. 2; Luz et al., 1981: 107; Freitas et al., 1987: 299; Rosa, 1987: 311; Figueiredo, 1989: 383; Barbosa, 1992: 311; Silva et al., 1994: 439; Lima, 1995b: 94, fig. 24; Souza et al., 1996: 542; Carvalho et al., 1998: 39; Luz et al., 1998: 41; Thiengo et al., 1998: 233; Souza et al., 1998: 451; Oliveira & Almeida, 1999: 14; Fernandez et al., 2001: 280; Souza et al., 2001: 294; Pointier et al., 2005: 250; Simone, 2006: 105, fig. 313; Agudo-Padrón, 2008: 155, 2014: 13; Massemin et al., 2009: 370; Pepe et al., 2009: 783; Carvalho et al., 2018: 3.

**Type locality:** Guadeloupe.

**Occurrence:** Central and South America (Simone, 2006).

**Material examined:** BRAZIL: Bahia; Andaraí, 12°39.54'32"S, 41°12.01'76"W, MZSP 121909, 4 sh (14/iv/2014); Maracás, 13°31'50.64"S, 40°33'12.24"W, MZSP 31599, 13 sh (W. Bokerman col. xi/1965); Vitória da Conquista, 14°51'42.93"S, 40°50'40.32"W, MZSP 98332, 6 sh (ex J. Vaz colln.); Condeúba, 14°54'02.39"S, 42°02'18.92"W, MZSP 136693, 1 sh (F.S. Silva col. 10/i/2018);

MZSP 139668, 2 sh (F.S. Silva col. 05/viii/2018); Cordeiros, 15°02'23.90"S, 41°56'02.07"W, MZSP 139666, 2 sh (F.S. Silva col. 04/viii/2018); MZSP 139667, 4 sh (F.S. Silva col. 13/viii/2018); Piripá, 15°02'28.09"S, 41°42'17.78"W, MZSP 136662, 1 sh (F.S. Silva col. 09/i/2018).

**Remarks:** *Biomphalaria glabrata* is a widespread neotropical freshwater species known as intermediary host of schistosomiasis and can often be found in anthropically disturbed areas (Massemin et al., 2009). It had already been reported from other 23 municipalities in the central southern region of Bahia (Carvalho et al., 2018); the new occurrences complement that list.

***Biomphalaria straminea* (Dunker, 1848)**  
**Figs. 3N-P**

Synonymy, see Lucena (1956: 40). Complement:

*Planorbis stramineus* Dunker, 1848: 42; Baker, 1913: 662; Lutz, 1918: 60; Ernest, 1948: 79.

*Planorbis centimetalis* Lutz, 1918: 53, pl. 7, figs. 8a-d; Martins, 1938: 34.

*Tropicorbis centimetalis* Lutz, 1918: 52; Morretes, 1949: 125; Lucena, 1953: 246; Olivier & Barbosa, 1955b: 105.

*Planorbina (Tropicorbis) straminea*: Baker, 1930: 46.

*Helisoma (Tropicorbis) centimetalis*: Haas, 1939: 267.

*Tropicorbis stramineus*: Lucena, 1951: 95, 1953: 246, 1956: 40; Morretes, 1953: 59.

*Biomphalaria straminea*: Barbosa & Figueiredo, 1969: 286; Paraense, 1975: 118, figs. 54-55, 2006: 21; Boffi, 1979: 30; Tillier, 1980: 40, pl. 3, fig. 3; Oliveira et al., 1981: 313; Rosa, 1987: 311; Teles & Vaz, 1988: 173; Figueiredo, 1989: 383; Teles et al., 1991: 350; Barbosa, 1992: 311; Ferrari & Hofmann, 1992: 33; Lima, 1995b: 101, fig. 27; Souza et al., 1996: 542; Teles, 1996: 342; Carvalho et al., 1998: 39; Luz et al., 1998: 41; Souza et al., 1998: 451; Thiengo et al., 1998: 233; Oliveira & Almeida, 1999: 14; Fernandez et al., 2001: 280; Agudo-Padrón, 2008: 156, 2014: 14; Martins-Silva & Barros, 2001: 867; Souza et al., 2001: 294; Pointier et al., 2005: 250; Simone, 2006: 109, fig. 321; Pepe et al., 2009: 783; Kotzian & Amaral, 2013: 306; Díaz & Martín, 2013: 26; Carvalho et al., 2018: 3.

**Type locality:** South America, restricted by Martens (1873) to Lagunilha and Caracas, Venezuela (see also Paraense, 1975).

**Occurrence:** Central America, Guyana, Venezuela and Brazil (Simone, 2006).

**Material examined:** BRAZIL: Bahia; Guanambi, 14°13'09.86"S, 42°49'46.82"W, MZSP 31549, 3 sh (F. Gianmots col. 15/xiii/1991); Condeúba, 14°54'02.39"S, 42°02'18.92"W, MZSP 140927, 1 sh (F.S. Silva col. 05/viii/2018); Cordeiros, 15°02'23.90"S, 41°56'02.07"W, MZSP 136659, 34 sh (F.S. Silva col. 02/i/2018); MZSP 139665, 3 sh (F.S. Silva col. 13/viii/2018); Piripá,

15°02'28.09"S, 41°42'17.78"W, MZSP 136663, 3 sh (F.S. Silva col. 09/i/2018).

**Remarks:** This species has a sympatric occurrence with *B. glabrata*, present in regions with longer dry seasons and being more resistant to desiccation than its congener (Lucena, 1951). It is also an intermediary host of schistosomiasis and has been reported from 12 municipalities of the central southern region of Bahia (Carvalho et al., 2018); the new occurrences complement that list.

**Superfamília Veronicelloidea**  
**Família Veronicellidae**  
**Gênero *Sarasinula* Grimpe & Hoffmann, 1924**  
***Sarasinula plebeia* (Fischer, 1868)**  
**Figs. 3Q-S**

Synonymy, see Gomes & Thomé (2004: 591). Complement: *Vaginula behni*: Morretes, 1949: 128; Thomé, 1969: 103.

*Vaginulus plebeius*: Thomé, 1975: 158.

*Sarasinula plebeia*: Andrews & Dundee, 1987: 165; Thomé, 1988: 809, 1993: 67; Mansur & Thomé, 1994: 41; Thomé, 1994: 45; Thomé et al., 1997: 530; Thomé et al., 1999: 161; Rueda et al., 2002: 115; Maceira, 2003: 459; Simone, 2006: 97, fig. 275; Thomé et al., 2006: 55; Naranjo-Garcia et al., 2007: 45; Agudo-Padrón, 2008: 153, 2014: 11.

**Type locality:** New Caledonia.

**Occurrence:** USA, Mexico, Central America, Antilles, Colombia, Venezuela, Brazil (Para to Rio Grande do Sul) and Chile (Simone, 2006).

**Material examined:** BRAZIL: Bahia; Cordeiros, 15°02'23.90"S, 41°56'02.07"W, MZSP 136616, 5 spm (F.S. Silva col. 04/i/2018).

**Barcoding:** GenBank reg nr MN792580 (MZSP 136616).

**Remarks:** Identification of *Sarasinula* spp. is not trivial and the taxonomy of the genus is still in flux. The anatomical characters observed in our specimens are in line with previous studies on *S. plebeia*, mainly due to the short club-like penis with 6-8 short tubules (Fig. 3S; Hoffmann, 1925). Furthermore, our COI sequence displayed 99% identity with those of voucher specimens of *S. plebeia* stemming from other regions in South America available in GenBank (from Gomes et al., 2013, unpublished).

**Superfamily Achatinoidea**  
**Family Achatinidae**  
**Genus *Lissachatina* Bequaert, 1950**  
***Lissachatina fulica* (Bowdich, 1822)**  
**Figs. 4A-B**

Synonymy, see Miquel & Herrera (2014: 120). Complement:

*Helix fulica* Férussac, 1821: 49.

*Achatina fulica* Bowdich, 1822: pl. 8; Oliveira et al., 1981: 329; Teles et al., 1997: 311; Oliveira & Almeida, 1999: 25; Vasconcellos & Pile, 2001: 582; Kosloski & Fischer, 2002: 66; Raut & Baker, 2002: 55; Teles & Fontes, 2002: 3; Fischer & Colley, 2004: 44, 2005: 128; Eston et al., 2006: 173; Fischer et al., 2006: 1; Simone, 2006: 308, fig. 10; Thomé et al., 2006: 69; Thiengo et al., 2007; Graeff-Teixeira, 2007: 743; Teixeira et al., 2008: 334; Albuquerque et al., 2008: 837, 2009: 880; Santos et al., 2010: 513; Silva & Aleluia, 2010: 199; Zanol et al., 2010: 448; Vogler et al., 2013: 39; Silva & Omena, 2014: 2; Madella & Auricchio, 2014: 53; Sá-Oliveira et al., 2016: 160; Valim & Bim, 2017: 7.

*Achatina (Lissachatina) fulica* Bequaert, 1950: 54; Agudo-Padrón, 2011: 56.

*Lissachatina fulica*: Miquel & Herrera, 2014: 120, fig. 36.

**Type locality:** Africa.

**Occurrence:** Natural from Africa, but introduced in the Americas, Southeast Asia and Oceania (Zanol et al., 2010).

**Material examined:** BRAZIL: Bahia; Cordeiros, 15°02'23.90"S, 41°56'02.07"W, MZSP 136582, 1 sh (F.S. Silva col. 03/i/2018).

**Remarks:** The giant African land snail is presently distributed in 25 (out of 26) Brazilian states (Zanol et al., 2010; Darrigran et al., 2020); the exception being the typically undersampled state of Acre (Salvador et al., 2020; Lima et al., 2021). Despite being common in several regions of Brazil, only one specimen (an empty shell) was recovered in the present study.

**Genus *Beckianum* Baker, 1961**  
***Beckianum beckianum* (Pfeiffer, 1846)**  
**Figs. 4C-D**

*Bulimus beckianus* Pfeiffer, 1846: 82.

*Synoepas (Opeas) beckiana*: Dall, 1896: 415.

*Synoepas beckianum*: Richards & Hummelinck, 1940: 9; Baker, 1945b: 91; Altena, 1960: 50; Baker, 1961: 84.

*Opeas beckianum*: Baker, 1913: 644; Pilsbry, 1906: 189, pl. 27, figs. 42-46, 54-55, 1910: 502; Haas, 1939: 268; Schalie, 1940: 5; Morretes, 1949: 132; Jaeckel, 1952: 6; Ramírez et al., 2003: 276; Salgado & Coelho, 2003: 155; Santos et al., 2010: 514.

*Opeas (Synoepas) beckianum*: Baker, 1927: 7; Pilsbry, 1930: 342.

*Opeas (Opeas) beckianum*: Haas, 1953, 205.

*Beckianum beckianum*: Marcus & Marcus, 1968: 204; Santos & Monteiro, 2001: 186; Simone, 2006: 187, fig. 685; Masseurin et al., 2009: 414, pl. 9E; Robinson et al., 2009: 632, fig. 7A; Almeida & Mota, 2011: 75; Kotzian & Amaral, 2013: 306; Simone & Casati, 2013: 156; Salvador & Simone, 2015: 3, fig. 9; Salvador et al., 2015: 75, fig. 30; Birckolz et al., 2016: 150, table 1; Breure et al., 2016: 35, fig. 19; Salvador et al., 2018: 114, figs. 9K-M; Lima et al., 2021: 273, figs. 3Q-S.

*Beckianum beckianum beckianum*: Thompson, 2011: 523.

**Type locality:** Opara Island, Polynesia (Pfeiffer, 1846). Pilsbry (1906) considered this mistaken, arguing that Pfeiffer's specimens were most similar to those found in Central America (see also Salvador & Simone, 2015).

**Occurrence:** Mexico to Brazil (Pará, Fernando de Noronha, Bahia, Rio Grande do Norte, Rondônia, Rio de Janeiro, and São Paulo states), including the Caribbean Islands (Simone, 2006; Birckolz *et al.*, 2016).

**Material examined:** BRAZIL: Bahia; Condeúba, 14°54'02.39"S, 42°02'18.92"W, MZSP 139788, 1 sh (F.S. Silva col. 04/viii/2018); Cordeiros, 15°02'23.90"S, 41°56'02.07"W, MZSP 139784, 4 spm (F.S. Silva col. 04/viii/2018); Piripá, 15°02'28.09"S, 41°42'17.78"W, MZSP 139785, 6 sh (F.S. Silva col. 07/viii/2018).

**Remarks:** Live specimens were only found during the dry season.

**Genus *Lamellaxis* Strebel & Pfeiffer, 1882**  
***Lamellaxis gracilis* (Hutton, 1834)**  
**Figs. 4E-F**

Synonymy, see Silva *et al.* (2019b: 3). Complement:

*Achatina subula* Pfeiffer, 1839: 352.

*Opeas gracile*: Schalie, 1940: 5.

*Lamellaxis gracilis*: Karlin, 1956: 122; Scarabino, 2003: 207; Santos *et al.*, 2010: 514; Simone & Casati, 2013: 156; González-Valdivia *et al.*, 2018: 7; Lim *et al.*, 2018: 114; Silva *et al.*, 2019b: 3, fig. 2H-I.

*Lamellaxis (Allopeas) gracilis*: Coomans, 1967: 135.

*Allopeas gracilis*: Robinson *et al.*, 2009: 632, fig. 7B; Thompson, 2011: 159; Miquel & Jaime, 2018: 5.

*Allopeas gracile*: Delannoye *et al.*, 2015: 258, pl. 51; Breure *et al.*, 2016: 33, fig. 15; Capinera, 2017: 116; D'Ávila *et al.*, 2018: 1553.

**Type locality:** Mirzapur, India.

**Occurrence:** West Indies to South America; introduced to tropical and subtropical areas in Asia, Australia and Polynesia (Simone, 2006; Capinera, 2017).

**Material examined:** BRAZIL: Bahia; Condeúba, 14°54'02.39"S, 42°02'18.92"W, MZSP 136658, 2 sh (F.S. Silva col. 11/i/2018); MZSP 138549, 3 sh (F.S. Silva col. 04/i/2018); Mortugaba, 15°01'42.20"S, 42°22'30.79"W, MZSP 136655, 4 sh (F.S. Silva col. 03/i/2018); Cordeiros, 15°02'23.90"S, 41°56'02.07"W, MZSP 136657, 1 sh (F.S. Silva col. 28/xii/2017); Piripá, 15°02'28.09"S, 41°42'17.78"W, MZSP 136656, 3 sh (F.S. Silva col. 08/i/2018).

**Remarks:** Generally found in dry environments (Delannoye *et al.*, 2015). Present specimens were all collected in urban areas.

**Genus *Leptinaria* Beck, 1837**  
***Leptinaria unilamellata* (d'Orbigny, 1838)**  
**Figs. 4G-H**

Synonymy, see Silva *et al.* (2019b: 3). Complement:

*Achatina lamellata* Potiez & Michaud, 1838: 128, pl. 11, figs. 7-8; Reeve, 1849a: pl. 18, fig. 97.

*Leptinaria lamellata*: Morretes, 1949: 132; Silva *et al.*, 2019b: 3, figs. 2J-K; Salvador *et al.*, 2021: table 2.

*Leptinaria (Leptinaria) lamellata*: Coomans, 1967: 134.

*Leptinaria unilamellata*: Robinson *et al.*, 2009: 632, fig. 7B; Santos *et al.*, 2010: 514; Breure *et al.*, 2016: 35, fig. 14; D'Ávila *et al.*, 2018: 1552. Miquel & Jaime, 2018: 5; Breure *et al.*, 2020: 23, fig. 5; Lima *et al.*, 2021: 274, figs. 3T-V.

**Type locality:** Undefined; nevertheless, Delannoye *et al.* (2015) quote Santa Cruz, Bolivia, as the possible type locality.

**Occurrence:** Nicaragua to Brazil (Simone, 2006; Delannoye *et al.*, 2015).

**Material examined:** BRAZIL: Bahia, Condeúba, 14°54'02.39"S, 42°02'18.92"W, MZSP 138552, 1 sh (F.S. Silva col., 11/i/2018).

**Remarks:** A single empty shell was found, collected in an urban area. This species is very common in anthropically disturbed environments, being likewise abundant in agricultural areas (Carvalho *et al.*, 2009).

**Genus *Opeas* Beck, 1837**  
***Opeas opella* Pilsbry & Vanatta, 1905**  
**Figs. 4I-J**

*Opeas opella* Pilsbry & Vanatta, 1905: 785, fig. 1; Pilsbry, 1906: 186, pl. 24, fig. 36; Baker, 1913: 645; Haas, 1939: 268; Morretes, 1949: 133; Marcus & Marcus, 1968: 193; Cowie, 1998: 356; Salgado & Coelho, 2003: 155; Simone, 2006: 309, fig. 13.

**Type locality:** Honolulu, Hawaii, EUA. Nevertheless, Cowie (1998) argued that the species should be native to Asia.

**Occurrence:** Natural distribution include "East Indies" to China (Cowie, 2001).

**Material examined:** BRAZIL: Bahia; Cordeiros, 15°02'23.90"S, 41°56'02.07"W, MZSP 138550, 15 sh (F.S. Silva col. 28/xii/2017); Mortugaba, 15°01'42.20"S, 42°22'30.79"W, MZSP 136653, 1 sh (F.S. Silva col. 03/i/2018).

**Remarks:** Only empty shells were found in our collection efforts. The species can be identified by its turritiform shell, irregular sculpture and tall aperture. In Brazil, *Opeas opella* has been reported as an introduced species,



but has been previously reported only from Pará state (Baker, 1913). The present new record from Bahia state represents a large extension in distribution in Brazil.

**Genus *Stenogyra* Shuttleworth, 1854**  
***Stenogyra octogyra* (Pfeiffer, 1856)**  
**Figs. 4K-L**

*Bulimus octogyrus* Pfeiffer, 1856: 45.

*Opeas octogyra*: Albers, 1860: 265.

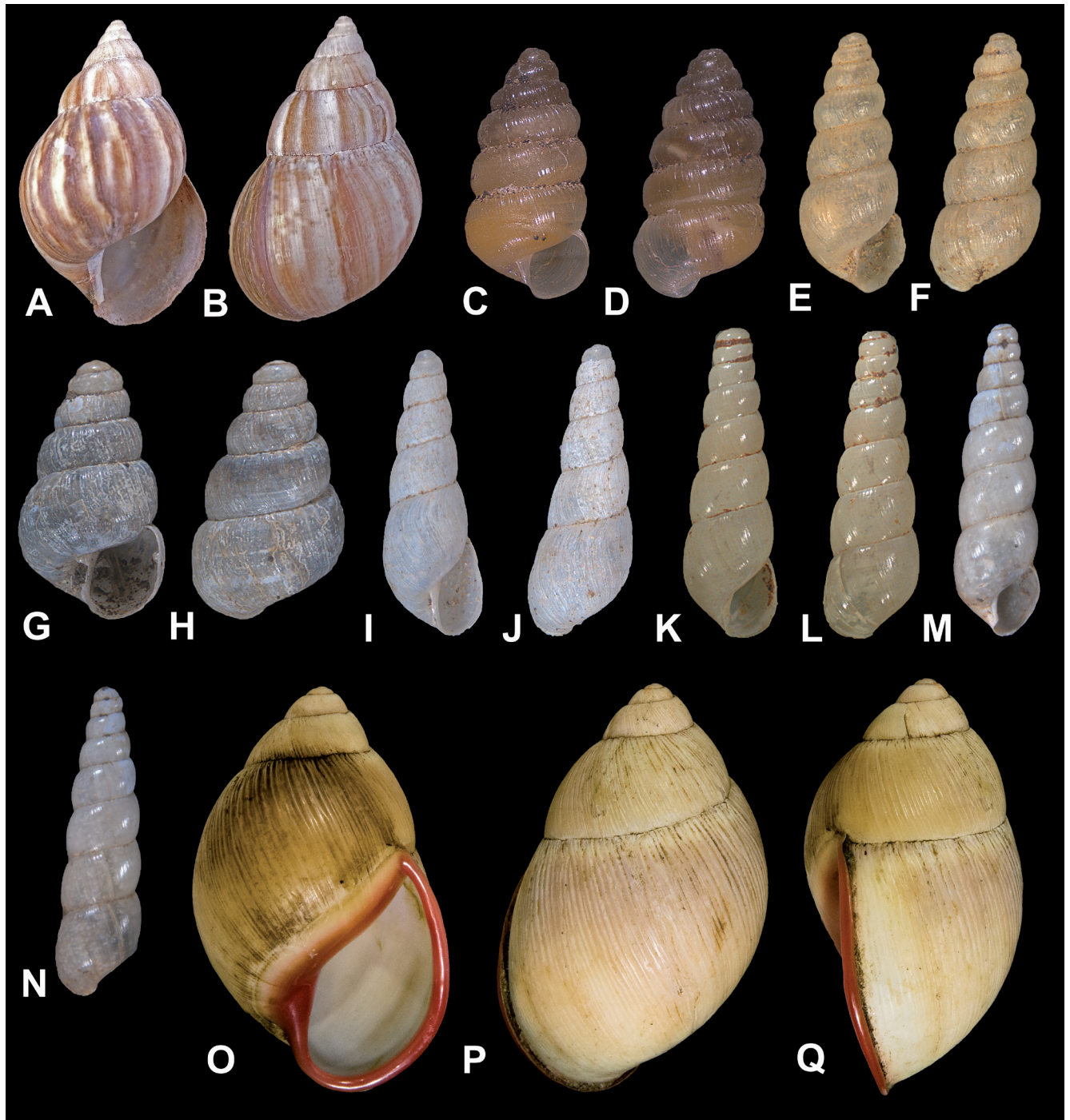
*Opeas octogyrum*: Pilsbry, 1906: 206, pl. 29, figs. 75-79;  
Baker, 1913: 644; Haas, 1939: 268; Jaeckel, 1952: 6;  
Salgado & Coelho, 2003: 155.

*Obeliscus (Stenogyra) octogyrus*: Baker, 1927: 4.

*Obeliscus octogyrus*: Pilsbry, 1933: 69.

*Obeliscus (Stenogyra) octogyrus octogyrus*: Morretes,  
1949: 133.

*Stenogyra octogyra*: Simone, 2006: 188, fig. 695; Salvador  
et al., 2017: 140, fig. 17, 2018: 116, figs. 10I-J.



**Figure 4.** Shells from Bahia state. (A-B) *Lissachatina fulica*, MZSP 136582, Cordeiros (H = 66.7 mm). (C-D) *Beckianum beckianum*, MZSP 139784, Cordeiros (H = 6.5 mm). (E-F) *Lamelaxis gracilis*, MZSP 136658, Condeúba (H = 6.4 mm). (G-H) *Leptinaria unilamellata*, MZSP 138552, Condeúba (H = 5.4 mm). (I-J) *Opeas opella*, MZSP 138550, Cordeiros (H = 5.7 mm). (K-L) *Stenogyra octogyra*, MZSP 103040, Itaquara (H = 10.7 mm). (M-N) *Subulina octona*, MZSP 136653, Mortugaba (H = 14.2 mm). (O-Q) *Megalobulimus oblongus*, MZSP 136679, Mortugaba (H = 117.5 mm).

**Type locality:** Caracas, Venezuela.

**Occurrence:** Venezuela to Brazil (Salvador *et al.*, 2017).

**Material examined:** BRAZIL: Bahia; Andaraí, 12°39'54.32"S, 41°12'01.76"W, MZSP 103030, 2 sh (30/vii/2010); Itaquara, 13°27'13.47"S, 39°52'42.54"W, MZSP 103040, 2 sh (19/vi/2009).

**Remarks:** This species was not found during our collection efforts but is represented in the MZUSP collection. Even so, given that the species is widely distributed in South America, there is no reason to suspect it became locally extinct in southern Bahia, as it may be only rare in the region.

**Genus Subulina, Beck, 1837**  
***Subulina octona* (Bruguière, 1792)**  
**Figs. 4M-N**

Synonymy, see Araújo & Bessa (1993: 492). Complement: *Bulimus octonus* Bruguière, 1792: 325.

*Helix octona*: d'Orbigny, 1835b: 9; d'Orbigny, 1835a: 260.

*Achatina octona*: Hidalgo, 1869: 138.

*Rumina* (*Subulina*) *octona*: Adams, 1866: 441.

*Subulina octona*: Pilsbry, 1906: 72, pl. 12, figs. 8-9; Baker, 1913: 609, 1927: 2, pl. 20, fig. 99; Haas, 1935: 111, 1939: 268; Richards & Hummelinck, 1940: 13; Morretes, 1949: 131; Jaekel, 1952: 6; Altena, 1960: 50; Coomans, 1967: 134; Marcus & Marcus, 1968: 187; Götting, 1978: 105, fig. 6; Tillier, 1980: 58; Dutra, 1988: 582; Araújo & Bessa, 1993: 492; Bessa & Araújo, 1995: 719; Oliveira & Almeida, 1999: 23; Santos & Monteiro, 2001: 188; Salgado & Coelho, 2003: 154; Simone, 2006: 308, fig. 11; Thomé *et al.*, 2006: 70; Agudo-Padrón, 2008: 157; Massemin *et al.*, 2009: 418, pl. 9B; Robinson *et al.*, 2009: 633, fig. 7B; Santos *et al.*, 2010: 514; Agudo-Padrón & Lenhard, 2011: 169; Madella & Auricchio, 2014: 55; D'Ávila *et al.*, 2018: 1552; Miquel & Jaime, 2018: 5; Lima *et al.*, 2021: 274, figs. 4F-H.

*Subulina* (*Subulina*) *octona*: Haas, 1953: 253.

*Subulina octonata*: Oliveira *et al.*, 1981: 327.

**Type locality:** Guadeloupe.

**Occurrence:** Naturally occurring in tropical continental Americas, but introduced to the Caribbean Islands, Africa, Asia and Pacific Islands (Massemin *et al.*, 2009; Miquel & Herrera, 2014).

**Material examined:** BRAZIL: Bahia; Condeúba, 14°54'02.39"S, 42°02'18.92"W, MZSP 138551, 1 sh (F.S. Silva col. 11/i/2018); Mortugaba, 15°01'42.20"S, 42°22'30.79"W, MZSP 136653, 1 sh (F.S. Silva col. 04/i/2018).

**Remarks:** The present specimens were all collected in urban areas.

**Superfamily Rhytidoidea**  
**Family Strophocheilidae**  
**Genus *Megalobulimus* Miller, 1878**  
***Megalobulimus oblongus* (Müller, 1774)**  
**Figs. 4O-Q**

Synonymy, see Bequaert (1948: 58). Complement:

*Bulimus oblongus*: Hupé, 1857: 26; Ernest, 1948: 76.

*Strophocheilus* (*Megalobulimus*) *oblongus*: Bequaert, 1948: 58; Arias, 1952: 55, pl. 2, fig. 4, 1953: 249; Solem, 1956: 3; Sawaya & Peterson, 1962: 33; Shade, 1965: 2015; Fernandez & Castellanos, 1973: 276.

*Strophocheilus* (*Megalobulimus*) *oblongus oblongus*: Haas, 1959: 365.

*Psiloicus oblongus* Morretes, 1952: 113, 1953: 69; Oliveira *et al.*, 1981: 340; Oliveira & Almeida, 1999: 31.

*Strophocheilus oblongus*: Morretes, 1949: 142; Barattini & Ledón, 1949: 2; Bigarella, 1951: 247; Jaekel, 1952: 7; Lopes, 1957: 44; Fiori & Jaeger, 1978: 847; Tillier, 1980: 57; Oliveira & Oliveira, 1984: 8; Parkinson *et al.*, 1987: pl. 15, fig. 1; Massemin *et al.*, 2009: 425, pl. 7B.

*Megalobulimus oblongus*: Leme, 1975: 174; Götting, 1978: 105, fig. 8; Boffi, 1979: 32; Deisler & Stange, 1982: 1; Vieira & Simone, 1990: 57; Cuzzo & Drahg, 1995: 196; Klappenbach, 1997: 45; Simone, 1999: 5, 2012: 438; Salgado & Coelho, 2003: 158; Agudo-Padrón, 2008: 161, 2011: 62, fig. 3; Santos *et al.*, 2010: 513; Ramírez *et al.*, 2012: 62, fig. 1G; Madella & Auricchio, 2014: 57; Páez *et al.*, 2014: 50, fig. 1; Roldán *et al.*, 2014: 80; Breure & Araújo, 2017: 105, fig. 38D; Gordillo, 2018: 64; Pilate *et al.*, 2018: 74.

*Megalobulimus oblongus oblongus*: Quintana, 1982: 83.

**Type locality:** Undefined.

**Occurrence:** South America (Simone, 2006).

**Material examined:** BRAZIL: Bahia; Mortugaba, 15°01'42.20"S, 42°22'30.79"W, MZSP 136652, 2 sh (F.S. Silva col. 03/i/2018); MZSP 136679, 1 spm (F.S. Silva col. 03/i/2018); MZSP 139663, 1 sh (F.S. Silva col. 11/viii/2018).

**Barcoding:** GenBank reg nr MN756630 (MZSP 136679).

**Remarks:** The specimens could be identified through conchological features (oblong-oval shell, blunt spire apex, and protoconch sculpture), as described and illustrated by Bequaert (1948) as the "typical *M. oblongus*". However, this species might represent a yet unresolved species complex.

***Megalobulimus conicus* (Bequaert, 1948)**  
**Figs. 5A-C**

*Strophocheilus oblongus conicus* Bequaert, 1948: 79, pl. 6, fig. 1; pl. 19, fig. 2; pl. 23, figs. 1-3.

*Strophocheilus* (*Strophocheilus*) *oblongus conicus*: Haas, 1949: 152.

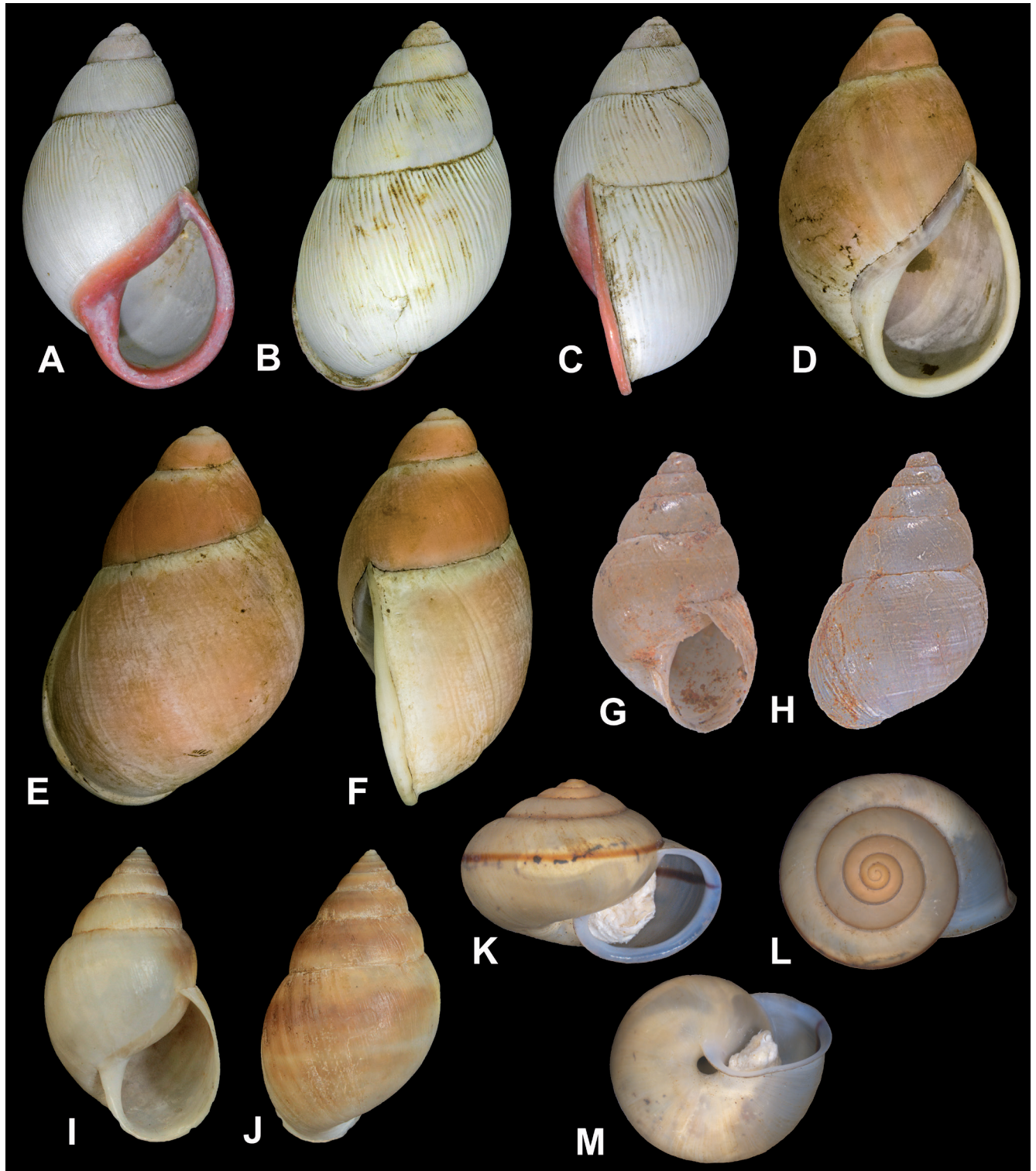
*Psiloicus conicus*: Morretes, 1952: 113, 1953: 69.

*Megalobulimus conicus*: Salgado & Coelho, 2003: 157; Simone, 2006: 208, fig. 791; Salvador et al., 2015: 75, figs. 28-29.

**Type locality:** Maranhão state, Brazil.

**Occurrence:** Brazil (Amazonas, Maranhão, Bahia, and Tocantins states) (Simone, 2006; Salvador et al., 2015).

**Material examined:** BRAZIL: Bahia; paratype MZSP 14610, 1 sh; Ibiajara, 12°59'00.88"S, 42°13'25.27"W, MZSP 29067, 1 sh (F.S. Silva col. 1986), Palmas de Monte Alto, 13°52'50.54"S, 43°03'49.38"W, MZSP 98238, 1 sh (F.S. Silva col. 1986); Caetitê, 14°03'53.52"S, 42°29'09.19"W, MZSP 29162, 15 sh (J. Vaz col. iii/1968); Mortugaba, 15°01'42.20"S, 42°22'30.79"W, MZSP 143688, 1 spm (F.S. Silva col. 03/i/2018); Piriapá, 15°02'28.09"S, 41°42'17.78"W,



**Figure 5.** Shells from Bahia state. (A-C) *Megalobulimus conicus*, MZSP 136647, Cordeiros (H = 90.9 mm). (D-F) *Megalobulimus terrestris*, MZSP 136671, Cordeiros (H = 95.5 mm). (G-H) *Bulimulus tenuissimus*, MZSP 136599, Mortugaba (H = 8.4 mm). (I-J) *Rhinus durus*, MZSP 144963, Cordeiros (H = 32.7 mm). (K-M) *Bradybaena similaris*, MZSP 136583, Piriapá (D = 11.6 mm).

MZSP 139661, 2 sh (F.S. Silva col. 07/viii/2018); Cordeiros, 15°02'23.90"S, 41°56'02.07"W, MZSP 136647, 4 sh (F.S. Silva col. 17/i/2018); MZSP 136648, 2 sh (F.S. Silva col. 03/i/2018); MZSP 136649, 1 sh (Doação, 2016); MZSP 136676, 1 spm (F.S. Silva col. 03/i/2018); MZSP 139662, 5 sh (F.S. Silva col. 04/viii/2018); MZSP 144961, 3 sh (ii/2019); Itapetinga, 15°14'51.08"S, 40°15'03.53"W, MZSP 102448, 1 sh (J.E. Santos col.).

**Barcoding:** GenBank reg nr MN688645 (MZSP 136674), MN688646 (MZSP 136676), MN756629 (MZSP 143688).

**Remarks:** This species differs from *Megalobulimus oblongus* by its size (70-100 mm) and the last whorl of the teleoconch, which has pronounced axial riblets near the suture and more discreet riblets on the abapical portion of the whorl. *Megalobulimus oblongus*, on the other hand, has irregular malleated sculpture on its last whorls. Furthermore, it also displays a more defined umbilicus.

***Megalobulimus terrestris* (Spix, 1827)  
Figs. 5D-F**

Synonymy, see Bequaert (1948: 108). Complement:  
*Strophocheilus* (*Megalobulimus*) *terrestris*: Bequaert, 1948: 108, pl. 7, fig. 5, pl. 18, fig. 1; Martins, 1950: 143.  
*Strophocheilus cantagallanus*: Morretes, 1949: 143; Jaekel, 1952: 7.  
*Megalobulimus* (*Megalobulimus*) *cantagallanus*: Morretes, 1953: 67; Oliveira & Almeida, 1999: 29.  
*Megalobulimus* (*Megalobulimus*) *terrestris*: Morretes, 1952: 113, 1953: 68; Oliveira & Almeida, 1999: 30.  
*Megalobulimus terrestris*: Oliveira et al., 1981: 337; Salgado & Coelho, 2003: 158; Simone, 2006: 220, fig. 834; Agudo-Padrón, 2014: 15; Breure & Araújo, 2017: 107, fig. 39B; Lima et al., 2017: 329, fig. 2.  
*Bulimus terrestris*: Fechter, 1983: 221.

**Type locality:** Bahia state, Brazil.

**Occurrence:** Brazil (Ceará, Rio Grande do Norte, Paraíba, Bahia, Rio de Janeiro, São Paulo, and Santa Catarina states) (Simone, 2006).

**Material examined:** BRAZIL: Bahia; Seabra, 12°28'00.00"S, 41°45'00.00"W, MZSP 90858, 3 sh (L. Santana col. iv/1969); MZSP 29333, 8 sh (R. Santana col. iv/1965); Planaltino, 13°10'26.02"S, 40°16'04.83"W, MZSP 18427, 5 sh (A. Silva. col. 1967); Ubaíra, 13°16'10.48"S, 39°39'44.79"W, MZSP 46480, 1 sh (J.E.A. Ranali col.); Jequié, 13°51'32.61"S, 40°05'01.59"W, MZSP 118328, 1 sh (M.U. Rodrigues col. 16/xii/1998); Caetité, 14°03'53.52"S, 42°29'09.19"W, MZSP 90855, 1 sh (ex J.F. Vaz colln. xi/1969); Cordeiros, 15°02'23.90"S, 41°56'02.07"W, MZSP 136671, 1 sh (F.S. Silva col. 31/xii/2017).

**Remarks:** In contrast to the other two *Megalobulimus* species listed above, adults of *M. terrestris* have an olivaceous-brown periostracum with a few darker chest-

nut-brown vertical streaks. Furthermore, the outer lip is white and the shell apex is short. Unfortunately, no fresh specimen was found for barcoding.

**Superfamily Orthalicoidea  
Family Bulimulidae  
Genus *Bulimulus* Leach, 1814  
*Bulimulus tenuissimus* (d'Orbigny, 1835)  
Figs. 5G-H**

*Helix tenuissima* d'Orbigny, 1835b: 11; Moricand. 1836: 435; Breure, 1973: 123, 1979: 64.  
*Bulimus tenuissimus*: Pfeiffer, 1848: 218; Reeve, 1849b: pl. 45, fig. 288; Albers, 1850: 167; Pfeiffer, 1853: 439, 1855: 160; Gray, 1854: 15; Hupé, 1857: 53; Pfeiffer, 1868: 152; Hidalgo, 1869: 119, 1870: 60; Duarte, 1971: 84.  
*Bulimus* (*Bulimulus*) *tenuissimus*: Baker, 1913: 635; Beck, 1837: 67; Pfeiffer, 1842: 122.  
*Bulimus* (*Bulimulus*) *thoreyi* Beck, 1837: 67; Pfeiffer, 1859: 500.  
*Bulimus corneus* Potiez & Michaud, 1838: 137, pl. 14, figs. 11-12.  
*Bulimus puellaris* Reeve, 1849b: pl. 76, fig. 637; Pfeiffer, 1855: 160, 1868: 114.  
*Bulimulus tenuissimus*: Smith, 1895: 316; Baker, 1926: 38, pl. 18, fig. 90; Jaekel, 1927: 137; Pilsbry, 1933: 69; Morretes, 1943: 116, 1949: 146; Barros-Araújo et al., 1960: 34; Oliveira et al., 1972: 16; Breure, 1976: 109; Tillier, 1980: 81; Oliveira et al., 1981: 345; Dutra, 1988: 583; Dutra-Clarke & Souza, 1991: 292, fig. 1; Oliveira & Oliveira, 1984: 11; Richardson, 1995: 63; Oliveira & Almeida, 1999: 35; Salgado & Coelho, 2003: 160; Silva & Castro, 2003: 67; Simone, 2006: 120, fig. 370; Agudo-Padrón, 2008: 159, 2014: 15; Santos et al., 2010: 513; Agudo-Padrón & Lenhard, 2011: 167; Salvador & Simone, 2015: 3, fig. 6; Birckolz et al., 2016: 149, table 1; Salvador et al., 2018: 109, fig. 7A.  
*Bulimulus* (*Bulimulus*) *tenuissimus*: Pilsbry, 1897-1898: 64, pl. 10, figs. 91-92; Baker, 1913: 635; Haas, 1935, 111; Jaekel, 1952: 7; Figueiras, 1963: 89.

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

**Occurrence:** Suriname, Bolivia, Brazil (Bahia, Espírito Santo, Maranhão, Pará, Pernambuco, Rio de Janeiro, São Paulo, Rio Grande do Sul, and Santa Catarina states), and Uruguay (Simone, 2006; Birckolz et al., 2016).

**Material examined:** BRAZIL: Bahia; Mortugaba, 15°01'42.20"S, 42°22'30.79"W, MZSP 136597, 1 sh (F.S. Silva col. 04/i/2018); MZSP 136599, 2 sh (F.S. Silva col. 03/i/2018).

**Remarks:** The species is adapted to living in urban areas and has already been introduced to North America (Salvador & Simone, 2015). The original natural distribution is unknown, but it likely included Bahia state (Salvador & Simone, 2015).

**Family Simpulopsidae**  
**Genus *Rhinus* Martens in Albers, 1960**  
***Rhinus durus* (Spix, 1827)**  
**Figs. 5I-J**

*Bulimus durus* Spix, 1827: 5, pl. 6, fig. 2; Pfeiffer, 1848: 104; Reeve, 1849b: pl. 40, fig. 253; Hupé, 1857: 43; Pilsbry, 1897-1898: 87, pl. 13, figs. 5-6, 24.

*Rhinus durus*: Albers, 1860: 223; Salgado & Coelho, 2003: 163; Simone, 2006: 127, fig. 404.

*Bulimulus durus*: Bland & Binney, 1873: 248; Oliveira et al., 2011: 87.

*Bulimulus (Protoglyptus) durus*: Haas, 1939: 269; Parodíz, 1944: 3; Jaekel, 1952: 7.

*Protoglyptus durus*: Morretes, 1953: 70; Dutra-Clarke & Souza, 1991: 294, pl. 2, fig. 5.

*Protoglyptus (Protoglyptus) durus*: Figueiras, 1962: 48.

*Naesiotus durus*: Breure, 1979: 69.

**Type locality:** Bahia state, Brazil.

**Occurrence:** Brazil (Ceará, Paraíba, Pernambuco, and Bahia states) (Simone, 2006).

**Material examined:** BRAZIL: Bahia; Brumado, 14°11'48.70"S, 41°40'51.50"W, MZSP 029871, 1 sh (L.S. Rocha col. 16/xii/1998); Cordeiros, 15°02'23.90"S, 41°56'02.07"W, MZSP 144963, 1 sh (ii/2019).

**Superfamily Helicoidea**  
**Family Camaenidae**  
**Genus *Bradybaena* Beck, 1837**  
***Bradybaena similaris* (Férussac, 1821)**  
**Figs. 5K-M**

Synonymy, see Silva et al. (2019b: 11). Complement:

*Helix similaris*: Férussac & Deshayes, 1820-1851: 171, pls. 25, 27.

*Bradybaena similaris*: Burch, 1960: 26; Oliveira et al., 1981: 366; Scarabino, 2003: 206; Simone, 2006: 312, fig. 29; Thomé et al., 2006: 83; Santos et al., 2010: 516; Agudo-Padrón, 2011: 56, fig. 21, 2014: 18; Madella & Auricchio, 2014: 55; Silva et al., 2019b: 11, fig. 4G-I.

**Type locality:** Timor.

**Occurrence:** Natural from Asia. Introduced in the USA (including Hawaii), Antilles, Venezuela, Brazil, Paraguay, and some Pacific Islands (Burch, 1960; Quintana, 1982; Cowie, 2001; Simone, 2006).

**Material examined:** BRAZIL: Bahia; Piripá, 15°02'28.09"S, 41°42'17.78"W, MZSP 136583, 25 spm (F.S. Silva col. 08/i/2018).

**Remarks:** Live specimens were collected in urban areas. A fairly known worldwide invasive species, present in several states in eastern and southern Brazil, from Minas Gerais to Rio Grande do Sul (Morretes, 1949; Oliveira et al., 1981;

Agudo-Padrón & Lenhard, 2011). The present record from Bahia represents a new occurrence and a northwards extension in the species distribution within Brazil.

## DISCUSSION

In total 19 freshwater and land snail species were sampled in Condeúba, Cordeiros, Mortugaba and Piripá municipalities (Table 1). This number was complemented by two additional species from the historical collection of the MZSP (*Asolene meta* and *Stenogyra octogyra*), totaling 21 species and 10 families. Expeditions during the rainy season (December and January) evidenced a greater wealth of species, with a total of 17 species (Table 1). Even so, the rainy season was unusually dry during our collection efforts (below the average values reported by Oliveira et al., 2017); the resulting dry soils and microhabitats could have influenced the number of species and of live specimens of land snails found (Pearce & Örstan, 2006).

Caenogastropods showed little overall diversity in the material resulting from our collections, with three species, but *Pomacea canaliculata* was the most abundant species (Table 1). The freshwater pulmonates *Biomphalaria glabrata* and *B. straminea* were likewise

**Table 1.** Species collected in December/2017 to January/2018 (rainy season) and August/2018 (dry season). An asterisk (\*) indicates a non-indigenous species.

Taxon	Rainy season	Dry season	Total
<b>Ampullariidae</b>			
<i>Pomacea canaliculata</i>	88	10	98
<b>Hemisinidae</b>			
<i>Aylacostoma</i> sp.	1	0	1
<b>Thiaridae</b>			
* <i>Melanoides tuberculata</i>	387	0	387
<b>Physidae</b>			
<i>Stenophysa marmorata</i>	2	9	11
<b>Planorbidae</b>			
<i>Biomphalaria glabrata</i>	2	8	10
<i>Biomphalaria straminea</i>	37	4	41
<b>Veronicellidae</b>			
<i>Sarasinula plebeia</i>	5	0	5
<b>Achatinidae</b>			
<i>Beckianum beckianum</i>	0	11	11
<i>Lamellaxis gracilis</i>	13	0	13
<i>Leptinaria unilamellata</i>	1	0	1
* <i>Lissachatina fulica</i>	1	0	1
* <i>Opeas opella</i>	16	0	16
* <i>Subulina octona</i>	2	0	2
<b>Strophocheilidae</b>			
<i>Megalobulimus conicus</i>	7	7	14
<i>Megalobulimus oblongus</i>	3	1	4
<i>Megalobulimus terrestris</i>	1	0	1
<b>Bulimulidae</b>			
<i>Bulimulus tenuissimus</i>	3	0	3
<i>Rhinus durus</i>	1	0	1
<b>Camaenidae</b>			
* <i>Bradybaena similaris</i>	25	0	25
<b>Total</b>	<b>595</b>	<b>50</b>	<b>645</b>

abundant (Table 1). Among the Stylommatophora, the Achatinidae were the most diverse group, with a total of six species, albeit including introduced ones. The superfamily Orthalicoidea, typically diverse in the region, was collected in very small numbers, with only two species, one in each of the families Bulimulidae and Simpulopsidae. This is at odds compared to recent surveys and checklists in the country (e.g., Salvador et al., 2018; Lima et al., 2021), but might be an artifact of the unfavorable weather during the collection effort, as mentioned above. Microgastropods such as Punctoidea, Euconulidae and Scolodontidae, also abundant in others localities (e.g., Salvador et al., 2018), were not found in the present collections, despite leaf litter sampling. Once again, the dry soil might be a cause, as litter and soil snails tend to burrow deeper in the soil during dry periods (pers. obs.).

The genus *Megalobulimus* was surprisingly abundant and diverse in the present collections, with 29 specimens, especially by the large size and K-selection strategy of reproduction (Miranda & Fontenelle, 2015). *Megalobulimus conicus*, in particular, was found in three of the four municipalities investigated.

Of all species recorded herein, five are non-indigenous. Of these, the records of *Bradybaena similaris* and *Opeas opella* represent important increments in these species' known distribution in Brazil, as these are the first records for Bahia state.

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## AUTHORS' CONTRIBUTIONS

**F.S.S.:** Conceptualization, data curation, investigation, formal analysis, writing (original draft). **L.R.L.S.** Supervision, data curation, formal analysis, writing (review & editing). **R.B.S.** Formal analysis, data curation, methodology, investigation, writing (review & editing).

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