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Research article
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Small, rare and little known: new records and species of *Cardiomya* (Bivalvia: Cuspidariidae) from Brazil

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Abstract. This paper describes rare *Cardiomya* species from Brazil which have been hitherto misidentified as *Cardiomya cleryana* (d'Orbigny, 1842) in literature or museum collections. *Cardiomya minerva* sp. nov. is proposed as new species and is characterized by its quadrangular shell, short and truncated rostrum, and external ornamentation composed of six radial ribs on the posterior half of the shell flank. *Cardiomya striolata* (Locard, 1897) described from the Mediterranean Sea and northwestern Atlantic Ocean, is reported from Brazil for the first time; although previously regarded as a junior synonym of *Cardiomya costellata* (Deshayes, 1835), it is herein considered as a full species and redescribed. This species is characterized by its trapezoidal shell flank, elongated rostrum, tapering towards the tip, and external ornamentation composed of 18–53 radial ribs, the 3–4 posterior ones being the strongest and more widely spaced. Other three previously unknown species are illustrated but not formally named due to the lack of well-preserved articulated shells.

Keywords. Mollusca, Septibranchia, biodiversity, taxonomy.

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Introduction

Cuspidariidae Dall, 1886 is a family of marine carnivorous bivalves (Allen & Morgan 1981; Morton 1981). Most species are less than 10 mm in length, and many of them are rare, only known by their original descriptions and few subsequent records. This rarity plus the fragility of the cuspidariid shells led to the scarcity of available specimens in scientific collections, where most species are represented only by few and usually broken shells.

Due to the numerous misidentifications in literature and in museum collections, many species are still not described or even recognized as new to science. A more complex problem of identification appears in *Cardiomya* A. Adams, 1864, where species are very similar, most of them with shells displaying few and variable characters.

Four species of *Cardiomya* have been reported from Brazil (Rios 2009; Oliveira *et al.* 2017): *Cardiomya cleryana* (d'Orbigny, 1842), *C. ornatissima* (d'Orbigny, 1853), *C. striata* (Jeffreys, 1876) and *C. perrostrata* (Dall, 1881).

Nevertheless, there are rare and little known *Cardiomya* still hidden on museums' shelves. Remarkable, most of them have been lumped with *C. cleryana*. The present study aims at reviewing these species.

Material and methods

We examined all available *Cardiomya* material from the Atlantic ocean found in the following institutions:

CMPHRM-A	=	Prof. Henry Ramos Matthews, Fortaleza, Brazil
IBUFRJ	=	Federal University of Rio de Janeiro, Rio de Janeiro, Brazil
MACN	=	Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Buenos Aires, Argentina
MCZ	=	Museum of Comparative Zoology, Cambridge, UK
MNHN	=	Muséum national d'histoire naturelle, Paris, France
MNHNM	=	Museo Nacional de Historia Natural, Montevideo, Uruguay
MNRJ	=	National Museum of Rio de Janeiro, Rio de Janeiro, Brazil
MORG	=	Oceanography Museum 'Professor Eliézer de Carvalho Rios', Federal University of Rio Grande, Rio Grande, Brazil
MZSP	=	Museum of Zoology of the University of São Paulo, São Paulo, Brazil
NHMUK	=	Natural History Museum, London, UK
RMNH.MOL	=	Naturalis Biodiversity Center, Leiden, The Netherlands
USNM	=	Smithsonian Institution, National Museum of Natural History, Washington, USA
ZMUC	=	Zoological Museum - University of Copenhagen, Copenhagen, Denmark
ZUEC-BIV	=	Bivalve Collection of the Museum of Zoology of the State University of Campinas, Campinas, Brazil

Specimens were compared with the type material and/or original descriptions. For the unknown species, only that with well preserved and articulated specimens are proposed as new.

Literature records were critically assessed and an updated geographical distribution of the species considered is provided. Records originating from checklists, unvouchered material, and non figured or properly described specimens are not included. Each species is compared with the most similar species or to those species with which they have been confused in the literature and/or in malacological collections. A pictogram illustrates the terminology used for the shell structures (Fig. 1). Higher taxonomy follows Gofas (2015). Species descriptions are based on original description and type/ordinary material examined. Table 1 summarizes the characters of the *Cardiomya* species studied here.

Only the lots containing types or ordinary material important for the discussions are listed. The preservation status of specimens is coded as 's' for articulated valves without soft parts (shells), 'v' for single valves, and 'i' for complete individuals; i.e., shells containing soft parts.

Results

Taxonomy

Phylum Mollusca Linnaeus, 1758
Class Bivalvia Linnaeus, 1758
Superorder Anomalodesmata Dall, 1889
Superfamily Cuspidarioidea Dall, 1886
Family Cuspidariidae Dall, 1886

Genus ***Cardiomya*** A. Adams, 1864

Type-species (by monotypy)

Neaera gouldiana Hinds, 1843: 77.

Description

Inequivalve, left valve slightly overlapping right valve along ventral margin, right valve overlapping left valve on dorsal margin of rostrum. External sculpture of radial ribs and commarginal growth lines. Hinge: left valve edentulous, right valve with a strong posterior lateral tooth. Ligament internal (Allen & Morgan 1981; Poutiers & Bernard 1995; Barroso *et al.* 2016; Machado *et al.* 2016; Oliveira *et al.* 2017).

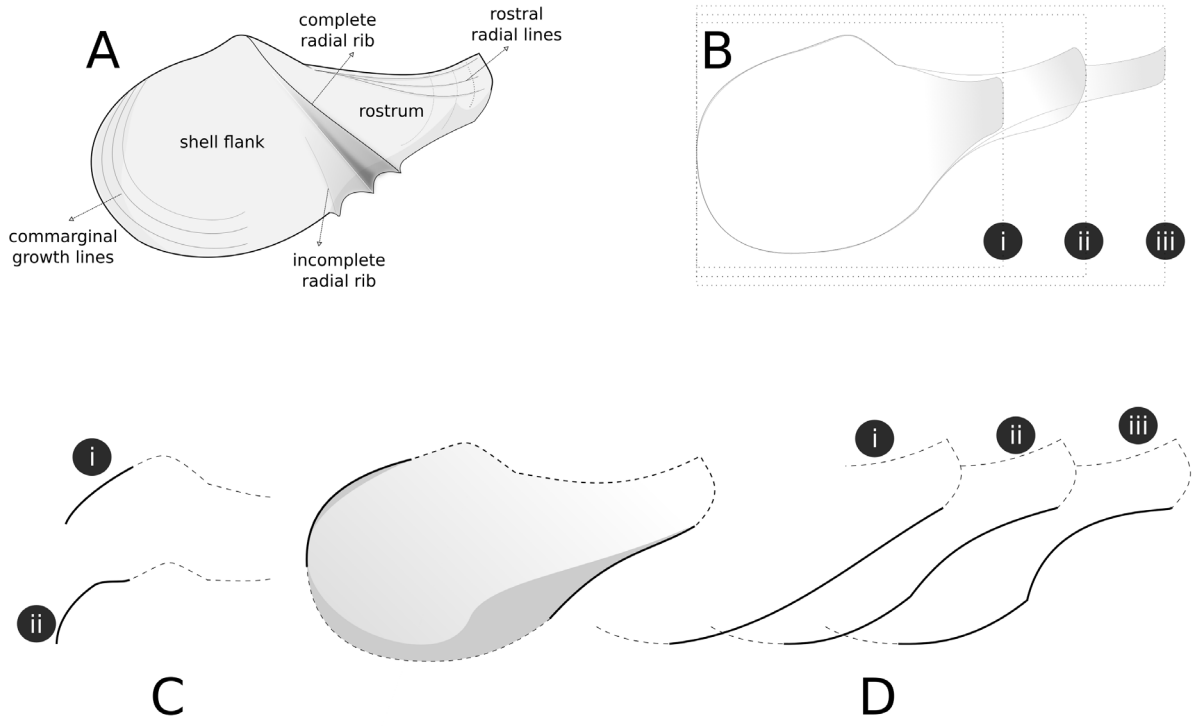

Fig. 1. Pictographic glossary. **A**. General shell features. **B**. Rostrum length, termed as very short (Bi), short (Bii) and long (Biii). **C**. Anterodorsal margin, termed as descending (Ci) and forming a shoulder (Cii). **D**. Posteroventral sinuation, termed as unobtrusive (Di), shallow (Dii) and gently marked (Diii).

Table 1. General characters of the six species of *Cardiomya* A. Adams, 1864 studied here.

	Cardiomya cleryana	***Cardiomya striolata***	***Cardiomya minerva*** sp. nov.	***Cardiomya* sp. 1**	***Cardiomya* sp. 2**	***Cardiomya* sp. 3**
Shell flank	Triangular	Trapezoidal	Quadrangular	Elliptical	Triangular	Triangular
Anterodorsal margin	Descending	Forming a shoulder	Forming a shoulder	Forming a shoulder	Descending	Descending
Rostrum	Very short to short	Short	Very short	Very short	Very short	Short
Posteroventral sinuation	Shallow	Unobtrusive	Shallow	Shallow	Unobtrusive	Shallow
Posterodorsal margin	Slightly curved upwards, not extending above the umbones	Curved upwards, extending above the umbones	Curved upwards, extending above the umbones	Curved upward, extending a little above the umbones	Slightly curved upwards, not extending much above the umbones	Slightly curved upwards, not extending much above the umbones
External sculpture	17–25 almost equally spaced radial ribs of varied expression on the shell flank	18–35 radial ribs, the last 3–4 strongest and most widely spaced	Six posterior radial ribs	22 radial ribs, less spaced towards the anterior region, the last four strongest and most widely spaced	17 radial ribs, many incomplete on the middle of the shell flank, the last three strongest and most widely spaced	Seven weak and incomplete radial ribs, which vanish towards the ventral margin, followed by six complete ribs

Cardiomya cleryana (d'Orbigny, 1842)
Fig. 2A–E

Sphenia cleryana d'Orbigny, 1842: 572 (description, as "*Sphena Cleryana*"), 708 (reference to illustrations, as "*Sphaenia Cleryana*"); 1846: pl. 83, figs 16–18 (as "*Sphaenia Cleryana*").
Cuspidaria (*Cardiomya*) *simillima* E.A. Smith, 1915: 104, pl. 2, fig. 24.

Sphenia cleryana – d'Orbigny 1853: 285.
Cuspidaria cleryana – Morretes 1949: 52.
Cardiomya cleryana – Rios 1970: 219; 1975: 261, pl. 85, fig. 1255; 1985: 281, pl. 99, fig. 1385; 1994: 303, pl. 104, fig. 1483; 2009: 606, fig. 1678. — Figueiras & Sicardi 1980: 157. — Layerle & Scarabino 1984: 6. — Poutiers & Bernard 1995: 151, 158. — Forcelli 2000: 171, figured. — Scarabino 2003a: 238. — Absalão *et al.* 2006: 223, 258. — Allen 2011: 440. — Passos & Magalhães 2011: 7. — Oliveira & Sartori 2014: 10, 13–14, fig. 2D–E. — Barroso *et al.* 2016: 2, 6–8, 11, in part. — Machado *et al.* 2016: in part. — Oliveira *et al.* 2017: 2, 4–6, 8–9, 11, 14, in part.
Cuspidaria (*Cardiomya*) *simillima* – Powell 1951: 51. — Figueiras & Sicardi 1970: 420–421, pl. vi, fig. 93. — Poutiers & Bernard 1995: 166. — Oliveira *et al.* 2017: 289, fig. 3C–D.
Cuspidaria simillima – Castellanos 1982: 41.
Cardiomya simillima – Rios 1970: 220; 1972: 197. — Zelaya 2005: 117.

Cardiomya perrostrata auct., *non* Dall, 1881 – Rios 1975: 261, pl. 85, fig. 1257; 1985: 281, pl. 99, fig. 1387; 1994: 303, pl. 104, fig. 1485. — Absalão & Pimenta 2005: 51, fig. 134.

Material examined

Type material

BRAZIL • [4v], syntypes of *Cardiomya simillima* (Smith, 1915); off Rio de Janeiro; 73 m depth; NHMUK 1915.4.18.512–515.

CARIBBEAN SEA • [4v and fragments], syntypes of *Cardiomya ornatissima* (d'Orbigny, 1853); NHMUK 1854.10.4.554.

COUNTRY UNKNOWN • [fragments], syntypes of *Cardiomya striata* (Jeffreys, 1876); North Atlantic; 1260–2651 m depth; NHMUK 1877.11.28.50.

DENMARK • [2v and fragments], syntypes of *Cardiomya striata*; Greenland; 56°11′00″ N, 37°41′00″ W; 2652 m depth; Valorous Expedition 1875, stn 12; USNM 63965 • [fragments], syntypes of *Cardiomya striata*; Greenland; 56°01′00″ N, 34°42′00″ W; 1262 m depth; Valorous Expedition 1875, stn 13; USNM 172288.

IRELAND • [1s], syntype of *Cardiomya striata*; Rockall Bank; 56°07′00″ N, 14°19′00″ W; 1152 m depth; Porcupine Expedition 1869, stn 23; USNM 172289 • [fragments], syntypes of *Cardiomya striata*; Rockall Bank; 56°13′00″ N, 14°18′00″ W; 768 m depth; Porcupine Expedition 1869, stn 23-A; USNM 172290.

SCOTLAND • [1s], syntype of *Cardiomya striata*; Off Hebrides islands; 60°45′00″ N, 04°49′00″ W; 933 m depth; Lightning Expedition 1868, stn 6; USNM 172286 • [1s], syntype of *Cardiomya striata*; Off Hebrides islands, 59°36′00″ N, 07°20′00″ W; 969 m depth; Lightning Expedition 1868, stn 12; USNM 172287.

UNITED STATES – **Florida state** • [2s], syntypes of *Cardiomya perrostrata* (Dall, 1881); off Dry Tortugas; 24°08′00″ N, 82°51′00″ W; 620 m depth; Blake Expedition, stn 43; USNM 63119 • [1s], syntype of *Cardiomya perrostrata*; same collecting data as for preceding; MCZ 8100.

Other material

ARGENTINA • [2v]; Patagonia, west of Bustamante Bay; 45°15′ S, 65°26′ W; MACN 9151-14.

BRAZIL – **Pernambuco state** • [in part, 5v]; Ilha de Itamaracá; CMPHRM 3659. – **Espírito Santo state** • [in part, 2v]; Guarapari; MZSP 77301. – **Rio de Janeiro state** • [4v]; 107 m depth; USNM 96108 • [2v]; 06 Aug. 1979; IBUFRJ 3355 • [in part, 1v]; Macaé, APA de Santana; 5–10 m depth; IBUFRJ 6434. – **São Paulo state** • [in part, 2v]; Caraguatatuba; 23°44′40″ S, 45°01′14″ W; 40 m depth; 16 Oct. 2001; ZUEC-BIV 2217 • [in part, 2v]; Caraguatatuba; 23°44′16″ S, 45°03′02″ W; 45 m depth; 16 Oct. 2001; ZUEC-BIV 2218 • [2v]; São Sebastião, Praia do Araçá; 23°49′20″ S, 45°24′10″ W; 21 Mar. 2014; ZUEC-BIV 5135 • [19v]; São Sebastião; 29 Apr. 1949; MNHNM 3281 • [4v]; Ubatuba, Praia da Enseada; 10 m depth; 25 May 1967; MZSP 57255 • [1s, 5v]; Tabatinga, Praia de Mococa; MZSP 87193. – **Rio Grande do Sul state** • [20v]; Off Rio Grande; 100 m depth; 4 Apr. 1998; Revizee, stn 6839; MORG 50583.

UNITED STATES – **Florida state** • [1s, 2v]; off West'n Dry Rocks; 164 m depth; 1916; USNM 460734.

URUGUAY • [4v]; MNHNM 2005-04l6 • [3s]; west of Uruguay; 34°40′ S, 52°18′ W; 100 m depth; 18 Sep. 1938; MACN 23465.

Description

Shell small (maximum length 10.5 mm; maximum height 8 mm). Shell flank triangular, umbones blunt. Anterodorsal margin descending, anterior margin rounded little extended, ventral margin rounded, crenulated. Rostrum very short to short, posteroventral sinuation shallow, posterodorsal margin slightly curved upwards, not extending above the umbones. External sculpture of 17–25 almost equally

Fig. 2. *Cardiomya cleryana* (d'Orbigny, 1842). **A–C**. External view. **A**. MNHNM 3281, left valve. **B**. USNM 96108, right valve. **C**. MORG 50583, left valve. **D–E**. MORG 50583, hinge detail. Scale bars = 2 mm.

spaced radial ribs of varied expression on the shell flank; rostrum with one to three radial lines or only commarginal growth lines.

Type localities

Jamaica, Cuba, Guadeloupe, Saint Thomas and Brazil, Cape São Tomé, Rio de Janeiro, 80 m.

Geographic distribution

Florida, USA to Chubut Province, Argentina. Confirmed records: United States: Florida, Off West's Dry Rocks (USNM 460734). Brazil: East and Northeast (Rios 1970), Pernambuco state: Ilha de Itamaracá (CMPHRM 3659); Espírito Santo state: Guarapari (MZSP 77301); Rio de Janeiro State: Macaé, APA de Santana (IBUFRJ 6434), Rasa Island (Rios 1970), off Juatinga, Paraty (Rios 1970); São Paulo State: Mocóca (Morretes 1949), Tabatinga (MZSP 87193), Ubatuba (MZSP 57255), Caraguatatuba (ZUEC-BIV 2217-2218), São Sebastião (Morretes 1949); Rio Grande do Sul State: Southeast of Rio Grande (Rios 1972), off Torres, Tramandaí, Solidão, Conceição, Cassino, Sarita, Albardão and Chuí (Rios 1975). Uruguay: 100 miles south of Rocha Department (Figueiras & Sicardi 1970). Argentina: Chubut Province: west of Cruz Bay (Castellanos 1982); Patagonia (Zelaya 2005). Bathymetry: from 49 m (Rios 1970) to 180 m (Rios 1972).

Remarks

Cardiomya ornatissima differs from *C. cleryana* by its straight posterodorsal margin by having only and 6–7 strong radial ribs, which may be followed or not by incomplete ribs. *Cardiomya perrostrata* can be distinguished from *C. cleryana* by its long rostrum, rounded shell flank, and the presence of a shoulder. *Cardiomya striata* can be distinguished from *C. cleryana* by its quadrangular shell flank, well marked shoulder, and radial ribs covering the entire shell, including the rostrum.

Cardiomya simillima, described from Rio de Janeiro (73 m depth) and Malvinas/Falkland Islands (229 m depth), exhibits the same shell outline and ornamentation than *C. cleryana* and it was therefore usually considered as a junior synonym (Rios 1975, 2009; Poutiers & Bernard 1995; Forcelli 2000; Scarabino 2003b; Bouchet 2009; Barroso *et al.* 2016; Machado *et al.* 2016; Oliveira *et al.* 2017), an opinion with which we agree.

The record of *C. simillima* to Malvinas/Falkland Islands was uncritically replicated by many authors (e.g., Powell 1951; Figueiras & Sicardi 1970; Rios 2009; Barroso *et al.* 2016; Machado *et al.* 2016). Nevertheless, subsequent records from Malvinas/Falkland Islands were never provided. As has happened to others species records from the Terra Nova expedition (for details see Scarabino 2003b; Signorelli *et al.* 2019), it is possible that a labeling error occurred in the record of *C. simillima* from station #38 (Malvinas/Falkland Islands, 229 m). Taking into account the evidence of tag scrambling and also the biogeographical implications of such an unusual distribution, the record of station #38 from Terra Nova expedition to *C. simillima* (= *C. cleryana*) should be viewed with caution.

Cardiomya striolata (Locard, 1897)
Figs 3A–F, 4A–H

Cuspidaria striolata Locard, 1897: 94–95.

Cuspidaria striolata – Locard 1898: 195–196, pl. VIII, figs 20–25; 1899: 130. — Poutiers & Bernard 1995: 151, 167. — Allen 2011: 441.

Cardiomya costellata auct., *non* Deshayes, 1835 –Jeffreys 1865: 49–50; 1869: pl. XLIX, fig. 3. — Allen & Morgan 1981: 464–466, fig. 29. — Salas 1996: 76, figs 137–138. — Porcheddu *et al.* 1997: 157–162, figs 1–3. — Mikkelsen & Bieler 2008: 224, figured. — Tunnell *et al.* 2010: 339, figured. — Oliver *et al.* 2016.

Cardiomya cleryana auct., *non* d'Orbigny, 1842 – Barroso *et al.* 2016: 6–7, fig. 5. — Oliveira *et al.* 2017: 286, 291.

Cardiomya perrostrata auct., *non* Dall, 1881 – Barroso *et al.* 2016: 10, fig. 7A–B. — Machado *et al.* 2016: 3, figs 1A–B.

Cardiomya striata auct., *non* Jeffreys, 1876 – Oliveira *et al.* 2017: 284.

Cardiomya sp. 3 – Lamy & Pointier 2018: 752, pl. 252, fig. 7.

Cardiomya sp. 7 – Lamy & Pointier 2018: 755, pl. 252, fig. 11.

Material examined

Type material

SPAIN • [2v], syntypes of *Cardiomya striolata* (Locard, 1897); north of Spain, Bay of Biscay; 44°05′ N, 05°36′ W; 608 m depth; Travailleur Expedition 1882, stn 02; MNHN 24210.

Other material

BARBADOS • [3s]; off Paynés Bay; 64–137 m depth; 1918; USNM 502902.

BRAZIL – **Amapá state** • [9v]; west of Cassiporé river mouth; 4°35′30″ N, 50°21′00″ W; 104 m depth; 18 May 1971; GEOMAR III, stn 210; CMPHRM 3678 • [4v]; west of Amazon river mouth; 02°01′00″ N, 47°32′30″ W; 86 m depth; 20 Apr. 1971; GEOMAR III, stn 150; CMPHRM 3679 • [1v]; Amazon canyons; 02°53′00″ N, 47°17′00″ W; 112 m depth; 14 Sep. 1970; GEOMAR II, stn 129; CMPHRM 3680I. **– Bahia state** • [5v]; 15°53′49″ S, 38°31′05″ W; 66 m depth; 30 Apr. 1996; REVIZEE/SCORE Central, stn C76; MNRJ 15892 • [5v]; Royal Charlotte Bank; 15°53′49″ S, 38°31′05″ W; 66 m depth; 30 Apr. 1996; REVIZEE/SCORE Central, stn 76C; IBUFRJ 12337. **– Espírito Santo state** • [1i, 2v]; Trindade island; 20°29′ S, 29°18′ W; 63 m depth; 22 May 1987; Marion Dufresne MD55, stn DC61; MNRJ 25957 • [1i]; Vitória-Trindade Seamounts; 20°41′41″ S, 34°35′02″ W; 108 m depth; 12 Jul. 2001; REVIZEE/SCORE Central, stn 45R; IBUFRJ 21296. – **Ceará state** • [1v]; Canopus Bank; 03°13′ S, 38°31′ W; CMPHRM 712A. **– Pernambuco state** • [2v]; Itamaracá island; CMPHRM 3695A. **– Alagoas state** • [1v]; Maceió; 09°27′08″ S, 35°07′07″ W; 08 Sep. 1965; CMPHRM 3651A.

COUNTRY UNKNOWN • [7v]; Mediterranean; 82 m depth; 1870; USNM 172020 • [2s, 5v]; Mediterranean, off Soloom Bay; 73–220 m depth; USNM 172017 • [3v]; Aegean Sea; 450 m depth; USNM 172025.

IBERIAN PENINSULA • [2v]; Gibraltar; 1942; C.B. Adams leg.; MCZ 154438.

IRELAND • [In part, 10s and 2v]; northwest off Ireland; 300 m depth; 1869; Porcupine Expedition, stn 25; USNM 172007.

ITALY • [4v]; Naples; 11 Sep. 1937; S. Putzep leg.; MCZ 231146.

SCOTLAND • [1v]; Loch Fyne; MCZ 243626.

SPAIN • [2v]; Cartagena Bay; 84–153 m depth; 1870; USNM 172018.

Description

Shell small (maximum length 9.3 mm; maximum height 6.3 mm). Shell flank trapezoidal, umbones blunt. Anterodorsal margin forming a shoulder, anterior margin little extended, ventral margin rounded,

crenulated. Rostrum short, tapering towards the tip, posteroventral sinuation unobtrusive, posterodorsal margin curved upwards, extending above the umbones. External sculpture of 18–35 radial ribs, weak and closely spaced anteriorly; becoming stronger posteriorly, the last three to four being the strongest and most widely spaced, the posterior most rib separated from the previous ones; commarginal growth lines well marked; rostrum with one to three radial lines.

Type localities

North of Spain, Bay of Biscay (608–1037 m depth). Southwest of Portugal, Gulf of Cádiz (2100 m depth). Mediterranean Sea, off Xauen Bank (322 m depth).

Geographic distribution

Mediterranean Sea, north Atlantic Ocean and Brazil. Confirmed records: United States: North Carolina to Florida (Mikkelsen & Bieler 2008), Texas (Tunnell *et al.* 2010). West Indies (Mikkelsen & Bieler 2008); Bahamas (Mikkelsen & Bieler 2008); Barbados, off Paynés Bay (USNM 502902); Guadeloupe (Lamy & Pointier 2018). Caribbean Central American (Mikkelsen & Bieler 2008). Scotland: Shetland: Whales Skerries (Jeffreys 1865), Loch Fyne (MCZ 243626). Western Europe: Hebrides Seamount (Allen & Morgan 1981). Dublin: off Ireland (USNM 172007). Italy: Sea of Sardinia, Tavolara island (Porcheddu *et al.* 1997), Naples (MCZ 231146). France: off Nantes (Allen & Morgan 1981); west of

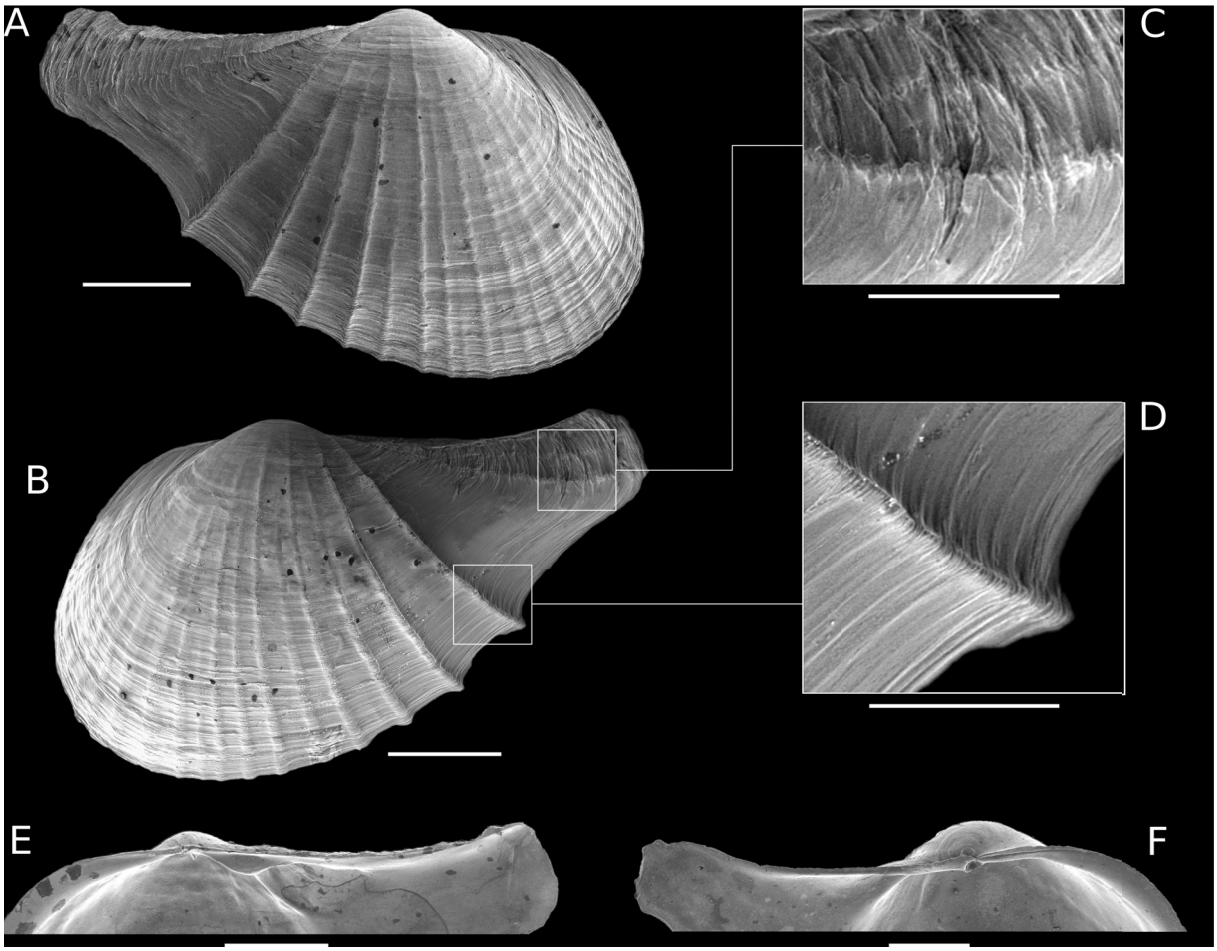

Fig. 3. *Cardiomya striolata* (Locard, 1897). **A–E**. IBUFRJ 21296. **A**–**B**. External view, right and left valve. **C**–**D**. Details of the rostrum and posterior radial rib. **E**. Hinge detail, right valve. **F**. CMPHRM 3679. Hinge detail, left valve. Scale bars: A–B, E–F = 1 mm; C–D = 0.5 mm.

Brest (Allen & Morgan 1981); Saint-Raphael (Locard 1898); Provence (Locard 1898); Marseille (Locard 1898); Bay of Biscay (Locard 1899; Allen & Morgan 1981). Iberian Peninsula: Gibraltar (MCZ 154438). Spain: Cartagena Bay (USNM 172018). Gulf of Cádiz (type locality). Portugal: Cape St Vicent (Salas 1996); Off Huelva (Salas 1996); West of the Straith of Gibraltar (Salas 1996). Morocco: off Casablanca (Salas 1996); off Rabat (Salas 1996); East of Ceuta (Salas 1996); Alboran Ridge (Salas 1996); Xauen Bank (Salas 1996); West of Alboran basin (Salas 1996); Aegean sea: (USNM 172025). Mediterranean: (Poutiers & Bernard 1995) (USNM 172020); off Soloom Bay (USNM 172017).Brazil: Amapá state, Amazon Canyons (CMPHRM 3680I); west of Cassiporé river mouth (CMPHRM 3679; CMPHRM 3678); Ceará state, Canopus, off Ceará (712A); Pernambuco state, Itamaracá Island (CMPHRM 3695A); Bahia state: (MNRJ 15892); Royal Charlotte Bank (IBUFRJ 12337); Espírito Santo state (MNRJ 25957). Bathymetry: from 50 m (Porcheddu *et al.* 1997) to 2100 m (Locard 1898).

Remarks

Cardiomya striolata (Locard, 1897), was usually regarded as a junior-synonym of *Cardiomya costellata* (Deshayes, 1835), with more strongly ribbed ornamentation (see Dall 1886; Salas 1996; Porcheddu *et al.* 1997). However, in our opinion *C. striolata* is a distinct, full species, which differs from *C. costellata* by its tapering rostrum which extends above the umbones, trapezoidal shell flank, anterodorsal margin forming a shoulder, and unobtrusive posteroventral sinuation.

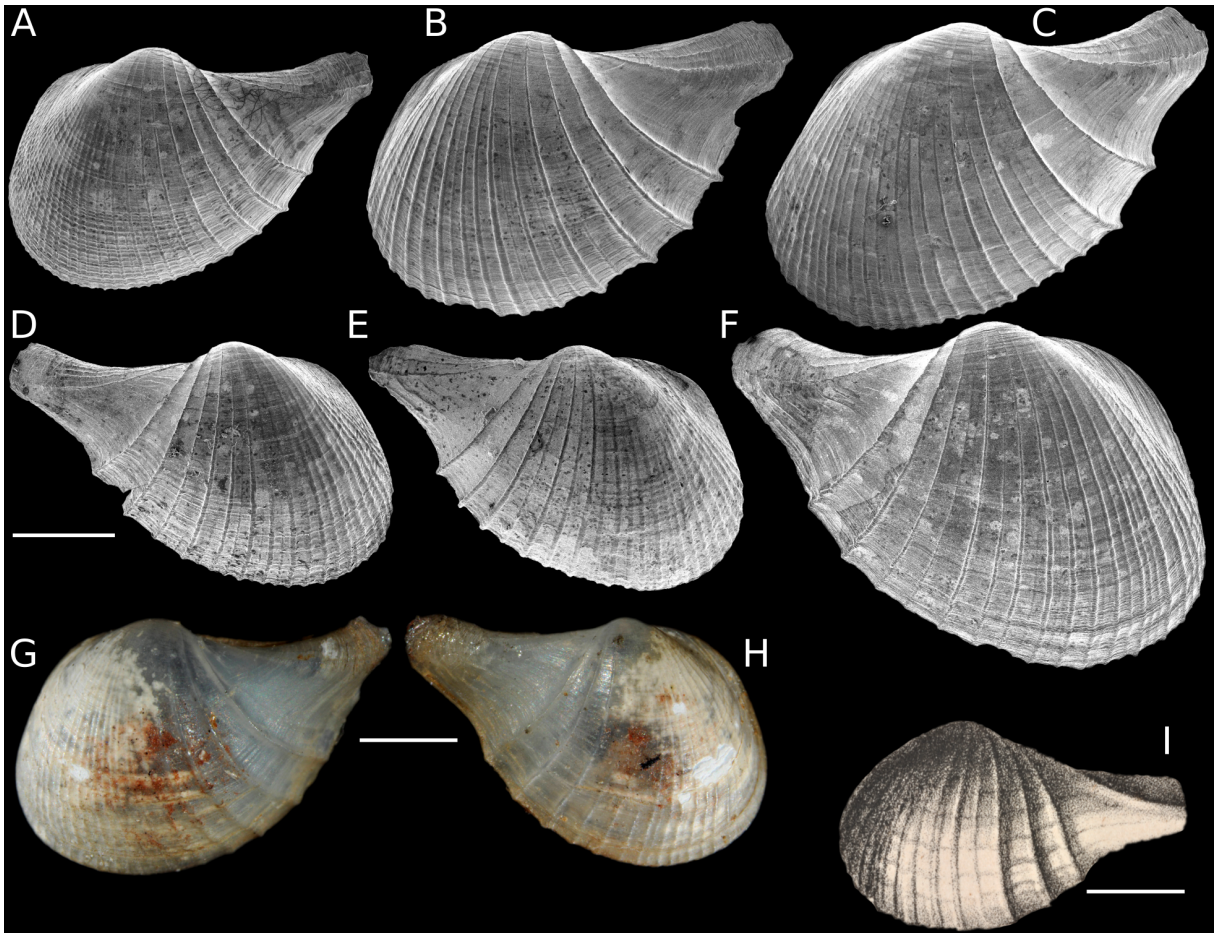

Fig. 4. A–H. *Cardiomya striolata* (Locard, 1897). External view. **A–C**. Left valve. **D–F**. Right valve. **A, E**. CMPHRM 3679. **B–C, F**. CMPHRM 3678. **D**. CMPHRM 3680I. **G–H**. Syntype MNHN 24210. — *Cardiomya costellata* (Deshayes, 1835). **I**. Original picture. Scale bars = 2 mm.

Cardiomya costellata was described based on fossil specimens from the Tertiary of Greece (Fig. 4I). Since its original description, several incorrect records of *C. costellata* have been made in a series of erroneous taxonomic identifications of different species (e.g., Philippi 1844; Abbott 1974; Abbott & Morris 1995; Redfern 2001; Ardovini & Cossignani 2004; Lee 2009; Morton 2016; Oliver *et al.* 2016; Lamy & Pointier 2018). Literature records of true specimens of *C. striolata* could be confirmed in references of *C. costellata* accompanied by figures, detailed descriptions or cross-referenced with vouchers in collections. Additionally, many specimens of *C. striolata* labeled as *C. costellata* were found among museums holdings.

Considering the specimens from Brazil, *Cardiomya striolata* has often been misidentified in the literature: **[1]** part of the specimens listed as *C. cleryana* in Barroso *et al.* (2016: 6), as well as the figured specimen in Barroso *et al.* (2016: 7, fig. 5). **[2]** the specimen figured in Machado *et al.* (2016: 3, figs 1A–B) as *C. perrostrata* and then identified as *C. cleryana* by Oliveira *et al.* (2017: 286). **[3]** the specimen from CMPHRM 712A reported upon as *C. perrostrata* by Barroso *et al.* (2016) and later identified as *C. striata* by Oliveira *et al.* (2017). **[4]** Absalão *et al.* (2006) recorded the occurrence of *C. cleryana* and *C. perrostrata* at Bahia State. These specimens were later identified as *Cardiomya cleryana* (MNRJ 15892) and a mix of *C. cleryana* and *C. ornatissima* (IBUFRJ 12337) by Oliveira *et al.* (2017: 291). However, the specimens identified as *C. cleryana* on both lots are actually *Cardiomya striolata.* The specimens of *C. ornatissima* were renumbered as IBUFRJ 21305.

Cardiomya striata can be distinguished from *C. striolata* by its rectangular shell flank and entire shell (including the rostrum) ornamented with radial ribs.

Cardiomya minerva sp. nov.
urn:lsid:zoobank.org:act:B7AF183B-CE39-4084-A9B1-E0F366458513
Fig. 5A–F

Diagnosis

Quadrangular shell flank, very short truncated rostrum, posterodorsal margin curved upwards, extending above the umbones; external sculpture composed of six posterior radial ribs, rostrum with commarginal growth lines only.

Etymology

This species is named after the character Minerva McGonagall, from the Harry Potter series of books written by the British J.K. Rowling. The name is employed as a noun in apposition.

Material examined

Holotype

BRAZIL – **Alagoas state** • [1i]; Maceió, Praia da Avenida; 10 m depth; 10 Apr. 1990; IBUFRJ 5785.

Other type material

PORTUGAL • [12v and fragments], syntypes of *Cardiomya cadiziana* Huber, 2010 [= replacement name for *Cardiomya curta* (Jeffreys, 1876)]; off Algarve; 36°54′00″ N, 8°14′30″ W; 523–684 m depth; USNM 172032 • [5v], syntypes of *Cardiomya cadiziana*; São Pedro Canyon; 39°55′00″ N, 9°56′00″ W; 1818 m depth; USNM 172033 • [4v], syntypes of *Cardiomya cadiziana*; São Pedro Canyon; 39°42′00″ N, 9°43′00″ W; 1097–2003 m depth; USNM 172034.

SURINAME • [1v], holotype of *Cardiomya surinamensis* van Regteren Altena, 1971; 06°22.5′ N, 55°10′ W; 20 m depth; RMNH.MOL.55387.

Description

Shell small (length 4.3 mm; height 3.2 mm). Shell flank quadrangular, umbones raised. Anterodorsal margin forming a shoulder, anterior and ventral and margin rounded, little angulated. Rostrum very short, truncated, posteroventral sinuation shallow, posterodorsal margin curved upwards, extending

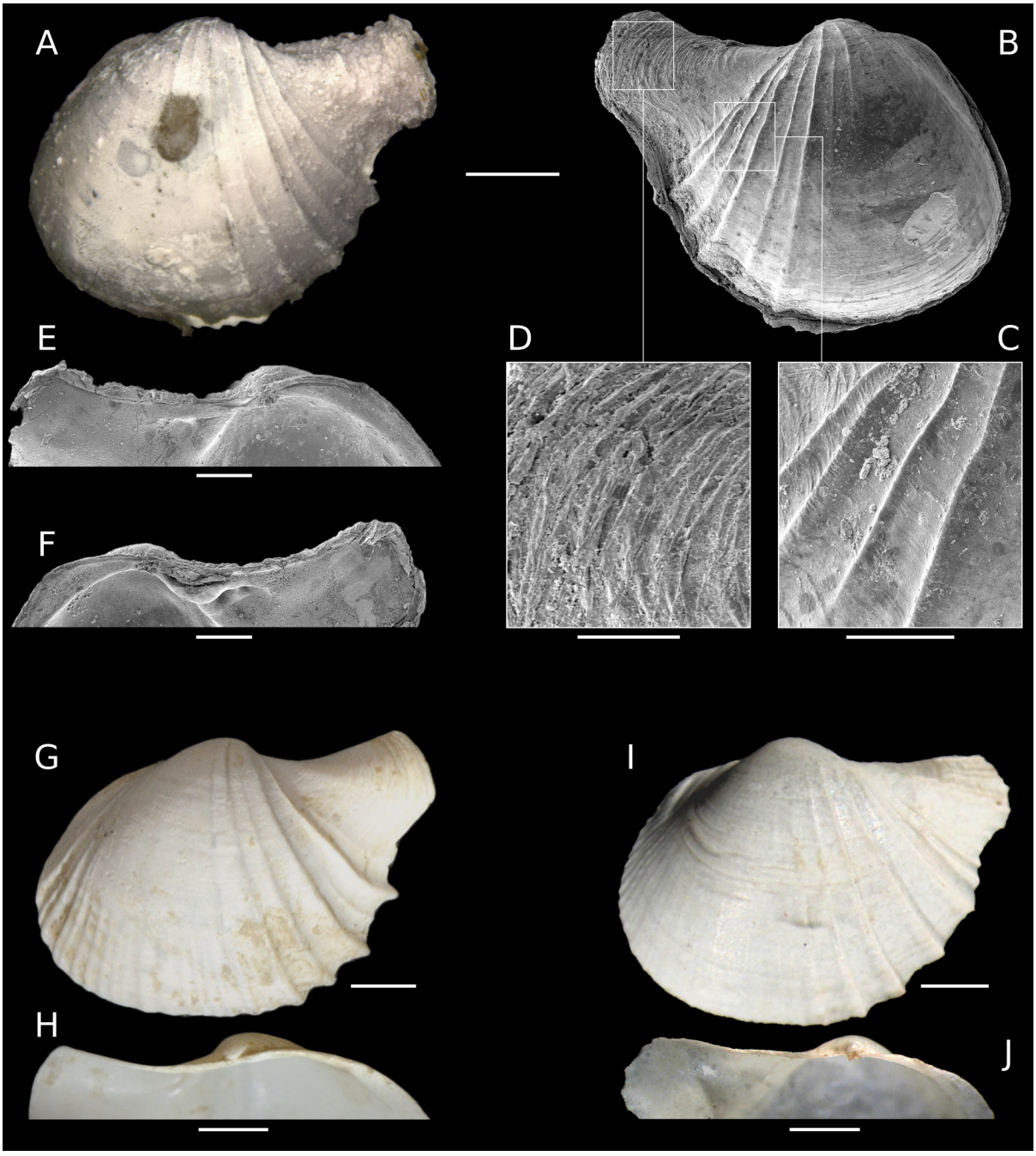

Fig. 5. A–F. *Cardiomya minerva* sp. nov., holotype (IBUFRJ 5785). **A–B**. External view, left and right valve. **C–D**. Details of the posterior radial ribs and the rostrum. **E–F**. Hinge detail. — **G–H**. *Cardiomya surinamensis* van Regteren Altena, 1971, holotype (RMNH.MOL.55387), left valve. **G**. External view. **H**. Hinge detail. — **I–J**. *Cardiomya cadiziana* Huber, 2010, syntype (USNM 172032), left valve. **I**. External view. **J**. Hinge detail. Scale bars: A–B, G–J = 1 mm; C–D = 0.25 mm; E–F = 0.5 mm.

above the umbones. External sculpture of six radial ribs on the posterior half of the shell flank; rostrum with commarginal growth lines only.

Geographic distribution

Only known from the type locality.

Remarks

The most similar species to *Cardiomya minerva* sp. nov. are *Cardiomya surinamensis* van Regteren Altena, 1971 (Fig. 5G–H) and *Cardiomya cadiziana* Huber, 2010 (Fig. 5I–J). These two species can be distinguished from *Cardiomya minerva* sp. nov. by their trapezoidal shell flank, external sculpture composed of incomplete radial ribs on anterior region of the shell flank. Additionally, *C. cadiziana* exhibits a shorter rostrum, with several faint radial lines, and straight posterodorsal margin, not extending above the umbones.

***Cardiomya* sp. 1**

Fig. 6A–B

Cardiomya cleryana auct., non d'Orbigny, 1842 – Barroso *et al.* 2016: in part.

Material examined

BRAZIL – **Amapá state •** [1v]; northwest of Amazon Canyons; 03°37′00″ S, 50°01′00″ W; 72 m depth; 08 May 1971; GEOMAR III, stn 193; CMPHRM 3681.

Description

Shell small (length 7.8 mm; height 6.1 mm). Shell flank elliptical, umbones blunt. Anterodorsal margin forming a shoulder, anterior margin truncated, ventral margin rounded, crenulated. Rostrum very short, truncated, posteroventral sinuation shallow, posterodorsal margin curved upwards, extending a little above the umbones. External sculpture of 22 radial ribs, less spaced towards the anterior region, the four strongest and most widely spaced ribs at the posterior end of the shell flank; rostrum with four radial lines.

Geographic distribution

Brazil, Amapá state, northwest of Amazon Canyons, 72 m.

Remarks

Part of the specimens listed as *Cardiomya cleryana* in Barroso *et al.* (2016: 6) (CMPHRM 3681) are here reassigned to *Cardiomya* sp. 1.

Cardiomya surinamensis van Regteren Altena, 1971 is similar to *Cardiomya* sp. 1, but can be distinguished from it by its weak radial ribs, which vanish towards the anterior region, and the wide rostrum, devoid of radial ornamentation.

***Cardiomya* sp. 2**

Fig. 6C–D

Material examined

BRAZIL – **Amapá state •** [1v]; off Salinópolis; 00°29′00″ S, 47°24′00″ W; 22 m depth; 15 Jun. 1971; GEOMAR III, stn 2533; CMPHRM 3668.

Description

Shell small (length 5.8 mm; height 4.1 mm). Shell flank triangular, umbones blunt. Anterodorsal margin descending, anterior margin extended, ventral margin rounded, crenulated. Rostrum very short, posteroventral sinuation unobtrusive, posterodorsal margin slightly curved upwards, not extending much above the umbones. External sculpture of 17 radial ribs, many incomplete on the middle of the shell flank, followed by three strongest and most widely spaced complete radial ribs; rostrum with commarginal growth lines only.

Geographic distribution

Brazil, Amapá state, off Salinópolis, 22 m.

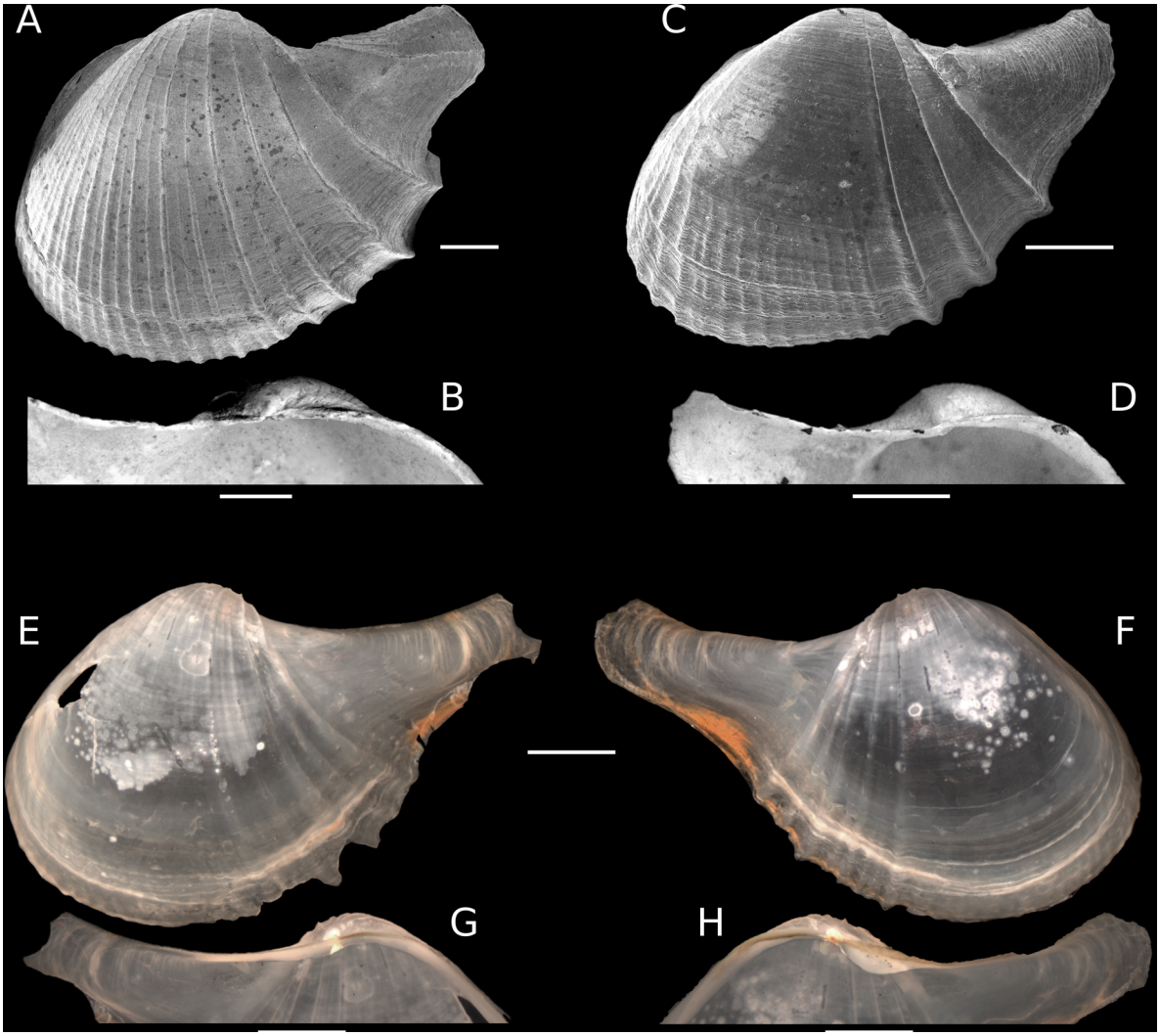

Fig. 6. A–B. *Cardiomya* sp. 1, CMPHRM 3681, left valve. **A**. External view. **B**. Hinge detail. — **C–D**. *Cardiomya* sp. 2, CMPHRM 3668, left valve. **C**. External view. **D**. Hinge detail. — **E–H**. *Cardiomya* sp. 3, ZUEC-BIV 5128. **E–F**. External view, left and right valve. **G–H**. Hinge detail. Scale bars = 1 mm.

***Cardiomya* sp. 3**
Fig. 6E–H

Cardiomya cleryana auct., non d'Orbigny, 1842 – Machado *et al.* 2016: in part.

Material examined

BRAZIL – **São Paulo state** • [1i]; São Sebastião, Biota Araçá; 23°49′20.1″ S, 45°24′10.3″ W; 20 m depth; 21 Mar. 2014; ZUEC-BIV 5128.

Description

Shell small (length 6.2 mm; height 4.2 mm). Shell flank triangular, umbones blunt. Anterodorsal margin descending, anterior margin angulated, ventral margin rounded. Rostrum short, posteroventral sinuation shallow, posterodorsal margin slightly curved upwards, not extending much above the umbones. External sculpture of seven weak and incomplete radial ribs, which vanish towards ventral margin, followed by six complete ribs on the posterior half of the shell flank; rostrum with commarginal growth lines only.

Geographic distribution

Brazil, São Paulo state, off São Sebastião, 20 m.

Remarks

Part of the material identified by Machado *et al.* (2016) (ZUEC-BIV 5128) as *C. cleryana*, is here referred as *Cardiomya* sp. 3.

Dichotomous key of the species from Brazilian waters

1. Complete ribs covering the entire shell flank 2
– Complete ribs restricted to posterior half of the shell flank 3

2. Anterodorsal margin descending 4
– Anterodorsal margin forming a shoulder 5

3. Rostrum short ..... ***Cardiomya* sp. 3**
– Rostrum very short 8

4. Numerous ribs (~ 20); equidistant ..... ***Cardiomya cleryana*** (d'Orbigny, 1842)
– Few strong ribs (~ 6–12); very spaced; distributed throughout the shell flank ..... ***Cardiomya ornatissima*** (d'Orbigny, 1853)

5. Shell flank rounded 6
– Shell flank elliptical to trapezoidal 7

6. Rostrum long ..... ***Cardiomya perrostrata*** (Dall, 1881)
– Rostrum very short ..... ***Cardiomya* sp. 1**

7. Ribs (~ 30–50) equidistant, evenly distributed throughout the shell to the rostrum ..... ***Cardiomya striata*** (Jeffreys, 1876)
– Ribs (~ 18–35) more spaced in the posterior part of the shell flank ..... ***Cardiomya striolata*** (Locard, 1897)

8. Anterodorsal margin forming a shoulder ..... ***Cardiomya minerva*** sp. nov.
– Anterodorsal margin descending ..... ***Cardiomya* sp. 2**

Discussion

The discovery of undescribed *Cardiomya* species hidden among the museum shelves in Brazilian collections reinforces the need for more taxonomic studies in this area. The combination of a reduced number of specialists, rarity of species and high cost of field expeditions hampers the improvement of our knowledge on marine biodiversity. It is not surprising that a large number of *Cardiomya* are still waiting proper description. But these limitations, especially the rarity of some species, should not prevent our attempts to understand and recognize them. Describing such species and their unique characteristics is the first step to understand their importance as components of natural ecosystems. It is worth noting that we do not comply with 'taxonomic splitting', which can lead to a rise in unwanted invalid names. We are aware that larger number of specimens allows for a more precise description of the full phenotypical variation for a species. Nevertheless, the cost of describing a rare species based on few specimens with noticeable diagnostic features seems lower than the cost of not knowing it at all. With predictions of massive extinctions in the near future, the next generation of taxonomists may be describing extinct species, only known from material preserved on the shelves (Fontaine *et al.* 2012).

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Conflict of Interest. The authors declare that they have no conflict of interest.

Ethical approval. No animal testing was performed during this study.

Sampling and field studies. The study does not contain sampling material or data from field studies.

Data availability. All data generated or analysed during this study are included in this published article.

References

Abbott R.T. 1974. *American Seashells. The Marine Molluska of the Atlantic and Pacific Coast of North America*. 2nd ed. Van Nostrand, New York.

Abbott R.T. & Morris P.A. 1995. *A Field Guide to Shells: Atlantic and Gulf Coasts and the West Indies*. Houghton Mifflin Company, Boston / New York.

Absalão R.S. & Pimenta A.D. 2005. *Moluscos Marinhos da APA do Arquipélago de Santana, Macaé, RJ - Chave para Identificação das Espécies do Substrato Inconsolidado*. Editora Ciência Moderna, Rio de Janeiro.

Absalão R.S., Caetano C.H.S. & Fortes F.R. 2006. Filo Mollusca. *In*: Lavrado H.P. & Ignacio B.L. (eds), *Biodiversidade Bentônica da Região Central da Zona Econômica Exclusiva Brasileira*: 211–260. Serie Livros.Documentos REVIZEE/SCORE Central, Rio de Janeiro.

Allen J.A. 2011. Descriptions of new deep-water species of the family Cuspidariidae (Mollusca: Bivalvia) and including a bibliography of the known species from the Atlantic. *Journal of Conchology* 40 (4): 428–445.

Allen J.A. & Morgan R.E. 1981. The functional morphology of Atlantic deep water species of the families Cuspidariidae and Poromyidae (Bivalvia): an analysis of the evolution of the septibranch condition. *Philosophical Transactions of the Royal Society of London, Series B* 294: 413–546. https://doi.org/10.1098/rstb.1981.0117

Ardovini R. & Cossignani T. 2004. *West African Seashells*. L'Informatore Piceno, Ancona.

Barroso C.X., Salani S., Rabay S.G. & Matthews-Cascon H. 2016. Septibranchia (Mollusca: Bivalvia) from the North and Northeast coasts of Brazil. *Marine Biodiversity Records* 9 (1): 1–14. https://doi.org/10.1186/s41200-016-0004-y

Bouchet P. 2009. *Cardiomya cleryana* (d'Orbigny, 1842). MolluscaBase. World Register of Marine Species. Available from http://www.marinespecies.org/aphia.php?p=taxdetails&id=408446 [accessed 13 Mar. 2019].

Castellanos Z.A. 1982. Los moluscos de las campañas del "Shinkai Maru". *Neotropica* 28 (79): 41–46.

Dall W.H. 1886. Reports on the results of dredging, under the supervision of Alexander Agassiz, in the Gulf of Mexico (1877-78) and in the Caribbean Sea (1879–80), by the U. S. Coast survey steamer "Blake", Lieut.-Commander C. D. Sigsbee, U. S. N., and Commander J. R. Bartlett, U. S. N., commanding. XXIX. Report on the Mollusca. Part 1. Brachiopoda and Pelecypoda. *Bulletin of the Museum of Comparative Zoology* 12 (6): 171–318.

Figueiras A. & Sicardi O.E. 1970. Catálogo de los moluscos marinos del Uruguay. *Comunicaciones de la Sociedad Malacológica del Uruguay* 2 (18): 407–421.

Figueiras A. & Sicardi O.E. 1980 ["1979"]. Catálogo de los moluscos marinos del Uruguay. Parte X. Revisión actualizada de los moluscos marinos del Uruguay con descripción de las especies agregadas. Sección I - Polyplacophora - Scaphopoda - Bivalvia. *Comunicaciones de la Sociedad Malacológica del Uruguay* 5: 107–157.

Fontaine B., Perrard A. & Bouchet P. 2012. 21 years of shelf life between discovery and description of new species. *Current Biology* 22 (22): 943–944. https://doi.org/10.1016/j.cub.2012.10.029

Forcelli D.O. 2000. *Moluscos Magallânicos: Guia de los Moluscos de la Patagonia y del Sur de Chile*. Vazquez Mazzini, Buenos Aires.

Gofas S. 2015. *Cardiomya* (Adams, 1864). MolluscaBase. World Register of Marine Species. Available from http://www.marinespecies.org/aphia.php?p=taxdetails&id=137857 [accessed 29 Mar. 2019].

Hinds R.B. 1843. Descriptions of new species of *Neœra*, from the collection of Edward Belcher, C.B., made during a voyage round the world, and from that of Hugh Cuming, Esq., obtained during his visit to the Philippines; with notices of the synonymy. *Proceedings of the Zoological Society of London* 11: 75–79.

Jeffreys J.G. 1865. *British Conchology, or an Account of the Mollusca which now inhabit the British Isles and the surrounding Seas. Vol III. Marine Shells, comprising the remaining Conchifera, the Solenoconchia and Gasteropoda as far as Littorina*.Van Voorst, London. https://doi.org/10.5962/bhl.title.16342

Jeffreys J.G. 1869. *British Conchology, or an account of the Mollusca which now inhabit the British Isles and the surrounding Seas. Vol V. Marine Shells and naked Mollusca to the end of the Gastropoda, the Pteropoda, and Cephalopoda with a supplement and other matter, concluding the work*. Van Voorst, London. https://doi.org/10.5962/bhl.title.16342

Lamy D. & Pointier J.P. 2018. *Marine and Freshwater Molluscs of the French Caribbean* Vol II. PLB Editions, Guadeloupe.

Layerle C. & Scarabino V. 1984. Moluscos del frente marítimo uruguayo entre 9 y 78 m de profundidad: análisis biocenológico. *Contribuciones del Departamento de Oceanografía* 1 (9): 1–17.

Lee H.G. 2009. *Marine Shells of Northeast Florida*. Jacksonville Shell Club, Florida.

Locard A. 1897. Notices conchyliologiques. XLVIII. Sur les *Cuspidaria* des côtes de France. *L'Échange, Revue Linnéenne* 13 (155): 94–95.

Locard A. 1898. *Expéditions Scientifiques du Travailleur et du Talisman pendant les Années 1880, 1881, 1882, 1883. Mollusques Testacés* vol. 2. G. Masson, Paris. https://doi.org/10.5962/bhl.title.98313

Locard A. 1899. *Les Coquilles Marines au large des Côtes de France: Faune Pélagique et Faune Abyssale: Description des Familles, Genres et Espèces*. Baillière, Paris. https://doi.org/10.5962/bhl.title.14011

Machado F.M., Morton B. & Passos F.D. 2016. Functional morphology of *Cardiomya cleryana* (d'Orbigny, 1842) (Bivalvia: Anomalodesmata: Cuspidariidae) from Brazilian waters: new insights into the lifestyle of carnivorous bivalves. *Journal of the Marine Biological Association of the United Kingdom* 97 (2): 447–462. https://doi.org/10.1017/S0025315416000564

Mikkelsen P.M. & Bieler R. 2008. *Seashells of Southern Florida: Living Marine Bivalves of the Florida Keys and Adjacent Regions*. Princeton University Press, New Jersey.

Morretes F.L. 1949. Ensaio de catálogo dos moluscos do Brasil. *Arquivos do Museu Paranaense, Curitiba* 7: 5–216.

Morton B. 1981. The Anomalodesmata. *Malacologia* 21 (1–2): 35–60.

Morton B. 2016. The biology and functional morphology of the predatory septibranch *Cardiomya costellata* (Deshayes, 1833) (Bivalvia: Anomalodesmata: Cuspidariidae) from the Açores: survival at the edge. *Journal of the Marine Biological Association of the United Kingdom* 96 (6): 1347–1361. https://doi.org/10.1017/S0025315415001848

Oliver P.G., Holmes A.M., Killeen I.J. & Turner J.A. 2016. Marine Bivalve Shells of the British Isles. Amgueddfa Cymru - National Museum Wales. Available from https://naturalhistory.museumwales.ac.uk/britishbivalves/ [accessed 25 Feb. 2019].

Oliveira C.D.C. & Sartori A.F. 2014. Discovery and anatomy of the arenophilic system of cuspidariid clams (Bivalvia: Anomalodesmata). *Journal of Morphology* 275: 9–16. https://doi.org/10.1002/jmor.20190

Oliveira C.D.C., Sartori A.F. & Absalão R.S. 2017. Error cascade in taxonomy: the case of *Cardiomya perrostrata* (Mollusca: Bivalvia: Cuspidariidae) in Brazilian waters. *Zootaxa* 4247 (3): 281–300. https://doi.org/10.11646/zootaxa.4247.3.3

d'Orbigny A.D. 1842. *Voyage dans l'Amérique Méridionale (le Brésil, la République Orientale de l'Uruguay, la République Argentine, la Patagonie, la République du Chili, la République de Bolivia, la République du Pérou), exécuté pendant les années 1826, 1827, 1828, 1829, 1830, 1831, 1832 et 1833. Tome 5, Partie 3, Mollusques*: I–XLIII, 1–758. P. Bertrand, Paris; V. Levrault, Strasbourg. Available from https://www.biodiversitylibrary.org/item/50739#page/35/mode/1up [accessed 20 Mar. 2020].

d'Orbigny A.D. 1846. *Voyage dans l'Amérique Méridionale (le Brésil, la République Orientale de l'Uruguay, la République Argentine, la Patagonie, la République du Chili, la République de Bolivia, la République du Pérou), exécuté pendant les années 1826, 1827, 1828, 1829, 1830, 1831, 1832 et 1833. Tome 9. Atlas zoologique (Mamifères, Oiseaux, Reptiles, Poissons, Mollusques, Polypiers, Foraminifères, Crustacés et Insectes). Atlas des Mollusques*: pls 1–85. P. Bertrand, Paris; V. Levrault, Strasbourg. Available from https://www.biodiversitylibrary.org/item/50740#page/7/mode/1up [accessed 20 Mar. 2020].

d'Orbigny A.D. 1853. Mollusques. Tome 2. *In*: de la Sagra R. (ed.) *Histoire Physique, Politique et Naturelle de l'île de Cuba*: 1–380. A. Bertrand, Paris.
Available from https://www.biodiversitylibrary.org/item/138987#page/247/mode/1up [accessed 20 Mar. 2020].

Passos F.D. & Magalhães F.T. 2011. A comparative study of the Bivalvia (Mollusca) from the continental shelves of Antarctica and Brazil. *Biota Neotropica* 11: 1–13.
https://doi.org/10.1590/S1676-06032011000100014

Philippi R.A. 1844. *Enumeratio Molluscorum Siciliae cum viventium tum in tellure tertiaria fossilium, quae in itinere suo observavit* Vol. 2. Schroppii, Berolini. https://doi.org/10.5962/bhl.title.100735

Porcheddu A.S., Ghisotti F. & Castelli A. 1997. Ritrovamento di *Cardiomya costellata* (Deshayes, 1835) nelle acque antistanti l'Isola Tavolara (Sardegna nord-orientale) e discussione sulla validità specifica di *Cardiomya striolata* (Locard, 1898). *Bollettino Malacologico* 32 (5–8): 157–162.

Poutiers J.M. & Bernard F.R. 1995. Carnivorous bivalve molluscs (Anomalodesmata) from the tropical western Pacific Ocean, with a proposed classification and a catalogue of recent species. *In:* Bouchet P. (ed.) Résultats des Campagnes MUSORSTOM 14. *Mémoires du Muséum national d'Histoire naturelle* 167: 107–187.

Powell A.W.B. 1951. Antarctic and subantarctic Mollusca: Pelecypoda and Gastropoda. *Discovery Reports* 26: 47–196. https://doi.org/10.5962/bhl.part.16335

Redfern C. 2001. *Bahamian Seashells: a Thousand Species from Abaco, Bahamas*. Boca Raton, Florida.

Rios E.C. 1970. *Coastal Brazilian Seashells.* Rio Grande, Rio Grande do Sul: Fundação Cidade do Rio Grande. Museu Oceanográfico de Rio Grande.

Rios E.C. 1972 ["1973"]. Moluscos marinos de la expedicion GEOMAR IV. *Comunicaciones de la Sociedad Malacológica del Uruguay* 3: 193–202.

Rios E.C. 1975. *Brazilian Marine Mollusks Iconography.* Fundação Universidade do Rio Grande, Centro de Ciências do Mar, Museu Oceanográfico, Rio Grande, Rio Grande do Sul.

Rios E.C. 1985. *Seashells of Brazil*. Fundação Cidade do Rio Grande. Fundação Universidade do Rio Grande. Museu Oceanográfico, Rio Grande, Rio Grande do Sul.

Rios E.C. 1994. *Seashells of Brazil*. Fundação Universidade do Rio Grande. Rio Grande.

Rios E.C. 2009. *Compendium of Brazilian Sea Shells*. Universidade Federal do Rio Grande, Museu Oceanográfico "Prof. E. C. Rios", Evangraf, Rio Grande.

Salas C. 1996. Marine Bivalves from off the Southern Iberian Peninsula collected by the Balgim and Fauna 1 expeditions. *Haliotis* 25: 33–100.

Scarabino F. 2003a. Lista sistemática de los Bivalvia marinos y estuarinos vivientes de Uruguay. *Comunicaciones de la Sociedad Malacológica del Uruguay* 8 (80–81): 229–259.

Scarabino F. 2003b. Lista sistemática de los Cephalopoda vivientes de Uruguay. *Comunicaciones de la Sociedad Malacológica del Uruguay* 8 (78–79) 197–202.

Signorelli J.H., Fonseca M.L., Scarabino F. & Passos F.D. 2019. The genus *Dallocardia* (Mollusca: Bivalvia: Cardiidae) in the Southwestern Atlantic Ocean. *Marine Biodiversity* 49: 2753–2773. https://doi.org/10.1007/s12526-019-01004-3

Smith E.A. 1915. Mollusca. Part I. Gastropoda, Prosobranchia, Scaphopoda and Pelecypoda. *British Antarctic ("Terra Nova") Expedition, 1910*: *Natural History Reports, Zoology* 2 (4): 61–112.

Tunnell Jr J.W., Andrews J., Barrera N.C. & Moretzsohn F. 2010. *Encyclopedia of Texas Seashells: Identification, Ecology, Distribution, and History*. Texas A&M University Press.

Zelaya D.G. 2005. The bivalves from the Scotia Arc islands: species richness and faunistic affinities. *Scientia Marina* 69 (Suppl. 2): 113–122. https://doi.org/10.3989/scimar.2005.69s2113

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