



Calliostomatidae, Colloniidae, Margaritidae, and Solariellidae (Gastropoda: Trochoidea) collected by the Marion Dufresne (MD55) expedition in southeastern Brazil, with description of a new species of *Calliostoma*

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Abstract

The deep-water mollusks collected during the Marion Dufresne (MD55) expedition to the southeastern Brazilian coast in 1987 have been studied in several recent works. The present paper lists and diagnoses 19 species belonging to the vetigastropod families Calliostomatidae, Colloniidae, Margaritidae, and Solariellidae. A new species, *Calliostoma valkuri* sp. nov., is described. It is mainly characterized by a very short teleoconch I, with limits marked by conspicuous varices and sculpture consisting of 3 spiral threads; sculpture of the teleoconch II consisting of spiral cords with thorn-like projections; and the presence of two strongly marked cords on the median portion of the whorls. Based on the MD55 samples and complementary specimens from other expeditions, the following species have their geographical and/or bathymetrical range extended: *Bathymophila euspira*, *Calliostoma gemmosum*, *Calliostoma rude*, *Callogaza watsoni*, *Gaza compta*, *Falsimargarita terespira*, *Homalopoma boffii*, *Lamellitrochus cancapae* comb. nov., *Lamellitrochus pourtalesi*, *Margarites imperialis*, and *Solariella quinni*.

Key words: *Calliostoma valkuri* new species, deep-water, MD55 expedition, range extension, Vetigastropoda

Introduction

The MD55 expedition of the research vessel Marion Dufresne was born from the combined efforts of the Muséum national d'Histoire naturelle (Paris, France) and Universidade Santa Úrsula (Rio de Janeiro, Brazil). Aiming at retrieving deep-water samples from off southeastern Brazil, the expedition took place in May–June 1987. It revealed a staggering amount of deep-water mollusk species, several of which have been steadily described during the current decade (e.g., Pimenta, 2012; Simone & Cunha 2012, 2014; Cavallari *et al.* 2014; Salvador *et al.* 2014). The present work represents an additional effort focused on the gastropod families Calliostomatidae Thiele, 1924, Colloniidae Cossmann, 1915, Margaritidae Thiele, 1924, and Solariellidae Powell, 1951.

Calliostomatidae is a very diverse family of typically small to medium-sized snails (8–100 mm) with trochiform shells. It includes over 20 genera and 300 species found living on soft and rocky substrates in all oceans, ranging from tropical to polar latitudes, from intertidal to bathyal (3,000 m) depths (Marshall 1995; Williams *et al.* 2010; Vilvens 2014; Marshall 2016). The genus *Calliostoma* Swainson, 1840 s.l. within the subfamily Calliostomatinae is the largest in the family, with over 200 species, 20 of which occur in Brazilian waters (Dornellas 2012; Cavallari & Simone 2018).

The Colloniidae are characterized by shell features such as the absence of nacre, aperture outline, and a calcified operculum, though some of these vary considerably (McLean 2012). Because of shell similarities and the calcified operculum, Colloniidae was previously considered a subfamily of Turbinidae but has recently been treated as a family (e.g., McLean & Kiel 2007; Williams *et al.* 2008; Bouchet *et al.* 2017). The oldest fossil record of the family dates from the Jurassic (Monari *et al.* 1996). The family currently includes 19 genera (Bouchet & Gofas, 2011), of which only *Homalopoma* Carpenter, 1864 occurs in Brazilian waters.

Margaritidae was considered a subfamily of Trochidae Rafinesque, 1815, but was recently raised to full family level by Williams (2012) with support from molecular data. Stoliczka (1868) originally introduced the name, but his nomenclatural act has since been invalidated (Bouchet *et al.* 2005, 2017). The authorship is currently attributed to Thiele (1924), who first reevaluated the group. Margaritids have small to medium-sized (rarely over 20 mm) turbinoid-trochiform nacreous shells. Three margaritid genera have been recorded in Brazil to date (Rios, 2009), namely *Callogaza* Dall, 1881, *Gaza* Watson, 1879, and *Margarites* Gray, 1847.

Solariellidae is a diverse, mostly deep-water group, with a circumglobal distribution. Species in this family are usually small (5–20 mm) and live on fine sediment and unconsolidated substrates in tropical and extra-tropical seas (Hickman & McLean 1990; Hickman 1998; Williams *et al.* 2013). Solariellidae was initially introduced as a subfamily of Trochidae, but the name has been raised to family level by Warein & Bouchet (in Bouchet & Rocroi 2005) and this has been corroborated by molecular analyses (Williams *et al.* 2008). Currently, Solariellidae includes 14 genera, some of which were introduced recently (e.g., Vilvens *et al.* 2014; Vilvens & Williams 2016). At least three solariellid genera are present in Brazilian waters (Rios 2009), namely *Microgaza* Dall, 1881, *Solariella* Wood, 1842 and *Suavotrochus* Dall, 1924.

The present study lists 19 species belonging to the aforementioned Trochoidea families collected by the MD55 expedition, and additional expeditions (e.g., from Canopus Bank, off northeastern Brazil) included herein for comparative purposes. We report new range and bathymetric extensions for 11 species and describe a new calliostomatid species based on shell morphology.

Material and methods

The material studied here mostly comprises empty shells collected by malacologists P. Bouchet, B. Métivier, and J.H. Leal during the MD55 expedition. These specimens are currently held in the collections of the Muséum national d'Histoire naturelle (MNHN, Paris, France) and the Museu de Zoologia da Universidade de São Paulo (MZSP, São Paulo, Brazil). Additional specimens from other institutions listed below, including types, were also examined for comparative purposes. A list of examined material is given in each species entry. Images and measurements were obtained with a Zeiss AxioCam MRc 5 and Zeiss AxioVision SE64 Rel 4.8 imaging software. SEM examination was carried out at the Staatliches Museum für Naturkunde Stuttgart (Stuttgart, Germany). Description of shell structures of the new species follows the terminology of Marshall (1995).

The following abbreviations are used throughout the text. **Specimens:** D=greatest shell width (perpendicular to H); H=shell height (parallel to coiling axis); n=number of specimens; sh=empty shell(s); spm=preserved specimen(s). **Institutional:** DMNH=Delaware Museum of Natural History (Wilmington, USA); MCZ=Museum of Comparative Zoology, Harvard University (Cambridge, USA); MFP=Museo Felipe Poey (Havana, Cuba); MHNG=Muséum d'Histoire naturelle Genève (Geneva, Switzerland); MORG=Museu Oceanográfico Prof. Eliezer de Carvalho Rios (Rio Grande, Brazil); RMNH=Naturalis Biodiversity Center (former Rijksmuseum van Natuurlijke Historie; Leiden, The Netherlands); USNM=Smithsonian National Museum of Natural History (Washington, D.C., USA).

Systematics

Family Calliostomatidae Thiele, 1924

Genus *Calliostoma* Swainson, 1840

Type species. *Trochus conulus* Linnaeus, 1758, by subsequent designation (Herrmannsen, 1846); Recent, Northeast Atlantic and Mediterranean.

Calliostoma caribbechinatum Landau, Van Dingenen & Ceulemans, 2017

(Fig. 1 A–D)

Synonymy see Leal (1991). Complement:

Calliostoma echinatum Dall, 1881: 47; Leal, 1991: 44, pl. 3, fig. A; Benkendorfer & Soares-Gomes, 2009: 147; Masseurin *et al.*, 2009: 84, pl. p83; Rios, 2009: 51, text fig.; Rosenberg *et al.*, 2009: 623; Dornellas, 2012: 103.

Calliostoma caribbechinatum Landau, Van Dingenen & Ceulemans 2017: 123.

Type material. Holotype: USNM 214270.

Type locality. Cuba, off Havana, Blake sta. 62, 146 m (Agassiz & Sigsbee leg., 1877).

Previously known distribution. From Cuba to southern Brazil, live specimens down to 146 m (Benkendorfer & Soares-Gomes, 2009; Rosenberg *et al.*, 2009).

New occurrence. Abrolhos Slope, 60–295 m (shells only).

Habitat. Coralline and muddy bottoms.

Material examined. Brazil: **Espírito Santo:** off São Mateus, Abrolhos Slope, 18°59'S, 37°50'W, MD55 sta. DC75, 295 m, MNHN, 1 sh (27/v/1987); Jaseur Seamount, 20°26'S, 36°17'W, MD55 sta. DC30, 60 m, MNHN, 2 sh (15/v/1987), 20°27'S, 35°54'W, MD55 sta. DC34, 54 m, MNHN, 5 sh (15/v/1987); Dogaressa Seamount, 20°50'S, 33°44'W, MD55 sta. DC43, 63 m, MNHN, 3 sh (17/v/1987). **Rio de Janeiro:** off Cabo de São Tomé, 21°37'S, 40°18'W, MD55 sta. DC15, 37 m, MNHN, 1 sh (10/v/1987). *Additional non-MD55 material:* **Cuba:** holotype.

Measurements. 6½–7 whorls, H=4.9–6.1 mm, D=4.5–5.5 mm (n=12).

Remarks. The name *Calliostoma caribbechinatum* was introduced by Landau *et al.* (2017) as a replacement for *C. echinatum* Dall, 1881, a junior secondary homonym of *C. echinatum* (Millet, 1865), a fossil species from the Miocene of France. In his study about selected specimens from the MD55 expedition, Leal (1991) reported the occurrence of *C. caribbechinatum* (as *C. echinatum* Dall, 1881) on the islands of Trindade and Martim Vaz as well as the seamounts Jaseur, Davis, and Dogaressa, but did not mention the Abrolhos Slope (sta. DC75). This location is newly reported herein and it is also the deepest occurrence of the species known so far, expanding the previous maximum depth record from 220 m to 295 m. Even though the specimens examined here are exclusively empty shells, some are very well preserved, which at least means they were collected not too long after death and likely not far removed from their living area.

Calliostoma gemmosum (Reeve, 1842)

(Fig. 1 E–I)

Synonymy see Clench & Turner (1960) and Leal (1991). Complement:

Trochus gemmosus Reeve, 1842: 165, pl. 218, fig. 9.

Calliostoma gemmosum: Kempf & Matthews, 1968: 91, tab. I; Matthews & Kempf, 1970: 18; Leal, 1991: 45; Gomes *et al.*, 2006: 185; Benkendorfer & Soares-Gomes, 2009: 147; Rios, 2009: 51, text fig.; Dornellas, 2012: 103, fig. 47.

Type material. Former Stainforth Collection, probably lost (Clench & Turner, 1960).

Type locality. Not given, probably Western Atlantic (Clench & Turner, 1960).

Previously known distribution. Probably endemic to Brazil, ranging from Maranhão state to Espírito Santo state, live specimens from 10–100 m (Leal, 1991; Rios, 2009).

New occurrence. Vitória-Trindade Chain.

Habitat. Sandy bottoms.

Material examined. Brazil: **Espírito Santo:** off São Mateus, Abrolhos Slope, 18°49'S, 37°57'W, MD55 sta. DC83, 60 m, MNHN, 1 sh (28/v/1987); Vitoria Bank, 20°21'S, 36°59'W, MD55 sta. DC26, 97.5 m, MNHN, 1 sh (14/v/1987); Montague Bank, 20°25'S, 36°42'W, MD55 sta. DC27, 81 m, MNHN, 1 sh (14/v/1987); Jaseur Bank, 20°42'S, 35°22'W, MD55 sta. DC35, 15–82 m, MNHN, 1 sh (16/v/1987). *Additional non-MD55 material:* Brazil: **Espírito Santo:** off Guarapari, under rocks, 20–25 m, NMR 56382, 1 sh (xii/1991, ex coll. J.G.B. Nieuwenhuis).

Measurements. 7 whorls, H=11.0 mm, D=11.0 mm (largest whole specimen).

Remarks. Reeve's introduction of *C. gemmosum* in *Conchologia Systematica* included a single figure depicting a specimen in umbilical view (Reeve, 1842: pl. 218, fig. 9). A complementary description published a year later

indicated the type locality as unknown (Reeve 1843). No further detail was given and the type material is presumably lost. Nevertheless, subsequent works pointed out the Western Atlantic as the correct provenance of Reeve's specimens (Clench & Turner 1960). Although species identity is uncertain due to the absence of type specimens, there is little doubt that the Brazilian specimens depicted and referred to as *C. gemmosum* in the works published so far are part of a single, well-defined entity (Clench & Turner, 1960).

Leal (1991) did not report this species among the MD55 material, but the present specimens compare well with Brazilian specimens described and illustrated so far (e.g., Rios, 1994, 2009). They also closely resemble specimens from museum collections examined here in outline, sculpture pattern and ground color. Curiously, the apex and the typical reddish-brown spiral stripes are much lighter in the MD55 specimens (Fig. 1 E–G). This could be due to post-mortem discoloration since the color is more vivid in juvenile specimens (Fig. 1 H). Based on the very few occurrences of *C. gemmosum* reported so far (Matthews & Kempf 1970; Leal 1991), the present records expand the range of the species ca. 190 km south from 19°S to 20°42'S.

***Calliostoma hassler* Clench & Aguayo, 1939**

(Fig. 2 A–G)

Synonymy see Dornellas & Simone (2013). Complement:

Calliostoma hassler Clench & Aguayo, 1939: 191, pl. 28, fig. 3; Abbott, 1974: 46; Masseurin *et al.*, 2009: 84, pl. p83; Dornellas, 2012: 104, figs 13–15; Dornellas & Simone, 2013: 285, figs 24–25, 44, 51–53, 91–98.

Astele (Leiotrochus) hassler: Macsotay & Campos, 2001: 35, pl. 13, figs 9–10.

Calliostoma sp.: Longo *et al.*, 2014: 2, fig. 4F.

Type material. Holotype: MCZ 104554. Paratypes: MCZ 104555, 1 sh; MFP, 1 sh; all from type locality.

Type locality. Brazil, off Cabo Frio, 75 miles east of Rio de Janeiro, 64 m (20/ii/1872).

Distribution. From Paria, northern Venezuela, to southeastern Brazil, live specimens from 20–100 m (Macso-
tay & Campos 2001; Dornellas & Simone 2013).

Habitat. On bottoms alongside bryozoans and coralline algae (Clench & Turner, 1960).

Material examined. Brazil: **Espírito Santo:** off São Mateus, Jaseur Bank, 20°27'S, 35°54'W, MD55 sta. DC34, 54 m, MNHN, 1 sh (15/v/1987); Vitoria Bank, 20°32'S, 38°10'W, MD55 sta. DC 22, 52 m, MNHN, 1 sh; Davis Bank, 20°39'S, 34°41'W, MD55 sta. DC40, 60 m, MNHN, 1 sh; Columbia Bank, 20°41'S, 32°12'W, MD55 sta. DC47, 94–105 m, MNHN, 2 sh (19/v/1987); Dogaressa Bank, 20°54'S, 34°01'W, MD55 sta. DC42, 60 m, MNHN, 1 sh (17/v/1987); **Rio de Janeiro:** off Cabo de São Tomé, 21°37'S, 40°18'W, MD55 sta. DC15, 37 m, MNHN, 7 sh (10/v/1987). *Additional non-MD55 material:* Brazil: **Rio de Janeiro:** types.

Measurements. 7¾ whorls, H=25.8 mm, D=25.7 mm (largest whole specimen).

Remarks. The single well-preserved adult individual from the MD55 assemblage (Fig. 2 A–B) is remarkably similar to the type specimens in outline, sculpture, and coloration. In the original description, Clench & Aguayo (1939) emphasized the yellowish hue of the types owing to a probable color loss after extended exposure to preservative fluid. However, the material studied herein, as well as the specimens illustrated by Dornellas & Simone (2013), suggest otherwise: the variation in color from yellowish (Fig. 2 A–B) to strongly red (Fig. 2 D) seems to be the normal color range of this species. Moreover, even though most specimens have a homogeneous coloration, except for some faint, darker colored axial stripes and white blotches (Fig. 2 D–F), some have a mixed coloration, showing a reddish-orange hue on the first whorls that becomes yellowish towards the body whorl (Fig. 2 A). The protoconch (Fig. 2 G), however, seems to be invariably ivory white. The record from the MD55 sta. CB77 is the deepest known so far, though it consists of an empty, fragmentary shell.

There is a large conchological overlap between *C. hassler* and *C. jujubinum* (Gmelin, 1791), a species known from Mexico and the Caribbean. Wide-ranging calliostomatid species are not entirely uncommon (Clench & Turner 1960), and a possible synonymy between these two should be further analyzed. Masseurin *et al.* (2009) reported both species occurring together in French Guyana.

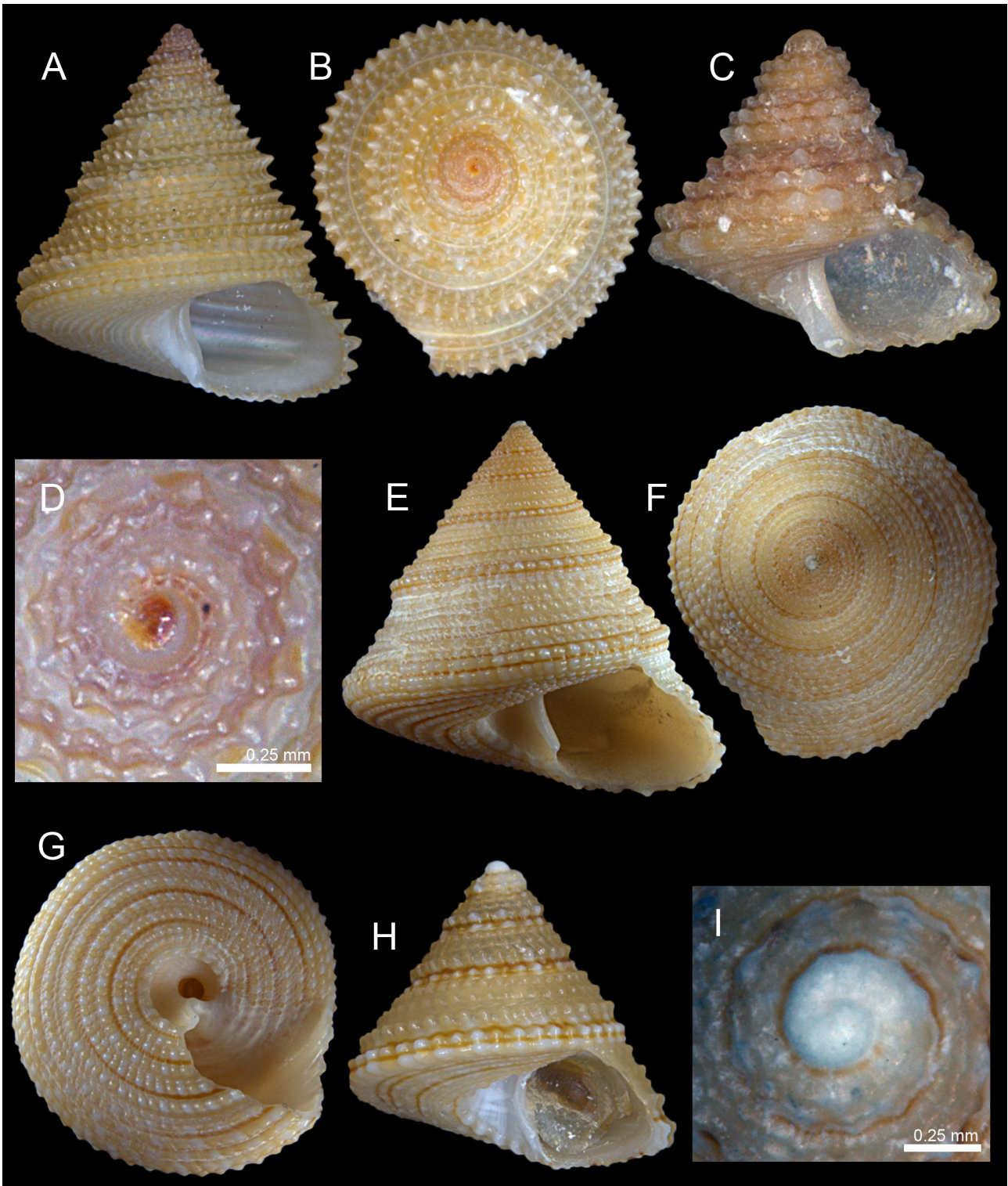


FIGURE 1. *Calliostoma* collected by the MD55 expedition. **A–D.** *Calliostoma caribbechinatum*. **A.** MNHN, sta. DC30, apertural view (H=6.4 mm, D=5.8 mm). **B.** same, apical view. **C.** MNHN, from Trindade Island, juvenile specimen, apertural view (H=1.9 mm, D=1.7 mm). **D.** MNHN, sta. DC43, detail of apex. **E–I.** *Calliostoma gemmosum*. **E.** MNHN, sta. DC83, apertural view (H=11.0 mm, D=10.9 mm). **F.** same, apical view. **G.** same, umbilical view. **H.** MNHN, sta. DC27, juvenile specimen, apertural view (H=3.3 mm, D=3.5 mm). **I.** MNHN, sta. DC26, detail of apex.

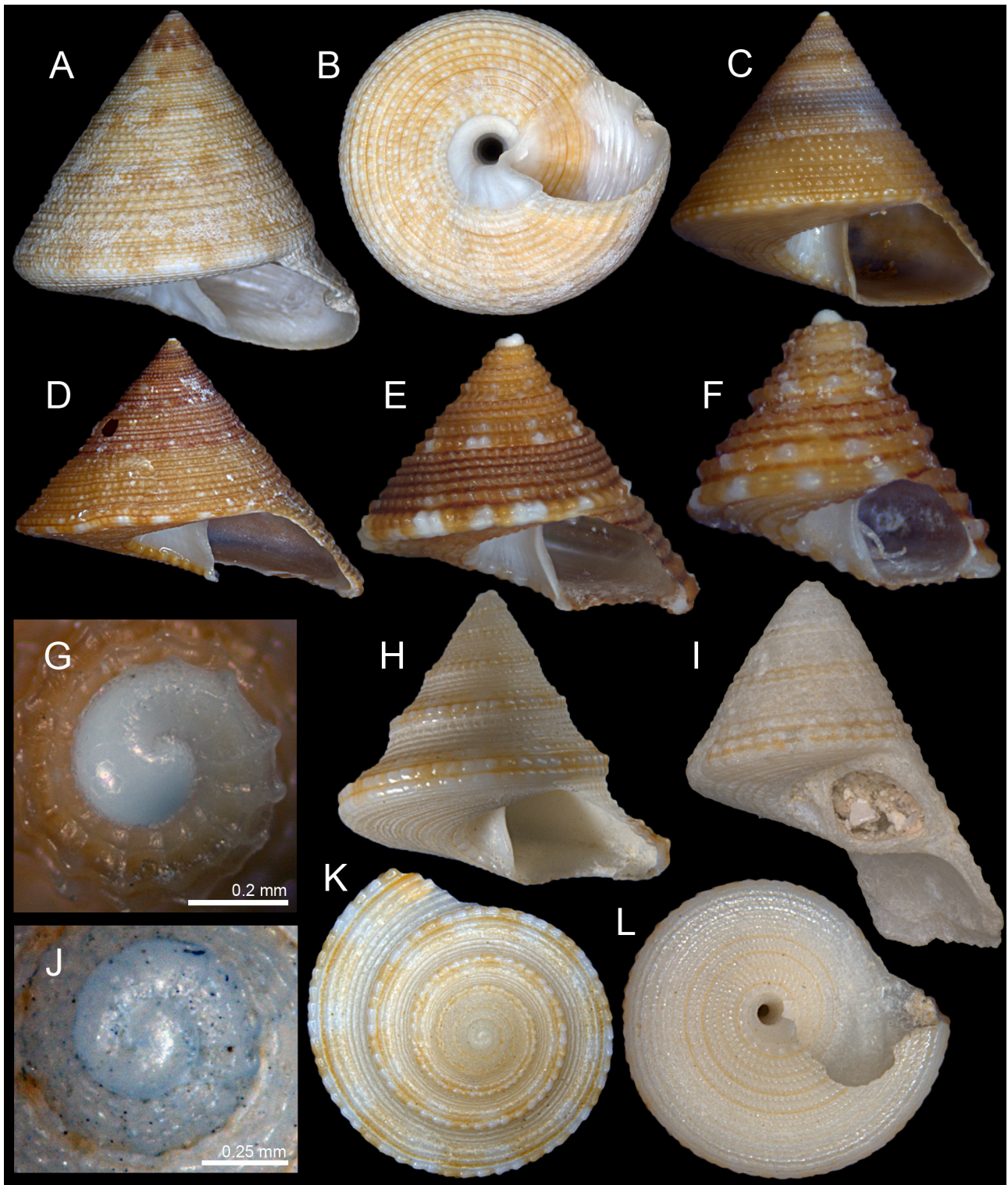


FIGURE 2. *Calliostoma* collected by the MD55 expedition. **A–G.** *Calliostoma hassler*. **A.** MNHN, sta. DC47, apertural view (H=25.8 mm, D=25.7 mm). **B.** same, umbilical view. **C.** MNHN, sta. DC15, apertural view (H=10.2 mm, D=11.1 mm). **D.** MNHN, sta. DC40, juvenile specimen, apertural view (H=9.6 mm, D=12.2 mm). **E.** MNHN, sta. DC42, apertural view (H=3.6 mm, D=4.4 mm). **F.** MNHN, sta. DC22, apertural view (H=1.4 mm, D=1.8 mm). **G.** MNHN, sta. DC42 detail of apex. **H–L.** *Calliostoma javanicum*. **H.** MNHN, sta. DC55, juvenile specimen, apertural view (H=5.4 mm, D=5.5 mm). **I.** MNHN, sta. CB77, fragmentary specimen (H~5.0 mm, D~4.7 mm). **J.** MNHN, sta. DC55, juvenile specimen, detail of apex. **K.** same, apical view. **L.** same, umbilical view.

***Calliostoma javanicum* (Lamarck, 1822)**

(Fig. 2 H–L)

Synonymy see Leal (1991). Complement:

Trochus javanicus Lamarck, 1822: 25.

Calliostoma javanicum: Leal, 1991: 45; Hess & Abbott, 1994: 142; Lyons, 1998: 16; Espinosa *et al.*, 2007: 64, fig. 003; Williams *et al.*, 2008: 487, tab. 2; Rosenberg *et al.*, 2009: 622; Williams *et al.*, 2010: 785, tab. 1.

Calliostoma sp.1: Leal, 1991: 47.

Type material. Holotype: MHNG-MOLL-51496.

Type locality. Java (in error; see Leal 1991).

Previously known distribution. East Florida to Brazil, live specimens from 1–97 m (Leal, 1991; Rosenberg *et al.* 2009).

New occurrences. Off southeastern Brazil, Martim Vaz Island and Abrolhos Bank, 780–940 m (shells only).

Habitat. Benthic, on coral, rocky and sandy habitats (Rodríguez-Sevilla *et al.* 2009).

Material examined. Brazil: **Espírito Santo:** off São Mateus, Abrolhos Slope, 19°40'S, 37°48'W, MD55 sta. CB77, 790–940 m, MNHN, 1 sh (27/v/1987); off Vitória, Martim Vaz Island, 20°32'S, 28°52'W, MD55 sta. DC55, 780–795 m, MNHN, 1 sh (20/v/1987). *Additional non-MD55 material:* holotype.

Measurements. ~6 whorls, H=5.4 mm, D=5.5 mm (juvenile).

Remarks. According to Rosenberg *et al.* (2009), the bathymetric range of this species is 1–97 m. The well-preserved juvenile specimen found in the present samples at 780–795 m depth suggests a greater maximum depth, though this single shell could still have been carried away from its original area. Leal (1991) reported *C. javanicum* from Vitoria Bank (MD55 stations DC22, DC26), Montague Bank (sta. DC27), Jasseur Bank (sta. DC34, DC35), Davis Bank (sta. DC40), Dogaressa Bank (sta. DC42) and Columbia Bank (sta. DC47). The species is newly reported here from Trindade (off Martim Vaz Island) further eastward, and the Abrolhos Bank to the west.

***Calliostoma rude* Quinn, 1992**

(Fig. 3 A–I)

Calliostoma rude Quinn, 1992: 83, figs 7–8; Masseurin *et al.*, 2009: 85.

Type material. Holotype: USNM 860251. Paratypes: UMML 305844, 2 sh, FSBC I 44076, 1 sh, from type locality; MCZ 302593, Guyana, off Georgetown, Chain Cruise 35, sta. 35 and 36, 8°10.5'–8°10'N, 57°48'W, 53–60 m (28/iv/1963).

Type locality. French Guyana, off Cayenne, Pillsbury sta. P-650, 6°07'N, 52°19'W, 84–91 m.

Previously known distribution. Guyana to French Guyana, live specimens from 53–91 m (Quinn 1992).

New occurrence. Southeastern Brazil, off Espírito Santo, Abrolhos Slope, 120–295 m (shells only).

Habitat. Sandy bottoms, 53–91 m.

Material examined. Brazil: **Espírito Santo:** off São Mateus, edge of the Abrolhos Slope, 18°59'S, 37°50'W, MD55 sta. DC75, 295 m, MNHN, 1 sh (27/v/1987); 19°00'S, 37°47'W, MD55 sta. DC81, 120–135 m, MNHN, 1 sh (27/v/1987). *Additional non-MD55 material:* **French Guyana:** holotype.

Measurements. 9 whorls, H=13.1 mm, D=9.2 mm (adult specimen).

Remarks. The adult specimen analyzed herein (Fig. 3 A–C) compares exceedingly well with the holotype, presenting nearly identical proportions, color, and sculpture. Shells of juvenile individuals (Fig. 3 D–I) have a somewhat flatter base, which also lacks the stronger sculpture of spiral ribs (Fig. 3 F) seen in adult individuals (Fig. 3 C). The new records reported here are the second since the original description of this apparently rare species. The new occurrence is far away from the previously known distribution in northern South America, extending its range ca. 3,200 km to southeastern Brazil.

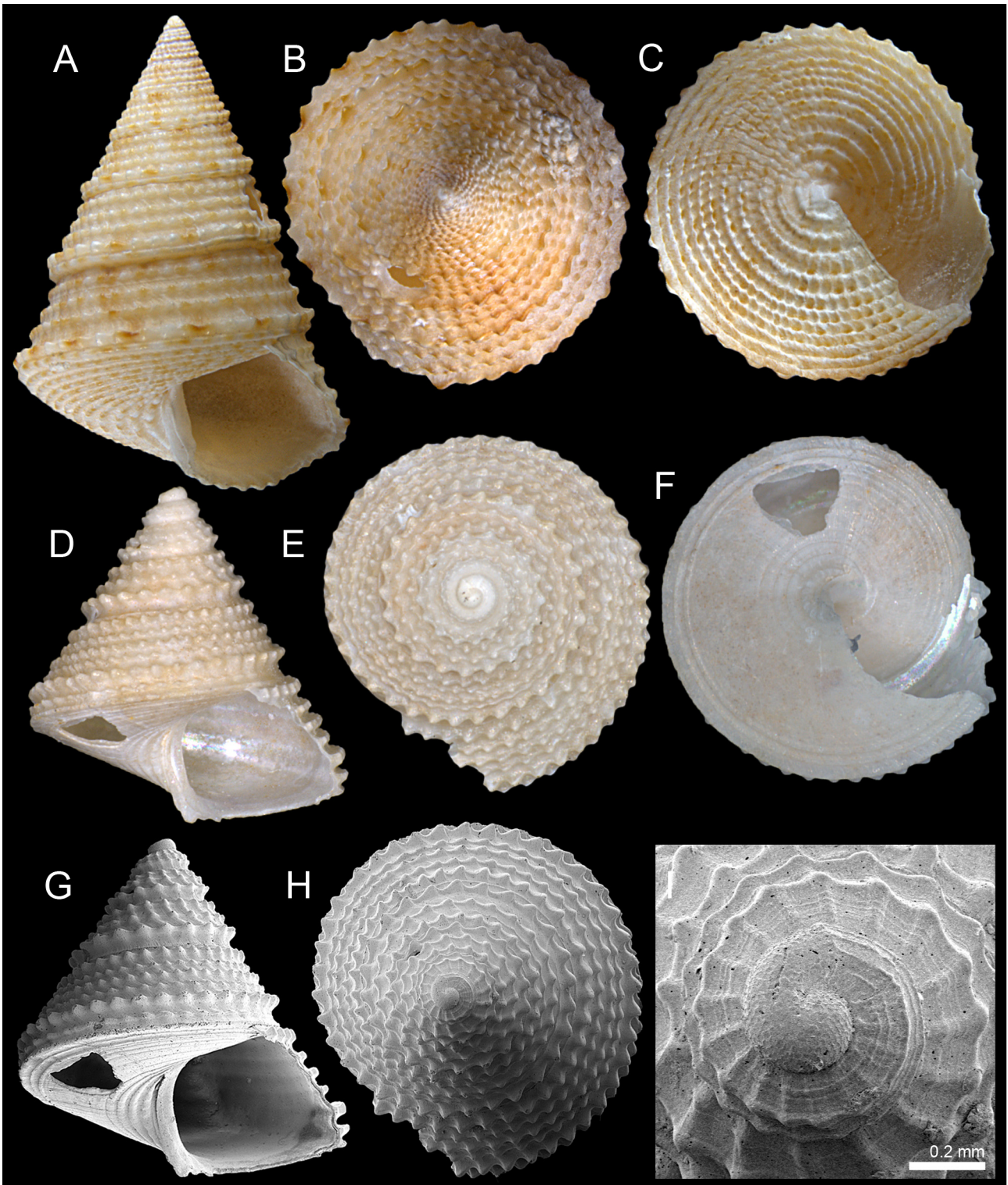


FIGURE 3. *Calliostoma* collected by the MD55 expedition, *Calliostoma rude*. **A–C.** MNHN, sta. DC81 (H=13.1 mm, D=9.2 mm). **A.** apertural view. **B.** apical view. **C.** umbilical view. **D–I.** MNHN, sta. DC75, juvenile specimen (H=5.0 mm, D=4.5 mm). **D.** apertural view. **E.** apical view. **F.** umbilical view. **G.** SEM, apertural view. **H.** SEM, apical view. **I.** SEM, detail of apex.

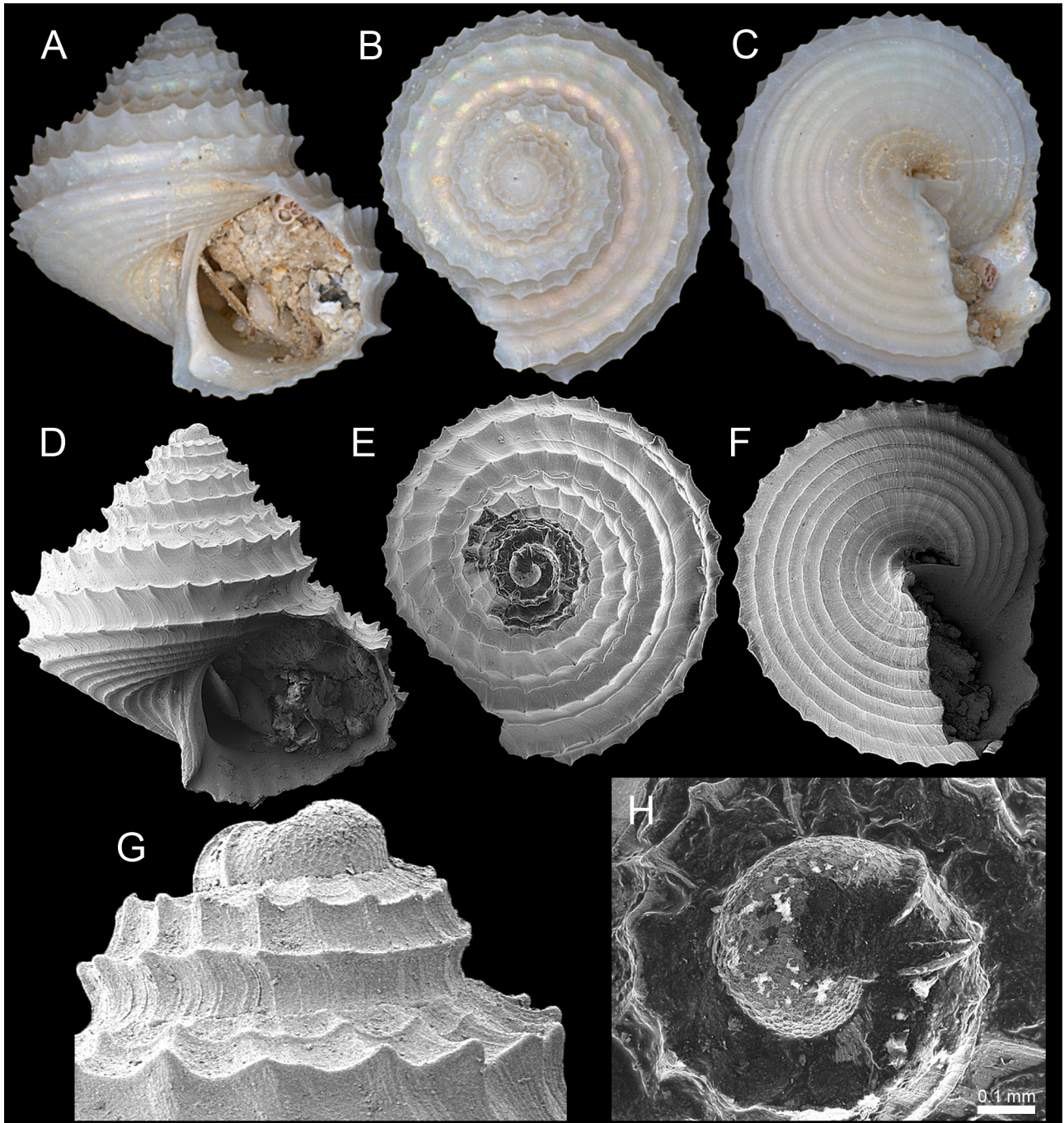


FIGURE 4. *Calliostoma valkuri* n. sp. Holotype MNHN-IM-2000-34300, sta. DC79 (H=4.1 mm, D=4.2 mm). **A.** apertural view. **B.** apical view. **C.** umbilical view. **D.** SEM, apertural. **E.** SEM, apical view. **F.** SEM, umbilical view. **G.** SEM, detail of spire. **H.** SEM, detail of apex showing the protoconch.

***Calliostoma valkuri* sp. nov.**

(Fig. 4)

Type material. Holotype MNHN-IM-2000-34300.

Type locality. Brazil, Espírito Santo, off São Mateus, Abrolhos Slope, 19°01'S, 37°47'W, MD55 sta. CB79, 1500–1575 m (Bouchet, Leal & Métivier leg., 28/v/1987).

Etymology. The name refers to Valkur, a fictional demigod from the Forgotten Realms campaign setting of the Dungeons and Dragons role-playing game. Valkur is the patron and protector of sailors.

Diagnosis. Teleoconch I very short (0.1 whorl), sculptured by three very delicate spiral cords, beginning and transition to teleoconch II marked by very prominent terminal varices. Teleoconch II sculpture consisting of spiral cords with prominent sharp thorn-like projections; two cords more prominent than remaining cords located on median portion of whorl.

Description. Shell small (H=4.2 mm, juvenile specimen), trochoid, roughly as tall as wide, with 4 very convex whorls; color homogeneous cream, with nacreous gleam underneath visible by translucency (Fig. 4 A–C). Spire tall (height ~1/3 of shell height), prominent; spire angle ~60°. Protoconch (Fig. 4 E, G, H) prominent, of ~1 whorl (width=0.4 mm), color indistinct from teleoconchs I/II, surface sculptured by intersected thin lines forming a reticulate pattern of roughly hexagonal shapes; transition marked by conspicuous terminal varix. Teleoconch I (Fig. 4 G, H) very short (~0.1 whorl after protoconch), surface sculptured by 3 spiral threads; transition to teleoconch II marked by conspicuous terminal varix. Teleoconch II of ~3½ convex whorls, mainly sculptured by 3–5 spiral cords (Fig. 4 A, D), separated by wider interspaces (~3–4x cord width); ontogeny of cords as follows (Fig. 4 B, E): P2 and P3 commencing right after protoconch; P1 commencing at 1.5 teleoconch whorl; S1 commencing at 4.0 whorls; S2 commencing at 4.1 whorls; cords presenting numerous large, spaced, sharp projections resembling rose thorns; two cords, on median region of whorl, more prominent than remaining cords; suture very delicate, nearly indistinguishable (Fig. 4 G), not channeled; body whorl sculptured by 5 spiral cords, with 3 larger, dominant cords and two thinner, intercalary cords. Aperture round, prosocline (Fig. 4 A, D), height ~1/2 of shell height, cream-colored, nacreous; inner lip slightly flared, forming narrow callus (Fig. 4 D). Base convex, sculptured by 8 smooth, well-marked spiral cords; umbilicus imperforate (Fig. 4 C, F); Operculum unknown.

Distribution. Known only from type locality (empty shell).

Measurements. ~4½ whorls, H=4.1 mm, D=4.2 mm (holotype).

Material examined. Holotype.

Remarks. A single shell among all the *Calliostoma* material looked clearly different from the remaining specimens. Among the Western Atlantic congeners, the most similar species is *C. militare* Ihering, 1907 because both have two strongly marked spiral cords on the median portion of the whorl bearing prominent spikes. The main differences between these species are that *C. valkuri* sp. nov. has a shorter shell with a less rounded profile, and has conical spikes, as opposed to the rounded ones in *C. militare*. Other similar species are *C. echinatum*, *C. fascinans* Schwengel & McGinty, 1942, and *C. sapidum* Dall, 1881, but the similarity is almost exclusive to the juveniles, due to the spikes on the spiral cords. Nevertheless, the shape of the spikes is much more conical, short and with blunt rounded tips in these species, and all cords display similar width/length, as opposed to the more prominent median cords of *C. valkuri* sp. nov.

Even without more samples, there are enough characters to easily distinguish it as a new entity. *Calliostoma valkuri* sp. nov. can be readily told apart from its congeners by two strongly marked spiral cords on the median portion of the whorl bearing prominent spikes resembling rose thorns; subsutural and suprasutural spiral cords similar to the two stronger ones in structure, but much weaker, with less prominent spikes - probably, an adult specimen would have more of such cords, as an increase in the number of cords as the shell grows is seen in nearly all congeners.

Genus *Falsimargarita* Powell, 1951

Type species. *Margarites gemma* E.A. Smith, 1915, by original designation; Recent, Antarctic Ocean.

Falsimargarita terespira Simone, 2008

(Fig. 5 A–C)

Falsimargarita terespira Simone, 2008: 15, figs 1–7; Dornellas & Simone, 2011: 39.

Type material. Holotype: MZSP 86789. Paratypes: MZSP 86784, 4 sh, Brazil, Santa Catarina, off Itajai, 26°53'S, 48°24'W, 400 m, otter trawl, inside *Lophelia* cf. *pertusa* (L.) (local fishermen leg., i/2006); MZSP 86786, 1 sh, from type locality.

Type locality. Brazil, Santa Catarina state, off Cape Santa Marta, 28°37'S, 48°43'W (stomach content of batfish *Lophius* sp.).

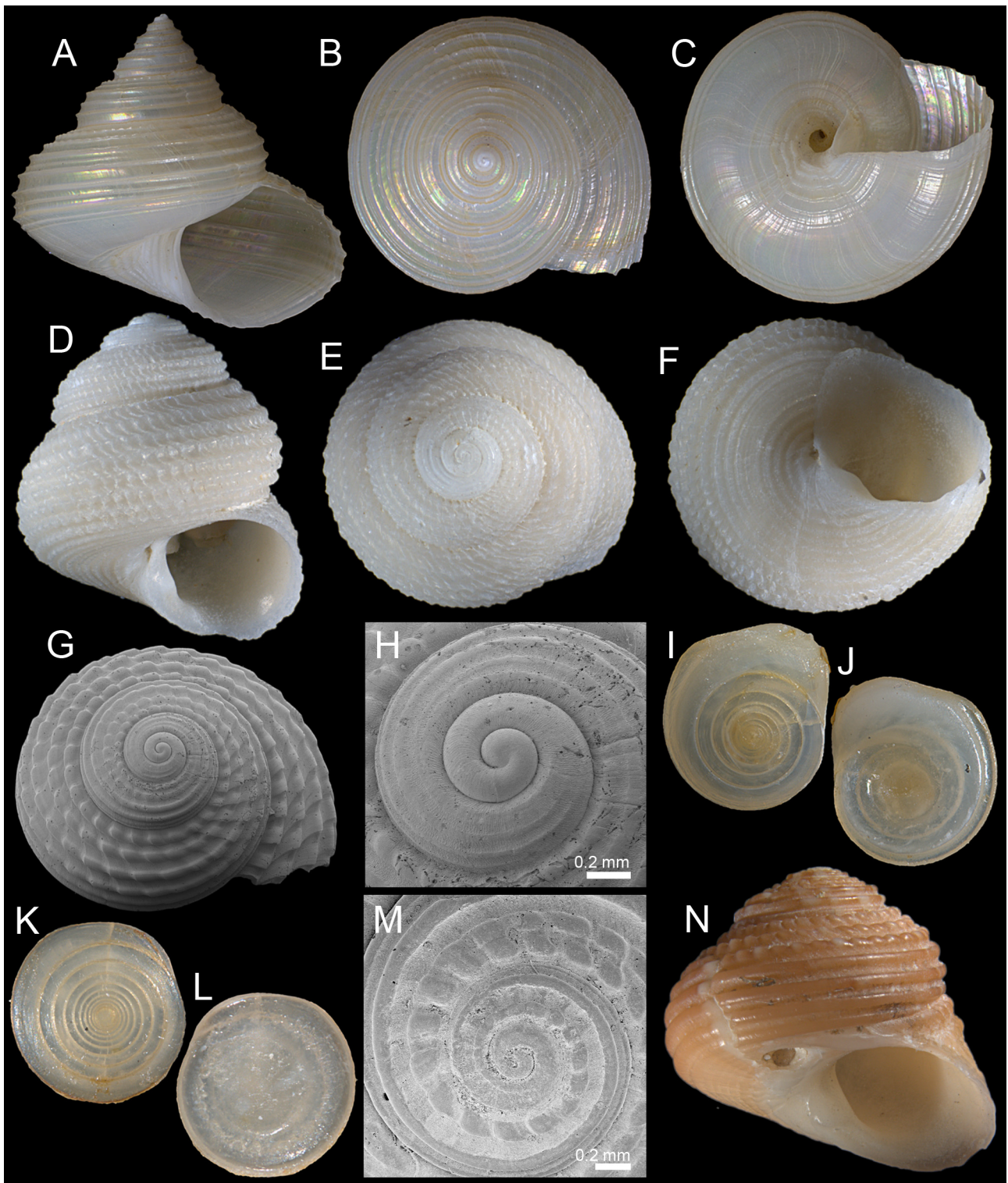


FIGURE 5. Calliostomatidae and Colloniidae collected by the MD55 expedition, and specimens from Northeast Brazil. **A–C.** *Falsimargarita terespira* MNHN, sta. CB103 (H=10.5 mm, D=10.7 mm). **A.** apertural view. **B.** apical view. **C.** umbilical view. **D–J.** *Homalopoma linnei*. **D–F.** MNHN, sta. DC73 spm #1 (H=5.5 mm, D=4.7 mm). **D.** apertural view. **E.** apical view. **F.** umbilical view. **G–I.** MNHN, sta DC73 spm #2 (H=4.8, D=5.4 mm), under SEM. **G.** apical view. **H.** detail of apex. **I–J.** operculum of specimen from Canopus Bank, off Northeast Brazil, MZSP 70295. **I.** inner side (L=1.5 mm), **J.** outer side. **K–N.** *Homalopoma boffii*, specimen from Canopus Bank, off Northeast Brazil, MZSP 93535. **K–L.** operculum (L=1.2 mm). **K.** inner side. **L.** outer side. **M.** detail of apex under SEM, **N.** apertural view (H=7.3 mm, D=7.8 mm).

Previously known distribution. Off Santa Catarina state, Cape Santa Marta and Itajaí, 200–400 m (live specimens).

New occurrence. Southeastern Brazil, Rio de Janeiro, off Cabo Frio.

Habitat. Coralline and sandy bottoms.

Material examined. Brazil: **Rio de Janeiro:** off Cabo Frio, 23°36'S, 42°01'W, MD55 sta. CB103, 200–217 m depth, MNHN, 10 sh (02/vi/1987). *Additional non-MD55 material:* Brazil: **Santa Catarina:** types.

Measurements. 5¾ whorls, H=10.5 mm, D=10.7 mm (largest specimen).

Remarks. The present material compares extremely well with the types. As remarked by Simone (2008), *F. terespira* is the northernmost species of the genus. This distribution is herein extended further to the north (ca. 450 km) in Brazilian waters.

Family Colloniidae Cossmann, 1915

Genus *Homalopoma* Carpenter, 1864

Type species. *Turbo sanguineus* Linnaeus, 1758, by monotypy; Recent, northeastern Atlantic and Mediterranean.

Homalopoma boffii Marini, 1975

(Fig. 5 K–N)

Homalopoma boffii Marini, 1975: 31, figs 1–3. Rios, 1985: 26, pl. 11, fig. 109; Rios, 1994: 43, pl. 14, fig. 145; Rios, 2009: 69, text fig. (switched with preceding species entry in error).

Homalopoma boffi [sic]: Leal, 1991: 58; Benkendorfer & Soares-Gomes, 2009: 151.

Type material. Holotype: MZSP 18772. Paratype: MZSP 18773, 1 spm, from type locality.

Type locality. Brazil, off Rio Grande do Sul state, 31°08'S, 49°31'W, 183–253 m, R/V “W. Besnard” sta. 1858 (6/viii/1972).

Previously known distribution. Off southeastern Brazil, from São Paulo state to Rio Grande do Sul state (Rios, 1994), including Trindade and Martim Vaz Islands, Montague and Columbia Seamounts (Leal, 1991), 60–253 m (live specimens).

New records. Northeastern Brazil, off Ceará state, down to 260 m (shells only).

Habitat. Coralline and muddy bottoms.

Material examined. Brazil: **São Paulo:** off Santos, MZSP 36037, 2 spm (local fishermen leg., xii/2002). *Additional Non-MD55 material:* Brazil: **Ceará:** 120 miles off Fortaleza, Canopus Bank, MZSP 53938, 240–260 m, 2 sh (viii/2005); MZSP 67303, 260 m, 7 sh (xi/2005); MZSP 70298, 260 m, 4 sh (xi/2005); MZSP 93535, 60–200 m, 2 sh (viii/2005); **Rio Grande do Sul:** types.

Measurements. 6–6½ whorls, H=8.7–10.0 mm, D=9.0–10.4 mm (n=3).

Remarks. This seemingly rare species is usually characterized by its large, reddish shell, with strong rounded spiral cords and coarse nodulose sculpture starting on the teleoconch, but usually restricted to the first 3–4 whorls (Marini 1975). The species, in fact, attains a larger size than reported in the original description (H=6.9, D=7.0 mm) and followed by the literature (e.g., Rios 1994, 2009; Rosenberg *et al.* 2009), reaching a shell height of 10.9 mm (MZSP 67303) and a maximum diameter of 10.8 mm (MZSP 36037) in non-MD55 specimens we analyzed (from Canopus Bank, off northeastern Brazil).

Leal (1991) argued that the figures in the original description by Marini (1975: figs 1–3) were switched with those of another species, but the present examination of the type material showed that the holotype is the illustrated specimen: the proportions, sculpture and even the location of damaged areas are identical (MZSP 18772). Both type specimens are subadult shells, and the slight change in outline with age (Fig. 5 N) may have caused confusion.

With its known distribution restricted to southern-southeastern Brazilian waters in recent works (Leal 1991; Rios 1994, 2009), *Homalopoma boffii* is here revealed as more widely distributed than initially assumed, ranging as far as northeastern Brazil. Part of this newly reported range overlaps with that of *Homalopoma linnei* (Dall, 1889), which has also been found in the MD55 material (see below). Marini (1975) pointed out the similarity of

these species, arguing that the main differences resided in the shell's ground color (reddish as opposed to pure white in *H. linnei*), number of spiral cords (fewer in *H. linnei*), and overall size (~25% larger than *H. linnei*). Except for the discrepancy in size, which is strongly consistent (and even amplified) in the assemblage examined here, the remaining dissimilarities are not confirmed: some specimens of *H. boffii* from Canopus are almost pure white, and the number of spiral cords on the body whorl is variable from 12 to 16 in both species. Even so, there are additional differences to be noted. In *H. boffii*, the protoconch is much less inflated, nearly flattened (Fig. 5 M), and the very first teleoconch whorl already bears coarse, large nodules. The nodules themselves are always rounder and proportionally larger in *H. boffii*. Moreover, the shell of *H. boffii* has a more compact outline with a shorter spire, giving it a more globose profile (Fig. 5 N). The suture is shallower in *H. boffii*, lacking the prominent, deep subsutural channel present in *H. linnei*. The spiral cords in *H. boffii* are proportionally wider, as are the interspaces, which in turn are shallower and less prominent than in *H. linnei*. The operculum in *H. boffii* is roughly circular (Fig. 5 K-L), as opposed to squarish in *H. linnei* (Fig. 5 I-J).

Homalopoma linnei (Dall, 1889)

(Fig. 5 D–J)

Leptothyra linnei Dall, 1889: 353, pl. 33, fig. 8 (9 in error, see below).

Leptothyra linnei var. *limata* Dall, 1889: 353.

Homalopoma linnei: Poirier, 1954: 26; Abbott, 1974: 60; Rios, 1985: 26, pl. 11, fig. 110; Rios, 1994: 43, pl. 14, fig. 146; Miyaji, 2004: 79; Rios, 2009: 69 [in part]; Rosenberg *et al.* 2009: 624; Miloslavich *et al.*, 2010: table S6; Welch, 2010: table S1.

Homalopoma sp.1: Leal, 1991: 58.

Type material. Syntypes: MCZ 7538, Cuba, Havana, off Morro Light, Blake sta. 02, 23°14'N, 82°25'W, 1472 m, 1 sh (R/V Blake leg., 1877); MCZ 7539, Cuba, off Havana, 822 m, 1 sh (R/V Blake leg., 1877); MCZ 7540, Cuba, off Honda Bay, 23°2'30"N, 83°11'0"W, 402 m, 1 sh (R/V Blake leg., i/1878); NMNH 94984, Caribbean Sea, Barbados, 13°17'N, 59°53'W, 183 m, 5 sh (R/V Blake leg.); NMNH 94985, Caribbean Sea, St. Lucia, Blake sta. 220, 13.8375N, 61.0625W, 212 m, 1 sh (R/V Blake leg., 16/ii/1879).

Type locality. Saint Lucia, BLAKE sta. 02, 1472 m depth; BLAKE sta. 20, 402 m depth; sta. 220, 212 m depth. Cuba, off Havana, 823 m depth. Barbados, 183 m depth.

Distribution. Florida, USA to southern Brazil, 60–260 m (live specimens) down to 1472 m (shells only) (Miyaji 2004; Rosenberg *et al.* 2009).

Habitat. Coralline and muddy bottoms.

Material examined. Brazil: **Espírito Santo:** off São Mateus, Abrolhos Slope, MD55 sta. DC73, 18°59'S, 37°48'W, 607–620 m, MNHN, 4 sh (27/v/1987); MD55 sta. CB77, 19°40'S, 37°48'W, 790–940 m, MNHN, 1 sh (27/v/1987). *Additional non-MD55 material:* **Caribbean:** types. Brazil: **Ceará:** 120 miles off Fortaleza, Canopus Bank, MZSP 53726, 60–260 m, 24 sh (viii/2005); MZSP 55524, 240–260 m, 2 spm (xi/2005); MZSP 67309, 260 m, 5 sh (viii/2005); MZSP 70295, 260 m, 3 sh + 4 spm (xi/2005); MZSP 94229, 260 m, 4 sh (xi/2005).

Measurements. 6 whorls, H=6.26 mm, D=5.07 mm (largest specimen).

Remarks. In the original description, Dall (1889) cited figure 9 on plate 33. That figure, however, corresponds to another taxon introduced in the same work (*Arene bairdii*, p. 389). The correct figure is number 8, which perfectly agrees with the original description as well as the types examined herein. Due likely to a typographical error, the figure number was switched with figure 8 before the final printing; one can easily notice that by the obvious interruption in the logical sequence of numbers.

The specimens studied here compare exceedingly well with the original description and the examined syntypes in size, sculpture elements, and variation. Even so, most shells inspected have spiral cords sculptured by spiny nodules on nearly all teleoconch whorls, which produce an overall rougher surface and a “spiky” appearance (Fig. 5 D–F). Dall (1889) already mentioned this variation, indicating it as rare, probably based on a syntype specimen examined herein (UNSM 04984). Nevertheless, based on the current assemblage, this variation seems to be more common than initially assumed. Leal (1991) described this variation as a probable distinct species based on MD55 material, tentatively naming it “*Homalopoma* sp.1”.

This species is quite similar to the sympatric congener *Homalopoma boffii* Marini, 1975, but differs in being smaller, exclusively cream/white colored, and usually more profusely sculptured. Regarding the sculpture elements, the

spiral cords referred to as “costae” by Dall in the original (1889) description, are usually narrower (though the number of spiral cords per whorl is variable and overlaps in both species) and the nodules are more irregular, angular (spiky), smaller and numerous than in *H. boffii*. These nodules are usually more closely spaced in *H. linnei*, and are often overlain giving the shell a scaly appearance (Fig. 5 G) that is very distinct from the larger and more widely spaced nodules of *H. boffii* (Fig. 5 N). Nevertheless, both species display some degree of overlapping variation. The only unequivocal characters that distinguish *H. linnei* from *H. boffii* in the analyzed material is the smoother, more elevated and inflated protoconch of the former (Fig. 5 H), and the sculpture of the initial whorls, which lacks the large, sequential nodules found on the initial teleoconch whorls in *H. boffii* (Fig. 5 M). Furthermore, the deep, well-marked subsutural channel in *H. linnei* is not so pronounced in *H. boffii*. Most importantly, the operculum is also strikingly distinct, having 9–10 whorls in *H. linnei* (Fig. 5 I–J), as opposed to 10–12 in *H. boffii* (Fig. 5 K–L), and also presenting a prominent widening of the last whorl in *H. linnei*. This widening produces an almost squarish outline (Fig. 5 I), which is different from the almost circular operculum of *H. boffii* (Fig. 5 K).

Family Margaritidae

Genus *Callogaza* Dall, 1881

Type species. *Callogaza watsoni* Dall, 1881, by subsequent designation (Clench & Abbott 1943); Recent, Atlantic.

Callogaza watsoni Dall, 1881

(Fig. 6 A–F)

Synonymy see Quinn (1979) and Simone & Cunha (2006). Complement:

Callogaza watsoni Dall, 1881: 50; Simone & Cunha, 2006: 22, figs 41–44, 58–60; Rosenberg *et al.*, 2009: 624.

Gaza (Callogaza) watsoni: Quinn, 1979: 25; Rios, 2009: 55.

Type material. Holotype: MCZ 7544.

Type locality. Cuba, off Havana, 24°34'N, 83°16'W, 324 m (Blake Expedition, 1877).

Previously known distribution. From the Yucatan strait to Northeast Brazil (Simone & Cunha, 2006), live specimens from 66–1170 m, usually deeper than 250 m (Quinn, 1979).

New occurrence. Southeast Brazil, off Espírito Santo, Abrolhos Slope.

Habitat: Coralline and sandy bottoms.

Material examined. Brazil: **Espírito Santo:** off São Mateus, Abrolhos Slope, 18°59'S, 37°50'W, MD55 sta. DC75, 295 m, MNHN, 9 sh (27/v/1987); 18°59'S, 37°48'W, MD55 sta. DC73, 607–620 m, MNHN, 2 sh (27/v/1987); 19°40'S, 37°48'W, MD55 sta. CB77, 790–940 m, MNHN, 2 lots (1 + 4 sh) (27/v/1987). *Additional non-MD55 material:* **Cuba:** holotype.

Measurements. ~5½ whorls, H=7.2 mm, D=9.2 mm (largest juvenile specimen).

Remarks. The present specimens are young individuals with up to 5½ whorls. Adult specimens have around 7 whorls according to Simone & Cunha (2006). Additionally, juveniles lack a well-developed callus and reflected lip. The MD55 specimens compare well with the holotype in that they present the strongly marked reticulate sculpture on the apical side of the whorls (Fig. 6 B), the dominant well-marked spiral sculpture that produces a slightly keeled shell profile (Fig. 6 A), and a similarly sculptured periumbilical region, with numerous axial furrows (Fig. 6 C). The youngest specimens (~3¾ whorls, protoconch included) have a distinct rounder profile (Fig. 6 E), which is compatible with the earliest whorls of older individuals. Nevertheless, the first spiral cords appear at 3½ whorls (Fig. 6 F), at which point the shell becomes characteristically keeled. The specimens analyzed here are very similar to the individual reported by Simone & Cunha (2006: figs 58–60), which was mentioned by Dall (1889: 342) as a record from Brazil. Dall's specimen was collected off Fortaleza, Ceará state, R/V Albatross sta. 2756, at 716 m depth. The present records thus represent a range expansion of over 1,800 km further south to Brazilian waters.

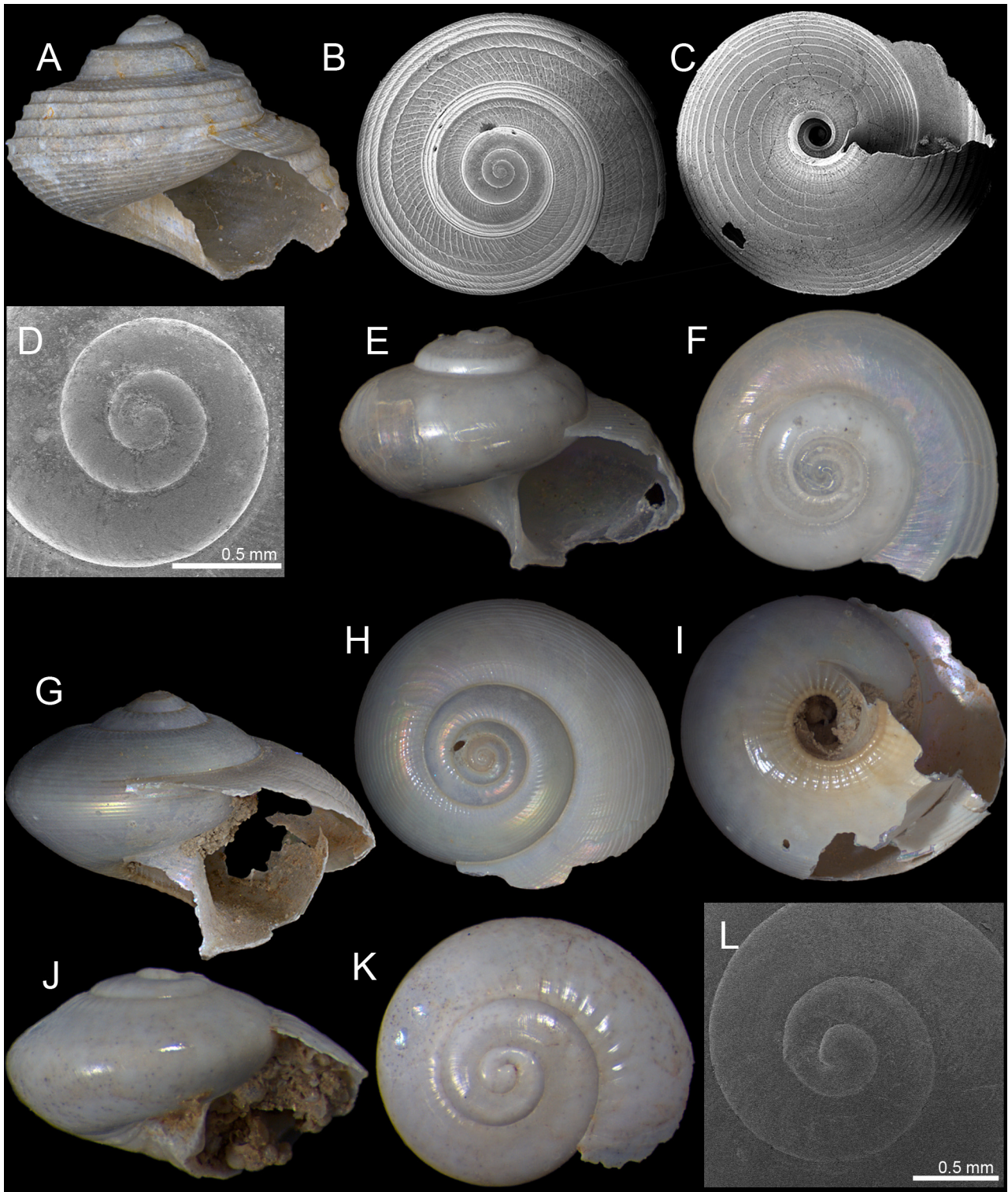


FIGURE 6. Margaritidae collected by the MD55 expedition. **A–F.** *Callogaza watsoni*. **A.** MNHN, sta. CB77, spm #1, apertural view (H=6.0 mm, D=8.0 mm). **B.** MNHN, sta. DC75, under SEM, apical view (D=6.7 mm). **C.** MNHN, sta. CB77, spm #2, under SEM, umbilical view (D=6.2 mm). **D.** MNHN, sta. DC75 under SEM, detail of apex. **E–F.** MNHN, sta. SY74, juvenile specimen (H=1.6 mm, D=2.3 mm). **E.** apertural view. **F.** apical view. **G–L.** *Gaza compta*. **G–I.** MNHN, sta. CB77, juvenile specimen (10.2 mm, D=14.1 mm). **G.** apertural view, **H.** apical view. **I.** umbilical view. **J–L.** MNHN, sta. CB93, juvenile specimen #1 (H=1.7 mm, D=2.7 mm). **J.** apertural view. **K.** apical view. **L.** detail of apex under SEM.

Genus *Gaza* Watson, 1879

Type species. *Gaza daedala* Watson, 1879, by original designation; Recent, Pacific.

Gaza compta Simone & Cunha, 2006

(Fig. 6 G–I)

Gaza compta Simone & Cunha, 2006: 4, figs 1–10, 49–52, 67–77, 92.

Type material. Holotype: MZSP 40324. Paratypes: MZSP 40325, 5 spm; ANSP 413312, 1 sh; MNRJ 10531, 1 sh; ZSM 20060173, 1 sh, all from type locality.

Type locality. Brazil, Rio de Janeiro, off Cabo Frio, 22°53'S 42°01'W, 700–800 m depth (otter trawl, i/2004. C.M. Cunha leg.).

Previously known distribution. Known only from type locality, 800–900 m (live specimens).

New occurrence. Off Espírito Santo, Abrolhos Slope, down to 940 m depth (shells only).

Material examined. *Additional material:* Brazil: **Espírito Santo:** off São Mateus, Abrolhos Slope, 18°59'S, 37°48'W, MD55, sta. DC73, 607–620 m, MNHN, 1 sh (27/v/1987); 19°36'S, 38°53'W, MD55 sta. CB93, 640 m, MNHN, 1 sh (30/v/1987); 19°40'S, 37°48'W, MD55 sta. CB77, 790–940 m, MNHN, 1 sh (27/v/1987). *Additional non-MD55 material:* Brazil: **Rio de Janeiro:** holotype.

Measurements. ~5¾ whorls, H=10.2 mm, D=14.1 mm (largest juvenile specimen).

Remarks. The MD55 specimens are all juvenile and fragmentary but retain enough conchological features to allow identification, such as the faintly purple-colored initial teleoconch whorls that also show well-marked axial undulations, the overall shell profile, and the compatible height/width ratio (~1.45 according to Simone & Cunha 2006). The new records from the MD55 expedition presented herein are the first published since the original description and expand the range of the species ca. 470 km to the north. The bathymetric range is also expanded from the previously known maximum depth of 800 m to 940 m.

Genus *Margarites* Gray, 1847

Type species. *Margarites diaphana* Gray, 1847, by monotypy; Recent, North Atlantic Ocean [as *Margarites helycinus* (Phipps, 1774)].

Margarites imperialis Simone & Birman, 2006

(Fig. 7 A–F)

Margarites imperialis Simone & Birman, 2006: 14, figs 6–10; Rios, 2009: 104, text fig. (in part); Dornellas & Simone, 2011: 19.

Type material. Holotype: MZSP 46025. Paratypes: MZSP 46026, 12 sh, ANSP 412951, 1 sh, BMNH 20050261, 1 sh, from type locality; Rio Grande do Sul, off Porto Alegre, 30°43'S 44°05'W, MZSP 40193, ~90 m, 3 sh (Colella leg., 1978).

Type locality. Brazil, Espírito Santo state, off Itapemirim, 21°37'S, 40°03'W, 900 m, IOUSP sta. E321 (09/ii/1969).

Previously known distribution. Off South-Southeastern Brazil, 21.62°S to 26.75°S, 46.91°W to 40.05°W, live specimens from 90–900 m.

New occurrence. As far northeast as the Abrolhos Slope, 19°36'S–18°58'S, 37°48'W–38°53'W, down to 1200 m (shells only).

Material examined. Brazil: **Espírito Santo:** off São Mateus, Abrolhos Slope, 18°58'S, 37°48'W, MD55 sta. CB78, 1200 m, MNHN, 2 sh (27/v/1987); 19°36'S, 38°53'W, MD55 sta. CB93, 640 m, MNHN, 2 sh (30/v/1987).

Rio de Janeiro: off Cabo Frio, 23°46'S, 42°10'W, MD55 sta. CB105, 610 m, MNHN, 2 sh (06/v/1987). *Additional non-MD55 material:* Brazil: types.

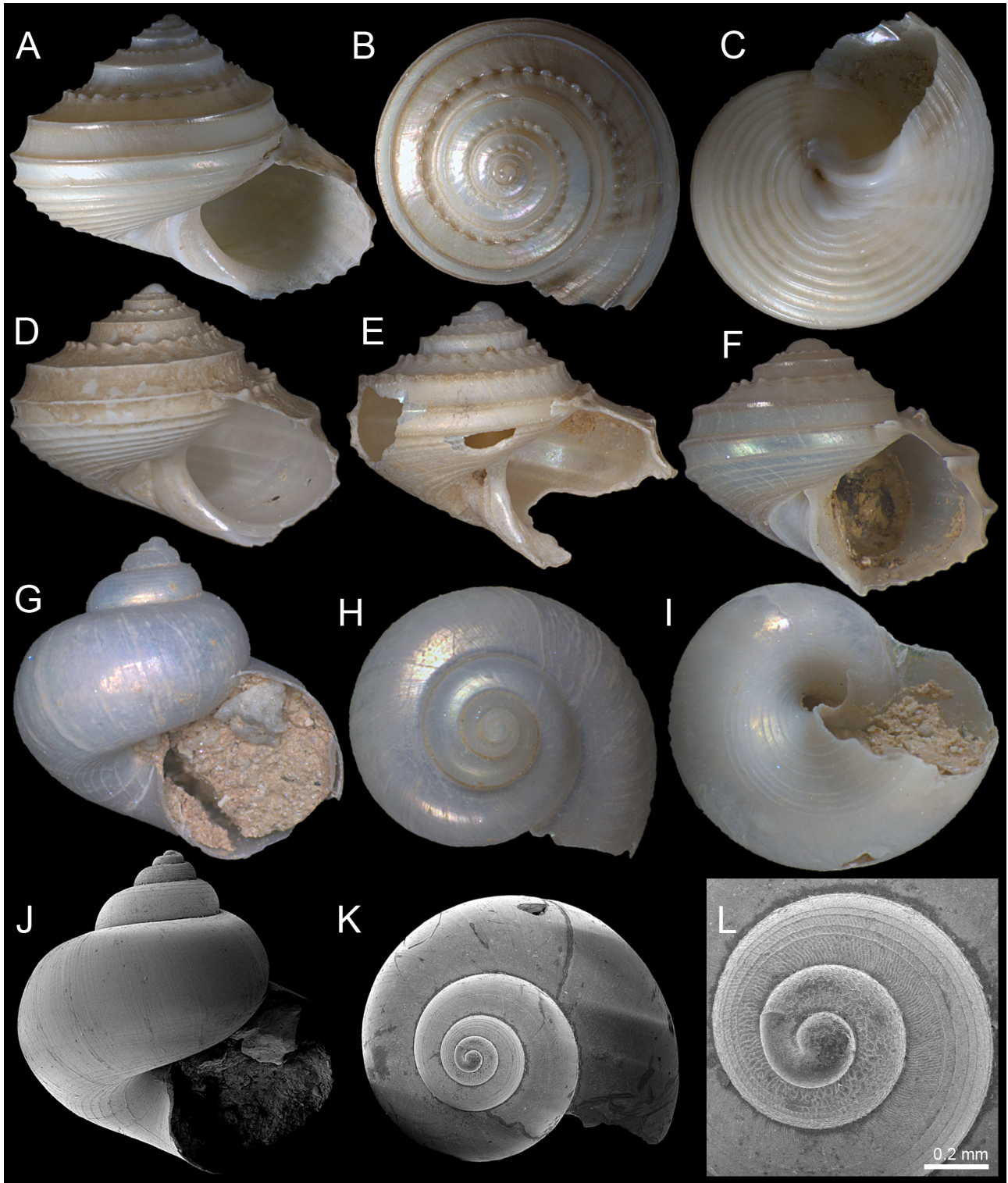


FIGURE 7. Margaritidae and Solariellidae collected by the MD55 expedition. **A–F.** *Margarites imperialis* **A–C.** MNHN, sta. CB105, spm #1 (H=8.8 mm, D=11.7 mm). **A.** apertural view. **B.** apical view. **C.** umbilical view. **D.** MNHN, sta. CB105, spm #2 (H=8.6 mm, D=11.2 mm), apertural view. **E.** MNHN, sta. CB78, juvenile specimen (H=5.5 mm, D=6.6 mm), apertural view. **F.** MNHN, sta. CB93, juvenile specimen (H=4.3 mm, D=5.2 mm), apertural view. **G–L.** *Bathymophila euspira*. **G–H.** MNHN, sta. DC72 (H=4.0 mm, D=4.1 mm). **G.** apertural view. **H.** apical view. **I.** MNHN, sta. CB77 (D=3.2 mm), umbilical view. **J–L.** MNHN, sta. DC72 under SEM. **J.** apertural view. **K.** apical view. **L.** detail of apex.

Measurements. 5 whorls, H=8.8 mm, D=11.7 mm (largest specimen).

Remarks. The present material compares extremely well with the types, showing a shell sculptured by uniform cords that become more closely spaced at the base, three more widely spaced spiral cords from the periphery to the adjacent suture on each whorl (Fig. 7 A, D), a subsutural cord with round nodules (Fig. 7 B), and an umbilicus covered by a smooth callus (Fig. 7 C). A single exception is a poorly preserved specimen that exhibits both the subsutural spiral cord and the following cord ornamented by triangular spikes (Fig. 7 E). A considerable conchological variation in sculpture strength is known in many trochoid species (e.g., Quinn 1979; Marshall 1999). Thus, this case is here interpreted as intraspecific conchological variation. The present record extends the range of the species ca. 320 km northwest to the Abrolhos Slope and the maximum depth from 900 m to 1200 m.

Family Solariellidae

Genus *Bathymophila* Dall, 1881

Type species. *Margarita euspira* Dall, 1881, by monotypy; Recent, Portugal, Gulf of Mexico, Caribbean Sea.

Bathymophila euspira (Dall, 1881)

(Fig. 7 G–L)

Synonymy see Quinn (1979). Complement:

Margarita euspira Dall, 1881: 44.

Trochus euspira: Jeffreys, 1883: 98, pl. 20, figs 6, 6a, 6b.

Margarites (Bathymophila) euspira: Quinn, 1979: 5, figs 1–2.

Bathymophila euspira: Marshall, 1999: 20.

Margarites euspira: Rosenberg *et al.*, 2009: 624; Welch, 2010: table S1.

Margarites euspirus: Miloslavich *et al.*, 2010: table S6.

Type material. Unknown (Quinn 1979).

Type locality. Cuba, off Havana, Blake sta. 2, 23°14'N, 82°25'W, 1472 m.

Previously known distribution. Portugal, Gulf of Mexico, Caribbean Sea, live specimens from 713–1472 m (Rosenberg *et al.*, 2009).

New occurrence. Southwestern Atlantic, Brazil, off Espírito Santo, Abrolhos Slope.

Habitat. Coralline and muddy bottoms.

Material examined. Brazil: **Espírito Santo:** off São Mateus, Abrolhos Slope, 19°00'S, 37°48'W, 950–1050 m, MNHN, 2 sh; 19°40'S, 37°48'W, MD55 sta. CB77, 790–940 m, MNHN, 1 sh (27/v/1987).

Measurements. 4½ whorls, H=4.0 mm, D=4.1 mm (largest specimen).

Remarks. The diagnostic spiral sculpture pattern of the early whorls, as well as the overall shell shape and proportions and the large circular aperture, is consistent with *Bathymophila euspira*. The holotype of this species could not be located. However, topotypes and the syntypes of the variety (and synonym) *B. euspira nitens* Dall, 1881 (USNM 214275, from off Portugal), alongside the redescription of Quinn (1979), support the identification of the present specimens. *Bathymophila euspira* is known for its considerable conchological variation, from completely smooth specimens to a variable number of fine spiral striae and having a subsutural spiny spiral thread (Quinn 1979). The present specimens lack the subsutural spiral thread and are almost completely smooth (Fig. 7 G, J), counting with circa 8 very fine spiral striae on the base of the whorl, circling the umbilicus (Fig. 7 I, J). Moreover, the present specimens have narrower shells than the typical *B. euspira*. The present record greatly extends the species range ca. 6,900 km to the southeast, which is relatively common for the MD55 material (e.g., *Calliostoma echinatum*, above).

Genus *Lamellitrochus* Quinn, 1991

Type species. *Margarita lamellosa* Verrill & Smith [*in Verrill*], 1880; Recent, New Jersey to Gulf of Mexico.

***Lamellitrochus cancapae* (Vilvens & Swinnen, 2007) comb. nov.**

(Fig. 8 A–C)

Solariella cancapae Vilvens & Swinnen, 2007: 124, figs 1–2.

Type material. Holotype: RNMH.MOL.109036.

Type locality. Portugal, Azores, east of Flores, CANCAP-V sta. 5171, 39°20'N, 30°53'W, 1874–1887 m.

Previously known distribution. Known only from type locality, 1874–1887 m (empty shells).

New occurrence. Western Atlantic, Brazil, off Espírito Santo, Abrolhos slope, 607–620 m (shells only).

Material examined. *Additional material:* Brazil: **Espírito Santo:** off São Mateus, continental slope of Abrolhos, 18°59'S, 37°48'W, MD55 sta. DC73, 607–620 m, MNHN, 2 sh (27/v/1987). *Additional non-MD55 material:* Portugal: **Azores:** holotype.

Measurements. 6¼ whorls, H=9.1 mm, D=9.0 mm (largest specimen).

Remarks. The species was originally classified in the genus *Solariella* S. Wood, 1842, but we propose here a new combination within the Atlantic genus *Lamellitrochus*. This is justified by the following characters (as defined by Quinn 1991): (1) The angular shell profile formed by a subsutural cord, a peripheral carina and a basal carina, with nearly flat regions between them. The two carinae are fainter in the rounded body whorl of *L. cancapae*, although they can be easily seen in earlier whorls. (2) A tuberculate subsutural cord. (3) Early whorls sculptured by strong spiral cords and well-marked axial riblets.

The present material compares exceedingly well with the holotype (and only known specimen) of *L. cancapae* (RNMH.MOL.109036) in overall dimensions, outline with a rounded body whorl (Fig. 8 A–B), and main spiral sculpture elements (see Vilvens & Swinnen 2007 for a full description). However, the present specimens only show spiral striae on the whorl base (Fig. 8 C) and do not have axial sculpture, thus they are lacking the type's reticulate sculpture pattern; they also lack interumbilical spiral striae. Nevertheless, as seen in other solariellids, the strength of the sculpture can be very variable intraspecifically (Quinn 1979; Marshall 1999) and thus, the present differences are here interpreted as morphological variation. The present record greatly extends the species range to the Western Atlantic and ca. 6,500 km to the south.

***Lamellitrochus carinatus* Quinn, 1991**

Lamellitrochus carinatus Quinn, 1991: 84, figs 7–12, 34–35; Barros *et al.*, 2008: 25, figs 50–56; Benkendorfer & Soares-Gomes, 2009: 147; Rios, 2009: 57, text fig.; Rosenberg *et al.*, 2009: 623; Barros, 2010: 69, figs 50–56; Welch, 2010: table S1. *Solariella* sp. 1: Leal, 1991: 47, pl. 3, figs B–D.

Type material. Holotype: DMNH 179393. Paratypes: Brazil, Espírito Santo, off Trindade Island, 20°29'02''S, 29°18'02''W, MD55 sta. DC61, 63 m, MORG 26529 (22/v/1987); 20°30'04''S, 29°18'05''W, MD55 sta. DC59, 52–60 m, MNHN-IM-2012-37681 (22/v/1987).

Type locality. USA, Florida, SW of Egmont Key, 366–421 m depth (J. Moore leg.).

Distribution. North Carolina, USA and Trindade Island, Brazil, 52–421 m depth (Quinn 1991).

Material examined. Brazil: **Espírito Santo:** paratypes.

Measurements. ~4¼ whorls, H=2.5–2.7 mm, D=2.7–2.9 mm (Quinn 1991).

Remarks. The paratypes, stemming from the MD55 expedition, were already studied and reported by Quinn (1991). No further specimens of *L. carinatus* were found in the remaining MD55 material.

***Lamellitrochus pourtalesi* (Clench & Aguayo, 1939)**

(Fig. 8 D–F)

Synonymy see Quinn (1979). Complement:

Solariella (*Solariella*) *pourtalesi*: Quinn, 1979: 42, figs 63–64.

Lamellitrochus pourtalesi: Quinn, 1991: 83, figs 4–6; Rosenberg *et al.*, 2009: 623; Barros, 2010: 67, figs 43–49.

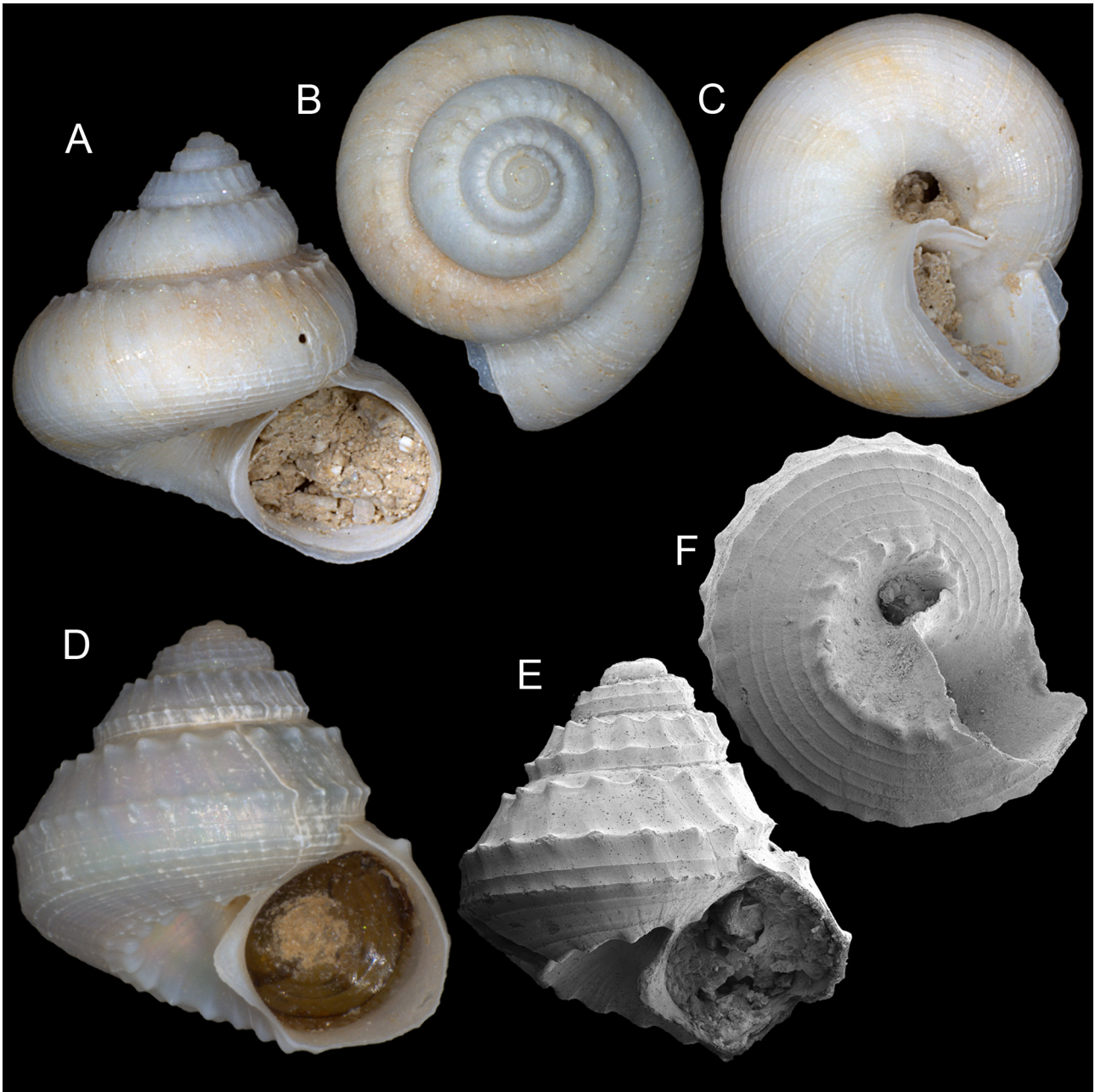


FIGURE 8. Solariellidae collected by the MD55 expedition. **A–C.** *Lamellitrochus cancapae* MNHN, sta. CB73 (H=9.1 mm, D=9.0 mm). **A.** apertural view. **B.** apical view. **C.** umbilical view. **D–F.** *Lamellitrochus pourtalesi*. **D.** MNHN, sta. CB76 (H=5.2 mm, D=5.2 mm), apertural view. **E–F.** MNHN, sta. CB79, juvenile specimen (H=3.5 mm, D=3.4 mm) under SEM. **E.** apertural view. **F.** umbilical view.

Type material. Holotype: MCZ 135018. Paratypes: MCZ 7579, Cuba, NW of Havana, 23°42'N, 83°13'W, 1572 m (24/ii/1878); MCZ 7585, Mexico, Yucatan Strait, 1170 m; MCZ 135019, Cuba, 23°24'N, 80°44'W, 1060 m (W.C. Schroeder leg., 1938); MCZ 135020, Cuba, 23°10'N, 81°29'W, 420 m (W.C. Schroeder leg., 1938).

Type locality Cuba, Atlantis sta. 2993, 23°24'N, 80°44'W, 1061 m.

Previously known distribution. Florida, USA, to Alagoas state, Brazil, 275–2350 m (Quinn, 1979; Barros, 2010).

New occurrence. Brazil, off Espírito Santo state, Abrolhos Slope.

Habitat. Quinn (1979) states that the species is more common in depths greater than 1000 m.

Material examined. Brazil: **Espírito Santo:** off São Mateus, Abrolhos Slope, 18°58'S, 37°49'W, MD55 sta.

CB76, 637 m, MNHN, 2 sh (27/v/1987); 19°01'S, 37°47'W, MD55 sta. CB79, 1500–1575 m, MNHN, 3 sh (28/v/1987). *Additional non-MD55 material*: **Mexico/Cuba**: types.

Measurements. 5 whorls, H=5.2 mm, D=5.2 mm (largest specimen).

Remarks. The present material compares well to the types of *L. pourtalesi*. The species is readily diagnosable by its sculpture pattern (see Quinn 1979 for a full description). The present record greatly expands the species range, ca. 1,000 km to the south.

Genus *Solariella* S. Wood, 1842

Type species. *Solariella maculata* S. Wood, 1842, by monotypy; Pliocene, England.

Solariella carvalhoi Lopes & Cardoso, 1958

(Fig. 9 A–C)

Solariella carvalhoi Lopes & Cardoso, 1958: 59, figs 1–3; Rios, 1970: 23; Abbott, 1974: 41; Rios, 1975: 21, pl. 4, fig. 45; Rios, 1985: 23, pl. 10, fig. 95; Calvo, 1987: 59, fig. 24; Rios, 1994: 35, pl. 10, fig. 105; Miyaji, 2004: 78; Barros, Santos & Francisco, 2008: 11, figs 8–14; Rios, 2009: 55, text fig.; Barros, 2010: 58, figs 8–14; Daccaret & Bossio, 2011: 54, fig. 92; Dornellas & Simone, 2011: 10, figs 41–43; Cavallari *et al.*, 2016: 1, figs 1–23.

Solariella sp. 2: Leal, 1991: 47, pl. 3, figs E–G.

Solariella quadricincta Quinn, 1992: 50, figs 1–4; Barros, Santos & Francisco, 2008: 9, figs 1–7; Barros, 2010: 56, figs 1–7; Miloslavich *et al.*, 2010: table S6.

Solariella staminea Quinn, 1992: 53, figs 11–12; Benkendorfer & Soares-Gomes, 2009: 147.

Type material. Holotype: MZSP 18446. Paratype: Paulo de Sá Cardoso Collection, same data as Holotype (probably lost; J. Heise, pers. comm.).

Type locality. Brazil, off São Paulo state, 31°35'08"S, 50°50'00"W, 54 m (Moreira leg., 11/xi/1956).

Distribution. From Venezuela to southern Brazil, live specimens from 0–350 m (Cavallari *et al.* 2016).

Habitat. Coralline and muddy bottoms.

Material examined. Brazil: **Espírito Santo**: Davis Seamount, 20°40'S, 34°40'W, 60 m, MNHN-IM-2012-37682, 3 paratypes of *S. staminea*, MORG 26530, holotype of *S. staminea* MD55 sta. DC40 (17/v/1987). **Rio de Janeiro**: off Cabo Frio, 22°58'S, 42°06'W, MD55 sta. CB101, 50 m, MNHN, 4 sh (01/vi/1987). *Additional non-MD55 material*: Brazil: **São Paulo**: holotype.

Measurements. 5–6 whorls, H=5.0–7.0 mm, D=5.5–8.0 mm (n=4).

Remarks. The present material compares well with *S. carvalhoi*. This species can be readily told apart from the local congener *Solariella quinni* Barros & Pereira in Barros *et al.*, 2008 (Fig. 9 D–G - see below) mainly by its larger and proportionally wider shell, its much wider umbilicus (Fig. 9 C), which was correctly emphasized by Lopes & Cardoso (1958), its more delicate axial and much stronger spiral sculpture (Fig. 9 A–B). The two remaining local congeners, *S. quadricincta* Quinn, 1992 and *S. staminea* Quinn, 1992, were considered junior synonyms of *S. carvalhoi* by Cavallari *et al.* (2016). Their study was based on a large sample, which revealed that both morphotypes (*S. quadricincta* and *S. staminea*) fall within a continuum of conchological variation.

Solariella quinni Barros & Pereira in Barros *et al.*, 2008

(Fig. 9 D–G)

Solariella quinni Barros & Pereira in Barros *et al.*, 2008: 13, figs 15–21; Barros, 2010: 60, figs 15–21; Cavallari *et al.*, 2016: 44.

Type material. Holotype: MZSP 77083. Paratypes: MZSP 77082, 08°11'S, 34°34'W, 66–71 m (18/xii/2004); MZSP 77084, 08°11'S, 34°36'W, 69–71 m (19/xii/2004); MZSP 77085, 08°11'S, 34°36'W, 69–71 m (19/xii/2004).

Type locality. Brazil, off Pernambuco, 08°09'S, 34°34'W, gravel bottom, 51–71 m (19/xii/2004).

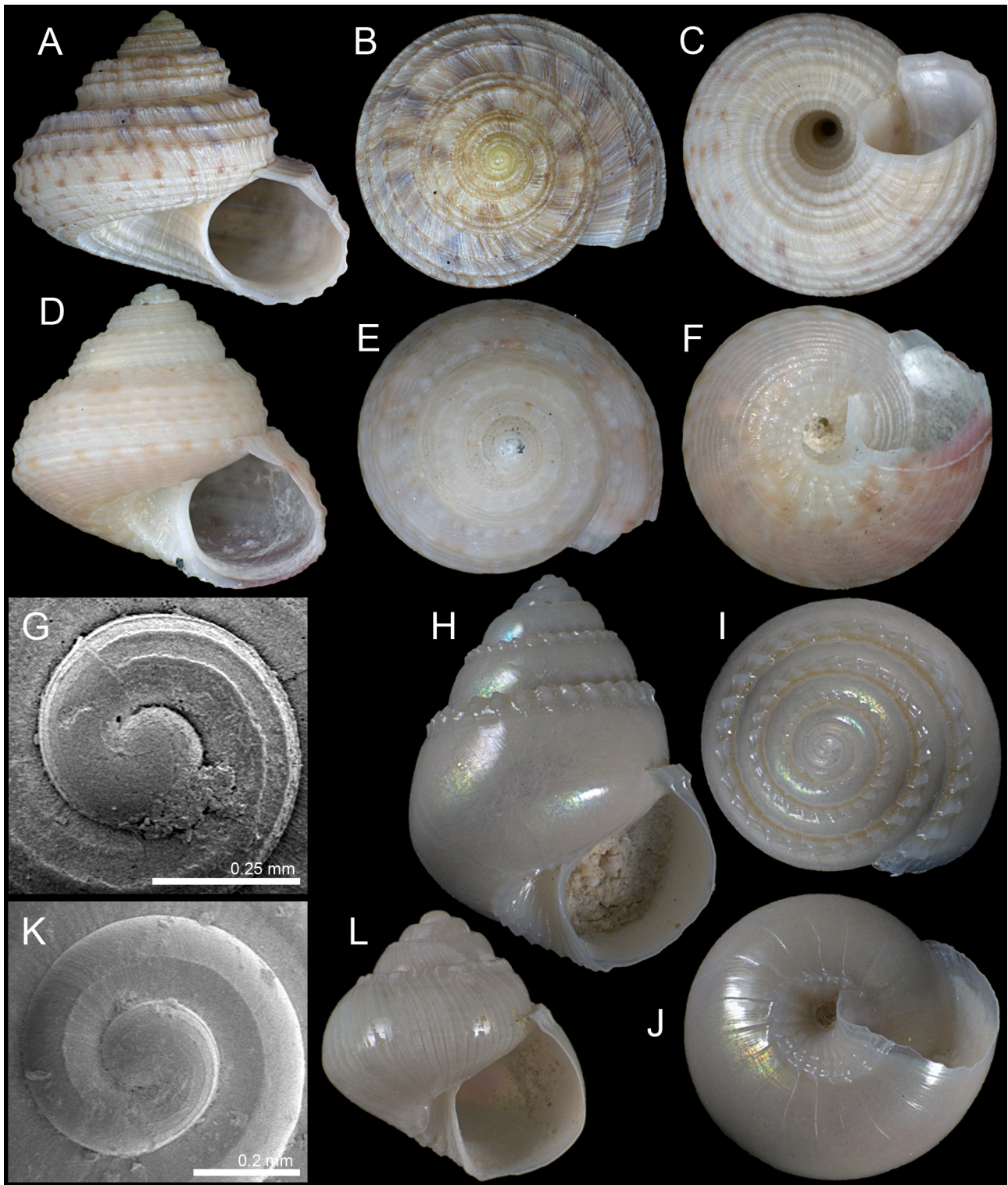


FIGURE 9. Solarieilliidae collected by the MD55 expedition. **A–C.** *Solarielliella carvalhoi* MNHN, sta. CB101 (H=6.9 mm, D=7.8 mm). **A.** apertural view. **B.** apical view. **C.** umbilical view. **D–G.** *Solarielliella quinni* MNHN, sta. DC73 (H=4.2 mm, D=4.2 mm). **D.** apertural view. **E.** apical view. **F.** umbilical view. **G.** SEM, protoconch detail. **H–L.** *Suavotrochus lubricus*. **H–J.** MNHN, sta. DC75, apertural view (H=4.8 mm, D=3.5 mm). **I.** apical view. **J.** umbilical view. **K.** MNHN, sta. DC75, detail of protoconch under SEM. **L.** MNHN, sta. CB93, juvenile specimen with ribbed sculpture (H=2.2 mm, D=2.1 mm).

Previously known distribution. Northeast Brazil, off Pernambuco state, live specimens from 51–71 m (Barros *et al.* 2008).

New occurrence. Espírito Santo state, off Southeast Brazil, Abrolhos Slope, 290–620 m (shells only).

Habitat. Gravel and muddy bottoms (Barros *et al.* 2008; present study).

Material examined. Brazil: **Espírito Santo:** off São Mateus, Abrolhos Slope, 18°59'S, 37°48'W, MD55 sta. DC73, 607–620 m, MNHN, 1 sh (27/v/1987); 18°59'S, 37°49'W, MD55 sta. CB80, 290–315 m, MNHN, 1 sh (28/v/1987). *Additional non-MD55 material:* Brazil: **Pernambuco:** types.

Measurements. 5 whorls, H=4.2 mm, D=4.2 mm (largest specimen).

Remarks. The present specimens compare well with the type material. The species can be readily diagnosed by the sculpture pattern on the whorl shoulder (Fig. 9 E) and base, as well as by the narrow, internally smooth umbilicus (Fig. 9 F). This species is similar to *S. lacunella* (Dall, 1881) from the Caribbean, but can be distinguished from it by: (1) being much smaller (H≈4.2 mm, as opposed to 8.5 mm in *S. lacunella*); (2) presenting an overall stronger axial sculpture with conspicuous axial ribs on the whorl shoulder, and weaker spiral sculpture with narrower cords, especially on the base; (3) having a more convex base; and (4) presenting a much narrower umbilicus. The records presented here greatly expand the species range ~1,200 km southward to Espírito Santo state. The maximum depth for the species is also updated herein from 71 to 620 m.

Solariella quinni was originally described by Barros *et al.* (2008). The subsequent paper by the senior author (Barros 2010) is an almost entirely verbatim repetition of the previous version and is herein considered a re-publication, even though it does not contain a reference to the former.

Genus *Suavotrochus* Dall, 1924

Type species. *Margarita lubrica* Dall, 1881, by monotypy and original designation; Recent, Florida Straits to Brazil.

Suavotrochus lubricus (Dall, 1881)

(Fig. 9 H–L)

Synonymy see Quinn (1979). Complement:

Margarita lubrica Dall, 1881: 44.

Solariella (Suavotrochus) lubrica: Quinn, 1979: 42, figs 68–74.

Solariella lubrica: Springer & Bullis, 1956: 25; Lopes & Cardoso, 1958: 62; Rios, 1975: 21, pl. 4, fig. 46; Rios, 1985: 23, pl. 10, fig. 96; Rios, 1994: 36, fig. 109; Gracia *et al.*, 2004: 50, fig. 17; Miyaji, 2004: 78; Benkendorfer & Soares-Gomes, 2009: 150; Rios, 2009: 56, text fig.; Rosenberg *et al.*, 2009: 623; Barros, 2010: 62, figs 22–28; Miloslavich *et al.*, 2010: table S6; Welch, 2010: table S1; Daccaret & Bossio, 2011: 54, fig. 91.

Suavotrochus lubricus: Bouchet, 2015.

Type material. Lectotype: USNM 95061.

Type locality. Cuba, North of Havana, Blake sta. 2, 23°14'N, 82°25'W, 1472 m (24/v/1893).

Distribution. From Florida Straits to southernmost Brazil, 73–1472 m (Rosenberg *et al.* 2009). Quinn (1979), however, remarked that the species might actually inhabit only depths up to 500 m, being carried post-mortem to greater depths. Barros (2010) gave a bathymetric range of up to 5633 m of depth based on empty shells.

Habitat. Muddy bottoms (Barros *et al.*, 2008)

Material examined. Brazil: **Espírito Santo:** off São Mateus, continental slope of Abrolhos, 18°59'S, 37°50'W, MD55 sta. DC75, 295 m, MNHN, 100 sh (27/v/1987). **Rio de Janeiro:** East of Cabo de São Tomé, 21°31'S, 40°08'W, MD55 sta. CB96, 295–300 m, MNHN, 1 sh (31/v/1987); S of Cabo Frio, 23°41'S, 42°06'W, MD55 sta. CB104, 430–450 m, MNHN, 50 sh (02/vi/1987). *Additional non-MD55 material:* **Cuba:** lectotype.

Measurements. 5½–6 whorls, H=5.0–5.5 mm, D=4.0–4.5 mm (n=20).

Remarks. This species is by far the most abundant trochoid found in the MD55 material. The present specimens compare very well with the lectotype, even though they show an overall less-pronounced sculpture; this is in line with the known degree of morphological variation of this species (Quinn 1979). The variety (subspecies) *Margarita lubrica iridae* was described by Dall (1889) as a nearly smooth form (lectotype USNM 95063, paralectotype USNM 887343), but was later considered a synonym of *S. lubricus* by Quinn (1979), who observed several intermediate stages between these two forms.

Interestingly, some specimens from one locality (sta. CB96) have the teleoconch sculptured by regularly spaced

well-marked prosocline ribs. Moreover, *S. lubricus* has some axial corrugations restricted to the periumbilical area (Fig. 9 J), but in these specimens the corrugations seem to be expanded, forming complete ribs (Fig. 9 L). To the best of our knowledge, this feature has never been reported for this species. In the present specimens, the axial sculpture is of variable strength and there are even completely smooth specimens.

Discussion

A total of 19 species were found in the present sample, including *Calliostoma valkuri* sp. nov. This study extends the geographic and/or bathymetric ranges for 11 species, some to a great extent. The following species have their geographical range extended within Brazilian waters: *Calliostoma gemmosum* (190 km southward), *Falsimargarita terespira* (450 km to the north), *Gaza compta* (470 km to the north), *Callogaza watsoni* (1,800 km to the south), *Margarites imperialis* (320 km northwest), *Lamellitrochus pourtalesi* (1,000 km to the south), and *Solariella quinni* (1,200 km southward). Species from other regions that are here newly reported from Brazil are: *Calliostoma rude* from the Guianas, *Bathymophila euspira* from the Caribbean, and *Lamellitrochus cancapae* from the Azores.

A few species (e.g., *Suavotrochus lubricus*) are extremely abundant in the sample, while others (e.g., *Calliostoma javanicum*, *Solariella quinni* and *Calliostoma valkuri* sp. nov.) appear to be much rarer, being reported here from just a few or even a single specimen. Large range extensions such as the present ones were also reported in other studies of MD55 material, including other vetigastropods (e.g., Salvador *et al.* 2014). Overall, the amount of new information brought in by the present study is on par with previous works focused on gastropods collected during the MD55 expedition (e.g., Simone & Cunha 2014; Salvador *et al.* 2014). Sampling efforts such as this expedition have added a wealth of information to the knowledge on Brazilian marine snails, especially to that of deep-water species, of which we still know surprisingly little about. Fortunately, studies about deep-sea species in Brazil have received increased attention in recent years. Knowledge of this fauna is imperative for further environmental studies and proper legal protection. This is especially true when it comes to potential petroleum extraction areas, which can greatly affect the environment and the local benthic biota (OSPAR 2009). The new species described herein, which appears to be extremely rare, illustrates this situation very well. Since it is only known from the type locality, causing disturbances in the area could greatly affect it, or even ultimately bring it to extinction.

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