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Unraveling one of the 'Big Five': update of the taxonomy of Triphoridae (Gastropoda, Triphoroidea) from Brazil

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Abstract. The present study aims to fulfill the gap of taxonomic knowledge on Triphoridae from Brazil. We describe five new species (*Isotriphora uncia* sp. nov., *Isotriphora leo* sp. nov., *Monophorus verecundus* sp. nov., *Sagenotriphora albocaput* sp. nov., *Similiphora lucida* sp. nov.), report five species previously known only from the Caribbean and related areas (*Cheirodonta dupliniana* (Olsson, 1916), *Eutriphora auffenbergi* Rolán & Lee, 2008, *Isotriphora tricingulata* Rolán & Fernández-Garcés, 2015, *Marshallora ostenta* Rolán & Fernández-Garcés, 2008, *Monophorus caracca* (Dall, 1927) comb. nov.) and describe six morphotypes at the generic level (*Isotriphora* sp. 1, *Marshallora* sp. 1, *Nanaphora* sp. 1, *Sagenotriphora* sp. 1, *Sagenotriphora* sp. 2, *Similiphora* sp. 1). Remarks are made to some species previously recorded from Brazil, including the invalidation of records, problems of generic allocation and geographical range extensions. Maps of the geographical distribution are provided for the 65 currently recognized species of Triphoridae from Brazil. Of these, 31 species are endemic to Brazil and 58 inhabit the continental shelf vs only seven from the continental slope. A distinct geographical zone occurs in southeastern Brazil. A few species occur exclusively near the mouth of the Amazon River, whereas others inhabit a local biogenic reef, possibly serving as a biogeographical corridor that connects western Atlantic populations. Species of *Isotriphora* from Brazil are particularly common around oceanic islands, probably due to adopting intracapsular metamorphosis, which may have evolved in more than one evolutionary event.

Keywords. Mollusca, marine snails, biodiversity, shell, West Atlantic.

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Introduction

Triphoridae Gray, 1847 is a family of marine gastropods, mainly distributed over shallow waters of tropical and temperate regions (Marshall 1983), with some species also occurring in the deep sea (Fernandes & Pimenta 2017a). Triphorids belong to the superfamily Triphoroidea Gray,1847, which also includes Cerithiopsidae Adams & Adams, 1853 and Newtoniellidae Korobkov, 1955. The feeding mode of triphorids follows that of the superfamily, i.e., they are mainly sponge feeders (Wells 1998). It is one of the best examples of problematic groups in molluscan taxonomy, with hundreds of synonyms, *nomina dubia* and species with very worn type material (Bouchet & Strong 2010).

Triphorids have a small, multi-whorled shell, usually less than 10 mm long in adults. They are commonly identified by their sinistral coiling, typical of the subfamily Triphorinae Gray, 1847, rather than the dextral shells of species in the other subfamily, Metaxiinae Marshall, 1977. Triphorids display a huge variation in the composition of the radula (Marshall 1983; Fernandes & Pimenta 2019a), sometimes referred to as “rhinioglossate” because of the presence of several marginal teeth and a peculiar morphological variability of teeth and cusps. Distinctive sculpture of both embryonic and larval shell for species with a multispiral protoconch constitute another remarkable feature of this family (Marshall 1983; Fernandes & Pimenta 2017b).

Illustrating its problematic taxonomy, only one third of triphorid types stored at the collections of the MNHN (Muséum national d’histoire naturelle, Paris, France) and the NMNH (National Museum of Natural History, Washington D.C., USA) has a protoconch in good condition (Bouchet & Strong 2010), which hinders a proper linkage between recently sampled material and described species. On the other hand, triphorids offer a unique opportunity for anyone interested to describe new species: 2500 to 5000 species (described or not) are estimated to be present in the Indo-Pacific alone (Albano *et al*. 2011), which is much more than the 658 Recent species described up to now in the world (MolluscaBase 2019). Notwithstanding this, Triphoridae is regarded as one of the “Big Five” (Bouchet *et al*. 2002; Albano *et al*. 2011), representing one of the five most species-rich families of marine gastropods in the world. Despite having 42 accepted genera (MolluscaBase 2019), no phylogeny of this speciose family has been inferred after the initial efforts of Kosuge (1966) and Nützel (1998), resulting in uncertain relationships and a questionable validity of many genera. Comprehensive taxonomic revisions of triphorids are scarce, which limits our knowledge of the real richness of this group and a thorough comparison of the distribution of species at regional scales.

Triphoridae was initially cited from Brazil by Lange-de-Morretes (1949), with two species: *Triphora pulchella* (C.B. Adams, 1850), from Rio Grande do Norte, and the invalid record of the eastern Atlantic species *Triphora perversa* (Linnaeus, 1758), from Pernambuco. After six decades and several general works and catalogues that listed Triphoridae (e.g., Marcus & Marcus 1963; Rios 1970, 1994, 2009; Absalão 1989; Leal 1991; Absalão *et al*. 2006; Santos *et al*. 2007), only Simone (2006) described one species with a type locality from Brazil. Until 2010, 13 triphorid species were known from Brazil, although most of them without appropriate illustrations or descriptions, some doubtful records, and mentioned under old generic or specific names. After 2010, a major taxonomic revision was conducted to evaluate the real diversity of Triphoridae in Brazil (Fernandes & Pimenta 2011, 2014, 2015, 2017b, 2019a, 2019b; Fernandes *et al*. 2013).

The present study completes a series of works that have gradually filled the large gap of taxonomic knowledge on Triphoridae from Brazil, and aims to: (1) describe and record the remaining species of Triphoridae from Brazil; (2) add some considerations to previously recorded species; (3) provide updated maps of geographical ranges of all triphorids from Brazil; (4) discuss common patterns related to the geographical and bathymetric distribution of triphorids from Brazil.

Material and methods

A large fraction of the material was sampled by dredgings along the Brazilian continental shelf and slope, through major scientific expeditions (Table 1) or minor projects, in addition to hand-collected specimens. Conchological procedures and terminologies were based on Fernandes & Pimenta (2015, 2019b). Descriptions are solely based on shells from Brazil in cases of species that have already been described from other regions. Measurements given for shells in figure captions are related to their length. The term "Caribbean", between quotation marks, is employed when referring to Caribbean and adjacent areas (i.e., Gulf of Mexico and northwestern Atlantic). The Appendix contains all examined material not previously listed in any paper, in addition to new illustrations of some species. The abbreviation 'st.' stands for 'station'.

Maps of the geographical distribution were created after an extensive literature review and the analysis of several malacological collections; most references can be checked in the synonymy lists of the respective species (including Appendix). Triphorids endemic to the "Caribbean" were not included. Diagonal marks inside circles indicate samples from REVIZEE-Norte (northern Brazil), which have inaccurate data. Samplings in some countries or states (e.g., Louisiana, USA) are generalized in the maps, because some authors did not specify precise coordinates. The single 'grey' reference used is the electronic database maintained by Dr. Harry Lee (www.jaxshells.org), especially from localities in Florida (USA), owing to the considerable experience of this author with triphorids (Lee 2009). Although Brazilian records have been carefully investigated, many "Caribbean" records in the literature were provided by non-specialist researchers. Some local checklists of molluscs from the "Caribbean" might have been overlooked, thus maps are possibly incomplete. Eastern Atlantic records of *Cosmotriphora melanura* (C.B. Adams, 1850) were disregarded, because they may belong to another species (see Results). The distribution map of a species complex in *Marshallora* will be shown elsewhere (unpublished data).

The following list summarizes acronyms of scientific institutions and expeditions hereafter mentioned: (AMASSEDS) A Multidisciplinary Amazon Shelf Sediment Study, OC. Ship Columbus Iselin coll.; (BMSM) The Bailey-Matthews National Shell Museum, Sanibel, USA; (BPot) Projeto de Caracterização e Monitoramento Ambiental da Bacia Potiguar [Project of Environmental Characterization and Monitoring of Potiguar Basin], supply-boat Astro Garoupa coll.; (CHL) Harry Lee′ S private collection, USA; (FLMNH) Florida Museum of Natural History, Gainesville, USA; (GEOMAR) Expedição Oceanográfica GEOMAR [Oceanographic Expedition GEOMAR], OC. Ship Almirante Saldanha coll.; (HAB) Projeto Habitats: Heterogeneidade Ambiental da Bacia de Campos [Habitats Project: Environmental Heterogeneity of Campos Basin], R/V Miss Emma McCall coll.; (IBUFRJ) Instituto de Biologia/Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil; (INV MOL) collection of Mollusca of the Instituto de Investigaciones Marinas y Costeras – INVEMAR, Santa Marta, Colombia; (JOPS) Joint Oceanographic Projects, R/V Victor Hensen coll.; (MARSEAL) Caracterização Ambiental da Bacia de Sergipe-Alagoas [Environmental Characterization of the Sergipe-Alagoas Basin]; (MCZ) Museum of Comparative Zoology, Cambridge, USA; (MD55) French-Brazilian Expedition MD55, R/V Marion-Dufresne coll.; (MLP) Museo de La Plata (Section: 'Paleozoología de Invertebrados'), La Plata, Argentina; (MNCN) Museo Nacional de Ciencias Naturales, Madrid, Spain; (MNHN) Muséum national d'histoire naturelle, Paris, France; (MNHN-Mo) Museo Nacional de Historia Natural, Montevideo, Uruguay; (MNRJ) Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil; (MORG) Museu Oceanográfico "Prof. Eliézer de Carvalho Rios", Rio Grande, Brazil; (MZUSP/MZSP) Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil; (PADCT) Programa de Apoio ao Desenvolvimento Tecnológico e Científico [Program of Support to the Technological and Scientific Development], OC. Ship Prof. W. Besnard coll.; (PRI) Paleontological Research Institute, Cornell University, New York, USA; (NHM) Natural History Museum, London, UK; (NMNH/USNM) National Museum of Natural History, Washington D.C., USA; (RAP-BIG) 'Rapid Assessment Protocol' of Baía da Ilha Grande; (REVIZEE) Programa de Avaliação do Potencial Sustentável de Recursos Vivos da

Table 1 (continued on next two pages). Scientific expeditions that sampled most material listed in this study.

Expedition/station	Coordinates	Depth (m)	Date
AMASSEDS st. 3210	01º52′27″ N, 48º16′01″ W	47	May 1990
AMASSEDS st. 4134	02º21′12″ N, 48º29′54″ W	45–50	Mar.1997
BPot 1-MR11	05º02′ S, 36º10′ W	5	–
BPot 1-MR22	04º58′ S, 36º15′ W	10	–
BPot 1-MR23	04º57′ S, 36º36′ W	10	–
BPot 1-MR25	04º53′ S, 36º46′ W	10	–
BPot 1-MR26	04º48′ S, 36º55′ W	10	–
BPot 1-MR31	04º53′ S, 36º10′ W	20	–
BPot 1-MR32	04º49′20″ S, 36º25′56″ W	22	27 Oct. 2009
BPot 1-MR34	04º52′ S, 36º39′ W	20	–
BPot 1-MR41	04º49′40″ S, 36º10′06″ W	58	27 Oct. 2009
BPot 1-MR42	04º45′54″ S, 36º25′49″ W	52	25 Oct. 2009
BPot 1-MR43	04º44′ S, 36º35′ W	50	–
BPot 1-MR44	04º38′28″ S, 36º45′37″ W	50	23 Oct. 2009
BPot 1-MR45	04º35′17″ S, 36º55′03″ W	47	–
BPot 2-MR22	04º58′ S, 36º15′ W	10	–
BPot 2-MR23	04º57′ S, 36º36′ W	10	–
BPot 2-MR32	04º49′20″ S, 36º25′56″ W	20	–
BPot 2-MR33	04º49′ S, 36º36′ W	20	–
BPot 2-MR34	04º52′ S, 36º39′ W	20	–
BPot 2-MR41	04º49′40″ S, 36º10′06″ W	50	–
BPot 2-MR42	04º45′54″ S, 36º25′49″ W	50	–
BPot 2-MR44	04º38′28″ S, 36º45′37″ W	50	–
BPot 2-MR45	04º35′17″ S, 36º55′03″ W	50	–
BPot MT45	04º36′41″ S, 36º46′41″ W	157–172	21 May 2011
GEOMAR II st. D	00º28′06″ S, 47º57′42″ W	29	8 Sep. 1970
GEOMAR II st. 99	02º38′30″ N, 48º55′00″ W	77	11 Sep. 1970
GEOMAR II st. 124	03º32′12″ N, 48º59′48″ W	103	13 Sep. 1970
GEOMAR III st. 181	04º46′00″ N, 50º46′30″ W	74	6 May 1971
HAB 11-B4	23º10′00″ S, 41º03′13″ W	107	21 Feb.2009
HAB 11-B5	23º11′25″ S, 41º00′56″ W	106	21 Feb.2009
HAB 11-C3	22º46′51″ S, 41º03′39″ W	77	22 Feb.2009
HAB 11-C4	22º51′57″ S, 40º57′35″ W	92	22 Feb.2009
HAB 11-D3	22º19′28″ S, 40º37′25″ W	75	15 Mar.2009
HAB 11-G3	22º03′41″ S, 40º10′05″ W	75	25 Feb.2009
HAB 11-G4	22º04′10″ S, 40º07′06″ W	91	25 Feb.2009
HAB 13-H1	21º43′18″ S, 40º31′58″ W	26	9 Mar.2009
HAB 13-H2	21º44′15″ S, 40º17′22″ W	50	9 Mar.2009
HAB 13-H3	21º43′06″ S, 40º11′37″ W	73	9 Mar.2009
HAB 13-H4	21º42′49″ S, 40º10′21″ W	98	9 Mar.2009
HAB 13-I2	21º22′55″ S, 40º19′48″ W	52	5 Mar.2009
HAB 13-I4	21º22′55″ S, 40º15′31″ W	103	6 Mar.2009
HAB 16-B4	23º10′01″ S, 41º03′13″ W	107	2 Jul. 2009
HAB 16-B5	23º12′04″ S, 40º59′42″ W	141	2 Jul. 2009
HAB 16-C3	22º46′50″ S, 41º03′39″ W	78	2 Jul. 2009
HAB 16-C4	22º51′57″ S, 40º57′35″ W	90	3 Jul. 2009
HAB 16-G1	21º49′50″ S, 40º44′42″ W	28	11 Jul. 2009
HAB 16-G3	22º03′41″ S, 40º10′05″ W	76	6 Jul. 2009

Table 1 (continued)**.** Scientific expeditions that sampled most material listed in this study.

Expedition/station	Coordinates	Depth (m)	Date
HAB 16-G4	22º03′34″ S, 40º07′06″ W	89	6 Jul. 2009
HAB 16-H2	21º44′15″ S, 40º17′22″ W	50	8 Jul. 2009
HAB 16-H3	21º43′06″ S, 40º11′37″ W	71	7 Jul. 2009
HAB 16-H4	21º42′50″ S, 40º10′21″ W	97	7 Jul. 2009
HAB 17-I1	21º10′56″ S, 40º28′34″ W	26	21 Jul. 2009
HAB 17-I2	21º22′54″ S, 40º19′51″ W	53	21 Jul. 2009
HAB 17-I3	21º23′34″ S, 40º15′43″ W	88	21 Jul. 2009
HAB 17-I4	21º09′05″ S, 40º16′13″ W	103	21 Jul. 2009
JOPS st. 3235	18º00′00″ S, 38º12′06″ W	55	23 Apr. 1995
JOPS st. 3236	18º07′24″ S, 38º21′00″ W	55	21 Apr. 1995
JOPS st. 3237	18º13′00″ S, 38º20′00″ W	55	23 Apr. 1995
JOPS st. 3238	18º15′48″ S, 38º27′00″ W	40	23 Apr. 1995
JOPS st. 3239	18º21′30″ S, 38º35′42″ W	50	23 Apr. 1995
MD55 42-DC75	18º59′02″ S, 37º50′01″ W	295	27 May 1987
PADCT st. 6571	24º12′44″ S, 44º58′59″ W	79	Nov. 1997–Jan. 1998
PADCT st. 6573	24º42′36″ S, 44º43′25″ W	155	Nov. 1997–Jan. 1998
PADCT st. 6577	25º15′45″ S, 45º04′37″ W	124	Nov. 1997–Jan. 1998
PADCT st. 6579	24º42′18″ S, 45º18′50″ W	84	Nov. 1997–Jan. 1998
PADCT st. 6595	26º23′33″ S, 46º39′29″ W	175	Nov. 1997–Jan. 1998
PADCT st. 6627	23º57′59″ S, 43º52′33″ W	133	Nov. 1997–Jan. 1998
PADCT st. 6635	27º10′23″ S, 47º27′32″ W	129	Nov. 1997–Jan. 1998
PADCT st. 6641	26º15′00″ S, 46º53′00″ W	130	Nov. 1997–Jan. 1998
PADCT st. 6642	25º49′18″ S, 46º34′00″ W	128	Nov. 1997–Jan. 1998
Petro/MAR st. 19	10º16′13″ S, 36º13′06″ W	10	2002–2003
Petro/MAR st. 21	10º24′31″ S, 36º03′06″ W	30	2002–2003
Petro/UFS st. E5-A1	10º45′36″ S, 36º36′08″ W	20	1999–2000
Petro/UFS st. E5-A2	10º45′36″ S, 36º36′08″ W	20	1999–2000
Petro/UFS st. E6-A1	10º49′47″ S, 36º32′10″ W	30	1999–2000
Petro/UFS st. E6-A2	10º49′47″ S, 36º32′10″ W	30	1999–2000
Petro/UFS st. E6-A4	10º49′47″ S, 36º32′10″ W	30	1999–2000
Petro/UFS st. 12.1	11º03′26″ S, 36º53′21″ W	30	1999
Petro/UFS st. 15.3	11º13′07″ S, 37º00′00″ W	30	1999
Petro/UFS st. 18.1	11º21′07″ S, 37º05′50″ W	30	1999
RAP-BIG st. 1	23º17′26″ S, 44º30′22″ W	–	17 Nov. 2003
RAP-BIG st. 3	23º15′18″ S, 44º34′56″ W	5	16 Nov. 2003
RAP-BIG st. 10	23º11′36″ S, 44º38′38″ W	–	18 Nov. 2003
RAP-BIG st. 12	23º09′46″ S, 44º39′47″ W	–	20 Nov. 2003
RAP-BIG st. 13	23º09′23″ S, 44º40′54″ W	3	20 Nov. 2003
RAP-BIG st. 17	23º00′33″ S, 44º28′28″ W	10	30 Oct. 2003
RAP-BIG st. 19	22º57′43″ S, 44º22′00″ W	6	29 Oct. 2003
RAP-BIG st. 20	22º58′22″ S, 44º19′48″ W	2.5	29 Oct. 2003
RAP-BIG st. 21	23º01′55″ S, 44º22′44″ W	6	28 Oct. 2003
RAP-BIG st. 22	23º04′16″ S, 44º21′45″ W	14	28 Oct. 2003
RAP-BIG st. 23	23º03′34″ S, 44º25′15″ W	–	31 Oct. 2003
RAP-BIG st. 24	23º05′53″ S, 44º24′24″ W	22	31 Oct. 2003
RAP-BIG st. 26	23º01′40″ S, 44º18′34″ W	5	2 Nov. 2003
RAP-BIG st. 30	23º04′43″ S, 44º13′29″ W	14	1 Dec. 2003
RAP-BIG st. 31	23º06′07″ S, 44º11′26″ W	6	1 Dec. 2003

Table 1 (continued)**.** Scientific expeditions that sampled most material listed in this study.

Expedition/station	Coordinates	Depth (m)	Date
RAP-BIG st. 32	23º07′28″ S, 44º08′51″ W	8	5 Dec. 2003
RAP-BIG st. 34	23º10′05″ S, 44º09′00″ W	–	4 Dec. 2003
RAP-BIG st. 35	23º13′16″ S, 44º09′00″ W	19	4 Dec. 2003
RAP-BIG st. 36	23º12′15″ S, 44º15′21″ W	35	3 Dec. 2003
RAP-BIG st. 37	23º11′33″ S, 44º18′55″ W	15	3 Dec. 2003
RAP-BIG st. 38	23º10′02″ S, 44º22′21″ W	13	6 Dec. 2003
RAP-BIG st. 39	23º08′15″ S, 44º19′35″ W	15	6 Dec. 2003
RAP-BIG st. 40	23º06′48″ S, 44º17′49″ W	16	7 Dec. 2003
REVIZEE-Central C1-D1	22º23′17″ S, 37º36′54″ W	105	8 Feb.1996
REVIZEE-Central C1-D1-2	22º49′05″ S, 41º09′25″ W	69	23 Feb.1996
REVIZEE-Central C1-D3	22º04′30″ S, 40º04′55″ W	80	13 Feb.1996
REVIZEE-Central C1-VV16	21º10′59″ S, 40º27′04″ W	28	26 Feb.1996
REVIZEE-Central C1-VV17	21º09′58″ S, 40º27′04″ W	27	26 Feb.1996
REVIZEE-Central C1-VV21	20º38′02″ S, 40º01′19″ W	56	27 Feb.1996
REVIZEE-Central C1-VV22	20º20′24″ S, 40º05′56″ W	33	27 Feb.1996
REVIZEE-Central C1-VV24	20º00′18″ S, 39º54′36″ W	45	27 Feb.1996
REVIZEE-Central C1-VV31	18º52′33″ S, 39º35′13″ W	23	28 Feb.1996
REVIZEE-Central C1-VV33	18º53′17″ S, 39º13′52″ W	37	28 Feb.1996
REVIZEE-Central C1-VV38	19º28′26″ S, 38º22′30″ W	71	29 Feb.1996
REVIZEE-Central C1-C61	20º30′22″ S, 37º19′05″ W	88	24 Apr. 1996
REVIZEE-Central C1-C63	19º40′26″ S, 38º08′10″ W	61	25 Apr. 1996
REVIZEE-Central C1-C64	19º16′58″ S, 38º42′00″ W	63	25 Apr. 1996
REVIZEE-Central C1-C65	18º52′58″ S, 39º06′00″ W	50	25 Apr. 1996
REVIZEE-Central C1-C66	18º19′58″ S, 38º55′01″ W	41	26 Apr. 1996
REVIZEE-Central C1-C76	15º53′49″ S, 38º31′05″ W	66	30 Apr. 1996
REVIZEE-Central C2-7R	16º19′55″ S, 38º14′38″ W	58	26 Oct. 1997
REVIZEE-Central C2-10R	17º05′53″ S, 36º45′07″ W	50	14 Nov. 1997
REVIZEE-Central C2-22R	20º30′40″ S, 35º50′17″ W	59	8 Nov. 1997
REVIZEE-Central C2-35R	20º52′01″ S, 40º10′01″ W	55	3 Nov. 1997
REVIZEE-Central C2-36R	21º31′01″ S, 40º18′00″ W	52	4 Nov. 1997
REVIZEE-Central C5-4R	14º48′29″ S, 38º55′01″ W	20	1 Jul. 2001
REVIZEE-Central C5-7R	16º07′01″ S, 38º10′12″ W	40	30 Jun. 2001
REVIZEE-Central C5-12R	17º02′31″ S, 37º36′29″ W	50	30 Jun. 2001
REVIZEE-Central C5-13R	16º47′10″ S, 37º41′10″ W	50	30 Jun. 2001
REVIZEE-Central C5-16R	18º03′32″ S, 37º18′54″ W	100	29 Jun. 2001
REVIZEE-Central C5-20R	19º16′19″ S, 38º01′08″ W	67	28 Jun. 2001
REVIZEE-Central C5-23R	20º29′13″ S, 36º06′11″ W	55	12 Jul. 2001
REVIZEE-Central C5-28R	19º48′29″ S, 37º56′20″ W	60	18 Jul. 2001
REVIZEE-Central C6-R2#1-1	19º45′36″ S, 39º31′05″ W	92	15 Jun. 2002
REVIZEE-Central C6-Y7	20º50′56″ S, 40º10′01″ W	75	28 Jun. 2002
REVIZEE-Sul st. 6646	25º43′47″ S, 45º16′03″ W	198	14 Dec. 1997
REVIZEE-Sul st. 6653	25º43′30″ S, 46º02′30″ W	155	15 Dec. 1997
REVIZEE-Sul st. 6657	25º17′18″ S, 46º55′36″ W	60	16 Dec. 1997
REVIZEE-Sul st. 6662	24º00′57″ S, 43º55′32″ W	135	9 Jan. 1998
REVIZEE-Sul st. 6666	24º17′08″ S, 44º12′09″ W	163	10 Jan. 1998
REVIZEE-Sul st. 6669	24º07′25″ S, 44º42′13″ W	101	11 Jan. 1998
REVIZEE-Sul st. 6676	24º49′42″ S, 44º44′58″ W	153	12 Jan. 1998
REVIZEE-Sul st. 6678	24º46′21″ S, 45º11′08″ W	100	12 Jan. 1998
REVIZEE-Sul st. 6686	25º37′01″ S, 45º13′35″ W	153	13 Jan. 1998
REVIZEE-Sul st. 6699	26º01′19″ S, 46º25′15″ W	153	20 Jan. 1998

Zona Econômica Exclusiva [Program of Evaluation of the Sustainable Potential of Living Resources in the Exclusive Economic Zone], Score Norte: OC. Ship Antares coll., Score Central: OC. Ship Antares and supply-boat Astro Garoupa coll., Score Sul: OC. Ship Prof. W. Besnard coll.; (UEPB) Universidade Estadual da Paraíba, Campina Grande, Brazil; (UERJ) Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brazil; (UFC-Labomar) Universidade Federal do Ceará, Instituto de Ciências do Mar, Fortaleza, Brazil; (UFMA) Universidade Federal do Maranhão, São Luís, Brazil; (UFRPE) Universidade Federal Rural de Pernambuco, Recife, Brazil; (UFS) Universidade Federal de Sergipe, Aracaju, Brazil; (ZUEC-GAS) collection of Gastropoda of the Museu de Zoologia, Universidade Estadual de Campinas – UNICAMP, Campinas, Brazil.

The recent fire at MNRJ (Zamudio *et al*. 2018) destroyed most lots from this institution listed in the present study, in addition to several ones lent from MORG, MZUSP and others; destroyed lots are marked by an asterisk (*) in the material examined and the figure legends as well as in the Appendix. However, types were photographed and detailed descriptions and illustrations are provided for all species. Three of the five new species do not have extant material in any scientific collection, but this does not preclude the establishment of new names (ICZN 1999: articles 72.5.6 and 73.1.4; ICZN 2017; Krell & Marshall 2017). Regarding the fact that the new species live in localities hard to access without major financial support (such as remote islands or the deepest zones of the continental shelf) and that the detailed descriptions and illustrations herein given allow species to be easily recognized, the authors do not refrain of providing new specific names.

Results

Taxonomic account

Family Triphoridae Gray, 1847
Subfamily Triphorinae Gray, 1847

Genus ***Cheirodonta*** Marshall, 1983

Type species

Cerithium perversum var. *pallescens* Jeffreys, 1867. Original designation. Recent, northeastern Atlantic and Mediterranean.

Cheirodonta dupliniana (Olsson, 1916)
Figs 1, 22G, 29, 83

Triphora dupliniana Olsson, 1916: 138, pl. 3 fig. 8.
Triphora bolax Olsson & Harbison, 1953: 295, pl. 43 fig. 4.
Cheirodonta mizifio Fernandes & Pimenta, 2015: 496, fig. 2.

Triphora dupliniana – Gardner 1948: 205, pl. 27 fig. 3. — Treece 1980: 560. — Miller 1989: 96.
Cosmotriphora dupliniana — Rosenberg *et al*. 2009: 645.
Triphora sp. 1 – Daccarett & Bossio 2011: fig. 423.
Cheirodonta dupliniana – Fernandes & Pimenta 2019a: 12, figs 5–6.

Triphora perversa nigrocincta non C.B. Adams, 1839 – Perry & Schwengel 1955: 139, pl. 27 fig. 189, *partim*.
Triphora lilacina non Dall, 1889 – Vokes & Vokes 1983: 18, pl. 27 fig. 13.
Triphora hemphilli non Bartsch, 1907 – Odé 1989: 112. — Tunnell *et al*. 2010.

Marshallora nigrocincta non C.B. Adams, 1839 – Lee 2009: 89, *partim*.
Sagenotriphora osclausum non Rolán & Fernández-Garcés, 1995 – Garcia & Lee 2011.
Triphora oreodoxa non Olsson & Harbison, 1953 – Garcia & Lee 2011.

Material examined

Lectotype (herein designated)
UNITED STATES OF AMERICA – **North Carolina** • Natural Well; Duplin formation, Miocene; figured in Olsson 1916; PRI 1376.

Paralectotype
UNITED STATES OF AMERICA – **Virginia** • 1 spec.; James River, north of Smithfield; Yorktown Formation, Miocene; PRI 11016.

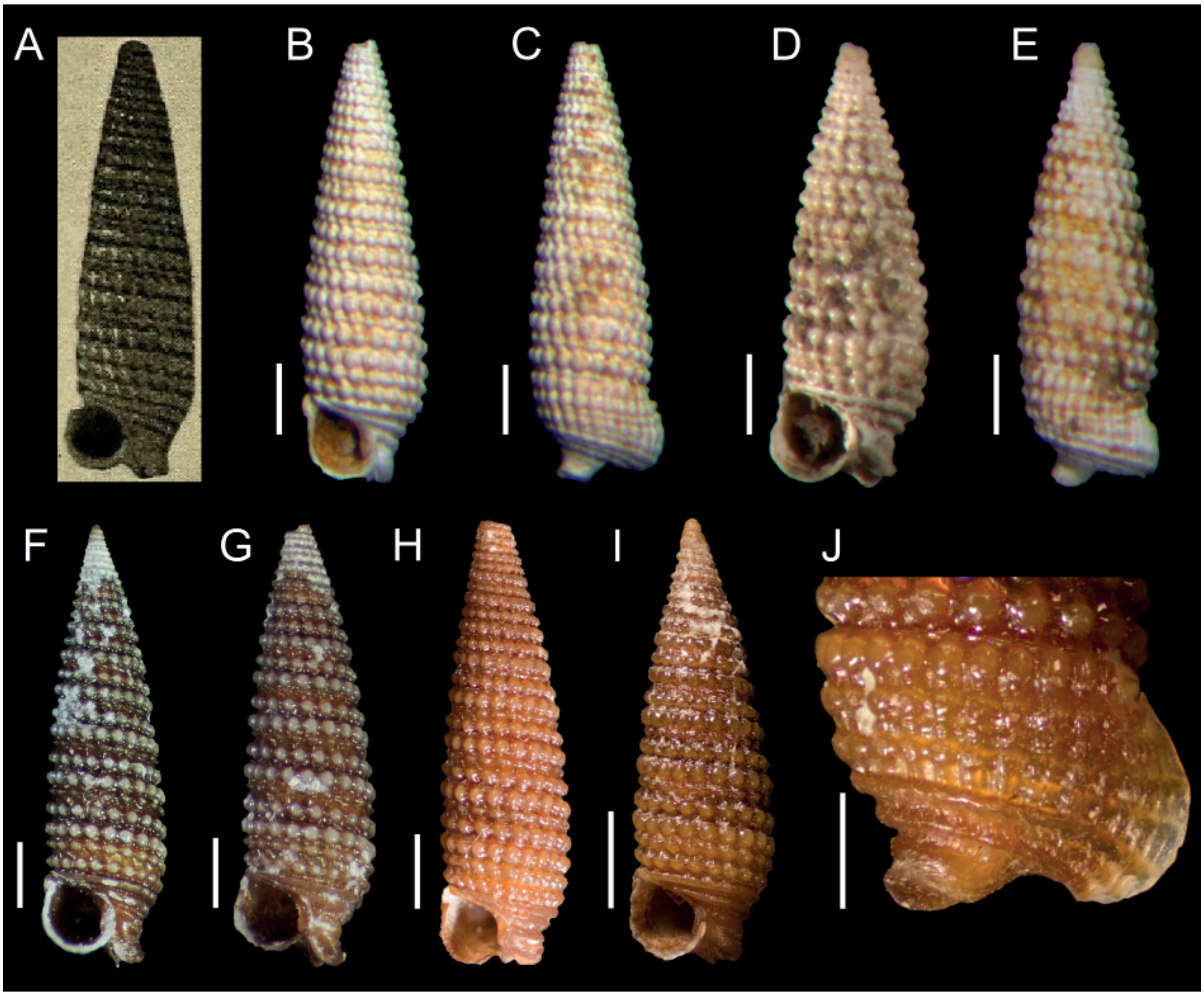

Fig. 1. *Cheirodonta dupliniana* (Olsson, 1916). **A–C**. PRI 1376, 5.75 mm (original description) or 6.31 mm (scale bar provided), lectotype, illustrated in Olsson (1916). **D–E**. PRI 11016, 5.57 mm, paralectotype, not illustrated in Olsson (1916). **F–G**. MCZ 34426, 6.75 mm and 6.35 mm, respectively. **H**. FLMNH 160564, 6.00 mm. **I–J**. FLMNH 507930, 4.60 mm. Scale bars: B–I = 1 mm; J = 500 µm. Photo credits B–E: Leslie Skibinski (Cornell University).

Other material

BRAZIL – **Fernando de Noronha Archipelago** • 2 specs; Porto; depth 6 m; 20 Jul. 1999; P. Souza and L. Simone leg.; MZSP 32023. See Fernandes & Pimenta (2015) for other localities.

PANAMA • 4 specs; Colón Island, Bocas del Toro; 1 Mar. 1953; McGinty leg.; FLMNH 160564.

UNITED STATES OF AMERICA – **Connecticut** • 9 specs; Branford; W.H. Winkley leg.; MCZ 34426. – **South Carolina** • 1 spec.; 32º29′36″ N, 79º42′30″ W; depth 18 m; 26 Jul. 1981; R/V Bagby leg.; USNM 850620. – **Florida** • 4 specs; off Yamato Rocks, Palm Beach; 26 Apr. 1939; F.B. Lyman leg., FLMNH 507930 • 1 spec.; off Palm Beach; depth 183 m; T.L. McGuity leg.; MCZ 244439 • 3 specs; Sanibel Island, Tarpon Bay; W.J. Clench and B. Chandler leg.; MCZ 256788 • 12 specs; 0.8 km E of Sanibel Island; depth 11–27 m; 1933; W.J. Clench and B. Chandler leg.; MCZ 256794 • 1 spec.; 4.8 km SW of Sanibel Lighthouse; depth 44–49 m; 1933; W.J. Clench and B. Chandler leg.; MCZ 356053 • 1 spec.; Sanibel Island; BMSM 20533 • 1 spec.; Middle Gulf shore, Sanibel Island; BMSM 33601 • 6 specs; Sanibel Island; 1935; L. Perry leg.; USNM 617570 • 1 spec.; off Kice Island, Ten Thousand Islands; BMSM 67455.

Remarks

Triphora dupliniana Olsson, 1916 and *Triphora bolax* Olsson & Harbison, 1953 were described as fossils from the Miocene/Pliocene, the former from Virginia and North Carolina, the latter from Florida (USA). The scarcity of integrative researches comprising fossil and Recent material precluded the use of both names in the literature of extant triphorids. Our analysis of several lots in malacological collections in the USA revealed that many shells originally labeled as *Marshallora nigrocincta* (C.B. Adams, 1839) or *Marshallora* sp. actually consist of *Cheirodonta dupliniana* (Olsson, 1916), including references in the literature (e.g., Lee 2009). *Cheirodonta bolax* (Olsson & Harbison, 1953) comb. nov. and *Cheirodonta mizifio* Fernandes & Pimenta, 2015 (described from Brazil) are regarded as junior synonyms of *C. dupliniana* owing to their identical shell morphology. If enough live material of *C. dupliniana* is posteriorly obtained, genetic comparisons of specimens from Brazil (*C. mizifio*) and "Caribbean" (*C. dupliniana*) could test the validity of the synonyms herein proposed.

The shell identified by Olsson & Harbison (1953: pl. 43 fig. 2) as *T. dupliniana* from the Pliocene of Florida (USA) actually belongs to *Marshallora* Bouchet, 1985.

Geographical records

USA: Connecticut (this study), Virginia (Olsson 1916), North Carolina (type locality of *C. dupliniana*), South Carolina to Florida (this study; Florida is the type locality of *C. bolax*), Louisiana (Garcia & Lee 2011; as *Sagenotriphora osclausum* and *Triphora oreodoxa*), Texas (Odé (1989) and Tunnell *et al*. (2010) as *Triphora hemphilli*); Mexico (Treece 1980; Vokes & Vokes 1983, as *Triphora lilacina*); Panama (this study); Colombia (Daccarett & Bossio 2011, as *Triphora* sp. 1); Brazil: Fernando de Noronha Archipelago (this study), Rio Grande do Norte, Bahia to Rio de Janeiro (Fernandes & Pimenta 2015, as *Cheirodonta mizifio*).

Bathymetric distribution

Depth: 6–183 m (this study).

Genus ***Eutriphora*** Cotton & Godfrey, 1931

Type species

Triphora cana Verco, 1909. Original designation. Recent, southern Australia.

Eutriphora auffenbergi Rolán & Lee, 2008
Figs 2, 22K, 33

Eutriphora auffenbergi Rolán & Lee *in* Rolán & Fernández-Garcés 2008: 92, fig. 6.

Eutriphora auffenbergi – Lee 2009: 88.

Material examined

Holotype

UNITED STATES OF AMERICA – **Florida** • West of Dry Tortugas, Monroe County; depth 90 m; FLMNH 419186.

Paratypes

See Rolán & Fernández-Garcés (2008).

Other material

BRAZIL – **Bahia** • 1 spec.; 13º29′33″ S, 38º48′58″ W; depth 26 m; MNRJ 32611* • 1 spec.; 13º30′27″ S, 38º48′43″ W; depth 29 m; 25 Nov. 2010; MNRJ 32995* • 1 spec.; 13º30′35″ S, 38º47′05″ W; depth 42 m; MNRJ 32390* • 1 spec.; Minerva Bank; 17º06′ S, 37º38′ W; depth 120 m; Aug. 2012; MZSP 110920.

MEXICO – 2 specs; Yucatan; depth 84–89 m; BMSM 107192.

UNITED STATES OF AMERICA – **Florida** • 5 specs; near Carrabelle, Franklin County; Aug. 1963; J. Moore leg.; BMSM 67500 • 1 spec.; west of Anna Maria Island, Manatee County; depth 122 m; J. Moore leg.; BMSM 107195 • 1 spec.; off Fort Myers; depth 18–36 m; BMSM 67496 • 1 spec.; off Marco Island, Collier County; depth 55–61 m; Sep. 1964; J. Moore leg.; BMSM 107198.

Description

Shell sinistral, very elongated, conical, nearly rectilinear profile, up to 16.0 mm long (broken apex), 3.3 mm wide, length/width ratio 4.6 to 5.2. Protoconch multispiral, conical or columnar, 0.49 mm long, 0.40 mm wide, 4.25 convex whorls; embryonic shell dome-shaped, entirely covered by rounded granules; larval shell with two spiral cords, situated at ~35% and ~64% of last whorl height, adapical one disappearing just before transition to teleoconch; ~31 nearly rectilinear to slightly sigmoid axial ribs. Teleoconch with up to 16 whorls (broken apex); two spiral cords (adapical and abapical) at beginning, abapical one continuing to that of protoconch; median spiral cord emerges in third whorl, reaching same size of other cords after one to 1.5 whorl; on body whorl, distance between spiral cords 1.3–1.6 × higher than width of cords; 19 opisthocline axial ribs; rounded to slightly elliptical nodules of medium to moderately small size; distinct and well-developed suture, with small sutural cord; moderately nodulose to considerably wavy subperipheral and adapical basal cords, smooth median and abapical basal cords (only one shell had three cords); one supranumerical cord may be present, between median and abapical spiral cords; ovate to almost circular aperture, 0.93–2.00 mm long, 0.68–1.52 mm wide, length/width ratio 1.2–1.4; anterior canal curved downwards, being very long in large shells, often closed, crossed in its base by projection of outer lip, 0.52–1.54 mm long, 0.73–0.93 mm wide, length/width ratio 1.6–2.0; posterior canal as small sinus, not detached from aperture, 0.24–0.28 mm long. Cream, beige or brown shell, protoconch and base darker than remaining shell, first 1.5 whorl of teleoconch can be whitish.

Remarks

This is one of the largest triphorids from Brazil. Shells from Bahia State slightly differ from those of Florida (USA): the holotype has a strong and exposed sutural cord, resulting in a thick subperipheral cord (Fig. 2B), but shells from Bahia present a less developed and partially hidden sutural cord (Fig. 2I), similar to one paratype from Florida (Rolán & Fernández-Garcés 2008: fig. 6d). In addition, the median spiral cord of the teleoconch emerges in the fourth/fifth whorl in shells from Florida (Rolán & Fernández-Garcés 2008), but in the third whorl in the single complete shell from Bahia (Fig. 2F), herein regarded as a minor discrepancy.

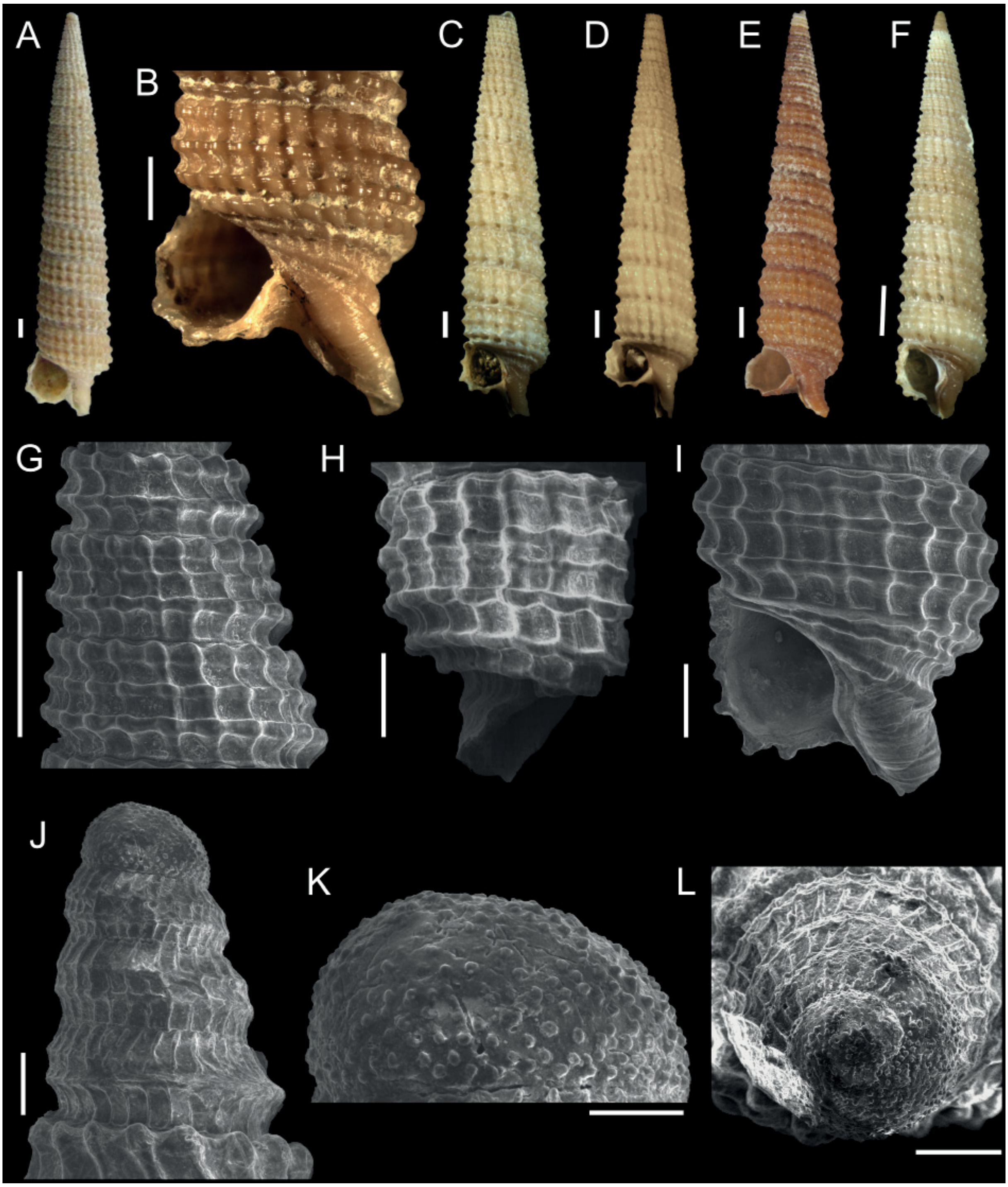

Fig. 2. *Eutriphora auffenbergi* Rolán & Lee, 2008. **A–B**. FLMNH 419186, holotype, 21.8 mm. **C**. MNRJ 32390*, 16.00 mm. **D**. MNRJ 32611*, 15.28 mm. **E**. MZSP 110920, 13.35 mm. **F**. MNRJ 32995*, 8.70 mm. **G–L**. Same shell as F. Scale bars: A–F = 1 mm; G–I = 500 µm; J, L = 100 µm; K = 50 µm.

In addition to differences noted by Fernandes & Pimenta (2015) to separate *Eutriphora costai* Fernandes & Pimenta, 2015 from *E. auffenbergi*, shells of *E. auffenbergi* from Bahia have almost one less protoconch whorl (Fig. 2J), an earlier emergence and development of the median spiral cord of the teleoconch, and a single supranumerical cord (Fig. 2H), not four as in *E. costai*. Moreover, the base is slightly darker in shells of *E. auffenbergi*. Although Bahia State represents the southern geographical limit of *E. auffenbergi* (Fig. 34), it is the northern limit of *E. costai* (Fig. 35).

Geographical records

USA: Florida (Rolán & Fernández-Garcés 2008; Lee 2009); Mexico (this study); Brazil: Bahia (this study).

Bathymetric distribution

Depth: 5 m (Rolán & Fernández-Garcés 2008) to 122 m (this study). Depths of 274 m and 183–578 m indicated in Rolán & Fernández-Garcés (2008) are suspicious, as they may be related to downslope transport.

Genus ***Isotriphora*** Cotton & Godfrey, 1931

Type species

Triforis tasmanica Tenison-Woods, 1875. Original designation. Recent, southern Australia.

Isotriphora tricingulata Rolán & Fernández-Garcés, 2015
Figs 3, 23G, 50

Isotriphora tricingulata Rolán & Fernández-Garcés, 2015: 47, fig. 2.

"*Isotriphora*" sp. – Zhang 2011: 99, fig. 296.

Material examined

Holotype
GUADELOUPE • Port-Louis, Grand Cul-de-Sac Marin; depth 81 m; MNHN IM-2000-30472.

Other material
BRAZIL – **Amapá** • 12 specs; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32558* • 2 specs; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32556* • 1 spec.; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32563* • 1 spec.; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32569* • 1 spec.; 03º58′43″ N, 49º33′24″ W 2001; MNRJ 32574 • 1 spec.; 02º45′ N, 48º42′ W; depth 75 m; Nov. 2008; MNRJ 17929* • 1 spec.; 02º21′12″ N, 48º29′54″ W; depth 72 m; Mar. 1997; MORG 52263.

Description

Shell sinistral, small, cyrtoconoid, rectilinear profile, up to 4.6 mm long, 1.4 mm wide, length/width ratio 2.8 to 3.1, up to 11 whorls. Protoconch paucispiral with truncated apex, without clear differentiation of the teleoconch; two strongly nodulose spiral cords starting from the slightly pointed and very narrow nucleus, situated at ~37% and ~73% of the last whorl height; median spiral cord usually emerging in the fifth whorl of the shell, sometimes as early as the end of fourth whorl or as late as the end of the sixth whorl, and readily reaching the same size of other cords; on the body whorl, distance between spiral cords is 0.9–1.2 × higher than width of cords; 17–20 orthocline to slightly opisthocline axial ribs at seventh whorl of shell; rounded to slightly elliptical nodules of medium size; distinct and well-developed suture, with small sutural cord; wavy subperipheral cord, mainly not developing nodules, two thin and nearly smooth basal cords, abapical one almost indistinct in some cases; no supranumerical cords; ovate aperture, 0.55–0.62 mm long, 0.47–0.50 mm wide, length/width ratio 1.2; anterior canal curved backwards/downwards, short, open or partly closed by projection of outer lip, 0.24–0.30 mm long, 0.14–0.17 mm wide, length/width ratio 1.7–1.8; posterior canal is small sinus, 0.09–0.11 mm long,

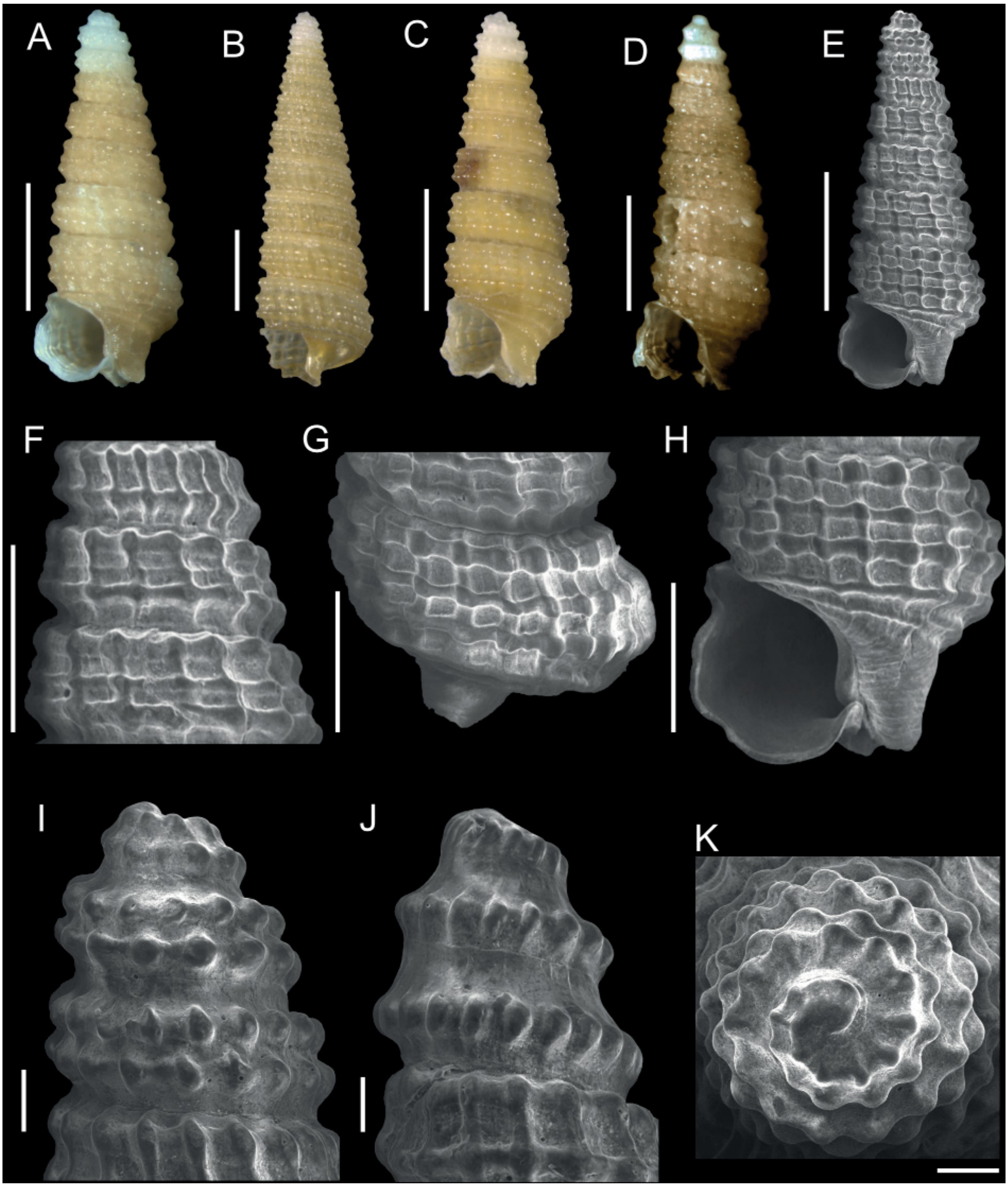

Fig. 3. *Isotriphora tricingulata* Rolán & Fernández-Garcés, 2015. **A, C**. MNRJ 32558*, 2.75 mm and 3.04 mm, respectively. **B**. MNRJ 17929*, 4.62 mm. **D**. MNRJ 32574*, 3.29 mm. **E–I, K**. Same shell as A. **J**. Same shell as D. Scale bars: A–E = 1 mm; F–H = 500 µm; I–K = 100 µm.

not detached from aperture. Two to three initial whorls white, remaining whorls homogeneously cream or light brown; worn shells dirty white.

Remarks

As indicated in the original description, the shell of *I. tricingulata* superficially resembles that of *Isotriphora peetersae* (Moolenbeek & Faber, 1989), a species widely distributed throughout the Caribbean (Moolenbeek & Faber 1989; Rolán & Espinosa 1994; Redfern 2013). However, *I. peetersae* is differentiated by a somewhat bottle-shaped shell, the presence of three spiral cords through most of the protoconch, a late median spiral cord of the teleoconch, the white coloration comprising the five initial whorls of the shell (but only two to three whorls in *I. tricingulata*, Fig. 3A–D) and a darker brown coloration in the remaining whorls.

Isotriphora tricingulata is also easily distinguished from *Isotriphora onca* Fernandes, Pimenta & Leal, 2013, from the Vitória-Trindade Seamount Chain (southeastern Brazil), by the presence of an evident median spiral cord emerging in the fifth/sixth whorl (Fig. 3F), but only with a very reduced size after the 13th whorl in *I. onca* (Fernandes *et al*. 2013). The shell of *I. onca* is more elongated, with a long and almost closed anterior canal, instead of the short and open or partly closed anterior canal of *I. tricingulata* (Fig. 3H).

The single difference between the holotype of *I. tricingulata* and shells from Brazil is the earlier emergence of the median spiral cord in the holotype (fourth whorl vs usually fifth whorl in shells from Brazil). Despite the supposed intracapsular metamorphosis suggested by protoconch morphology (Fig. 3I), different populations of this species may be connected by the stepping stones of the Lesser Antilles and the continental shelf of the Guyana.

One shell of *I. tricingulata* from Brazil has a late emergence of the adapical spiral cord, only at the end of the third whorl of the shell (Fig. 3J). This might be a small abnormality in the development of the initial whorls.

Geographical records

Antigua (Zhang 2011); Guadeloupe (type locality); Brazil: Amapá (this study).

Bathymetric distribution

Depth: 72 m (this study) to 81 m (type locality).

Isotriphora uncia sp. nov.

urn:lsid:zoobank.org:act:2D9B275B-0251-48C5-A192-61FD1A16B0BE

Figs 4, 23H, 51

Diagnosis

Small, white shell; truncated apex; median spiral cord (or supranumerical cord) emerges in the ninth/eleventh whorl of the shell; closed anterior canal.

Etymology

The specific name alludes to the snow leopard (*Panthera uncia* (Schreber, 1775)) owing to the white shell color and the habit of authors to name species of *Isotriphora* after big felines.

Material examined

Holotype

BRAZIL – **Fernando de Noronha Archipelago** • Ilha Rata; depth 12 m; 8 Jul. 1999; IBUFRJ 11165.

Other material

BRAZIL – **Fernando de Noronha Archipelago** • 1 spec.; same collection data as for holotype; MNRJ 34420* • 2 specs; Baía Sueste; depth 17 m; Jan. 1979; MORG 20632* • 1 spec.; Cabeço da Sapata; depth 40 m; 5 Dec. 1985; M. Cabeda leg.; MORG 24622* • 2 specs; Cabeço da Sapata; depth 40 m; 5 Dec. 1985; M. Cabeda leg.; MORG 52610*. – **Atol das Rocas** • 30 specs; Ilha do Farol; Feb. 1977; MORG 19120* • 8 specs; Feb. 1977; on coral; MORG 19137*.

Description

Shell sinistral, small, cyrtoconoid or slightly ovoid, nearly rectilinear to moderately convex profile, up to 3.7 mm long, 1.2 mm wide, length/width ratio 2.4 to 3.0 up to 10.5 whorls. Protoconch paucispiral with truncated apex, without clear differentiation from teleoconch; two strongly nodulose spiral cords starting from slightly pointed and very narrow nucleus, abapical cord initially much more prominent; adapical cord usually more prominent than abapical one in the body whorl of adult shells; median spiral cord (or just supranumerical cord) emerges in ninth to eleventh whorl of shell, bordering closely adapical cord; on body whorl, spiral cords are 1.3–2.3 × as wide as the distance between them; 14–17 nearly orthocline (initial whorls) to opisthocline (late whorls), weak axial ribs at the seventh whorl of shell; rounded nodules of medium to moderately large size; distinct but very shallow suture, with small sutural cord, more evident in late whorls; thin, slightly wavy to nearly smooth subperipheral cord, not developing

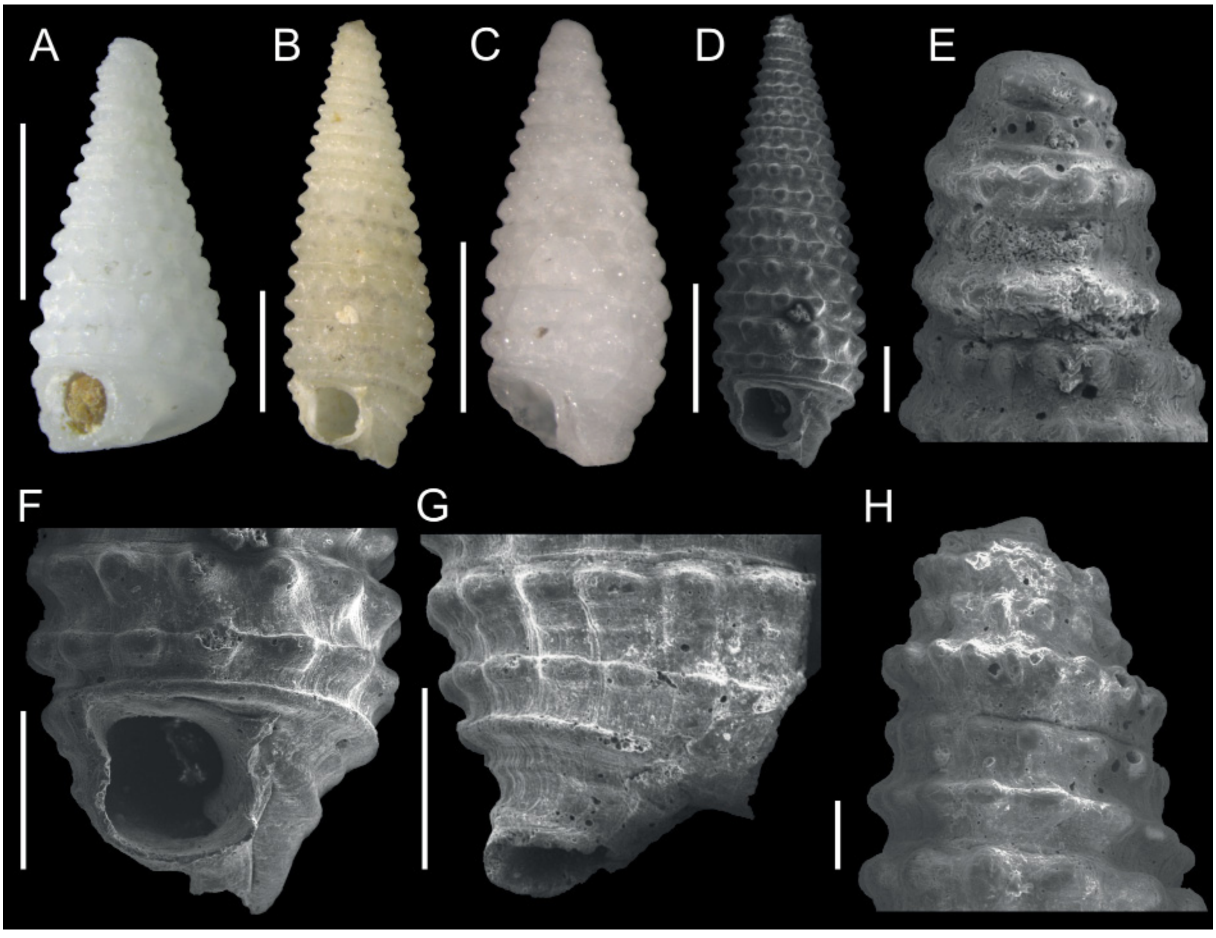

Fig. 4. *Isotriphora uncia* sp. nov. **A**. IBUFRJ 11165, holotype, 2.37 mm. **B**. MORG 24622*, 3.63 mm. **C**. MORG 19137*, 2.50 mm. **D, F–H**. Same shell as A. **E**. MORG 20632*. Scale bars: A–D = 1 mm; E, H = 100 µm; F–G = 500 µm.

nodules, one to two very small and ill-defined basal cords; supranumerical cords apparently absent; small and ovate aperture, 0.54–0.62 mm long, 0.43–0.44 mm wide, length/width ratio 1.2–1.4; anterior canal closed, medium-sized, curved backwards/downwards, 0.27–0.37 mm long, 0.25–0.27 mm wide, length/width ratio 1.1–1.3; posterior canal as somewhat deep sinus, 0.12–0.14 mm long, not detached from aperture. Shell white.

Remarks

This is one of the smallest triphorids in the world, with the largest adult shell herein analysed reaching only 3.7 mm in length. The species is abundant in Fernando de Noronha and Atol das Rocas, but shells are often much eroded, especially at the apex.

Isotriphora guanahacabibes Rolán & Fernández-Garcés, 2008, up to now restricted to Cuba and Cayman Islands, shares similar features with *I. uncia* sp. nov., including the white shell and late development of the median spiral cord. In contrast, the shell of *I. guanahacabibes* reaches up to 5.5 mm in length and it is more elongated and slightly bottle-shaped (Rolán & Fernández-Garcés 2008), instead of the short and usually slightly ovoid shell of *I. uncia* sp. nov. (Fig. 4C).

The median spiral cord of the teleoconch of *I. uncia* sp. nov. is not fully developed in shells herein analysed, appearing as a very small thread just behind the peristome (Fig. 4G), which raises the hypothesis of it to be merely a supranumerical cord. However, other species of *Isotriphora* also show a very late development of this median spiral cord (Rolán & Fernández-Garcés 2008; Fernandes *et al*. 2013), suggesting that a shell of *I. uncia* sp. nov. attaining more whorls would reveal a gradual development of the median spiral cord.

Geographical records

Brazil: Fernando de Noronha and Atol das Rocas.

Bathymetric distribution

Depth: 12–40 m.

Isotriphora leo sp. nov.

urn:lsid:zoobank.org:act:D7BFF5C6-9436-4BA3-BE0F-8551DCB43F8A

Figs 5, 23D, 52

Diagnosis

Small shell with a truncated apex; late adapical spiral cord, emerging in the third whorl of shell; white color, but light brown in the adapical spiral, subperipheral and adapical basal cords.

Etymology

The specific name alludes to the lion (*Panthera leo* (Linnaeus, 1758)) owing to the habit of authors to name species of *Isotriphora* after big felines.

Material examined

Holotype

BRAZIL – **Trindade Island** • Beberibe; depth 4–6 m; Barcellos and Laurino leg.; MNRJ 29392*.

Other material

BRAZIL – **Trindade Island** • 1 spec.; same collection data as for holotype; Barcellos and Laurino leg.; MORG 25615* • 2 specs; Fundeadouro; depth 15 m; 15 Sep. 1987; Barcellos and Laurino leg.; MORG 25645*.

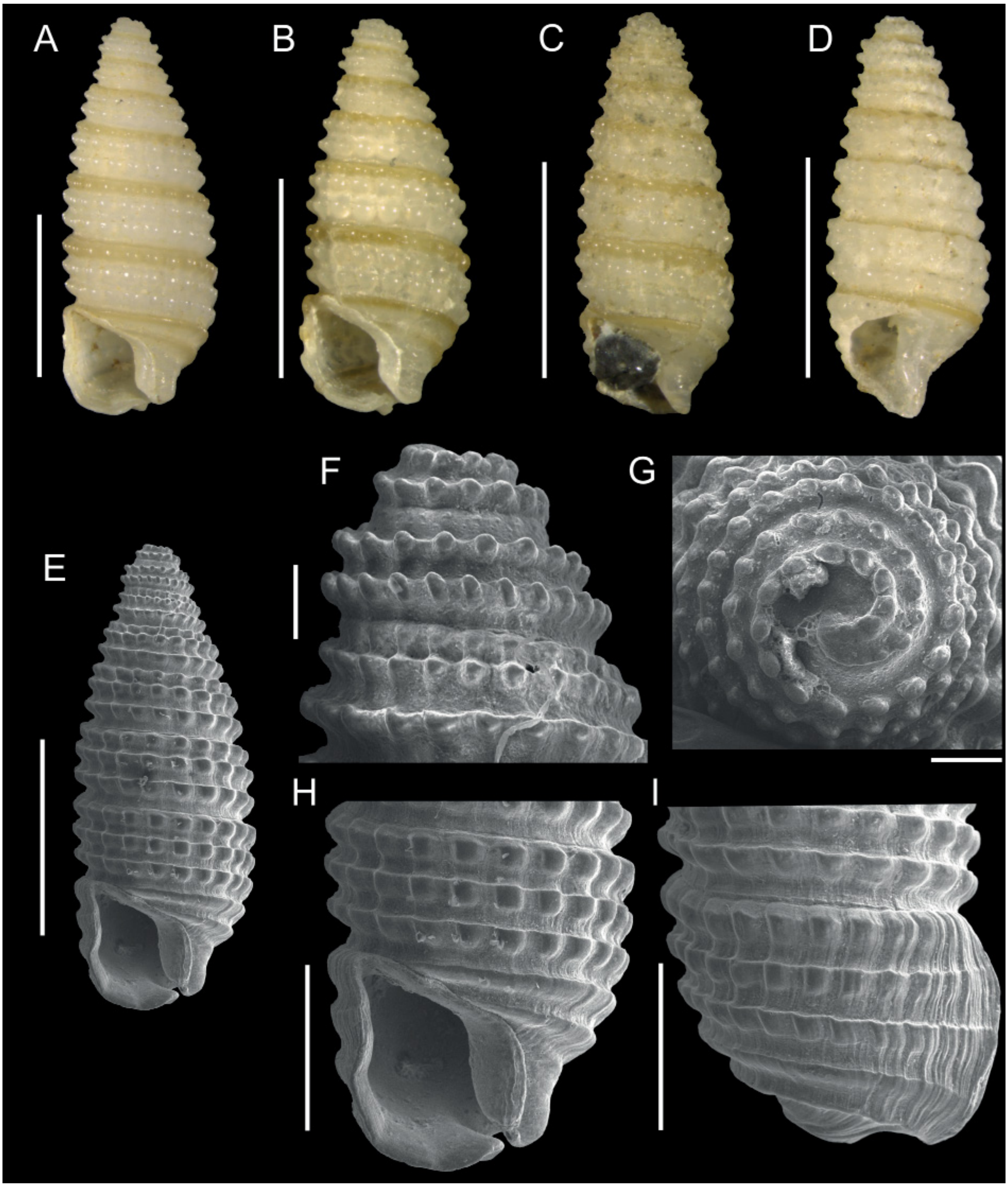

Fig. 5. *Isotriphora leo* sp. nov. **A**. MNRJ 29392*, holotype, 2.39 mm. **B**. MORG 25615*, 2.00 mm. **C–D**. MORG 25645*, 1.76 mm and 1.79 mm, respectively. **E–I**. HolotypE. Scale bars: A–E = 1 mm; F–G = 100 µm; H–I = 500 µm.

Description

Shell sinistral, small, cyrtoconoid to ovoid, slightly convex profile, up to 2.4 mm long, 0.9 mm wide, length/width ratio 2.4 to 2.5, up to 7.5 whorls. Protoconch paucispiral with truncated apex, without clear differentiation from teleoconch; two strongly nodulose spiral cords (median and abapical) of equal size starting from slightly pointed and very narrow nucleus, respectively situated at ~34% and ~71% of whorl height; third (adapical) spiral cord evident since third whorl of shell, bordering median cord and reaching same size of other cords after 1.5 to two whorls, being usually slightly more prominent than others on body whorl; on body whorl, spiral cords are 1.0–1.2 × as wide as distance between them; 17–20 axial ribs at sixth whorl of shell, with varying arrangement, often orthocline, but slightly prosocline or slightly opisthocline in some whorls of certain shells; rounded nodules of medium to moderately large size; distinct and well-developed suture, with small sutural cord; smooth subperipheral and basal cords, abapical one very reduced, even indistinct in some shells; supranumerical cords absent; ovate to elliptical aperture, 0.34–0.57 mm long, 0.31–0.43 mm wide, length/width ratio 1.1–1.4; anterior canal very short, open, 0.08–0.14 mm long, 0.13–0.14 mm wide, length/width ratio 0.6–1.0; posterior canal as acute sinus, 0.07–0.12 mm long, not detached from aperture. Shell white, but light brown in the adapical spiral, subperipheral and adapical basal cords.

Remarks

This species is unique in *Isotriphora* by the late emergence of the adapical spiral cord of the teleoconch (Fig. 5E–F), thus raising doubts about the generic allocation. In fact, the shell of *Isotriphora leo* sp. nov. is very similar to that of some species of the family Cerithiopsidae in shape, small size and the late development of the adapical spiral cord, constituting an example of convergence in Triphoroidea.

The late emergence of the adapical spiral cord distinguishes *I. leo* sp. nov. from the also small and slightly ovoid shell of *I. uncia* sp. nov. from Fernando de Noronha and Atol das Rocas, and the similarly colored shell of *Isotriphora tigrina* Fernandes, Pimenta & Leal, 2013 from the Vitória-Trindade Chain. *Isotriphora leo* sp. nov. probably is restricted to the shallow waters of Trindade Island, as it was not sampled in deeper waters of the Vitória-Trindade Chain by expeditions MD55 and REVIZEE-Central (Fernandes *et al*. 2013).

Geographical records

Brazil: Trindade Island.

Bathymetric distribution

Depth: 4–15 m.

Isotriphora sp. 1

Figs 6, 23I, 52

Material examined

BRAZIL – **Fernando de Noronha Archipelago** • 2 specs; Cabeço da Sapata; depth 40 m; 5 Dec. 1985; M. Cabeda leg.; MORG 52611* • 2 specs; Cabeço da Sapata; 03º52′41″ S, 32º29′04″ W; depth 45 m; 6 Sep. 2013; in rhodolit beds; ZUEC-GAS 7353 • 1 spec.; Cabeço da Sapata; 03º52′41″ S, 32º29′04″ W; depth 45 m; 6 Sep. 2013; in rhodolit beds; ZUEC-GAS 7489.

Remarks

The incomplete shells of *Isotriphora* sp. 1 are easily differentiated from those of the sympatric *I. uncia* sp. nov. by the presence of brown axial patches (Fig. 6A–B, E–F) and an earlier emergence of the median spiral cord, rapidly enlarging and reaching the same size of other cords (Fig. 6C). The most similar species to *Isotriphora* sp. 1 is "*Inella*" *maculata* Fernandes & Pimenta, 2019, from southeastern Brazil, which has a different protoconch. Complete shells of *Isotriphora* sp. 1 are required to formally describe this species.

Geographical distribution

Brazil: Fernando de Noronha.

Bathymetric distribution

Depth: 40–45 m.

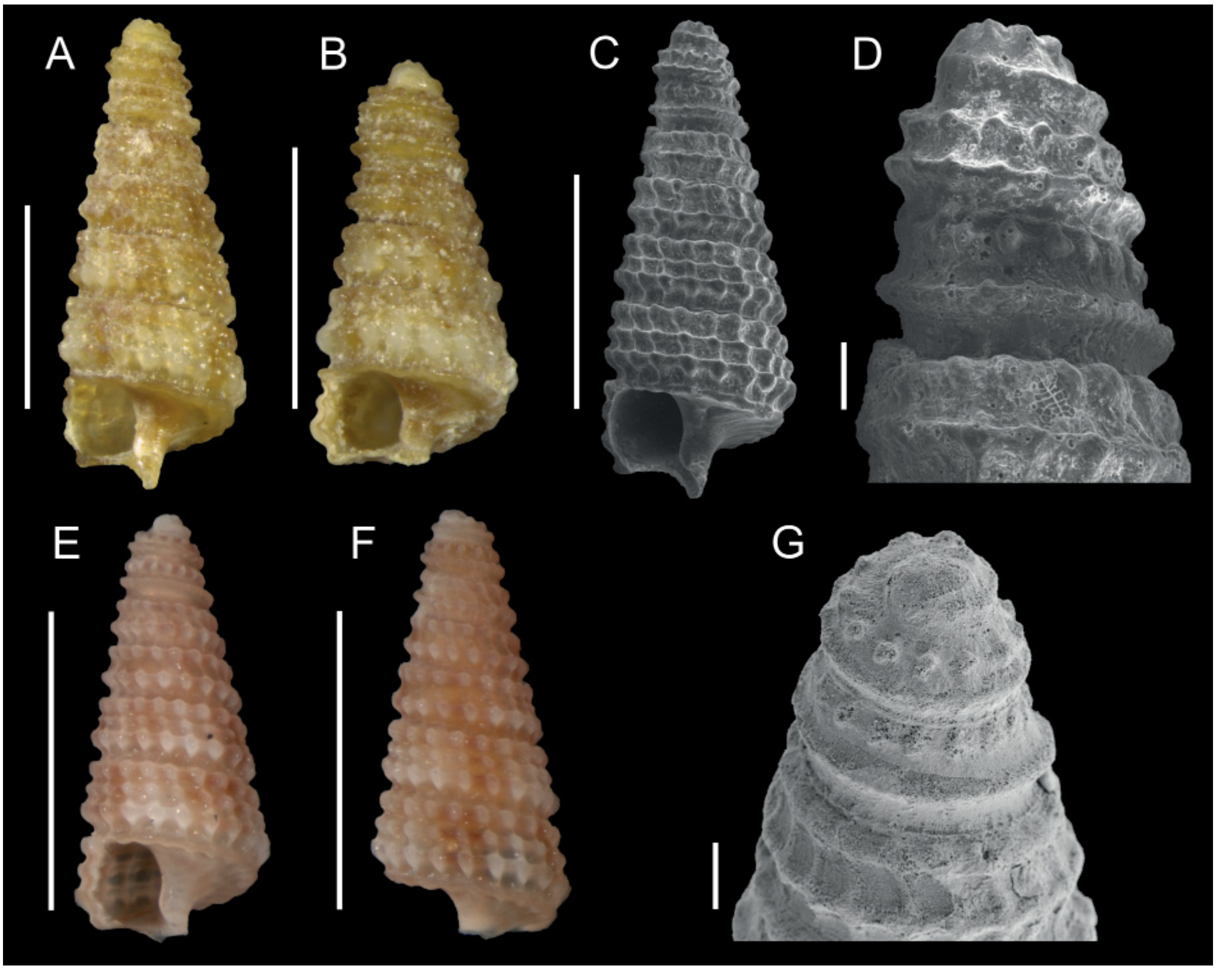

Fig. 6. *Isotriphora* sp. 1. **A–B**. MORG 52611*, 2.08 mm and 1.58 mm, respectively. **C–D**. Same shell as A. **E–F**. ZUEC-GAS 7489, 1.44 mm. **G**. ZUEC-GAS 7489, same shell as E. Scale bars: A–C, E–F = 1 mm; D, G = 100 µm. Photo credits E–G: Aramys Cesar (UNICAMP).

Genus ***Marshallora*** Bouchet, 1985

Type species

Murex adversus Montagu, 1803. Original designation. Recent, northeastern Atlantic and Mediterranean.

Marshallora ostenta Rolán & Fernández-Garcés, 2008
Figs 7–8, 23L, 54, 83

Marshallora ostenta Rolán & Fernández-Garcés, 2008: 94, figs 7A–N, 8E–F.

Marshallora ostenta – Lee 2009: 89.

Material examined

Holotype
CUBA • Cienfuegos Bay; MNCN 15.05/47055.

Paratypes
See Rolán & Fernández-Garcés (2008).

Other material
BRAZIL – **North Brazil** • 11 specs; REVIZEE-Norte III st. 176; UFMA* • 1 spec.; REVIZEE-Norte III st. 192; UFMA*. – **Amapá** • 1 spec.; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32570* • 1 spec.; AMASSEDS st. 4134; MORG 43335 • 1 spec.; AMASSEDS st. 3210; MNRJ 33801*. – **Rio Grande do Norte** • 1 spec.; BPot 1-MR31; MNRJ 31536* • 1 spec.; BPot 1-MR41; MNRJ 31538* • 1 spec.; BPot 2-MR32; MNRJ 31657* • 2 specs; BPot 2-MR41; MNRJ 31540* • 1 spec.; BPot 2-MR45; MNRJ 31541*. – **Sergipe** • 1 spec.; Petro/UFS st. E5-A1; with soft part preservation; UFS • 1 spec.; Petro/UFS st. 15.3; UFS • 1 spec.; Petro/UFS st. 18.1; UFS. – **Bahia** • 4 specs; Baía de Todos os Santos; May 1997; MNRJ 34430* • 1 spec.; Parcel Paredes, Alcobaça; depth 0–3 m; 8 Jan. 2000; P.J. Souza and E. Gonçalves leg.; MZSP 56305*. – **Espírito Santo** • 1 spec.; REVIZEE-Central C1-VV24; MORG 40378 • 2 specs; REVIZEE-Central C1-VV24; MORG 52253 • 3 specs; REVIZEE-Central C1-VV31; IBUFRJ 19484 • 1 spec.; REVIZEE-Central C1-C65; MORG 39090* • 1 spec.; 19º25′08″ S, 39º15′59″ W; depth 46 m; Oct. 2003; MNRJ 31169* • 1 spec.; 19º25′37″ S, 39º22′22″ W; depth 43 m; Oct. 2003; MNRJ 30750* • 1 spec.; REVIZEE-Central C1-VV38; IBUFRJ 19614 • 1 spec.; REVIZEE-Central C6-R2#1-1; IBUFRJ 19506 • 1 spec.; 20º14′ S, 40º12′ W; Jun. 2008; MNRJ 32659* • 1 spec.; 20º42′00″ S, 40º24′28″ W, Ilha Escalvada; depth 10–15 m; Jan. 2013; W. Vieira leg.; MNRJ 34026* • 2 specs; 20º42′ S, 40º06′ W; depth 43 m; 27 Aug. 1979; IBUFRJ 19551 • 6 specs; 20º47′ S, 40º34′ W; Nov. 2007; MNRJ 32412* • 1 spec.; 20º47′ S, 40º34′ W; Sep. 2007–Oct. 2008; MNRJ 17227* • 1 spec.; 20º47′ S, 40º34′ W; Sep. 2007–Oct. 2008; MNRJ 30838* • 1 spec.; 20º47′ S, 40º34′ W; Sep. 2007–Oct. 2008; MNRJ 31017* • 1 spec.; 20º47′ S, 40º34′ W; Sep. 2007–Oct. 2008; MNRJ 31029* • 1 spec.; 20º47′ S, 40º34′ W; Sep. 2007–Oct. 2008; MNRJ 31139* • 1 spec.; 20º47′ S, 40º34′ W; Mar. 2010; MNRJ 31047* • 2spec; 20º47′ S, 40º34′ W; Mar. 2010; MNRJ 31087* • 1 spec.; 20º47′ S, 40º34′ W; Mar. 2010; MNRJ 31092* – **Rio de Janeiro** • 2 specs; HAB 13-H2; MNRJ 18588* • 1 spec.; HAB 16-G1; MNRJ 18623* • 1 spec.; REVIZEE-Central C1-D1-2; IBUFRJ 19532 • 1 spec.; REVIZEE-Central C1-D3; IBUFRJ 12881.

UNITED STATES OF AMERICA – **Georgia** • 1 spec.; 30º54′18″ N, 80º36′12″ W; depth 35 m; 4 Sep. 1980; R/V Bagby leg.; with soft part preservation; USNM 848771.

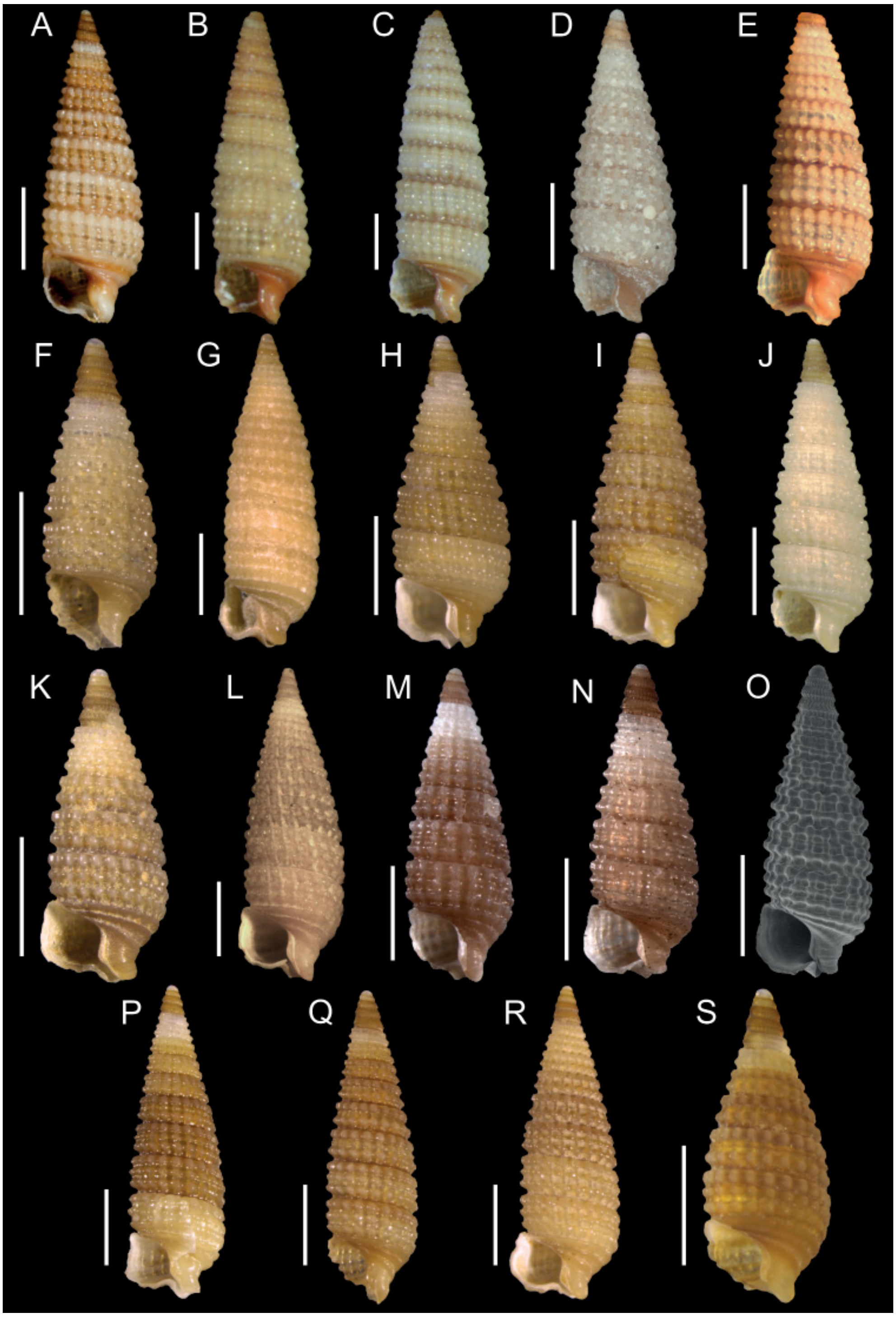

Fig. 7. *Marshallora ostenta* Rolán & Fernández-Garcés, 2008. **A–E**. From "Caribbean". **A**. MNCN 15.05/47055, holotype, 4.20 mm. **B–C**. BMSM 15206, paratypes, 5.55 mm and 5.65 mm, respectively. **D**. USNM 1112660, paratype, 3.64 mm. **E**. FLMNH 419187, paratype, 3.71 mm. **F–S**. From Brazil. **F**. MNRJ 33801*, 2.42 mm. **G**. MORG 39090*, 4.00 mm. **H–I**. MNRJ 32412*, 3.03 mm and 3.07 mm, respectively. **J**. MNRJ 30750*, 3.61 mm. **K**. MNRJ 31017*, 2.50 mm. **L**. MNRJ 17227*, 4.40 mm. **M**. MNRJ 18588*, 3.34 mm. **N–O**. IBUFRJ 19532, 3.07 mm. **P**. MNRJ 31012*, 4.12 mm. **Q**. MNRJ 31087*, 3.91 mm. **R**. MNRJ 32659*, 3.91 mm. **S**. MNRJ 34026*, 2.65 mm. Scale bars: 1 mm.

Description

Shell sinistral, elongated, cyrtoconoid to slightly ovoid, moderately convex profile, up to 4.4 mm long, 1.4 mm wide, length/width ratio 2.4 to 3.4. Protoconch multispiral, conical, 0.47–0.55 mm long, 0.40–0.45 mm wide, 4.75–5.25 convex whorls; embryonic shell dome-shaped, covered by small granules in its abapical portion; larval shell with two spiral cords strengthening through first whorl, soon becoming distinct, but adapical one disappears about one whorl after its emergence or as late as at last whorl; adapical cord can be much weaker than abapical one; cords respectively situated at ~39% and 60%–69% of penultimate whorl height; ~27 nearly rectilinear to slightly sigmoid axial ribs. Teleoconch with up to

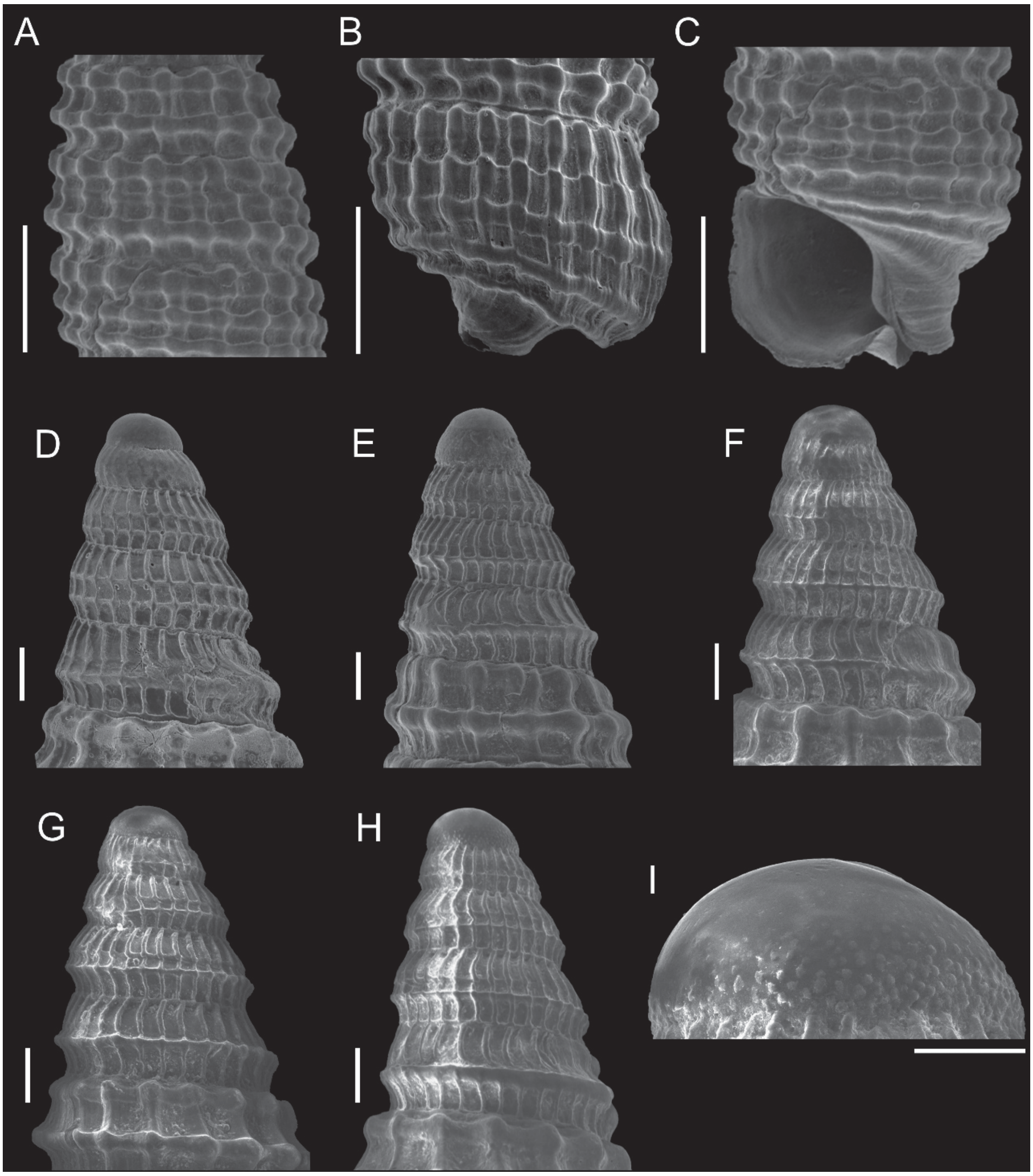

Fig. 8. *Marshallora ostenta* Rolán & Fernández-Garcés, 2008 from Brazil. **A–C, E**. IBUFRJ 19532, same shell as Fig. 7N. **D**. MNRJ 18623*. **F**. MNRJ 31017*, same shell as Fig. 7K. **G**. MNRJ 33801*, same shell as Fig. 7F. **H–I**. MNRJ 30750*, same shell as Fig. 7J. Scale bars: A–C = 500 µm; D–H = 100 µm; I = 50 µm.

nine whorls; two spiral cords (adapical and abapical) at beginning, abapical one continuous to that of protoconch; median spiral cord emerges in fourth or fifth whorl (rarely in sixth whorl), reaching same size as other cords after 0.5 to 1.5 whorl; on body whorl, spiral cords are 0.9–1.5 × as wide as distance between them; 20–23 nearly orthocline axial ribs at fifth whorl; rounded nodules, with moderately large to medium size; suture distinct, well developed, with small sutural cord; slightly wavy to nearly smooth subperipheral cord, two smooth basal cords; no supranumerical cords; ovate aperture, 0.58–0.79 mm long, 0.45–0.61 mm wide, length/width ratio 1.2–1.3; anterior canal short, open or partly closed by the projection of outer lip, 0.18–0.31 mm long, 0.17–0.25 mm wide, length/width ratio 0.9–1.4; posterior canal as small sinus, 0.07–0.12 mm long. Protoconch light-brown to golden, embryonic shell whitish; teleoconch with faint cream to light brown background, one or two initial whorls often slightly clearer or even white.

Remarks

Rolán & Fernández-Garcés (2008) hesitated about the taxonomic integrity of *M. ostenta*, which may constitute a species with a considerable conchological variation or more than one species. They warned for the chromatic variation, the emergence of the median spiral cord of the teleoconch, and the number of whorls and spiral cords of the protoconch. Differences in the size and shape of adult shells (Fig. 7) also occur. Agreeing with the previous authors, an in-depth analysis of anatomy and DNA may solve this taxonomical problem. Meanwhile, shells from Brazil are allocated under this name.

The shell illustrated by Garcia & Lee (2011) as *M. ostenta* from Louisiana (southern USA) is dark and with a much rectilinear profile, not being recognized as belonging to this species. Shells from Brazil hardly ever show a slightly different coloration in the adapical spiral cord (somewhat darker or clearer) in relation to the remaining teleoconch (Fig. 7F–S), as sometimes observed in shells from the type material.

Shells of *Marshallora modesta* (C.B. Adams, 1850) and *Marshallora nigrocincta* (C.B. Adams, 1839) are darker than those of *M. ostenta*, never acquiring a white coloration in the initial whorls of the teleoconch (Rolán & Fernández-Garcés 2008). In addition, *M. ostenta* is found in a wider bathymetric range than the two former species, which are mainly restricted to the littoral zone.

Geographical records

USA: Georgia (this study), Florida (Rolán & Fernández-Garcés 2008; Lee 2009); Cuba (type locality); Brazil: Amapá, Rio Grande do Norte, Sergipe to Rio de Janeiro (this study).

Bathymetric distribution

Depth: 3–92 m (this study).

Marshallora **sp. 1**

Figs 9, 23M, 55

Material examined

BRAZIL – **Rio de Janeiro** • 2 specs; Rio das Ostras; Sep. 1971; MZSP 63331*.

Description

Shell sinistral, elongated, cyrtoconoid, slightly convex profile, up to 4.0 mm long, 1.2 mm wide, length/width ratio 3.2. Protoconch paucispiral, slightly globose but small, 2.25–2.5 convex whorls, 0.36–0.47 mm long, 0.41–0.47 mm wide; first whorl dome-shaped and smooth, remaining whorls mainly smooth (maybe due to erosion), with one faint abapical cord or two distinct and equidistant spiral cords; small axial threads (or growth lines) may be present. Teleoconch with up to eight whorls; two spiral cords (adapical and abapical) at the beginning, abapical one continuous to that of the protoconch; median spiral cord emerges in the fifth whorl, reaching same size of other cords after 1.5 whorl; abapical cord initially larger, but the adapical one becoming the most prominent in abapical whorls; on the body whorl, the distance between spiral cords is 1.2 × higher than the width of cords; 19 nearly orthocline to

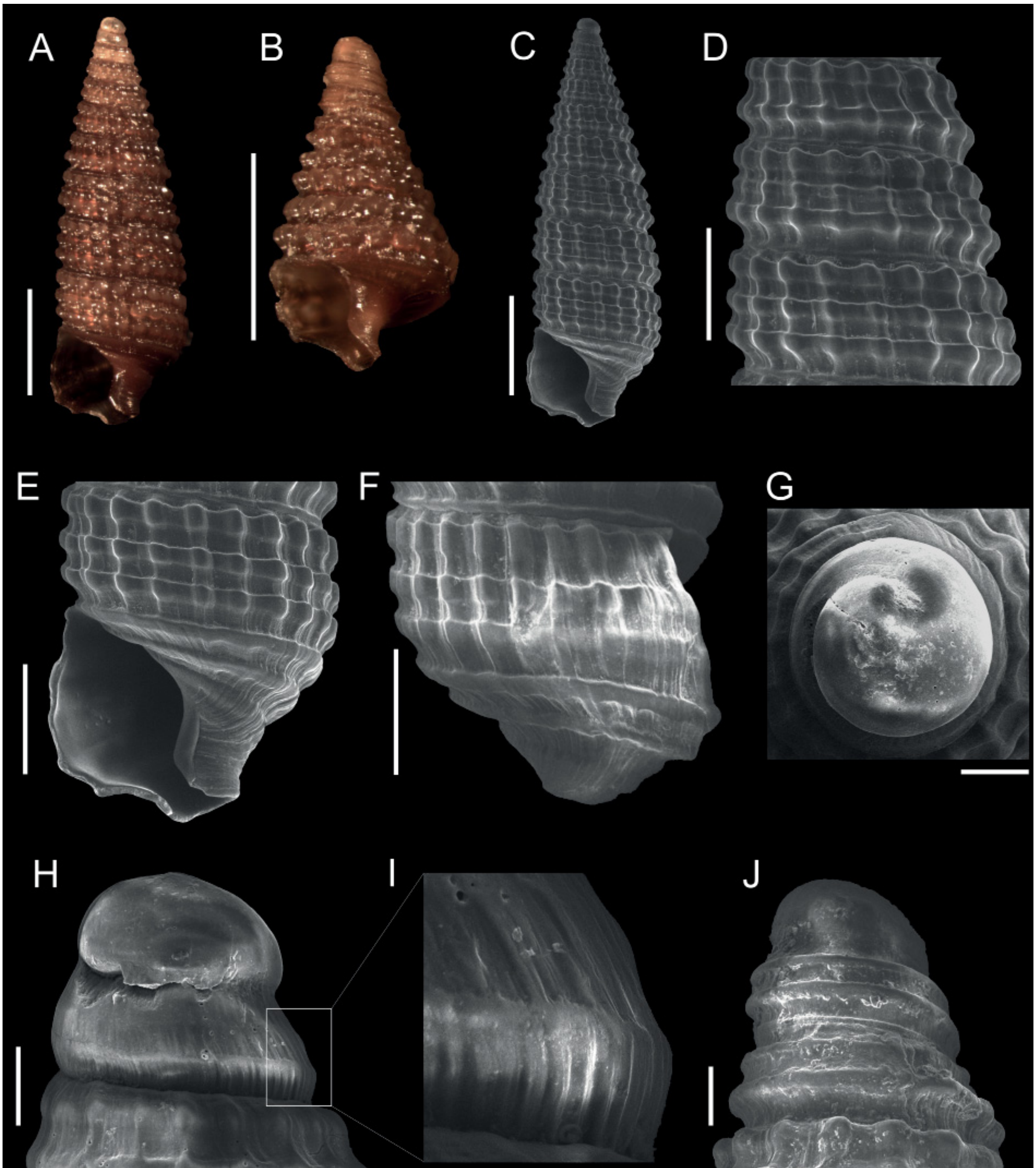

Fig. 9. *Marshallora* sp. 1. A–B. MZSP 63331*, 4.00 mm and 1.65 mm, respectively. **C–I**. Same shell as A. **J**. Same shell as B. Scale bars: A–C = 1 mm; D–F = 500 µm; G–H, J = 100 µm; I = 20 µm.

slightly opisthocline axial ribs; rounded nodules of medium size; distinct, well-developed suture, with a small sutural cord; smooth subperipheral cord, two smooth and thick basal cords; no supranumerical cords; ovate aperture, 0.69 mm long, 0.61 mm wide, length/width ratio 1.1; open, short anterior canal, 0.24 mm long, 0.30 mm wide, length/width ratio 0.8; posterior canal is a very small notch, 0.15 mm long. Brown shell.

Remarks

Marshallora sp. 1 is similar to three Caribbean species with a paucispiral protoconch, *Marshallora calva* (Faber & Moolenbeek, 1991), *Marshallora nicaraguensis* Rolán & Luque, 1999 and the polychromatic *Marshallora nichupte* Rolán & Cruz-Ábrego, 1996. The protoconch of *M. calva* bears a single spiral cord (Faber & Moolenbeek 1991; Rolán & Fernández-Garcés 2008), but two cords appear in the juvenile shell of *Marshallora* sp. 1 (the protoconch of the adult shell is more similar to that of *M. calva*), and the brown shell of *M. calva* can present whitened nodules, but not in *Marshallora* sp. 1 (Fig. 9A–B). *Marshallora nicaraguensis* bears two main spiral cords in the protoconch (similar to the juvenile shell of *Marshallora* sp. 1), although the subperipheral and adapical basal cords are slightly nodulose and the median spiral cord of the teleoconch emerges in the third/fourth whorl (Rolán & Luque 1999), but in the fifth whorl in *Marshallora* sp. 1 (Fig. 9C). *Marshallora nichupte* has a smooth protoconch and the median spiral cord of the teleoconch emerging in the second to the fourth whorl (Rolán & Cruz-Ábrego 1996), also earlier than in *Marshallora* sp. 1. Despite the similarities with those species, the absence of any other record of a lecithotrophic species of *Marshallora* in Brazil after the examination of thousands of lots suggests that a change to lecithotrophy occurred in an ancestral planctotrophic population in southeastern Brazil.

Geographical records

Brazil: Rio de Janeiro.

Bathymetric distribution

Only known from beach drift.

Genus ***Monophorus*** Grillo, 1877

Type species

Trochus perversus Linnaeus, 1758. Designation by monotypy. Recent, northeastern Atlantic and Mediterranean.

Monophorus caracca (Dall, 1927) comb. nov.

Figs 10, 23N, 57

Triphora (*Biforina*) *caracca* Dall, 1927: 92.

“*Triphora*” *caracca* – Rolán & Fernández-Garcés 2008: 140, fig. 24a–e.

Material examined

Lectotype

UNITED STATES OF AMERICA – **off Georgia** • 30º43′59″ N, 79º25′59″ W; depth 805 m; 1 Apr. 1885; R/V Albatross leg.; USNM 108343. Two paralectotypes are also found under the same lot number.

Other material

BRAZIL – **off Espírito Santo** • 4 specs; MD55 st. 42-DC75; MNHN*.

Description

Shell sinistral, elongated, conical, rectilinear profile, the better-preserved shell is 5.7 mm long, 1.5 mm wide, although complete adult shells may be much larger. Protoconch multispiral but partially broken; penultimate whorl with cruciform granules spirally disposed; last whorl with two spiral cords, situated at ~31% and ~62% of whorl height, crossed by weak axial ribs, despite a smooth spiral zone (i.e., without axial sculpture) just above the adapical spiral cord; prosocline (below suture) to opisthocline (below adapical cord) axial ribs. Teleoconch with up to 14 whorls; two spiral cords (adapical and abapical) at

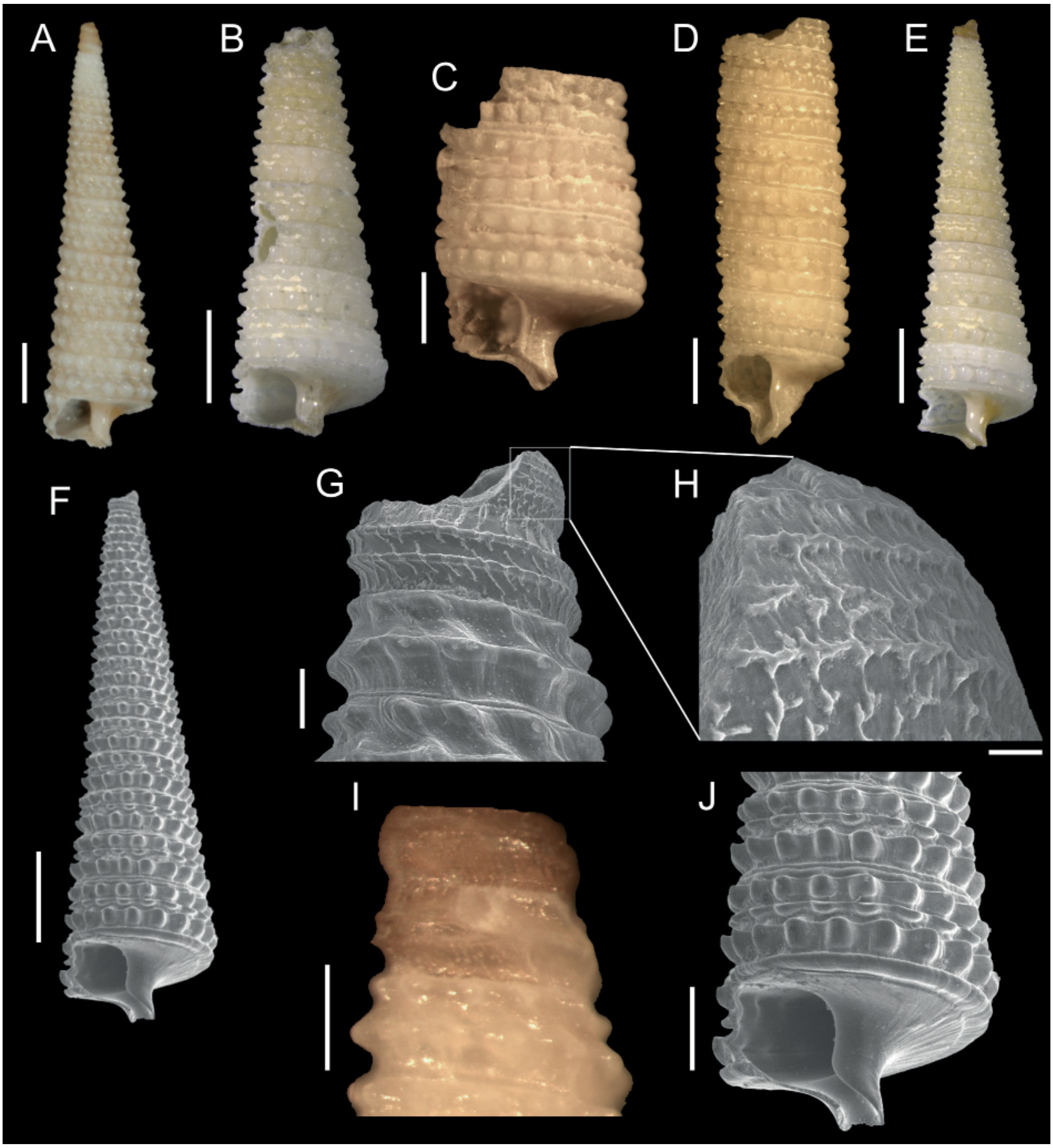

Fig. 10. *Monophorus caracca* (Dall, 1927) comb. nov. **A**. USNM 108343, lectotype, 7.1 mm. **B–E**. MNHN*, 4.42 mm, 6.84 mm, 4.50 mm and 5.74 mm, respectively. **F–J**. Same shell as E. Scale bars: A–F = 1 mm; G = 100 µm; H = 20 µm; I = 250 µm; J = 500 µm.

beginning, abapical one continuous to that of protoconch; median spiral cord emerges very weakly in sixth/seventh whorl, much close to adapical cord, gradually strengthening but not reaching same size of other cords even after eight whorls; in late whorls, the spiral cords are 2.0–3.5 × as wide as distance between them; 16 opisthocline axial ribs; rounded to elliptical nodules of medium size, pointed profile, keeled-shaped, especially in abapical cord; median spiral cord initially wavy, acquiring nodules after many whorls; distinct but somewhat shallow suture, with small sutural cord that gradually strengthens and becomes thick in late whorls; additional spiral cord emerges in very late whorls, immediately above adapical spiral cord; thick, smooth subperipheral cord, one thin and smooth basal cord much close to subperipheral cord; base and canals not formed or considerably damaged. Brown protoconch, white teleoconch.

Remarks

The present species shows a late median spiral cord of the teleoconch (Fig. 10J), a protoconch with cruciform granules and a smooth spiral zone (Fig. 10G), features which are also observed in *Monophorus* (Marshall 1983). *Monophorus caracca* (Dall, 1927) comb. nov. was described from the deep sea off Georgia (USA). After comparisons with the type material (Fig. 10A), the single minor difference being the median spiral cord emerging in the sixth/seventh whorl of the teleoconch in a Brazilian shell, but it emerging discreetly in the eighth whorl of the lectotype, being properly detected only in the tenth whorl (Rolán & Fernández-Garcés 2008). In addition, the bathymetric record of the type locality is deeper than seen in Brazil (805 m and 295 m, respectively).

Agreeing with the initial assignment of this species to the subgenus *Biforina* (currently a synonym of *Monophorus*) by Dall (1927), this species is now regarded as belonging to *Monophorus*. Although Dall (1927) did not explain the etymology of the specific name, '*caracca*' is a word in Italian which refers to large sailboats/ships used during the Great Navigations; because it is a noun, the ending remains unaltered after the new generic allocation (ICZN 1999: article 31.2).

Geographical records

USA: off Georgia (type locality). Brazil: off Espírito Santo (this study).

Bathymetric distribution

Depth: 295 m (this study) to 805 m (type locality).

Monophorus verecundus sp. nov.

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Figs 11, 23P, 57, 83

Diagnosis

Embryonic shell covered by micro-spiral threads; larval shell initially with two spiral cords, but adapical cord disappears after 0.5 to 0.75 whorl; teleoconch with brown internodular spaces, especially in the adapical spiral cord.

Etymology

The name is derived from the Latin '*verecundus*', meaning 'shy, bashful', and referring to the scarce records of this species even after an extensive revision.

Material examined

Holotype

BRAZIL – **Rio de Janeiro** • 23º12′04″ S, 40º59′42″ W, HAB 16-B5; depth 141 m; 2 Jul. 2009; MNRJ 18383*.

Other material

BRAZIL – **Rio Grande do Norte** • 1 spec.; 04º44′53″ S, 36º25′27″ W; depth 102–108 m; 23 May 2011; MNRJ 35114*. – **Rio de Janeiro** • 1 spec.; 22º42′ S, 40º40′ W; depth 110–120 m; 11 Apr. 2003; MNRJ 19479*. – **São Paulo** • 1 spec.; PADCT st. 6577; MNRJ 27843*.

Description

Shell sinistral, elongated, cyrtoconoid, slightly convex profile, up to 5.4 mm long, 1.4 mm wide, length/width ratio 3.3 to 4.0. Protoconch multispiral, conical/columnar, 4.5–5 keeled-shaped whorls, 0.49–0.52 mm long, 0.37–0.40 mm wide; embryonic shell dome-shaped, covered by about 10–12 micro-spiral threads, each composed of granules usually with somewhat pointed profile; larval shell initially with two spiral cords, but adapical cord disappears after 0.5 to 0.75 whorl, remaining abapical cord extends to end of protoconch, situated at ~46%–53% of last whorl height; ~27 slightly sigmoid axial ribs. Teleoconch with up to 11 whorls; two spiral cords (adapical and abapical) at beginning, abapical one continuous to that of protoconch, adapical cord can be slightly larger than abapical one in early whorls; median spiral cord emerges at beginning of third to beginning of fifth whorl, reaching same size of other cords after two to 2.5 whorls; on body whorl, distance between spiral cords is equal or up to 1.2 × higher than width of cords; 17–19 nearly orthocline axial ribs; rounded to elliptical (especially in median and abapical spiral cords) nodules of medium size; distinct, well-developed suture, with small sutural cord; subperipheral and adapical basal cords narrow and nodulose, wavy abapical basal cord; two apparent supranumerical cords emerge near peristome, one between median and abapical spiral cords, the other between abapical and subperipheral cords; ovate aperture, 0.70 mm long, 0.49 mm wide, length/width ratio 1.4; partly closed anterior canal, crossed in its base by projection of outer lip, 0.26 mm long, 0.21 mm wide, length/width ratio 1.2; deep posterior canal, up to 0.29 mm long, almost detached from aperture. Light brown protoconch; teleoconch with cream background, brown internodular spaces, especially in adapical spiral cord and in abapical whorls; whitened nodules.

Remarks

This species has a color pattern similar to that of *Similiphora intermedia* (C.B. Adams, 1850), but it is mainly distinguished by a protoconch with fewer whorls (4.5 to 5 whorls, Fig. 11I, vs ~6 whorls in *S. intermedia*), the embryonic shell covered by micro-spiral threads (Fig. 11J–K, instead of granules in *S. intermedia*), larval shell with one main spiral cord (Fig. 11I, but two cords in *S. intermedia*), and a different transition protoconch/teleoconch. Another species with a similar color pattern is *Triphora scylla* Fernandes & Pimenta, 2015, but *T. scylla* is somewhat darker, possessing a larval shell with two spiral cords, a late median spiral cord of the teleoconch, and thicker subperipheral and basal cords (Fernandes & Pimenta 2015).

The micro-spiral threads in the embryonic shell of *M. verecundus* sp. nov. (Fig. 11J–K) are similar to the cruciform granules often observed in this genus. Even though *Monophorus* is usually described as having two spiral cords in the larval shell (e.g., Marshall 1983), the type species *Monophorus perversus* shows a variation of one to two spiral cords (Bouchet 1985), thus not being an impediment to the present generic allocation.

Geographical records

Brazil: Rio Grande do Norte, Rio de Janeiro, São Paulo.

Bathymetric distribution

Depth: 102–141 m.

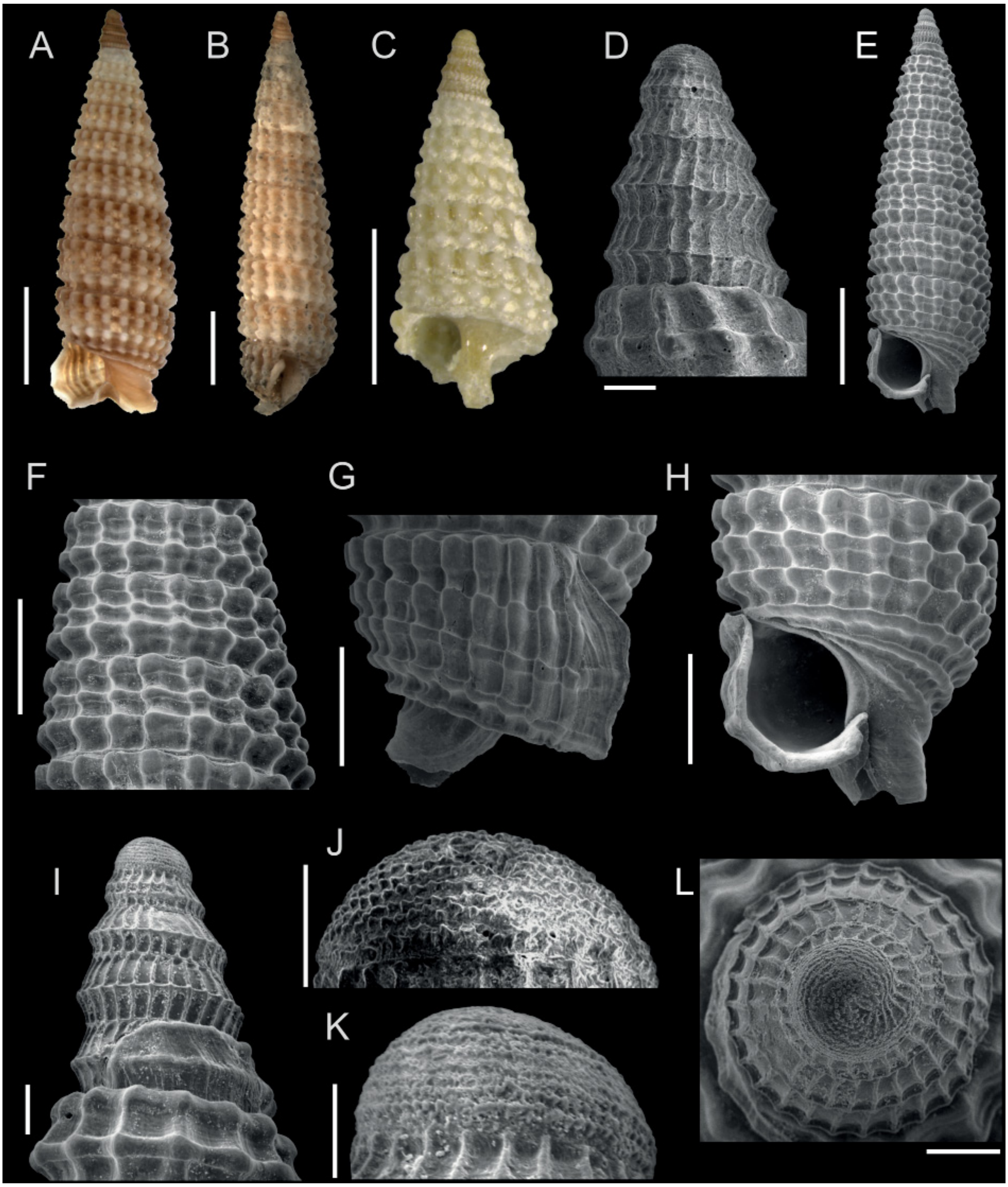

Fig. 11. *Monophorus verecundus* sp. nov. **A**. MNRJ 18383*, holotype, 4.24 mm. **B**. MNRJ 19479*, 5.40 mm. **C**. MNRJ 35114*, 2.47 mm. **D, J**. Same shell as C. **E–I, K–L**. Holotype. Scale bars: A–C, E = 1 mm; D, I, L = 100 µm; F–H = 500 µm; J–K = 50 µm.

Genus ***Nanaphora*** Laseron, 1958

Type species

Nanaphora torquesa Laseron, 1958. Original designation. Recent, eastern Australia.

Nanaphora sp. 1
Figs 12, 23S, 60

Material examined

BRAZIL – **Rio Grande do Norte** • 1 spec.; 04º41′20″ S, 36º34′45″ W; depth 145 m; 22 May 2011; MNRJ 35177*.

Description

Shell sinistral, inflated, biconical/ovoid, convex profile, 2.9 mm long, 1.2 mm wide, length/width ratio 2.5. Protoconch multispiral, conical/columnar, 0.40 mm long, 0.36 mm wide, four convex whorls; embryonic shell dome-shaped, eroded; larval shell with two spiral cords, situated at ~41% and ~66% of penultimate whorl height, the adapical cord disappears in the last whorl; ~28 nearly rectilinear axial ribs. Teleoconch with 6.5 whorls; two spiral cords (adapical and abapical) at beginning, abapical one continuous to that of protoconch; median spiral cord emerges in fourth whorl, reaching same size of

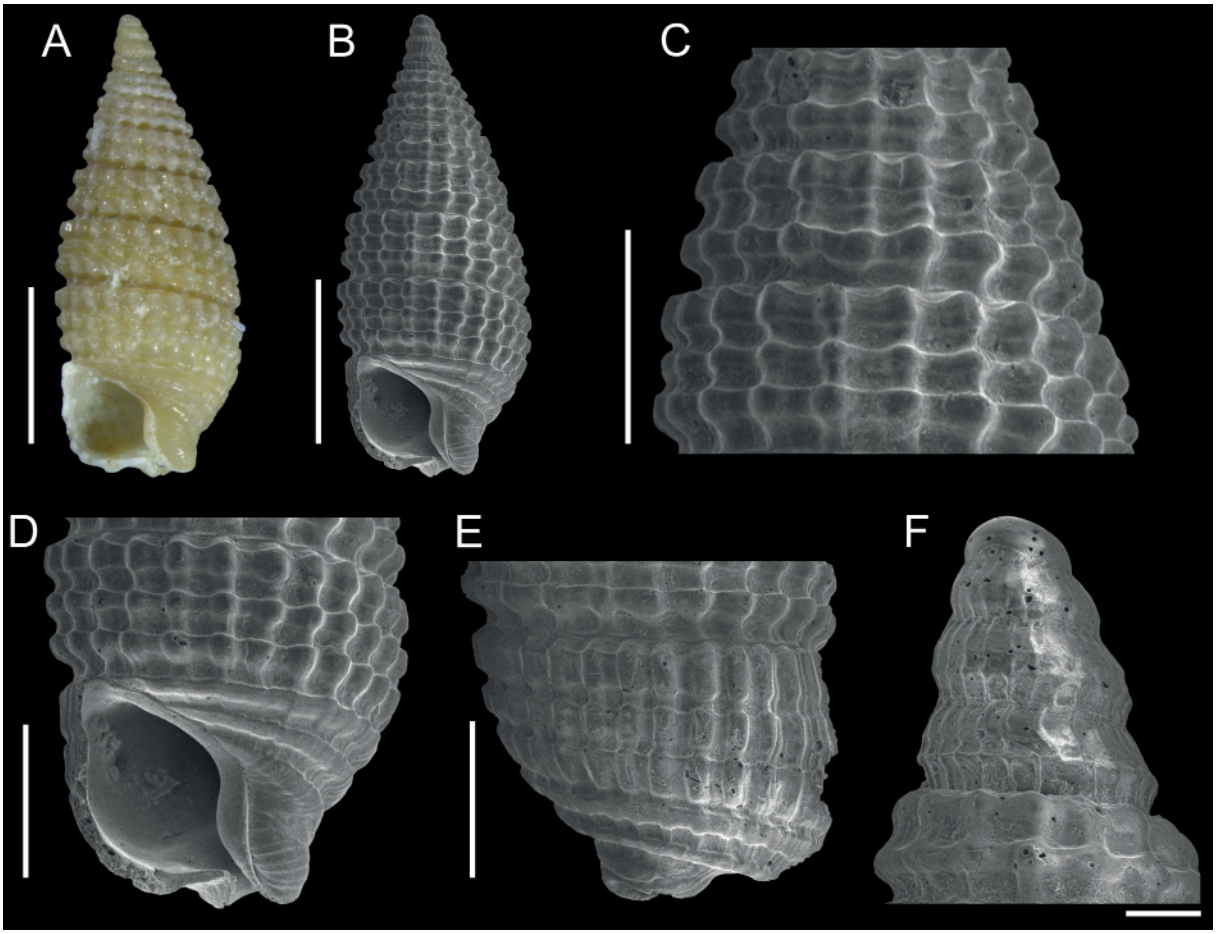

Fig. 12. *Nanaphora* sp. 1. **A–F**. MNRJ 35177*, 2.94 mm. Scale bars: A–B = 1 mm; C–E = 500 µm; F = 100 µm.

other cords after 1.5 whorl; on body whorl, spiral cords are as wide as distance between them; 24 nearly orthocline axial ribs in sixth whorl; rounded nodules of medium size; distinct suture, with very small sutural cord; wavy subperipheral cord, two nearly smooth basal cords; no supranumerical cords; elliptical aperture, 0.69 mm long, 0.44 mm wide, length/width ratio 1.5; anterior canal curved backwards/downwards, short, partially open, 0.11 mm long, 0.22 mm wide, length/width ratio 0.5; posterior canal as small sinus, 0.08 mm long. Shell beige, nodules of teleoconch slightly clearer than internodular spaces.

Remarks

The most similar species to *Nanaphora* sp. 1 is *Triphora turtlebayensis* Rolán & Lee, 2008, both sharing a distinct ovoid shell shape. However, *T. turtlebayensis* has a paucispiral protoconch and is restricted to Bermuda. *Nanaphora* sp. 1 is also superficially similar to the western Atlantic species *Nanaphora verbernei* (Moolenbeek & Faber, 1989), but mainly distinguished by an earlier emergence of the median spiral cord of the teleoconch (Fig. 12B) and by the smoothness of the subperipheral and basal cords (Fig. 12D). *Nanaphora* sp. 1 is herein regarded as belonging to this genus especially owing to its shell shape and to the small size of its protoconch, although this species has smaller nodules of the teleoconch when compared to typical species of *Nanaphora*, and its embryonic shell sculpture remains unknown due to erosion.

Geographical records

Brazil: Rio Grande do Norte.

Bathymetric distribution

Only known from 145 m depth.

Genus ***Sagenotriphora*** Marshall, 1983

Type species

Triphora ampulla Hedley, 1903. Original designation. Recent, southwestern Pacific.

Sagenotriphora albocaput sp. nov.
urn:lsid:zoobank.org:act:8BFB0B3F-052C-4299-B8D8-9E527FBC650D
Figs 13, 24B, 64

Diagnosis

Embryonic shell with irregular-shaped and vesicular granules, larval shell with two spiral cords; median spiral cord emerges in the fourth whorl of the teleoconch; protoconch white, teleoconch cream to golden-brown.

Etymology

The specific name is derived fom the Latin ‘*albus*’, meaning ‘white, clear’ and ‘*caput*’, meaning ‘summit’, and referring to its white shell apex.

Material examined

Holotype

BRAZIL – **Rio Grande do Norte** • 04º44′ S, 36º35′ W, BPot 1-MR43; depth 50 m; MNRJ 29393*.

Other material

BRAZIL – **Amapá** • 4 specs; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32568* • 3 specs; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32580* • 1 spec.; 02º21′12″ N, 48º29′54″ W; depth 72 m; MNRJ 34458*. – **Rio Grande do Norte** • 1 spec.; BPot 1-MR32; MNRJ 29394* • 4 specs; BPot 1-MR32; MNRJ 31652* • 15 specs; BPot 1-MR41; MNRJ 31586* • 5 specs; BPot 1-MR42; MNRJ 29395* • 35 specs; BPot 1-MR42; MNRJ 31587* • 28 specs; same collection data as for holotype; MNRJ 31588* • 8 specs; BPot 1-MR44; MNRJ 31589* • 1 spec.; BPot 2-MR32; MNRJ 31656* • 4 specs; BPot 2-MR41; MNRJ 31638* • 14 specs; BPot 2-MR42; MNRJ 31636* • 19 specs; BPot 2-MR44; MNRJ 31639* • 7 specs; BPot 2-MR45; MNRJ 31646*. – **Fernando de Noronha Archipelago** • 2 specs; Jan. 1979; MORG 20634*.

Description

Shell sinistral, small, elongated, cyrtoconoid, slightly convex profile, up to 3.5 mm long, 1.1 mm wide, length/width ratio 2.7 to 3.1. Protoconch multispiral, conical, 4–4.25 whorls, 0.40–0.45 mm long, 0.35–0.39 mm wide; embryonic shell dome-shaped, covered by irregular, often rounded granules, and vesicular, axially-disposed granules appearing predominantly in the final and abapical portion of embryonic shell, resulting in axial ribs of the larval shell; larval shell with two spiral cords, situated at 29%–37% and 60%–65% of last whorl height; ~34 nearly rectilinear axial ribs; transition to the teleoconch defined by an often inconspicuous scar. Teleoconch with up to eight whorls; two spiral cords (adapical and abapical) at the beginning, the abapical one continuous to that of the protoconch; median spiral cord emerges in the fourth whorl (rarely at the end of the third or at the very beginning of the fifth whorl), reaching same size of abapical cord (adapical one slightly more prominent in late whorls) after 2.0 to 2.5 whorls; on the body whorl, the spiral cords are 1.1–1.8 × as wide as the distance between them; 19–21 nearly orthocline axial ribs; rounded nodules of medium size; distinct, well-developed suture, with a small sutural cord; slightly wavy to nearly smooth subperipheral cord, two smooth basal cords; three distinct supranumerical cords, one between median and abapical spiral cords, another between abapical and subperipheral cords, and a small one between subperipheral and adapical basal cords; ovate aperture, 0.51–0.60 mm long, 0.42–0.53 mm wide, length/width ratio 1.1 to 1.4; anterior canal moderately short, curved backwards/downwards, partly or almost closed, 0.16–0.23 mm long, 0.12–0.16 mm wide, length/width ratio 1.0–1.7; deep posterior canal, 0.12 mm long, not detached from aperture. White protoconch, cream to golden-brown teleoconch.

Remarks

The generic placement of this species was based on the sculpture of the embryonic shell (Fig. 13L–M), the presence of two continuous spiral cords in the larval shell (Fig. 13I–K), the smooth subperipheral and basal cords (Fig. 13H), and the presence of supranumerical cords (Fig. 13G). Although not all of them are shared with the type species *Sagenotriphora ampulla* (Hedley, 1903), these features are quite similar to those of *Sagenotriphora osclausum* (Rolán & Fernández-Garcés, 1995) and *Sagenotriphora candidula* Rolán & Lee, 2008 (Fig. 14), but *S. albocaput* sp. nov. is unique by having a white protoconch and a cream to golden-brown teleoconch (Fig. 13A–D). This coloration is similar to that of *Isotriphora tricingulata*, but the latter species has a paucispiral protoconch (Fig. 3I).

Geographical records

Brazil: Amapá, Rio Grande do Norte and Fernando de Noronha.

Bathymetric distribution

Depth: 20–72 m.

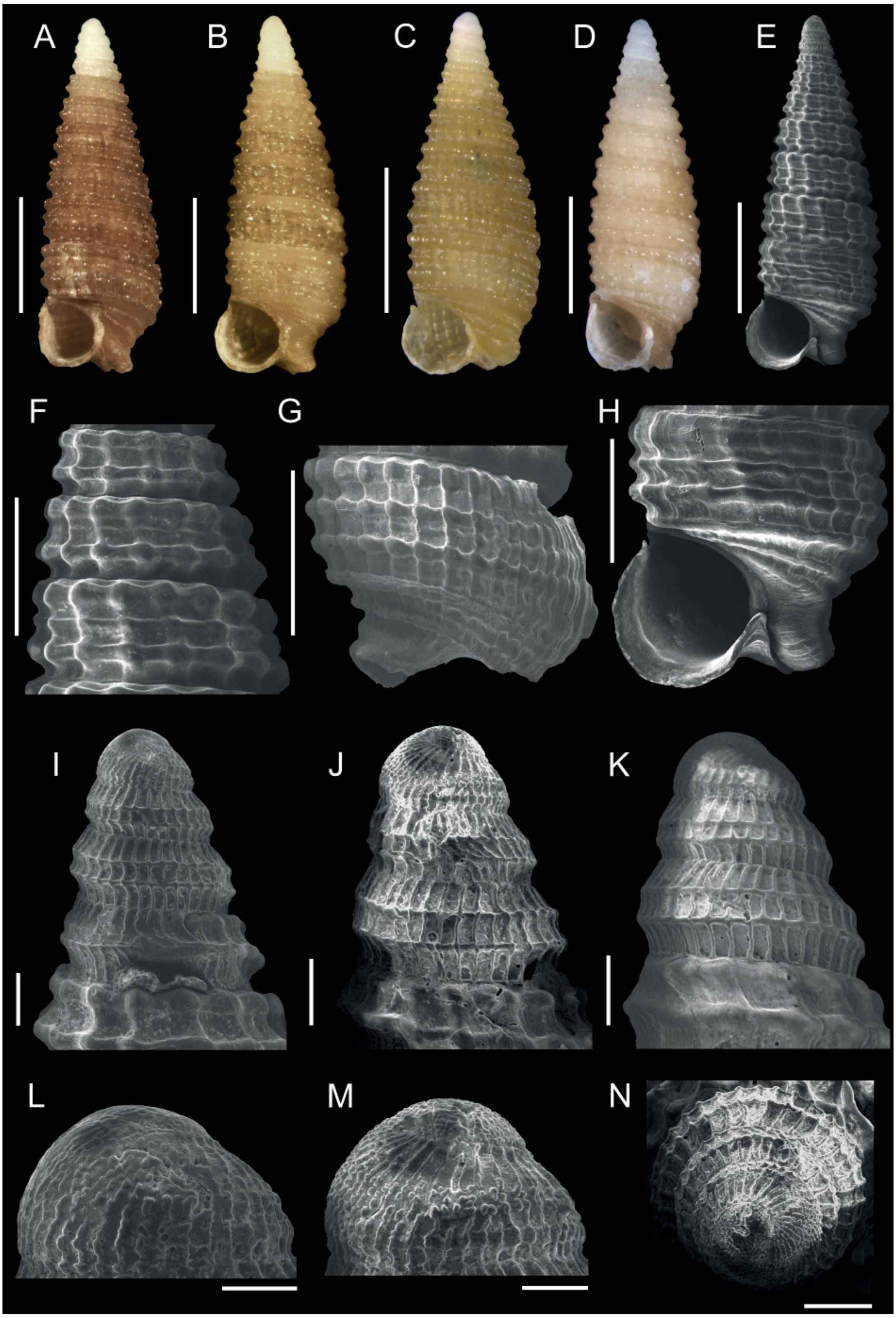

Fig. 13. *Sagenotriphora albocaput* sp. nov. **A**. MNRJ 29393*, holotype, 2.84 mm. **B**. MNRJ 29394*, 3.00 mm. **C**. MORG 20634*, 2.49 mm. **D**. MNRJ 32580*, 2.82 mm. **E–F, H**. Same shell as B. **G, J, M–N**. MNRJ 29395*. **I, L**. MNRJ 31652*. **K**. Same shell as D. Scale bars: A–E = 1 mm; F–H = 500 µm; I–K, N = 100 µm; L–M = 50 µm.

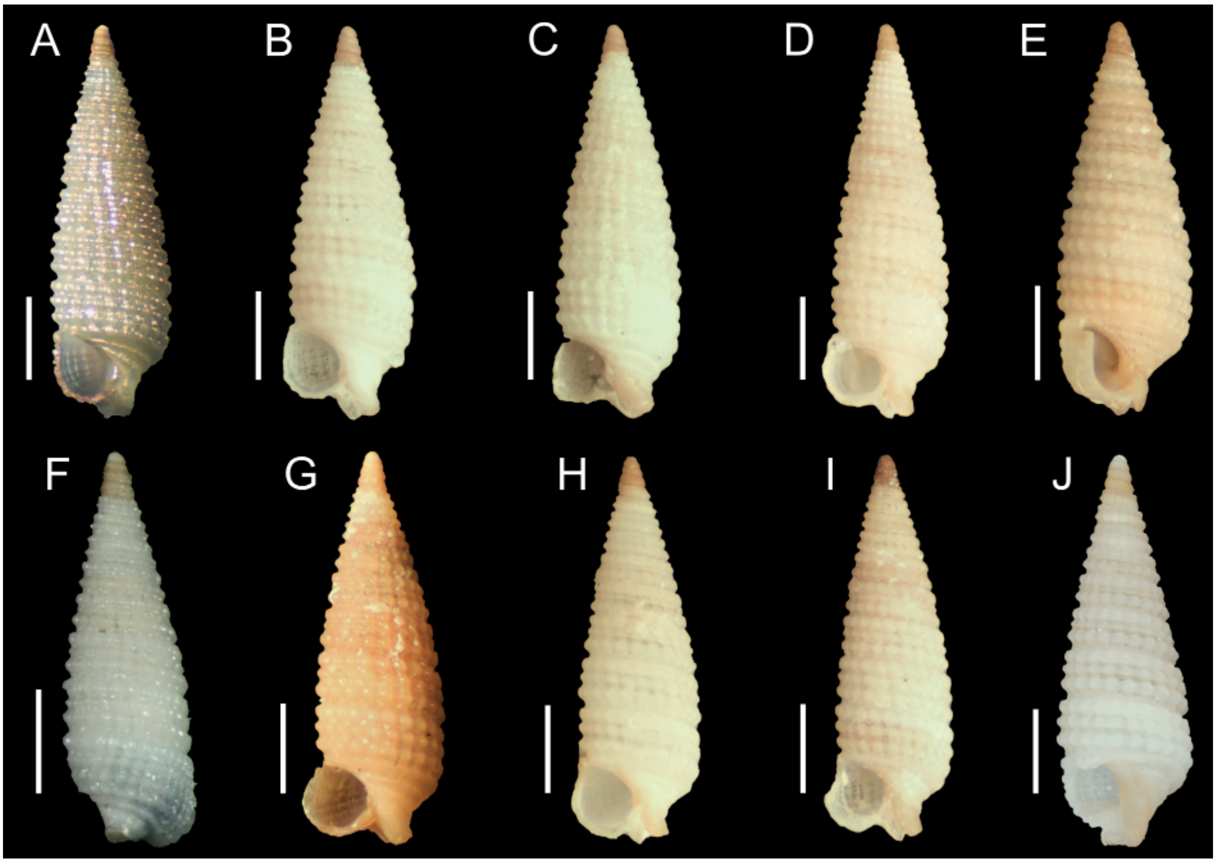

Fig. 14. Types of *Sagenotriphora candidula* Rolán & Lee, 2008. **A**. FLMNH 419189, holotype, 5.00 mm. **B–E**. FLMNH 249739, paratypes, 4.46 mm, 4.44 mm, 4.77 mm and 4.18 mm, respectively. **F**. BMSM 15202, paratype, 3.80 mm. **G**. FLMNH 178388, paratype, 4.38 mm. **H**. FLMNH 154860, paratype, 4.51 mm. **I**. FLMNH 127829, paratype, 4.44 mm. **J**. USNM 1112659, paratype, 4.66 mm. Scale bars: 1 mm.

Sagenotriphora **sp. 1**
Figs 15, 24D, 63

Material examined

BRAZIL – **Amapá** • 12 specs; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32560* • 3 specs; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32561* • 18 specs; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32562* • 7 specs; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32579* • 1 spec.; GEOMAR II st. 124; MNRJ 33792* • 3 specs; 02º21′12″ N, 48º29′54″ W; depth 72 m; Mar. 1997; MNRJ 34457*.

Description

Shell sinistral, elongated, cyrtoconoid, slightly convex profile in adult shells, up to 5.4 mm long, 1.6 mm wide, length/width ratio 2.9 to 3.1. Protoconch multispiral, conical, 4–4.5 convex whorls, 0.40–0.46 mm long, 0.36–0.40 mm wide; embryonic shell dome-shaped, covered by irregular-shaped granules, vesicular/axially-disposed granules appearing in the final and abapical portion of embryonic shell, resulting in axial ribs of larval shell; larval shell with two spiral cords, situated at ~27%–29% and ~60%–61% of last whorl height; ~32 nearly rectilinear to slightly sigmoid axial ribs. Teleoconch with up to ten whorls; two spiral cords (adapical and abapical) at beginning, abapical one continuous to that of protoconch; median spiral cord emerges in fourth or fifth whorl, reaching same size of other cords after 1.5–2.5 whorls; on body whorl, the spiral cords are 0.8–1.3 × as wide as the distance between them; 19–20 nearly orthocline to slightly opisthocline axial ribs; rounded to slightly elliptical nodules, medium to moderately small size; distinct, well-developed suture, with small sutural cord; wavy subperipheral cord, usually not developing nodules, two thick and slightly wavy to smooth basal cords; three strong

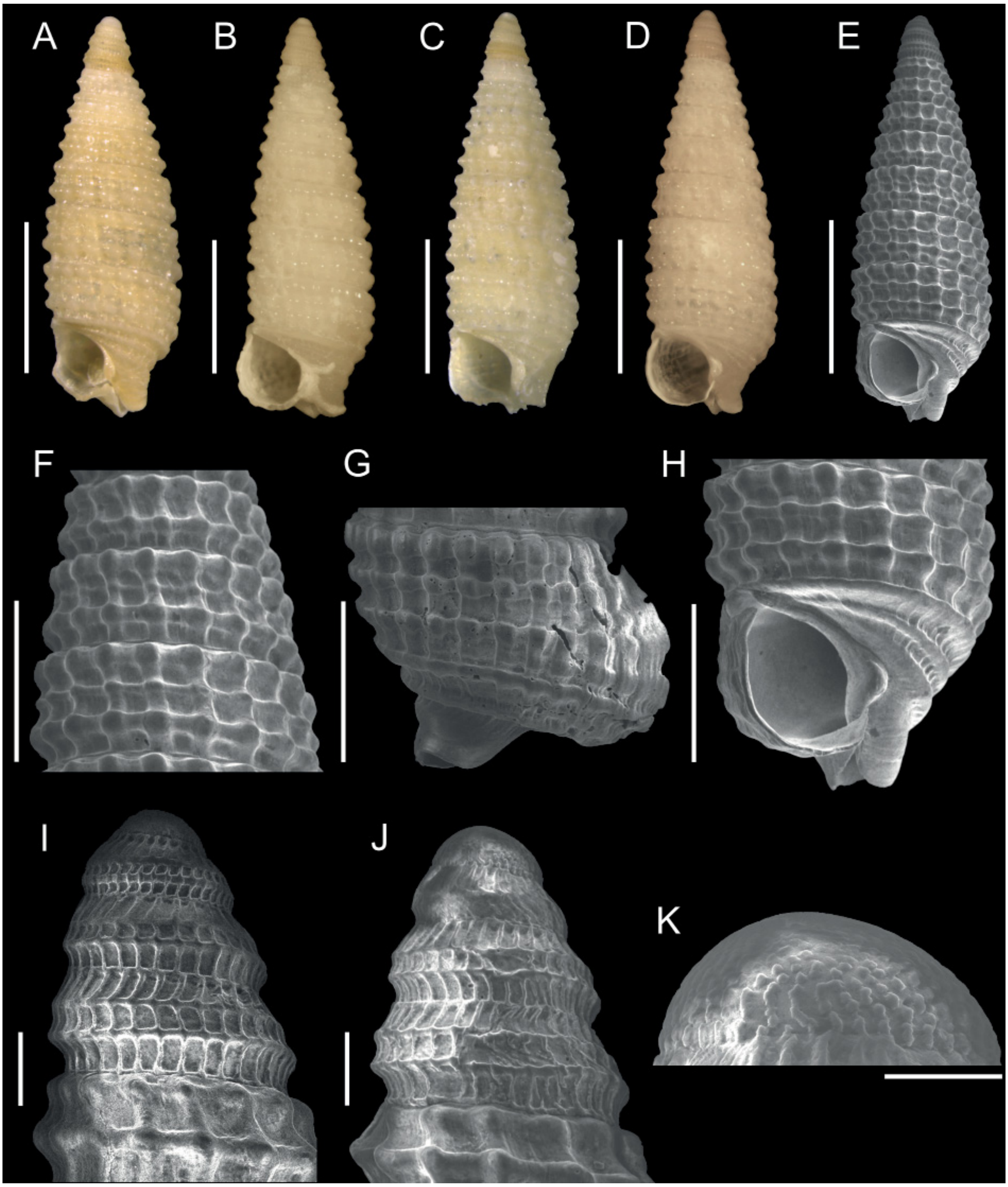

Fig. 15. *Sagenotriphora* sp. 1. **A**. MNRJ 34457*, 2.66 mm. **B**. MNRJ 32560*, 2.82 mm. **C**. MNRJ 32562*, 2.95 mm. **D–E**. MNRJ 32579*, 2.83 mm. **F, H–I**. Same shell as D. **G**. Same shell as B. **J–K**. MNRJ 32560. Scale bars: A–E = 1 mm; F–H = 500 µm; I–J = 100 µm; K = 50 µm.

supranumerical cords, one between median and abapical spiral cords, other between abapical and subperipheral cords, another between subperipheral and adapical basal cords; ovate to elliptical aperture, with slightly projected outer lip, 0.50–0.61 mm long, 0.33–0.48 mm wide, length/width ratio 1.3–1.5; anterior canal short, curved backwards/downwards, partly or almost closed, 0.16–0.23 mm long, 0.14–0.17 mm wide, length/width ratio 1.0–1.6; posterior canal is deep sinus, almost detached from aperture, 0.08–0.12 mm long. Light brown to cream-white protoconch, dirty-white to cream-white teleoconch.

Remarks

Sagenotriphora sp. 1, sampled near the mouth of the Amazon River, is similar in several shell features to *S. candidula* from Florida (USA). The most distinct aspect is the variable shell color of *Sagenotriphora* sp. 1. It varies from a light brown protoconch and white teleoconch, similar but not equal to typical *S. candidula* (Fig. 14, usually much clearer than Brazilian shells), to a whitened protoconch or even an almost cream teleoconch in other shells (Fig. 15A–D), which is somewhat similar to the common western Atlantic species *S. osclausum*. The white appearance of *S. candidula* is much more common than the gold appearance of *S. osclausum* in the examined material of *Sagenotriphora* sp. 1. It is plausible that *Sagenotriphora* sp. 1 is a third species of this genus in the western Atlantic, considering the impact of the Amazon River in this region (see Discussion). Once again, the study of soft parts is crucial, as *S. osclausum* and *S. candidula* were mainly distinguished by radular morphology, in addition to differences in shell color (Rolán & Fernández-Garcés 2008). Nevertheless, a few shells of *S. osclausum* are also found among the paratypes of *S. candidula* (Fig. 14G).

Geographical records

Brazil: Amapá.

Bathymetric distribution

Depth: 72–103 m.

Sagenotriphora sp. 2

Figs 16, 24E, 64

Material examined

BRAZIL – **Rio de Janeiro** • 1 spec.; REVIZEE-Central C1-D3; IBUFRJ 19556.

Description

Shell sinistral, elongated, cyrtoconoid, slightly convex profile, 3.1 mm long, 1.1 mm wide, length/width ratio 2.8. Protoconch multispiral, conical, 4.5 convex whorls, 0.48 mm long, 0.36 mm wide; embryonic shell dome-shaped, covered by irregular-shaped granules, vesicular granules appearing in final and abapical portion of embryonic shell, resulting in axial ribs of larval shell; larval shell with two spiral cords, situated at ~27% and ~58% of last whorl height; 33 nearly rectilinear to slightly sigmoid axial ribs. Teleoconch with seven whorls; two spiral cords, abapical one continuous to that of protoconch, median spiral cord absent; spiral cords initially with same strength, abapical cord becomes broader betwen beginning of fourth and end of fifth whorls, but adapical cord becomes most developed in following whorls; on body whorl, spiral cords are 1.4 × as wide as distance between them; weak axial ribs, irregularly disposed, orthocline to slightly opisthocline; rounded and very close nodules (with reduced internodular spaces), with medium to large size, according to thickness of spiral cord; well-developed and spaced suture, with strong and wavy sutural cord; subperipheral and two basal cords spaced and wavy, sometimes developing minute nodules, especially in subperipheral cord; two very small supranumerical cords appear near peristome, one between adapical and abapical spiral cords, other between abapical and subperipheral cords; elliptical aperture, 0.62 mm long, 0.41 mm wide, length/width ratio 1.5; totally open anterior canal, curved downwards, 0.20 mm long, 0.22 wide, length/width ratio 0.9; posterior canal is deep notch, 0.17 mm long, not detached from aperture. Beige teleoconch, light brown protoconch, darker than teleoconch.

Remarks

The protoconch of *Sagenotriphora* sp. 2 is very similar to that of *S. osclausum*, with the embryonic shell possessing vesicular granules (Fig. 16G) and the larval shell with two median spiral cords of equal strength (Fig. 16F), in addition to a similar shell color. Their main differences comprise *Sagenotriphora* sp. 2 not developing a median spiral cord until the end of the seventh whorl of teleoconch (whereas such cord emerges in the fourth or fifth whorl in *S. osclausum*), but showing a change of thickness of spiral cords throughout the teleoconch (Fig. 16B–C) (whereas cords with nearly the same thickness in *S. osclausum*). In addition, *Sagenotriphora* sp. 2 has a considerable development of the suture and very reduced internodular spaces in spiral cords of teleoconch (internodular spaces more developed in *S. osclausum*). This species is tentatively placed in *Sagenotriphora* solely due to its resemblance with *S. osclausum*.

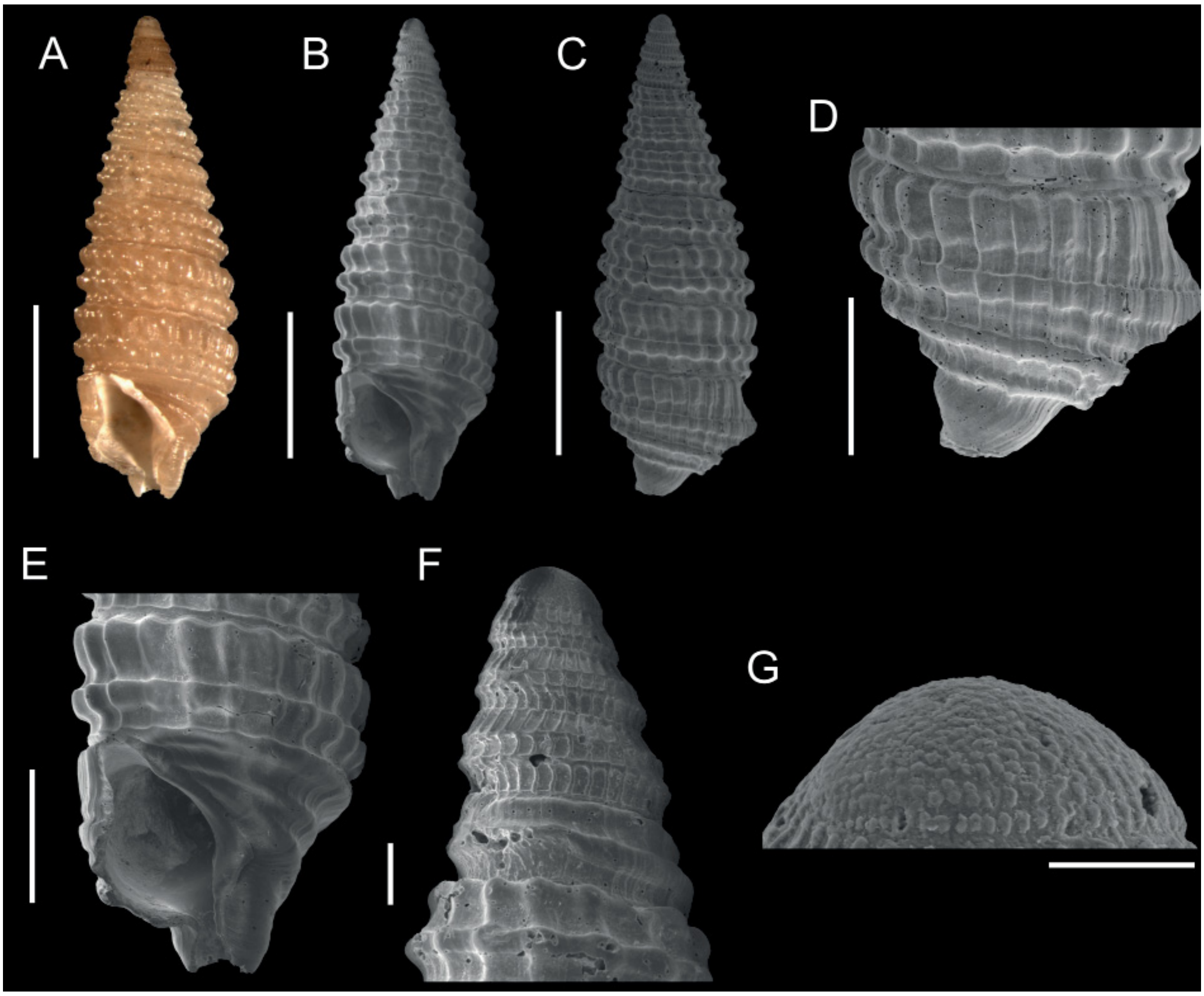

Fig. 16. *Sagenotriphora* sp. 2. **A–G**. IBUFRJ 19556, 3.09 mm. Scale bars: A–C = 1 mm; D–E = 500 µm; F = 100 µm; G = 50 µm.

Geographical records

Brazil: Rio de Janeiro.

Bathymetric distribution

Only known from 80 m depth.

Genus ***Similiphora*** Bouchet, 1985

Type species

Triphora similior Bouchet & Guillemot, 1978. Original designation. Recent, northeastern Atlantic and Mediterranean.

Similiphora lucida sp. nov.
urn:lsid:zoobank.org:act:A3AA98F7-3D0C-4487-9857-82223BBF954E
Figs 17, 24G, 66

Diagnosis

Median spiral cord usually emerges in the third or fourth whorl of the teleoconch; snow-white shell, adapical spiral cord of the teleoconch usually with a faint to much distinct brown color throughout mid-late whorls.

Etymology

The specific name is derived from the latin '*lucidus*', meaning 'lucid, bright' and alluding to the white shell color.

Material examined

Holotype

BRAZIL – **Maranhão** • 01º53′ S, 43º20′ W; depth 33 m; 22 Nov. 2008; MZSP 92075.

Other material

BRAZIL – **Amapá** • 2 specs; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32565*• 1 spec.; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32578* • 2 specs; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32581* • 1 spec.; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32584*. – **Rio Grande do Norte** • 10 specs; BPot 1-MR32; MNRJ 31602* • 4 specs; BPot 1-MR41; MNRJ 31603* • 3 specs; BPot 1-MR42; MNRJ 31604* • 7 specs; BPot 1-MR43; MNRJ 31605* • 1 spec.; BPot 1-MR44; MNRJ 31606* • 1 spec.; BPot 1-MR45; MNRJ 31607* • 1 spec.; BPot 2-MR32; MNRJ 31608* • 1 spec.; BPot 2-MR34; MNRJ 31609* • 2 specs; BPot 2-MR41; MNRJ 31610* • 6 specs; BPot 2-MR42; MNRJ 31611* • 1 spec.; BPot 2-MR44; MNRJ 29396* • 1 spec.; BPot 2-MR44; MNRJ 31612*.

Description

Shell sinistral, elongated, cyrtoconoid, nearly rectilinear profile, up to 4.7 mm long, 1.3 mm wide, length/width ratio 3.2 to 3.4. Protoconch multispiral, conical, five to 5.5 convex whorls, 0.54–0.65 mm long, 0.41–0.49 mm wide; embryonic shell dome-shaped, entirely covered by small rounded granules; larval shell with two faint and close spiral cords occupying mid (adapical cord) and abapical (abapical cord) portion of each whorl, respectively situated at ~45%–46% and ~66%–72% of last whorl height; abapical cord weakening and disappearing before transition to teleoconch; ~30 rectilinear to slightly sigmoid axial ribs. Teleoconch with up to 9.5 whorls; two spiral cords (adapical and abapical) at beginning, the abapical one continuous to adapical cord of protoconch; median spiral cord emerging in third or fourth whorl (rarely as late as beginning of fifth whorl), reaching same size of abapical cord (adapical one slightly more prominent in late whorls) after one to two whorls; on body whorl, spiral cords are 1.0–1.4 × as wide as distance between them; 17–20 orthocline to slightly opisthocline axial ribs; rounded to

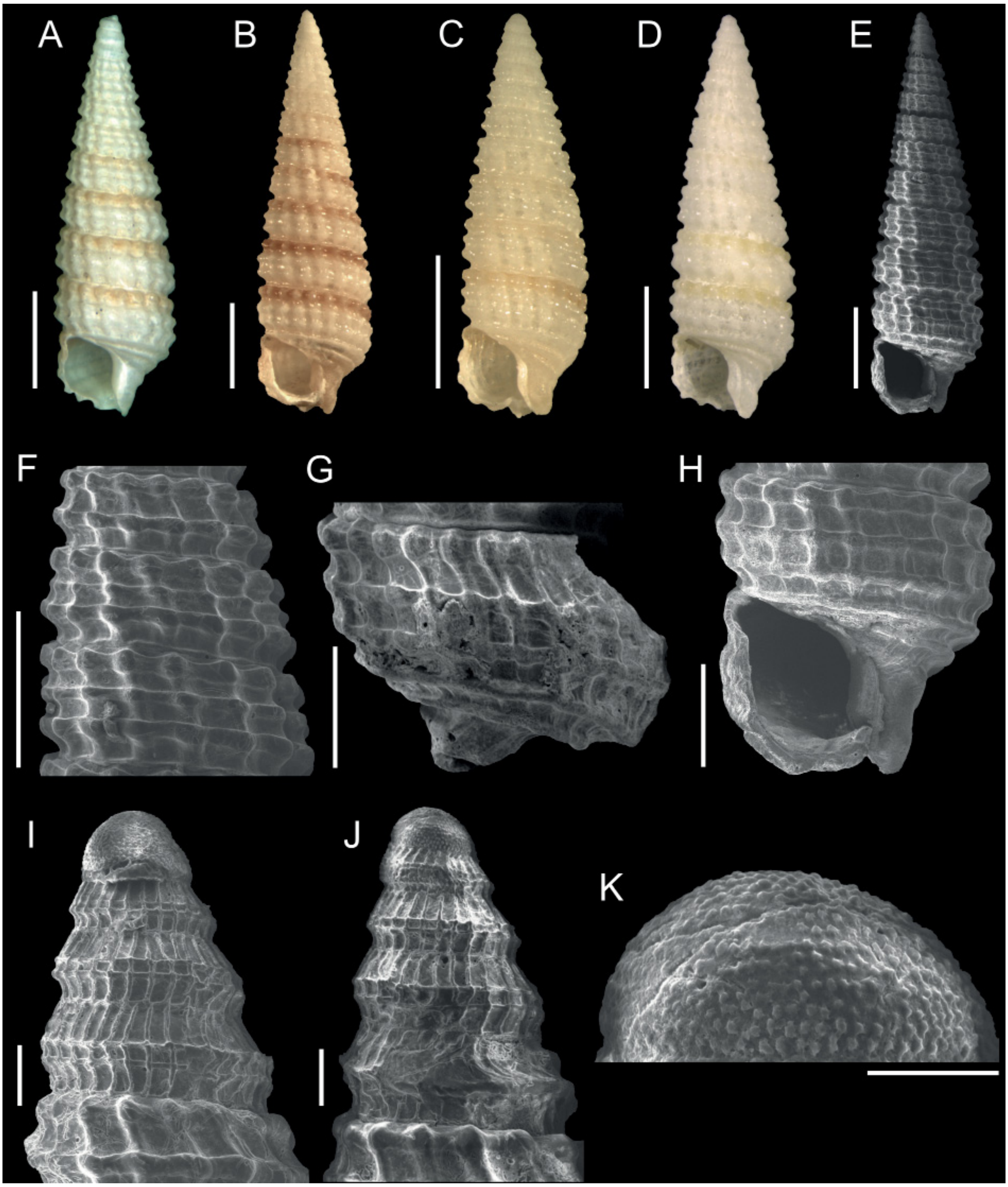

Fig. 17. *Similiphora lucida* sp. nov. **A**. MZSP 92075, holotype, 4.14 mm. **B**. MNRJ 29396*, 4.73 mm. **C**. MNRJ 31603*, 2.84 mm. **D**. MNRJ 31602*, 3.97 mm. **E–H**. Same shell as B. **I–K**. Same shell as C. Scale bars: A–E = 1 mm; F–H = 500 µm; I–J = 100 µm; K = 50 µm. Photo credits A: Daniel Abbate (MZUSP).

slightly elliptical (especially in abapical cord), medium-sized nodules; distinct, well-developed suture, with small sutural cord; wavy subperipheral cord, usually not developing nodules, two slightly wavy to smooth basal cords; small supranumerical cord may emerge between median and abapical spiral cords; ovate aperture, 0.55–0.72 mm long, 0.42–0.51 mm wide, length/width ratio 1.3–1.4; anterior canal short, curved downwards, widely open, but almost crossed in its base by projection of outer lip, 0.18–0.24 mm long, 0.19–0.29 mm wide, length/width ratio 0.8–0.9; posterior canal is small to considerably deep and wide sinus, 0.12–0.19 mm long, not detached from aperture. Snow-white shell, but adapical spiral cord of teleoconch usually acquires faint to much distinct brown color throughout mid-late whorls; base usually white.

Remarks

Similiphora lucida sp. nov. is markedly different from any other triphorid, especially considering the typical larval shell of the genus (Fig. 17I–J) and the pattern of shell coloration. Some intraspecific variation exists in shells of *S. lucida* sp. nov., mainly related to the emergence of the median spiral cord of the teleoconch and the coloration of the adapical spiral cord, white to weakly or distinctly tinted with brown (Fig. 17A–D).

Geographical records

Brazil: Amapá, Maranhão and Rio Grande do Norte.

Bathymetric distribution

Depth: 20–58 m.

Similiphora sp. 1

Figs 18B–L, 24H, 67

Material examined

BRAZIL – **Amapá** • 15 specs; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32566* • 4 specs; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32567* • 5 specs; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32582* • 1 spec.; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32585* • 1 spec.; GEOMAR II st. 124; MNRJ 33793* • 1 spec.; AMASSEDS st. 4134; MORG 52262 • 3 specs; AMASSEDS st. 3210; MNRJ 33800*.

BRITISH GUYANA • 1 spec.; 08º53′ N, 59º04′ W, R/V Chain Cruise 35, st. 42; depth 73–82 m; 29 Apr. 1963; MCZ 274232.

FRENCH GUYANA • 1 spec.; 06º18′ N, 52º13′ W; depth 95–97 m; 8 Aug. 2014; OC. Ship Hermano Gines leg.; MNHN-IM-2012-43226.

Other material (not included in the description)
BRAZIL – **Pará** • 1 spec.; GEOMAR II st. D; MORG 16441*.

Description

Shell sinistral, elongated, cyrtoconoid, rectilinear to slightly convex profile, up to 3.7 mm long, 1.1 mm wide, length/width ratio 3.2 to 3.3. Protoconch multispiral, conical, 5.5–6.0 very convex whorls, 0.58–0.70 mm long, 0.45–0.52 mm wide; embryonic shell dome-shaped, covered by small rounded granules in its abapical portion; larval shell with two faint and close spiral cords occupying the mid (adapical cord) and abapical (abapical cord) portion of each whorl, respectively situated at ~49% and ~74% of last whorl height, adapical cord emerging later at beginning of larval shell, abapical one weakening and disappearing before transition to teleoconch; ~34 rectilinear to slightly sigmoid axial ribs. Teleoconch with up to eight whorls; two spiral cords (adapical and abapical) at beginning, abapical one continuous to adapical cord of protoconch; median spiral cord emerges in third to fifth whorl, reaching same size of other cords after one to two whorls, adapical cord slightly more prominent than other cords in late

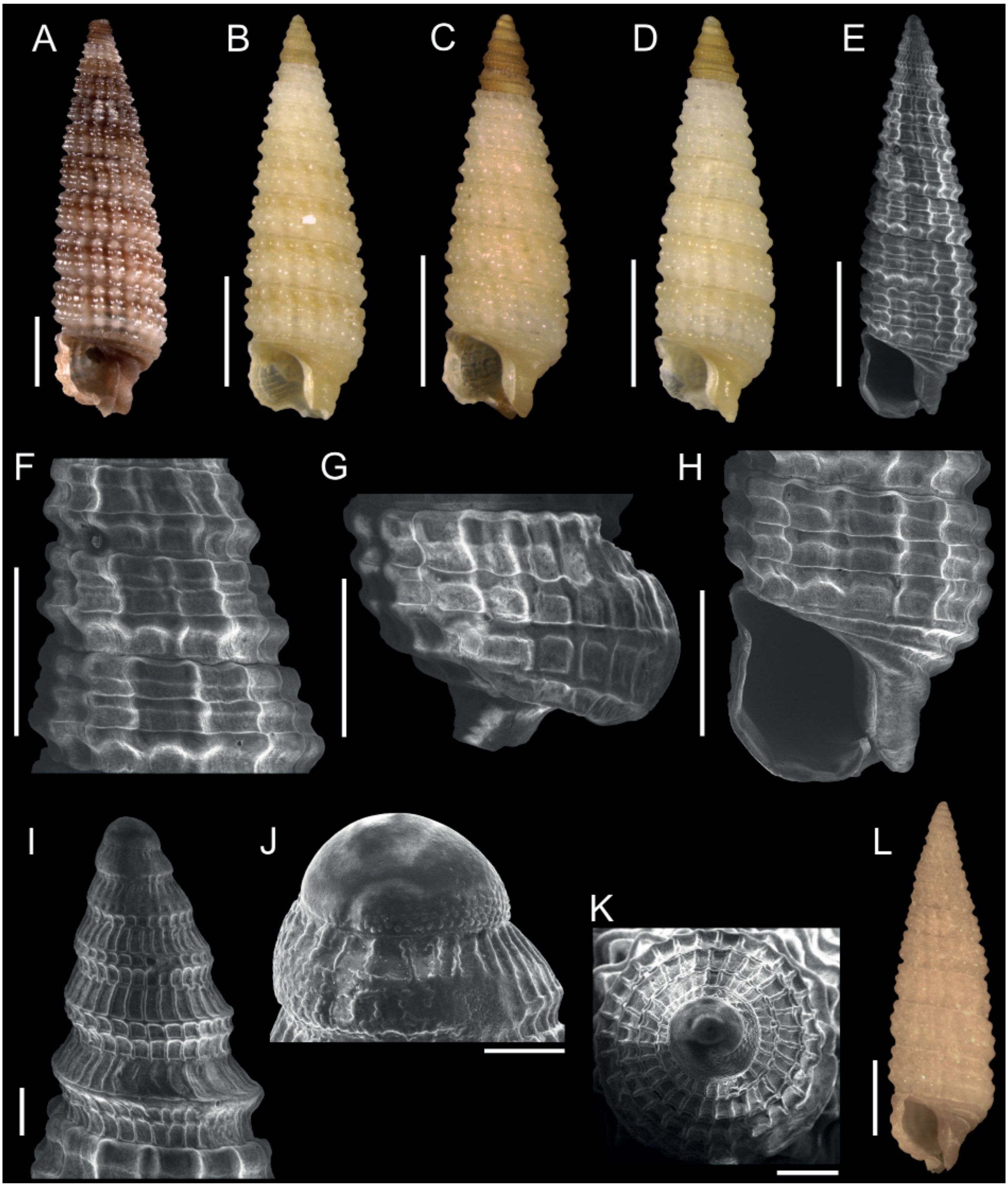

Fig. 18. A. *Similiphora apexdiversus* (Rolán & Lee, 2008) comb. nov., holotype, FLMNH 363887. **B–L**. *Similiphora* sp. 1. **B–D**. MNRJ 32566*, 3.75 mm, 3.17 mm and 3.25 mm, respectively. **E–K**. Same shell as C. **L**. MORG 16441*, 5.18 mm. Scale bars: A–E, L = 1 mm; F–H = 500 µm; I, K = 100 µm; J = 50 µm.

whorls of some shells; on body whorl, spiral cords are 1.2–1.4 × as wide as distance between them; 16–17 nearly orthocline axial ribs; rounded nodules, with medium size; distinct, well-developed suture, with small sutural cord; wavy subperipheral cord, usually not developing nodules, two nearly smooth basal cords; no supranumerical cords; ovate aperture, 0.54–0.61 mm long, 0.44–0.51 mm wide, length/width ratio 1.2; anterior canal moderately short to medium-sized, curved downwards, open, but almost crossed at its base by the projection of outer lip, 0.18–0.26 mm long, 0.13–0.18 mm wide, length/width ratio 1.0–2.0; posterior canal is wide sinus, 0.10–0.17 mm long, not detached from aperture. Protoconch light brown; teleoconch with whitish background, adapical spiral cord may be or not slightly darker, with faint cream-brownish coloration; base may be or not slightly darker.

Remarks

Similiphora sp. 1 is very similar to the widespread western Atlantic species *S. intermedia* and an endemic species from Florida (USA), *Similiphora apexdiversus* (Rolán & Lee, 2008) comb. nov. (Fig. 18A), previously allocated to *Marshallora* despite the typical protoconch of *Similiphora* (Rolán & Fernández-Garcés 2008: fig. 8g). *Similiphora* sp. 1 apparently has smaller adult shells and a whitened teleoconch (sometimes with a faint cream-brownish band in the adapical spiral cord), instead of the distinct brown spiral bands in *S. intermedia* and the slightly darker teleoconch of *S. apexdiversus* comb. nov. The absence of soft parts and the great similarity with the two above-mentioned species preclude the description of *Similiphora* sp. 1 as a new species.

The moderately large shell of MORG 16441 (Fig. 18L) does not fit exactly into the definition of *Similiphora* sp. 1. That shell is homogeneously cream, reaching 5.2 mm to nine whorls of the teleoconch, instead of *Similiphora* sp. 1 (up to 3.7 mm, eight whorls).

Geographical records

British Guyana; French Guyana; Brazil: Amapá.

Bathymetric distribution

Depth: 45–103 m.

Some considerations to species previously recorded from Brazil

Genus ***Coriophora*** Laseron, 1958

Type species

Coriophora negrita Laseron, 1958. Original designation. Recent, western Pacific.

Coriophora novem (Nowell-Usticke, 1969)
Fig. 19, 22H, 30, 83

Triphora novem Nowell-Usticke, 1969: 12, pl. 2 fig. 403.

Triphora novem – De Jong & Coomans 1988: 49, pl. 34 fig. 236. — Moolenbeek & Faber 1989: 80. — Boyko & Cordeiro 2001: 122.
Triphora sp. indet. A – Odé 1989: 111, fig. 6.
Marshallora sp. 1 – Leal 1991: 121, pl. 16 figs h–i.
Mesophora aff. *novem* – Rolán & Fernández-Garcés 1995: 11, figs 12–16.
Mesophora novem – Rolán & Fernández-Garcés 1995: 11, figs 8–11; 2007: 23, pl. 4 figs 1–5. — Redfern 2001: 67, pl. 33 fig. 282; 2013: 129, fig. 367. — Espinosa *et al*. 2007: 74; 2012: 257. — Lee 2009: 90. — Tunnell *et al*. 2010: 205. — Garcia & Lee 2011. — García 2016: 106.

Coriophora novem – Zhang 2011: 101, fig. 299 (*Mesophora novem*). — Özdikmen 2013: 255. — Fernandes *et al*. 2013: 12, figs 12, 23, 33. — Rolán & Fernández-Garcés 2015: 54, pl. 4 fig. i. — Hewitt & van Leeuwen 2017: 54. — Lamy & Pointier 2018: 284, pl. 91 fig. 4.

Material examined

Holotype

VIRGIN ISLANDS • AMNH 195419.

Other material

BELIZE • 1 spec.; Carrie Bow Cay; 16º47′30″ N, 88º04′42″ W; 27 May 1972; R. Houbrick leg.; USNM 879550.

BONAIRE • 1 spec.; Nukove; 21 m; 14 Feb. 1998; MNRJ 32363*.

BRAZIL – **Amapá** • 1 spec.; GEOMAR III st. 181; UFC-Labomar 1894. – **Rio Grande do Norte** • 1 spec.; BPot 1-MR43; MNRJ 31542* • 2 specs; BPot 1-MR45; MNRJ 31543* • 1 spec.; BPot 2-MR45; MNRJ 31544* • 1 spec.; 04º44′53″ S, 36º25′27″ W; depth 102–108 m; 23 May 2011; MNRJ 35118*. – **Pernambuco** • 1 spec.; Porto de Galinhas, Ipojuca; 5 Oct. 1982; UFRPE. – **Alagoas** • 4 specs; Maceió; Jaraguá; MORG 18264 • 37 specs; Maceió; Jaraguá; MORG 33736. – **Bahia** • 3 specs; Salvador; Itapuã; MORG 16385• 4 specs; Salvador; Itapuã; MORG 33727 • 9 specs; Salvador; Itapuã; MORG 52615 • 1 spec.; Salvador; Itapuã; MORG 33742 • 1 spec.; Salvador; Itapuã; MZSP 133316 • 1 spec.; Salvador, beach drift; Apr. 1981; J.C. Tarasconi leg.; MNRJ 29366* • 2 specs; Salvador; MZSP 64881 • 1 spec.; 13º25′43″ S, 38º49′30″ W; depth 33 m; MNRJ 33085* • 5 specs; Ilhéus MNRJ 32374* • 1 spec.; Ilhéus MNRJ 32975* • 1 spec.; REVIZEE-Central C5-7R; MNRJ 18631* • 1 spec.; Abrolhos; Jan. 1985; MORG 29825. – **Espírito Santo** • 1 spec.; 19º26′ S, 39º22′ W; depth 46 m; Oct. 2003; MNRJ 32134* • 1 spec.; 19º26′03″ S, 39º22′35″ W; depth 44 m; Oct. 2003; MNRJ 32838*. –**Vitória-Trindade Chain** • 3 specs; REVIZEE-Central C2-22R; MORG 52620 • 1 spec.; Trindade Island; Mar. 1986; H. Bulhões leg.; MORG 24433. – **Campos Basin** (Espírito Santo/Rio de Janeiro) • 1 spec.; HAB 16-C4; MNRJ 18434* • 1 spec.; HAB 16-H3; MNRJ 18622* • 1 spec.; 22º42′ S, 40º40′ W; depth 110 m; 2006; MNRJ 18754* • 2 specs; 23º04′ S, 40º59′ W; 17 Dec. 2004; MNRJ 18963* • 1 spec.; 23º04′ S, 40º59′ W; 1 Apr. 2005; MNRJ 31110* • 1 spec.; 23º04′ S, 40º59′ W; MNRJ 32625*.

Remarks

Rolán & Fernández-Garcés (1995) and Fernandes *et al*. (2013) discussed the existence of two morphs under the name *C. novem*, one lighter in colour (like the holotype), the other darker. Typical shells of *C. novem* in southeastern Brazil belong to the darker morph (Fig. 19A), besides showing the median spiral cord of the teleoconch emerging between the seventh and ninth whorl (Fernandes *et al*. 2013; Fernandes 2014). Some shells from northeastern Brazil are similar to the holotype, with a clearer coloration; a few of them are smaller and have smooth basal cords, a reduced anterior canal and the median spiral cord emerging early, even at the fifth whorl of the teleoconch (Fig. 19C).

Fernandes *et al*. (2013) indicated some inconsistencies related to the larval shell and radular formula in the generic assignment of *C. novem* in *Mesophora* Laseron, 1958 (synonym of *Coriophora* Laseron, 1958; see Marshall 1983 and Özdikmen 2013) by Rolán & Fernández-Garcés (1995). The discovery of a spiral microsculpture in the teleoconch of *C. novem* (Fig. 19F–G) is relevant, as it is very weak or usually absent in *Mesophora* (Marshall 1983) but distinct in the related genus *Mastonia* Hinds, 1843. Additionally, *Mastonia* typically has two spiral cords in the larval shell, just as in most part of the larval shell of *C. novem* (Fig. 19J), instead of the usual single cord in *Mesophora* (Marshall 1983). In contrast, *C. novem* possesses two basal cords (Fig. 19H) and a shell shape more similar to *Mesophora*, different from the bottle-shaped shell of *Mastonia*, which has only one basal cord (Marshall 1983). Both genera are also distinguished by the more developed aperture and later emergence of the median spiral cord of the teleoconch in *Mastonia* (Laseron 1958; Marshall 1983), but they share features such as the late median spiral cord and the strongly opisthocline orientation of axial ribs posteriorly to the body whorl. Except for *C. novem*, *Coriophora*/*Mesophora* and *Mastonia* are restricted to the Indo-Pacific.

According to Marshall (1983), the radulae of the type species of *Coriophora*, *Mesophora*, *Mastonia* and *Iniforis* Jousseaume, 1884 are quite similar. The radula of *C. novem*, illustrated in Rolán & Fernández-

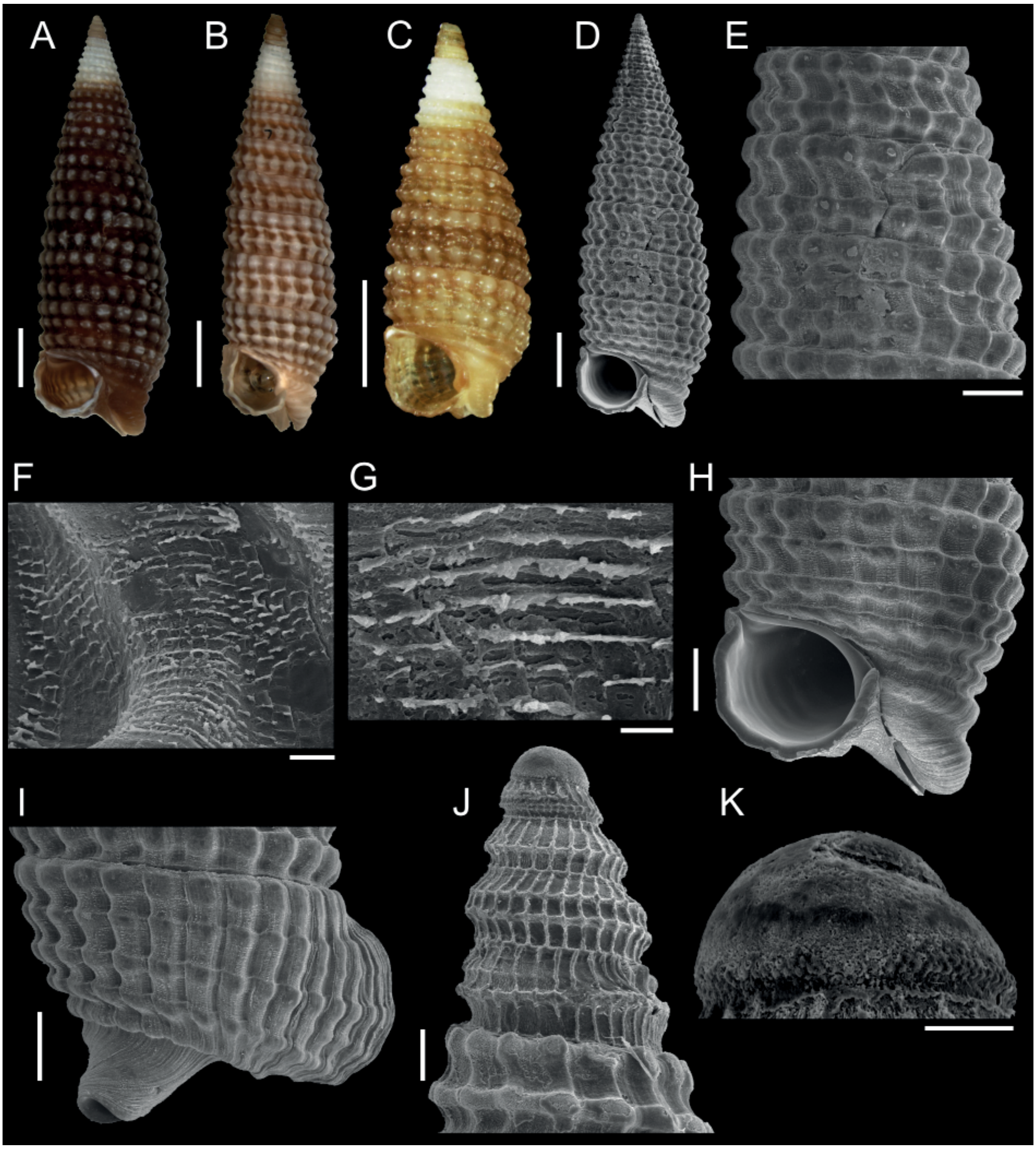

Fig. 19. *Coriophora novem* (Nowell-Usticke, 1969). **A**. MNRJ 18754*, 7.35 mm. **B**. MNRJ 18963*, 6.24 mm. **C**. MNRJ 29366*, 3.73 mm. **D–K**. Same shell as A (F–G: micro-spiral sculpture in the teleoconch). Scale bars: A–D = 1 mm; E, H–I = 500 µm; F, K = 50 µm; G = 20 µm; J = 100 µm.

Garcés (1995) under the name *Mesophora* aff. *novem*, has combined features of those genera: the central tooth is similar to that of all except *Mastonia*, lateral teeth are more similar to those of *Coriophora* (in number and shape of cusps), and marginal teeth are only similar to those of *Iniforis*, distinct from the remaining genera because the central cusp is not elongated and thin. The radular formula of *C. novem* (12-1-1-1-12) is distinct from that of *Mesophora* (24-1-1-1-24), but identical to the type species of *Mastonia* (Kosuge 1966); the radular formula of the type species of *Coriophora* and *Iniforis* is not known. Marshall (1983: 45) considered *Mesophora* (currently accepted as *Coriophora*), *Mastonia* and *Iniforis* as closely related genera, warning that "it will be essential to compare radulae of many more species to ascertain the extent of variation within the groups". The spiral microsculpture of *Mastonia* is quite different from that of other genera, consisting of distinct rows of small nodules covering all interspaces between the main spiral cords (Fig. 20; Marshall 1983: fig. 20c), whereas *C. novem* exhibits a pattern more similar to that of some species of *Iniforis* (e.g., Rolán & Fernández-Garcés 2009: fig. 29), i.e., more discrete and resembling a peeled surface (Fig. 19F–G). As above-mentioned, *C. novem* has some features more similar to those of *Coriophora*, others to *Mastonia*; it is preferred to maintain this species in the former genus, although pending future fine anatomical comparisons and molecular data. A proposition for a new genus exclusive to this western Atlantic species is possible, instead of tentatively maintaining it in Indo-Pacific genera.

Geographical records

USA: Florida (Lee 2009), Louisiana (Garcia & Lee 2002), Texas (Tunnell *et al*. 2010); Gulf of Mexico (Rosenberg *et al*. 2009); Bahamas (Redfern 2001); Cuba (Rolán & Fernández-Garcés 1995); Jamaica (Rosenberg 2009); Puerto Rico (Lee 2009); Virgin Islands (type locality); Antigua (Lamy & Pointier 2018); Guadeloupe (Rolán & Fernández-Garcés 2015); Belize (this study); Aruba, Bonaire and Curaçao (De Jong & Coomans 1988); Brazil: Amapá, Rio Grande do Norte, Pernambuco to Alagoas, Bahia (this study), Sulphur Bank, Vitória-Trindade Chain (Fernandes *et al*. 2013), Espírito Santo to Rio de Janeiro (this study).

Bathymetric distribution

Depth: 2 m (Rolán & Fernández-Garcés 1995) to 110 m (this study).

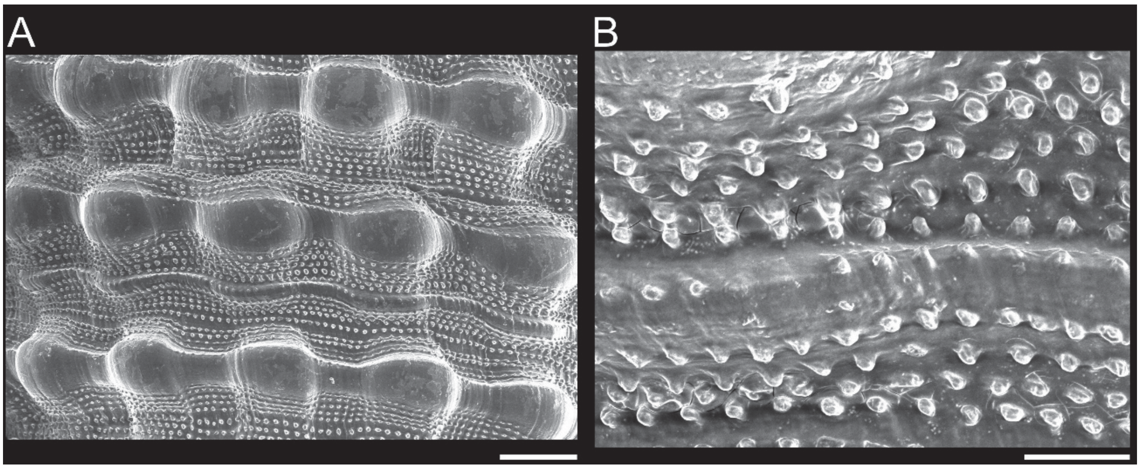

Fig. 20. Micro-spiral sculpture of *Mastonia rubra* (Hinds, 1843). **A–B**. MNRJ 28879*, Niuatoputapu, Tonga, Polynesia, T. McCleery leg., Aug. 2003. Scale bars: A = 200 µm; B = 50 µm.

Genus ***Cosmotriphora*** Olsson & Harbison, 1953

Type species

Cerithium melanura C.B. Adams, 1850. Original designation. Recent, western Atlantic.

Cosmotriphora* cf. *melanura (C.B. Adams, 1850)
Figs 21A–F, 32

Material examined

BAHAMAS • 1 spec.; Abaco; depth 12 m; 19 Jul. 1983; C. Redfern leg.; BMSM 55421 • 1 spec.; Abaco; depth 3 m; 12 Aug. 1981; C. Redfern leg.; BMSM 55419 • 6 specs; Abaco; depth 7 m; 13 Aug. 2005; C. Redfern leg.; BMSM 55425 • 5 specs; Abaco; depth 7 m; 12 Aug. 2007; C. Redfern leg.; BMSM 55426.

BRAZIL – **Amapá** • 1 spec.; Cabo Orange; depth 103 m; Nov. 1968; MORG 14448* • 1 spec.; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32571* • 3 specs; off Amapá; Apr. 1997; MORG 39890*. – **Ceará** • 2 specs; Canopus Bank; 02º14′25″ S, 38º22′50″ W; depth 60–70 m; Aug. 2005; MZSP 70279 • 2 specs; Canopus Bank; 02º14′25″ S, 38º22′50″ W; depth 60–70 m; Aug. 2005; MZSP 53736. – **Rio Grande do Norte** • 1 spec.; BPot MT54; MNRJ 35176* • 1 spec.; Potiguar Basin; MNRJ 35182*. – **São Pedro e São Paulo Archipelago** • 1 spec.; Jul. 2003; G. Vianna leg.; MNRJ 32421* • 1 spec.; Apr. 2001; P.S. Oliveira leg.; MORG 42626 • 1 spec.; 00º56′ N, 29º22′ W; 2 Nov. 2007; C.M. Cunha leg.; MZSP 87436. – **Fernando de Noronha Archipelago** • 21 specs; Cabeço da Sapata; depth 40 m; 5 Dec. 1985; M. Cabeda leg.; MORG 24616*.

Remarks

Most shells in the material herein examined are assigned, with restrictions, to *Cosmotriphora melanura* (C.B. Adams, 1850) owing to the late emergence of the median spiral cord in the fifth or even sixth whorl of the teleoconch, reaching the same size of other cords after about three or more whorls. A typical shell of *C. melanura* has the median cord emerging in the third or fourth whorl, reaching the same size of other cords after one whorl. Typical shells of *C. melanura* were also herein listed, being usually sympatric with the atypical ones.

Triforis grimaldii Dautzenberg & Fischer, 1906, an eastern Atlantic species originally described from the Canary Islands and Cape Verde, is widely accepted as a synonym of *C. melanura* (Bouchet 1985; Rolán & Fernández-Garcés 1994; Fernandes *et al*. 2013), even with its median spiral cord emerging between the sixth and eighth whorl of the teleoconch (Rolán & Fernández-Garcés 1994). Despite the suggestion of Scheltema (1971) and Fernandes & Rolán (1994) that several species of Triphoridae can be amphi-Atlantic, only *C. melanura* is currently recognized as such.

In spite of the lack of knowledge about triphorid larval development, *C. melanura* seems to be the western Atlantic triphorid with the longest larval phase in the open ocean, being the commonest species in the seamounts and islands of the Vitória-Trindade Chain (Fernandes *et al*. 2013) and in Campos Basin (southeastern Brazil) offshore waters (Fernandes & Pimenta 2017b). The ability of larvae to cross an ocean does not imply the panoceanic presence of adults owing to difficulties of post-larval survivorship and establishment in the new territory (Bhaud 1998), especially regarding the dietary limitations caused by the feeding mode of triphorids on particular sponges. Krug & Zimmer (2004) and Young *et al*. (2012) also provided arguments against the hypothesis of frequent larval exchange across the Atlantic. Several supposedly amphi-atlantic gastropods from tropical shallow waters have been proved to be constituted

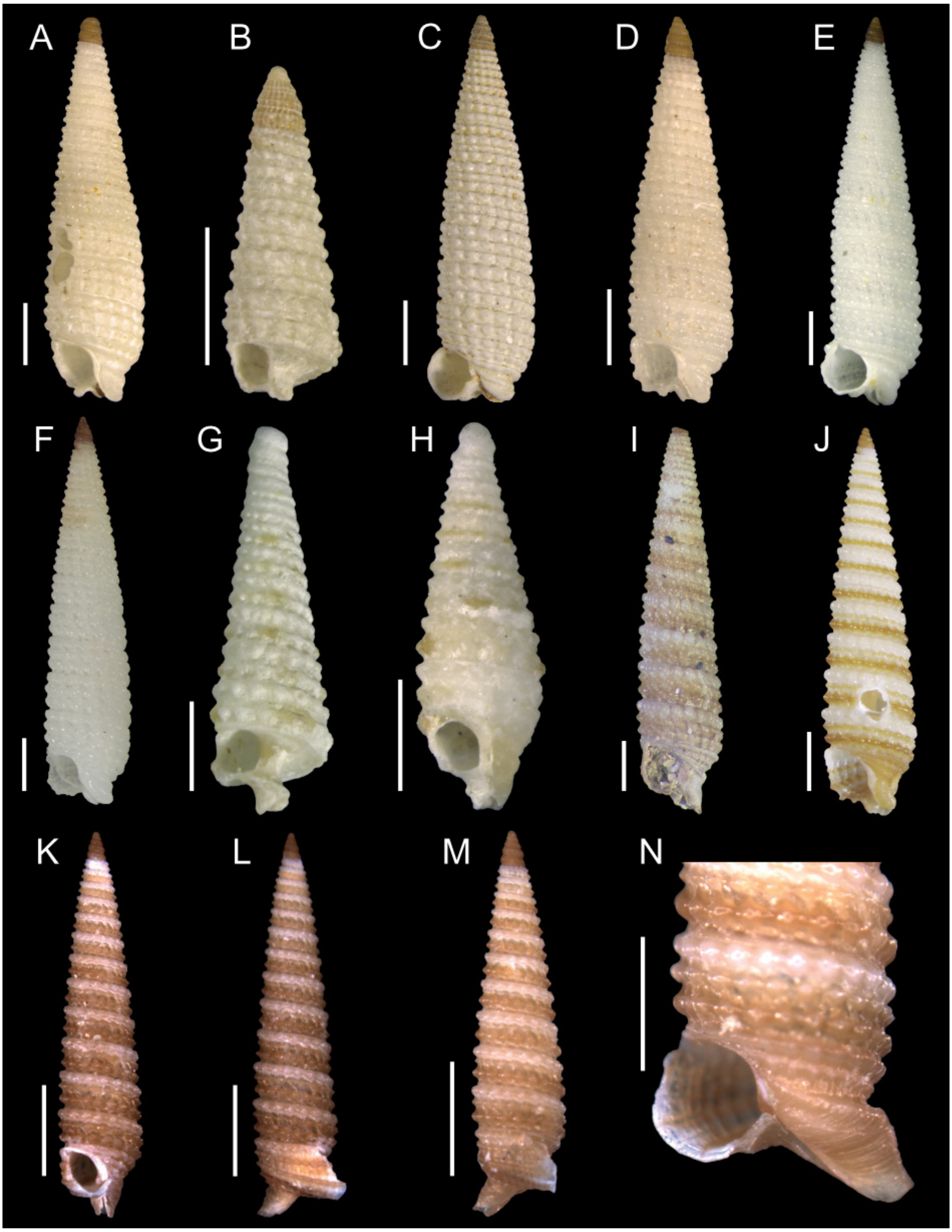

Fig. 21. A–F. *Cosmotriphora* cf. *melanura* (C.B. Adams, 1850). **A**. MORG 14448*, 6.15 mm. **B**. MORG 39890*, 2.10 mm. **C**. MNRJ 32421*, 5.97 mm. **D**. MORG 24616*, 5.09 mm. **E**. MNRJ 35176*, 7.24 mm. **F**. MZSP 70279, 7.35 mm. — **G–H**. *Iniforis carmelae* Rolán & Fernández-Garcés, 1993. **G**. MNRJ 35184*, 4.40 mm. **H**. IBUFRJ 17351, 3.38 mm. — **I–N**. *Triphora charybdis* Fernandes & Pimenta, 2015. **I**. MCZ 273420, 7.75 mm. **J**. MNRJ 35109*, 6.57 mm. **K–L**. INV MOL6534, 4.25 mm. **M–N**. INV MOL6531, 3.39 mm. Scale bars: A–M = 1 mm; N = 500 µm. Photo credits K–N: Erika Montoya (INVEMAR).

of different species (e.g., Malaquias & Reid 2009; Claremont *et al*. 2011; Carmona *et al*. 2014), whereas others indeed show broad ranges (e.g., Claremont *et al*. 2011; Padula *et al*. 2016).

Shells of *C*. cf. *melanura* seem to represent an intermediate phenotype with respect to the emergence of the median spiral cord between typical *C*. *melanura* and eastern Atlantic shells. The oceanic islands of Fernando de Noronha and São Pedro e São Paulo could represent a hybrid zone, being localized above a main oceanic current connecting both sides of the Atlantic (but regarding the fact that several shells of typical *C*. *melanura* are also present there). In addition, shells of *C*. cf. *melanura* are often found in the Bahamas and in deeper waters of northern and upper-northeastern Brazil (see Material examined). To elucidate whether it constitutes a complex of species or just intraspecific variation, an integrative taxonomic approach is needed. Sampling must also include oceanic islands that may serve as stepping stones for this species, like St. Helena Island (Smith 1890).

Another hypothesis on the variation in shell morphology of *C*. cf. *melanura* proposes phenotypic plasticity owing to latent effects of the larval development (Pechenik 2006). A common feature between atypical shells from oceanic islands and deep records is a possibly extended larval period in the water column if there is no habitat for settlement. Fernandes & Pimenta (2017b) suggested that the protoconch of *C*. *melanura* has a different color when larvae spend a long period in the water column. At least in northern and part of northeastern Brazil, it is observed that the deeper the site, the more frequent to see atypical shells, perhaps associated to latent effects and stress during an extended larval development (Pechenik 2006). In contrast, isolated oceanic islands contain both typical and atypical shells, the former possibly derived from self-retained larvae (short larval period), the latter possibly derived from distant sources; exceptions are the 'pseudo-isolated' islands of Trindade and Martin Vaz, connected to the continent by the shallow seamounts of the Vitória-Trindade Chain, not showing atypical shells. *Ex situ* experiments with the ontogeny of *C*. *melanura* may be conducted to evaluate if delayed metamorphosis affects the development of the median spiral cord of the teleoconch. This hypothesis, however, does not explain differences in the shell between *C*. *melanura* from both sides of the Atlantic Ocean.

Genus ***Iniforis*** Jousseaume, 1884

Type species

Iniforis malvaceus Jousseaume, 1884. Original designation. Recent, New Caledonia.

Iniforis carmelae Rolán & Fernández-Garcés, 1993
Fig. 21G–H, 23B, 48

Iniforis carmelae Rolán & Fernández-Garcés, 1993: 102, figs 12–15, 28–30.

Triphora sp. 3 – Leal 1991: 123, pl. 17 figs A–B.
Iniforis carmelae – Rolán & Fernández-Garcés 2007: 21, pl. II figs 18–22. — Espinosa *et al*. 2007: 74; 2012: 257. — García & Capote 2013: 29. — Fernandes *et al*. 2013: 7, figs 4, 20, 31.

Material examined

Holotype

CUBA • Cienfuegos; MNCN 15.05/6822.

Paratypes

See Rolán & Fernández-Garcés (1993).

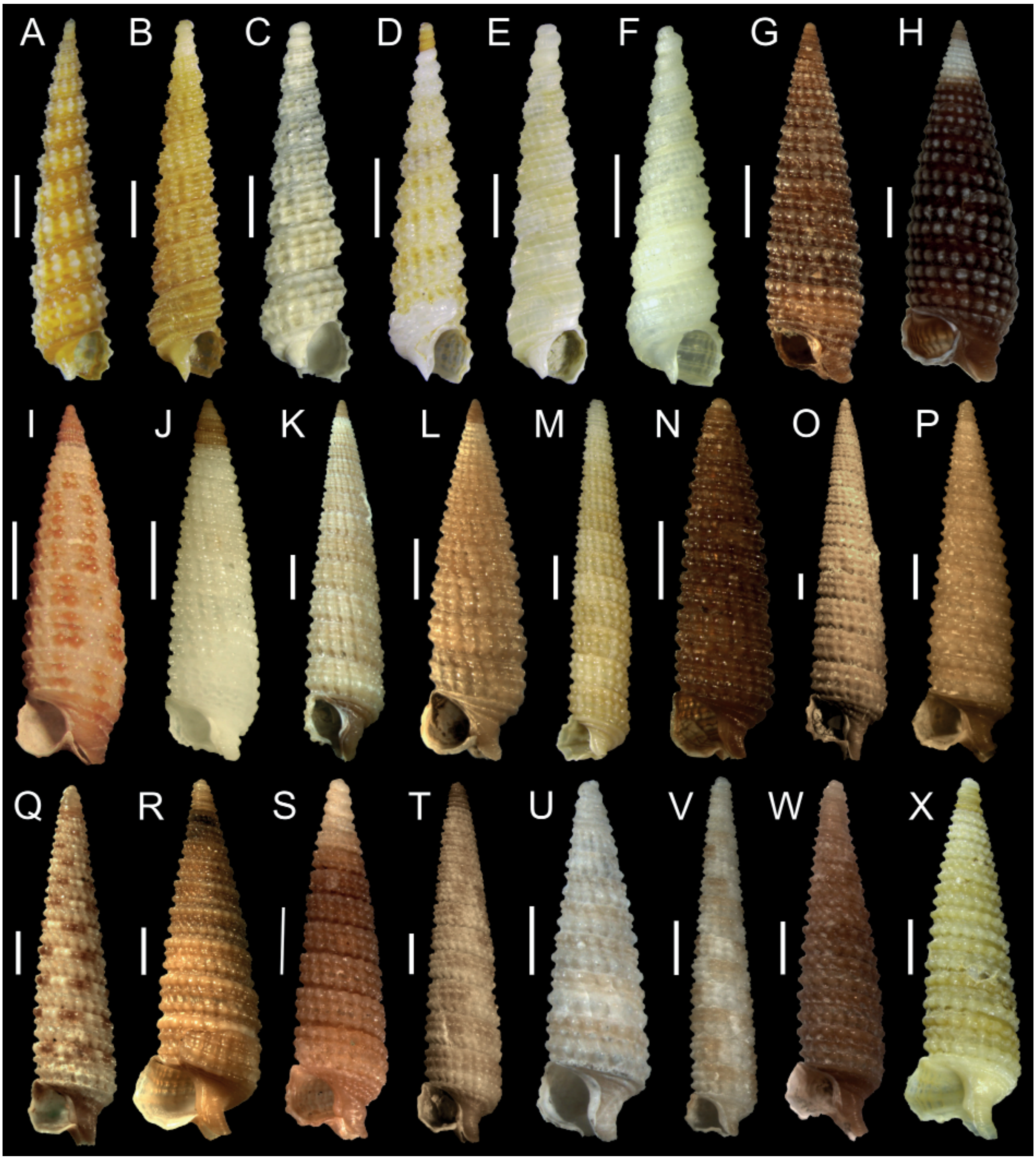

Fig. 22. Triphoridae from Brazil (1). **A**. *Metaxia excelsa* Faber & Moolenbeek, 1991. **B–C**. *Metaxia rugulosa* (C.B. Adams, 1850). **D**. *Metaxia taeniolata* (Dall, 1889). **E**. *Metaxia gongyloskymnus* Fernandes & Pimenta, 2011. **F**. *Metaxia prompta* Rolán & Fernández-Garcés, 2008. **G**. *Cheirodonta dupliniana* (Olsson, 1916). **H**. *Coriophora novem* (Nowell-Usticke, 1969). **I**. *Cosmotriphora arnoldoi* Faber & Moolenbeek, 1991. **J**. *Cosmotriphora melanura*. **K**. *Eutriphora auffenbergi* Rolán & Lee, 2008. **L**. *Eutriphora costai* Fernandes & Pimenta, 2015. **M**. *Inella apexbilirata* Rolán & Fernández-Garcés, 2008. **N**. "*Inella*" *differens* Rolán & Lee, 2008. **O**. "*Inella*" *euconfio* Fernandes & Pimenta, 2019. **P**. "*Inella*" *faberi* Rolán & Fernández-Garcés, 2008. **Q**. "*Inella*" *faceta* Fernandes & Pimenta, 2019. **R**. "*Inella*" *galo* Fernandes & Pimenta, 2019. **S**. "*Inella*" *leucocephala* Fernandes & Pimenta, 2019. **T**. "*Inella*" *maculata* Fernandes & Pimenta, 2019. **U**. "*Inella*" *vanilla* Fernandes & Pimenta, 2019. **V**. *Inella* sp. 1. **W**. "*Inella*" sp. 2. **X**. "*Inella*" sp. 3. Scale bars: 1 mm.

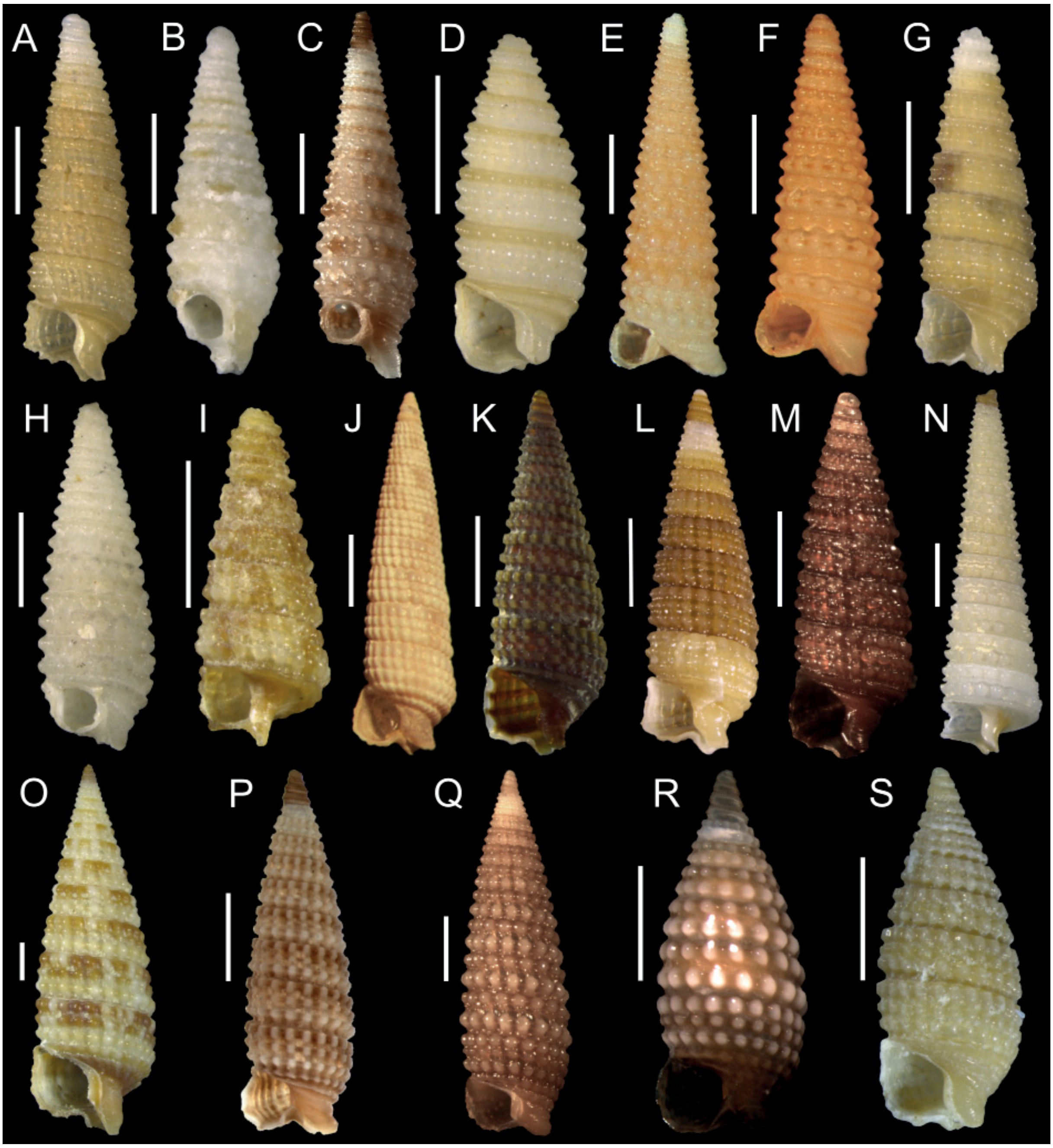

Fig. 23. Triphoridae from Brazil (2). **A**. "*Inella*" sp. 4. **B**. *Iniforis carmelae* Rolán & Fernández-Garcés, 1993. **C**. *Iniforis pseudothomae* Rolán & Fernández-Garcés, 1993. **D**. *Isotriphora leo* sp. nov. **E**. *Isotriphora onca* Fernandes, Pimenta & Leal, 2013. **F**. *Isotriphora tigrina* Fernandes, Pimenta & Leal, 2013. **G**. *Isotriphora tricingulata* Rolán & Fernández-Garcés, 2015. **H**. *Isotriphora uncia* sp. nov. **I**. *Isotriphora* sp. 1. **J**. *Latitriphora albida* (A. Adams, 1854). **K**. *Marshallora* sp. **L**. *Marshallora ostenta* Rolán & Fernández-Garcés, 2008. **M**. *Marshallora* sp. 1. **N**. *Monophorus caracca* (Dall, 1927) comb. nov. **O**. *Monophorus olivaceus* (Dall, 1889). **P**. *Monophorus verecundus* sp. nov. **Q**. *Nanaphora leei* Fernandes & Pimenta, 2015. **R**. *Nanaphora verbernei* (Moolenbeek & Faber, 1989). **S**. *Nanaphora* sp. 1. Scale bars: 1 mm.

Other material
BRAZIL – **Maranhão** • 1 spec.; Parcel Manuel Luís; 16 Aug. 1997; IBUFRJ 17351. – **Rio Grande do Norte** • 1 spec.; Potiguar Basin; MNRJ 35184*.

Remarks

The worn shells from northeastern Brazil herein studied (Fig. 21G–H) are only the fifth/sixth records of *I. carmelae* from Brazil, even after the analysis of thousands of lots from several localities; all other shells were recorded from the Vitória-Trindade Chain (Fernandes *et al*. 2013). The paucispiral protoconch of *I. carmelae* has one whorl of larval shell, scupltured with axial ribs and a spiral cord (Rolán & Fernández-Garcés 1993; Fernandes *et al*. 2013), indicative of a short but existing planctonic stage. More records may be added to the present ones in the following years, both in the Caribbean and Brazil, instead of the current geographically isolated records (but see Discussion).

Geographical records

Cuba (type locality); Brazil: Maranhão, Rio Grande do Norte (this study), Vitória-Trindade Chain (Fernandes *et al*. 2013).

Bathymetric distribution

5 m (Rolán & Fernández-Garcés 1993) to 82–105 m (Fernandes *et al*. 2013).

Genus "*Triphora*" Blainville, 1828 s.l.

Triphora charybdis Fernandes & Pimenta, 2015
Figs 21I–N, 24S, 77, 83, 84E

Triphora charybdis Fernandes & Pimenta, 2015: 507, fig. 7C–K.

Material examined

Holotype
BRAZIL – **Rio de Janeiro** • 23º10′01″ S, 41º03′13″ W; depth 107 m; MNRJ 18620*.

Paratypes
See Fernandes & Pimenta (2015).

Other material
BRAZIL – **Ceará** • 1 spec.; 02º14′25″ S, 38º22′50″ W, Canopus Bank; depth 260 m; Nov. 2005; MZSP 94263. – **Rio Grande do Norte** • 2 specs; 04º44′11′ S, 36º24′55″ W; depth 425–450 m; 7 May 2011; MNRJ 35109* • 1 spec.; 04º44′53″ S, 36º25′27″ W; depth 102–108 m; 23 May 2011; MNRJ 35116* • 2 specs; 04º33′17″ S, 36º56′35″ W; depth 130–160 m; 21 May 2011; MNRJ 35180*. – **Alagoas** • 1 worn spec.; 10º32′07″ S, 36º05′11″ W, MARSEAL st. BN4-R1; depth 400 m; UFS. – **Rio de Janeiro** • 3 specs; PADCT st. 6627; MNRJ 29387*. – **São Paulo** • 1 spec.; REVIZEE-Sul st. 6666; MNRJ 29379* • 3 specs; REVIZEE-Sul st. 6653; MNRJ 60189. – **Paraná** • 1 spec.; REVIZEE-Sul st. 6699; MNRJ 29388* • 3 specs; PADCT st. 6641; MZSP 133498 • 3 specs; PADCT st. 6595; MNRJ 29386*. – **Santa Catarina** • 1 spec.; PADCT st. 6635; MNRJ 29380*. – **Rio Grande do Sul** • 1 spec.; off Solidão; 30º42′ S, 49º03′ W; depth 182–186 m; 6 Aug. 1972; OC. Ship W. Besnard leg.; MZSP 19331.

COLOMBIA • 1 spec.; Archipiélagos Coralinos; 09º51′46″ N, 76º09′02″ W; depth 101 m; 30 Apr. 2005; A. Clavijo leg.; INV MOL6534 • 2 specs; Archipiélagos Coralinos; 09º48′04″ N, 76º11′09″ W; depth 95 m; 29 Apr. 2005; A. Clavijo leg.; INV MOL6538 • 1 spec.; Archipiélagos Coralinos; 09º47′17″ N, 76º11′56″ W; depth 98 m; 1 May 2005; A. Clavijo leg.; INV MOL6531 • 1 spec.; Archipiélagos Coralinos; 09º46′36″ N, 76º12′49″ W; depth 102 m; 29 Apr. 2005; A. Clavijo leg.; INV MOL6532.

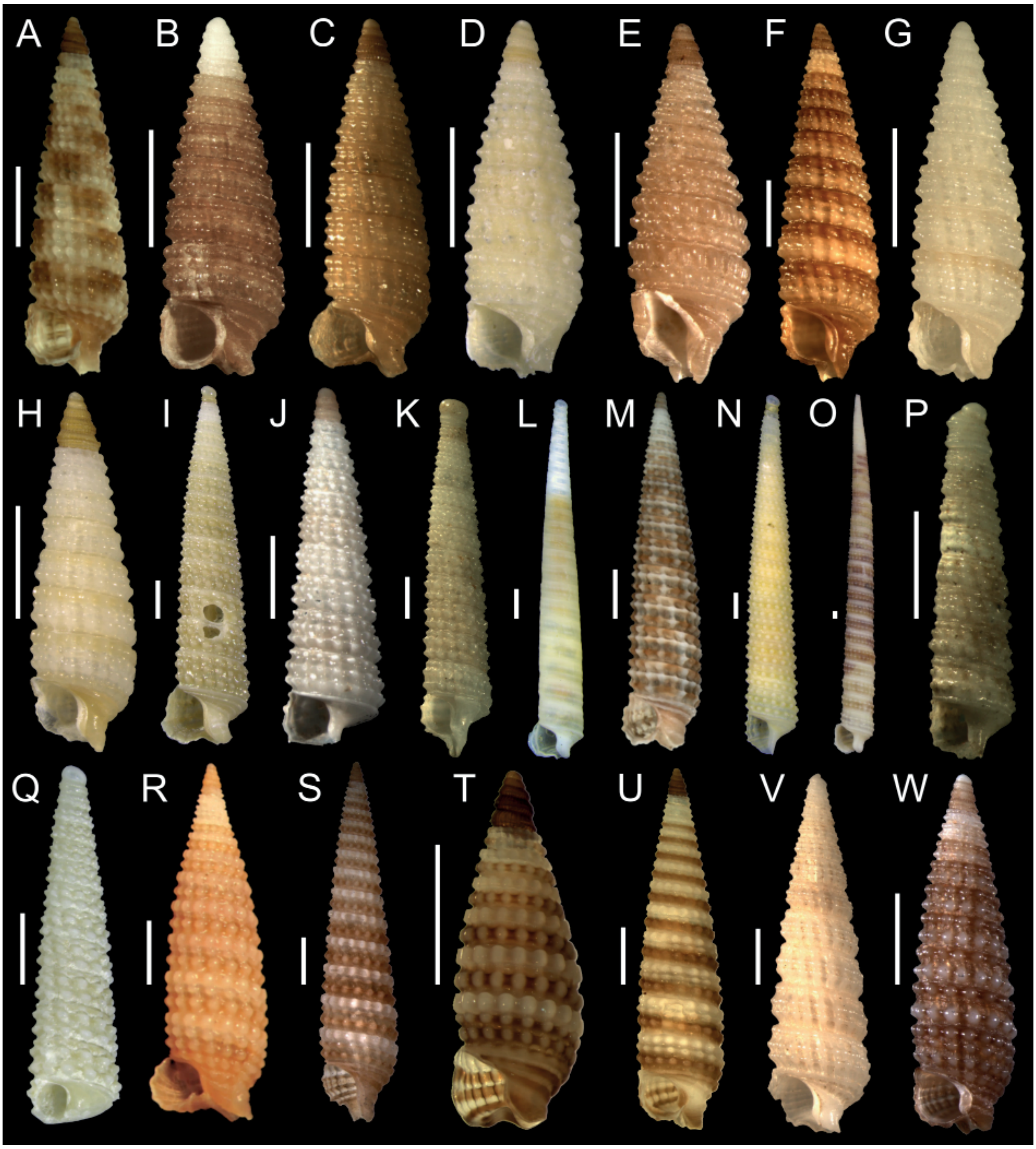

Fig. 24. Triphoridae from Brazil (3). **A**. *Nototriphora decorata* (C.B. Adams, 1850). **B**. *Sagenotriphora albocaput* sp. nov. **C**. *Sagenotriphora osclausum* (Rolán & Fernández-Garcés, 1995). **D**. *Sagenotriphora* sp. 1. **E**. *Sagenotriphora* sp. 2. **F**. *Similiphora intermedia* (C.B. Adams, 1850). **G**. *Similiphora lucida* sp. nov. **H**. *Similiphora* sp. 1. **I**. *Strobiligera campista* Fernandes & Pimenta, 2019. **J**. *Strobiligera delicata* Fernandes & Pimenta, 2014. **K**. *Strobiligera dinea* (Dall, 1927). **L**. *Strobiligera gaesona* (Dall, 1927). **M**. *Strobiligera inaudita* (Rolán & Lee, 2008). **N**. *Strobiligera santista* Fernandes & Pimenta, 2019. **O**. *Strobiligera unicornium* (Simone, 2006). **P**. *Strobiligera* sp. 1. **Q**. *Strobiligera* sp. 2. **R**. *Triphora atlantica* Smith, 1890. **S**. *Triphora charybdis* Fernandes & Pimenta, 2015. **T**. *Triphora ellyae* De Jong & Coomans, 1988. **U**. *Triphora elvirae* De Jong & Coomans, 1988. **V**. *Triphora portoricensis* Rolán & Redfern, 2008. **W**. *Triphora scylla* Fernandes & Pimenta, 2015. Scale bars: 1 mm.

GUYANA • 1 spec.; 08º08′00″ N, 57º52′30″ W, R/V Chain Cruise 35, station 37; depth 82–110 m; 28 Apr. 1963; MCZ 273420.

Remarks

Fernandes & Pimenta (2015) indicated that well-preserved shells of *Triphora charybdis* were sampled only in southeastern Brazil, and worn shells from Amapá and Santa Catarina were probably subfossil forms. Herein, the range of *T. charybdis* is extended based both on preserved and worn material (Fig. 77). Shells with a faint coloration are present northward up to the Guyana (Fig. 21I) and southward to Rio Grande do Sul (Fig. 84E). Small adult shells were found in Colombia (Fig. 21K–N), and their intact conditions indicate that this species is currently present there.

Triphora charybdis may have remained unnoticed in the Caribbean because of its moderately deep habitat, i.e., the mid-low depths of the continental shelf, and similarities with other shallow-water triphorids (Fernandes & Pimenta 2015). However, if the pattern of worn vs preserved shells in the range of *T. charybdis* is confirmed after the availability of more material, a scenario of range retraction in northern and southern Brazil will be likely. In this case, living *T. charybdis* would be restricted to tropical waters of northeastern and southeastern Brazil, with the population from Colombia being increasingly diverged because of the lack of gene flow; their small adult size may be indicative of such a divergence.

Geographical records

Colombia (this study – well preserved); Guyana (this study – worn); Brazil: Amapá to Ceará (Fernandes & Pimenta 2015; this study – worn), Rio Grande do Norte to Rio de Janeiro (Fernandes & Pimenta 2015; this study – well preserved), São Paulo to Rio Grande do Sul (Fernandes & Pimenta 2015; this study – worn).

Bathymetric distribution

Depth: 80 m (Fernandes & Pimenta 2015) to 186 m (this study). Some deeper records, down to 450 m, are anomalous and probably derived from *post mortem* dislodgement.

Invalidation of previous record in Brazil

Iniforis turristhomae (Holten, 1802)

Rios (1970, 1975, 1985, 1994, 2009) presented the main records of *I. turristhomae* for Brazil. Yet, these were questioned by Leal (1991) and Fernandes *et al*. (2013), who suggested the correct species was *Iniforis pseudothomae* Rolán & Fernández-Garcés, 1993. After examining all lots referred to *I. turristhomae* at the MORG collection, where Dr Rios worked for most of his life, we conclude that almost all of them indeed corresponded to *I. pseudothomae*, and no shell of *I. turristhomae* was seen. Hence, the record of *I. turristhomae* in Brazil is invalidated, and the southernmost range of this species lies somewhere between Venezuela and the Guyanas.

Summing up species of Triphoridae in Brazil

Data about geographical and bathymetric ranges of species occurring in Brazil are compiled in Table 2. Maps are provided for each species (Figs 25–81).

Table 2 (continued on next two pages)**.** Geographical and bathymetric range of triphorids from Brazil. New geographical records and/or extensions of depth range are underlined. The bathymetric range comprises all records of the species, including "Caribbean" ones, but not including very worn shells or discrepant records. Species of the "pseudo *Inella*" group are indicated as "*Inella*" (between quotation marks). References in Brazil: 1 = Simone (2006); 2 = Fernandes & Pimenta (2011); 3 = Fernandes *et al*. (2013); 4 = Fernandes (2014); 5 = Fernandes & Pimenta (2014); 6 = Fernandes & Pimenta (2015); 7 = Fernandes & Pimenta (2019b); 8 = Fernandes & Pimenta (2019a); 9 = Fernandes *et al*. in prep.

Species	Geographical range	Bathymetric range	References in Brazil
Metaxia excelsa Faber & Moolenbeek, 1991	USA: Florida to Texas; Caribbean; Brazil: Amapá to Rio de Janeiro, Fernando de Noronha, Vitória-Trindade	1 m to 147 m	2, 8
Metaxia gongyloskymnus Fernandes & Pimenta, 2011	Brazil: Espírito Santo to Rio de Janeiro	100 m to 120 m	2
Metaxia prompta Rolán & Fernández-Garcés, 2008	Bermuda; Brazil: Vitória-Trindade. The previous record from Bahia actually consists of very worn material	10 m to 105 m	2
Metaxia rugulosa (C.B. Adams, 1850)	Bermuda; USA: North Carolina to Texas; Mexico; Caribbean; Brazil: Amapá to São Paulo	0 m to 198 m	2, 8
Metaxia taeniolata (Dall, 1889)	USA: North Carolina to Texas; Caribbean; Brazil: Rio Grande do Norte to São Paulo, Vitória-Trindade. It also occurs in northern Brazil	4 m to 101 m	2
Cheirodonta dupliniana (Olsson, 1916)	USA: Connecticut to Texas; Mexico; Caribbean; Brazil: Rio Grande do Norte to Rio de Janeiro, Fernando de Noronha	6 m to 183 m	6, 8, this study
Coriophora novem (Nowell-Usticke, 1969)	USA: Florida to Texas; Caribbean; Brazil: Amapá to Rio de Janeiro, Vitória-Trindade	2 m to 110 m	3, 4, this study
Cosmotriphora arnoldoi Faber & Moolenbeek, 1991	USA: Florida to Texas; Mexico; Caribbean; Brazil: Rio Grande do Norte to São Paulo, Vitória-Trindade. Worn shells south to Santa Catarina	20 m to 155 m	3, 4, this study
Cosmotriphora melanura (C.B. Adams, 1850)	Bermuda; USA: North Carolina to Texas; Mexico; Caribbean; Brazil: Amapá to Rio de Janeiro, São Pedro e São Paulo, Fernando de Noronha, Vitória-Trindade. Eastern Atlantic records require confirmation	0 m to 160 m, discrepant records down to 480 m	3, 4, 8, this study
Eutriphora auffenbergi Rolán & Lee, 2008	USA: Florida; Mexico; Brazil: Bahia	5 m to 122 m, discrepant records down to 274 m	This study
Eutriphora costai Fernandes & Pimenta, 2015	Brazil: Bahia to Rio de Janeiro	40 m to 112 m	6
Inella apexbilirata Rolán & Fernández-Garcés, 2008	Bahamas; Brazil: Espírito Santo to São Paulo	69 m to 300 m	7
"*Inella*" *differens* Rolán & Lee, 2008	USA: Florida to Louisiana; Brazil: Espírito Santo to Rio de Janeiro	58 m to 145 m	7
"*Inella*" *euconfio* Fernandes & Pimenta, 2019	Brazil: Rio de Janeiro to São Paulo	91 m to 160 m	7
"*Inella*" *faberi* Rolán & Fernández-Garcés, 2008	USA: Louisiana; Brazil: Espírito Santo to São Paulo	46 m to 143 m	7
"*Inella*" *faceta* Fernandes & Pimenta, 2019	Brazil: Bahia to São Paulo	32 m to 160 m	7
"*Inella*" *galo* Fernandes & Pimenta, 2019	Brazil: Rio de Janeiro	25 m to 48 m	7

Table 2 (continued)**.** Geographical and bathymetric range of triphorids from Brazil.

Species	Geographical range	Bathymetric range	References in Brazil
“*Inella*” *leucocephala* Fernandes & Pimenta, 2019	Brazil: Espírito Santo to Rio de Janeiro	33 m to 80 m	7
“*Inella*” *maculata* Fernandes & Pimenta, 2019	Brazil: Espírito Santo to Rio de Janeiro	51 m to 105 m	7
“*Inella*” *vanilla* Fernandes & Pimenta, 2019	Brazil: Amapá to Pará	25 m to 160 m	7
Inella sp. 1	Brazil: Espírito Santo to Rio de Janeiro	65 m to 80 m	7
“*Inella*” sp. 2	Brazil: Rio de Janeiro to São Paulo, worn shells north to Bahia	47 m to 160 m	7
“*Inella*” sp. 3	Brazil: São Paulo to Rio Grande do Sul	50 m to 450 m	7
“*Inella*” sp. 4	Brazil: Amapá to Espírito Santo	33 m to 74 m	7
Iniforis carmelae Rolán & Fernández-Garcés, 1993	Cuba; Brazil: Maranhão to Rio Grande do Norte, Vitória-Trindade	5 m to 82 m	3, this study
Iniforis pseudothomae Rolán & Fernández-Garcés, 1993	Caribbean; Brazil: Amapá to Rio de Janeiro, Vitória-Trindade	5 m to 98 m, worn shells down to 300 m	3, 4, 8, this study
Isotriphora leo sp. nov.	Brazil: Trindade Island	4 m to 15 m	This study
Isotriphora onca Fernandes *et al*., 2013	Brazil: Vitória-Trindade	85 m to 105 m	3
Isotriphora tigrina Fernandes *et al*., 2013	Brazil: Vitória-Trindade. The previous record from Bahia actually consists of *I. pseudothomae*	52 m to 82 m	3
Isotriphora tricingulata Rolán & Fernández-Garcés, 2015	Antigua; Guadeloupe; Brazil: Amapá	72 m to 81 m	This study
Isotriphora uncia sp. nov.	Brazil: Fernando de Noronha, Atol das Rocas	12 m to 40 m	This study
Isotriphora sp. 1	Brazil: Fernando de Noronha	40 m to 45 m	This study
Latitriphora albida (A. Adams, 1854)	Bermuda; USA: Georgia to Florida; Mexico; Caribbean; Brazil: Rio Grande do Norte to Rio de Janeiro, Fernando de Noronha, Vitória-Trindade. It also occurs in northern Brazil	0 m to 107 m	3, 4, 8, this study
Marshallora ostenta Rolán & Fernández-Garcés, 2008	USA: Georgia to Florida; Cuba; Brazil: Amapá to Rio de Janeiro	3 m to 92 m	4, this study
Marshallora sp. 1	Brazil: Rio de Janeiro	Beach drift	This study
Marshallora spp.	See Fernandes *et al*., in prep.	Live specimens apparently restricted from intertidal to 20 m	9
Monophorus caracca (Dall, 1927) comb. nov.	USA: Georgia; Brazil: Espírito Santo	295 m to 805 m	This study
Monophorus olivaceus (Dall, 1889)	USA: Florida to Texas; Mexico; Caribbean; Brazil: Amapá to São Paulo, Fernando de Noronha, Vitória-Trindade	0 m to 120 m, discrepant records down to 260 m	3, 4, 8, this study
Monophorus verecundus sp. nov.	Brazil: Rio Grande do Norte to São Paulo	102 m to 141 m	This study
Nanaphora leei Fernandes & Pimenta, 2015	Brazil: Espírito Santo, Rio de Janeiro. It requires confirmation from the Caribbean	10 m to 25 m	6
Nanaphora verbernei (Moolenbeek & Faber, 1989)	Caribbean; Brazil: Rio Grande do Norte to Santa Catarina	0 m to 90 m	6, 8
Nanaphora sp. 1	Brazil: Rio Grande do Norte	Only known from 145 m	This study

Table 2 (continued)**.** Geographical and bathymetric range of triphorids from Brazil.

Species	Geographical range	Bathymetric range	References in Brazil
Nototriphora decorata (C.B. Adams, 1850)	Bermuda; USA: North Carolina to Texas; Mexico; Caribbean; Brazil: Amapá to Santa Catarina, Fernando de Noronha, Vitória-Trindade	0 m to 110 m, discrepant records down to 450 m	3, 4, 8, this study
Sagenotriphora albocaput sp. nov.	Brazil: Amapá to Rio Grande do Norte, Fernando de Noronha	20 m to 72 m	This study
Sagenotriphora osclausum (Rolán & Fernández-Garcés, 1995)	USA: North Carolina to Florida; Mexico; Caribbean; Brazil: Maranhão to São Paulo. It also occurs in northern Brazil	2 m to 183 m	4, 8, this study
Sagenotriphora sp. 1	Brazil: Amapá	72 m to 103 m	This study
Sagenotriphora sp. 2	Brazil: Rio de Janeiro	Only known from 80 m	This study
Similiphora intermedia (C.B. Adams, 1850)	USA: North Carolina to Texas; Mexico; Caribbean; Brazil: Pará to Santa Catarina	0 m to 150 m	4, 8, this study
Similiphora lucida sp. nov.	Brazil: Amapá to Rio Grande do Norte	20 m to 58 m	This study
Similiphora sp. 1	Guyana; Brazil: Amapá	45 m to 103 m	This study
Strobiligera campista Fernandes & Pimenta, 2019	Brazil: Rio de Janeiro	100 m to 149 m	7
Strobiligera delicata Fernandes & Pimenta, 2014	Brazil: Espírito Santo to Rio de Janeiro	607 m to 940 m	5
Strobiligera dinea (Dall, 1927)	USA: Georgia; Brazil: Espírito Santo, Champlain Seamount	607 m to 940 m	7
Strobiligera gaesona (Dall, 1927)	USA: Georgia; Brazil: Ceará	240 m to 805 m	7, 8
Strobiligera inaudita (Rolán & Lee, 2008)	USA: Florida to Louisiana; Brazil: Espírito Santo to São Paulo	58 m to 163 m	5
Strobiligera santista Fernandes & Pimenta, 2019	Brazil: São Paulo	153 m to 258 m	7
Strobiligera unicornium (Simone, 2006)	Brazil: Maranhão to Ceará	240 m to 274 m	1, 7
Strobiligera sp. 1	Brazil: Espírito Santo	607 m to 620 m	7
Strobiligera sp. 2	Brazil: Rio Grande do Norte	102 m to 108 m	7
Triphora atlantica Smith, 1890	USA: Florida to Louisiana; Puerto Rico; Brazil: Amapá to Rio de Janeiro, Fernando de Noronha, Vitória-Trindade; Saint Helena Island	12 m to 150 m	3, 4, this study
Triphora charybdis Fernandes & Pimenta, 2015	Colombia; Guyana; Brazil: Amapá to Rio Grande do Sul (see above preserved vs worn material)	80 m to 186 m, worn shells down to 450 m	6, this study
Triphora ellyae De Jong & Coomans, 1988	USA: Florida to Louisiana; Caribbean; Brazil: Rio Grande do Norte to Santa Catarina, Vitória-Trindade	3 m to 110 m	3, 4, this study
Triphora elvirae De Jong & Coomans, 1988	USA: Florida, Louisiana; Caribbean; Brazil: Maranhão to Rio de Janeiro, Fernando de Noronha, Atol das Rocas, Vitória-Trindade	7 m to 100 m	3, 4, this study
Triphora portoricensis Rolán & Redfern, 2008	Caribbean; Brazil: Rio Grande do Norte to Rio de Janeiro	23 m to 100 m	6
Triphora scylla Fernandes & Pimenta, 2015	Brazil: Maranhão to Rio de Janeiro	20 m to 150 m	6

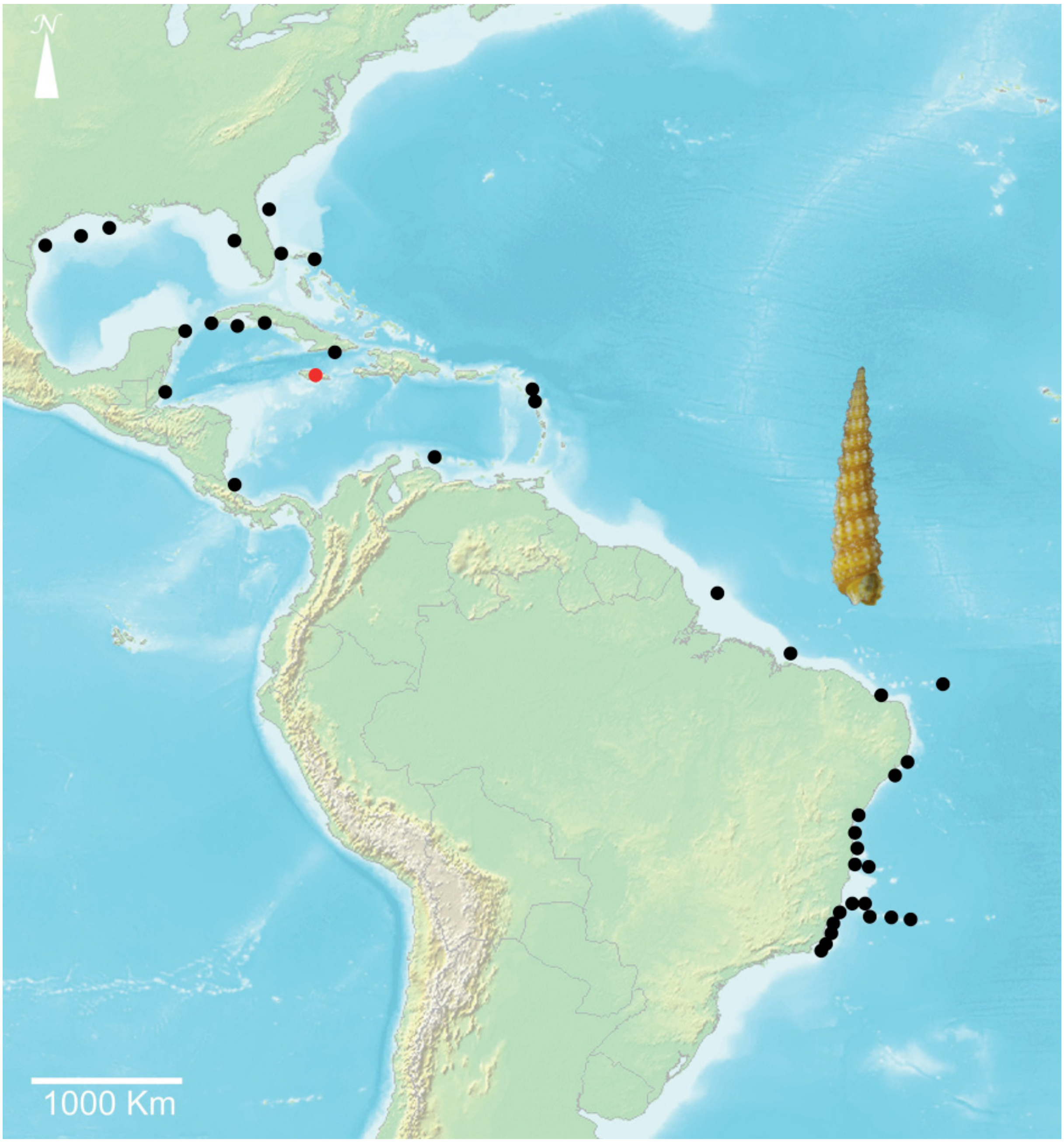

Fig. 25. Distribution map of *Metaxia excelsa* Faber & Moolenbeek, 1991; red circle = type locality.

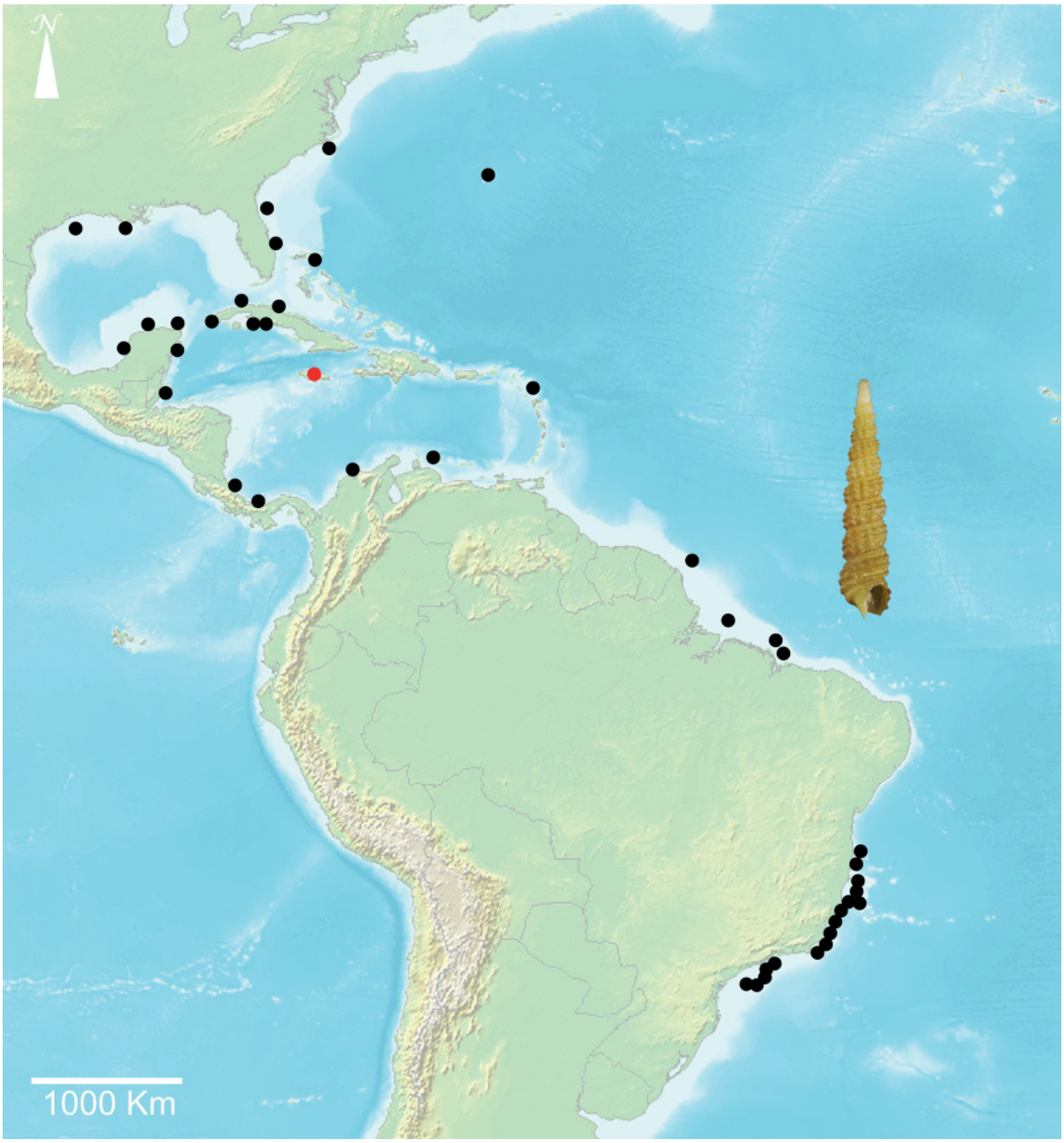

Fig. 26. Distribution map of *Metaxia rugulosa* (C.B. Adams, 1850); red circle = type locality.

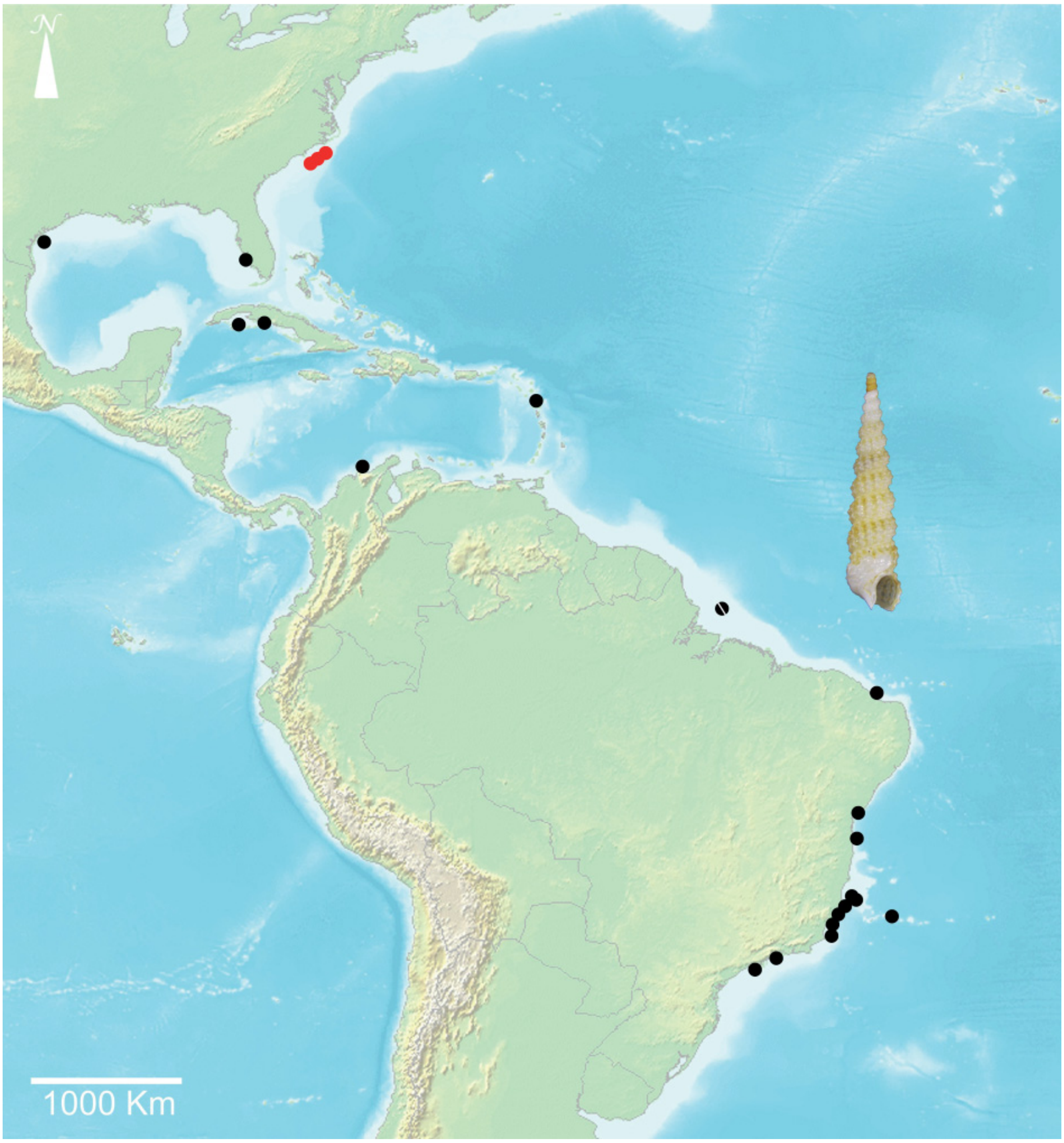

Fig. 27. Distribution map of *Metaxia taeniolata* (Dall, 1889); red circles = type locality.

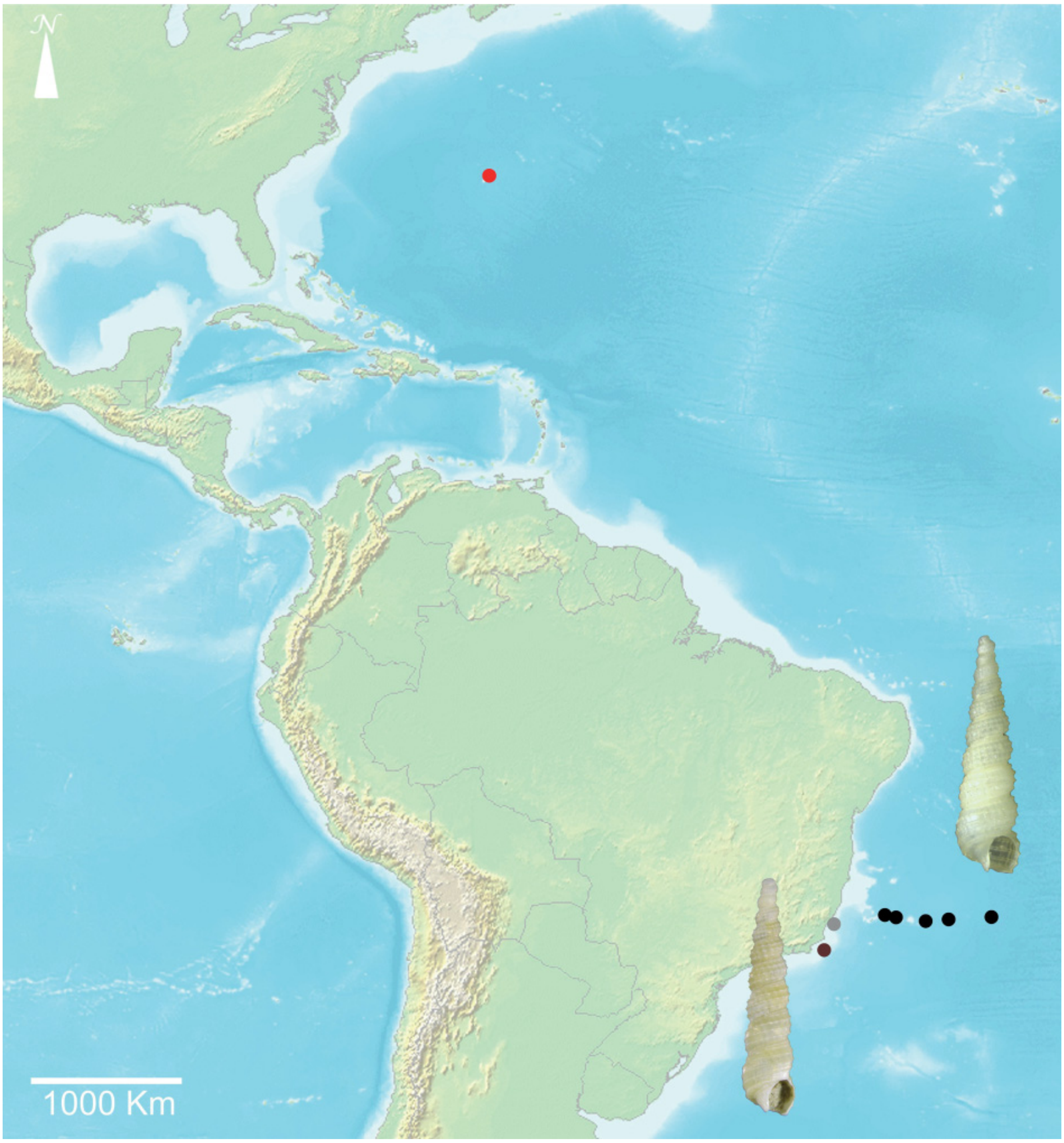

Fig. 28. Distribution map of *Metaxia prompta* Rolán & Fernández-Garcés, 2008 (red circle = type locality; black circles = additional localities) and *Metaxia gongyloskymnus* Fernandes & Pimenta, 2011 (brown circle = type locality; gray circle = additional locality).

Fig. 29. Distribution map of *Cheirodonta dupliniana* (Olsson, 1916); red circle = type locality.

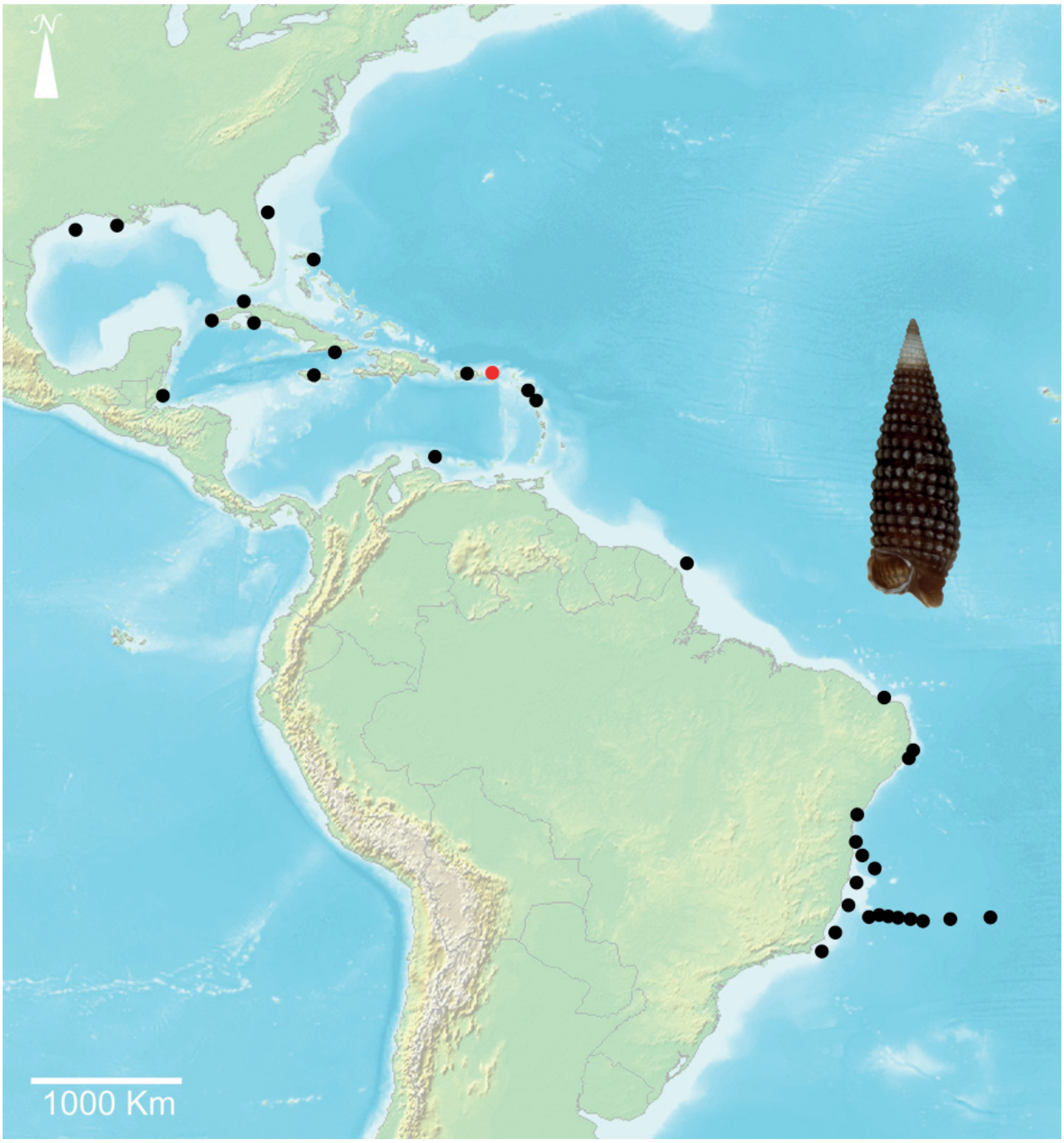

Fig. 30. Distribution map of *Coriophora novem* (Nowell-Usticke, 1969); red circle = type locality.

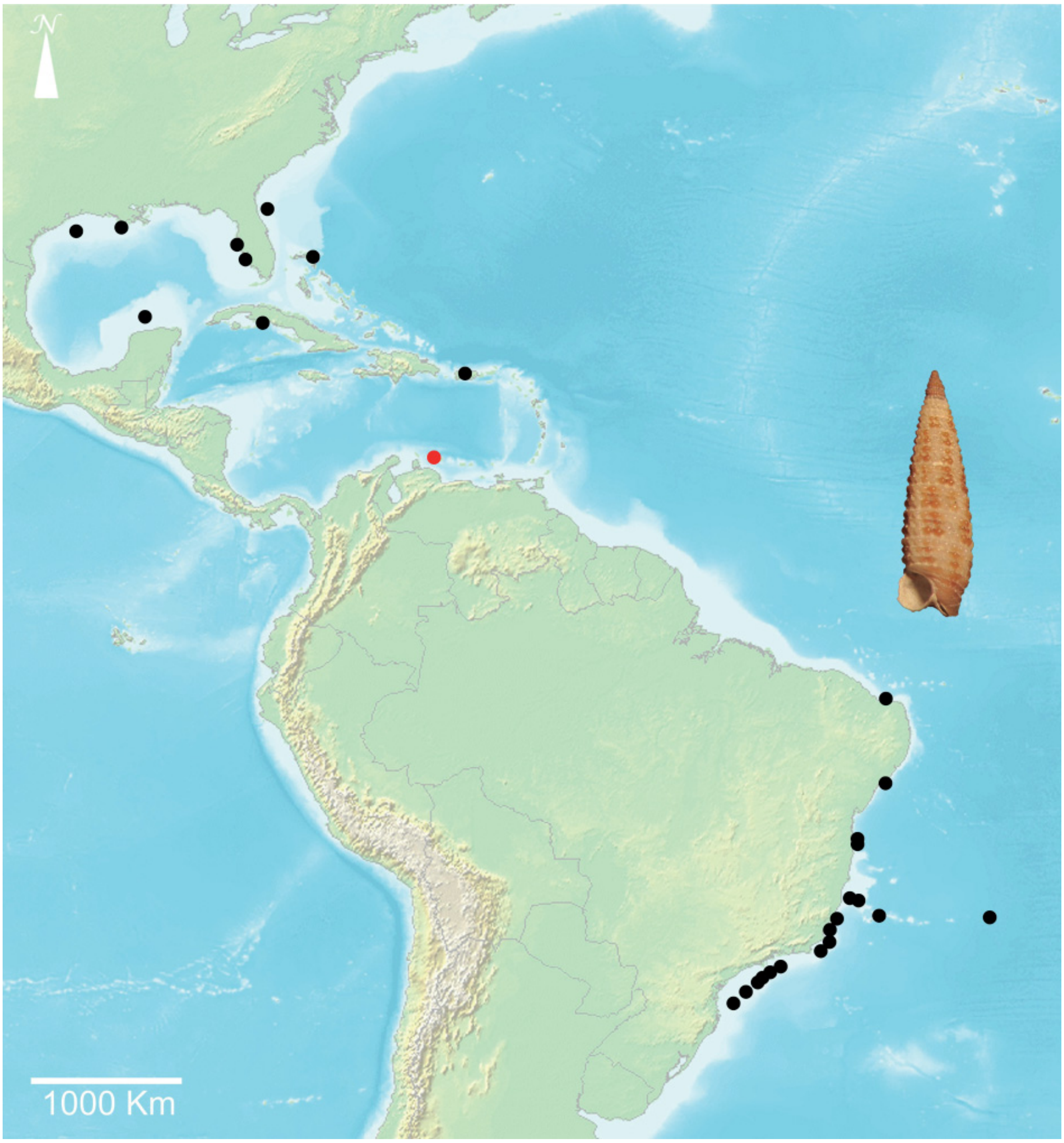

Fig. 31. Distribution map of *Cosmotriphora arnoldoi* Faber & Moolenbeek, 1991; red circle = type locality.

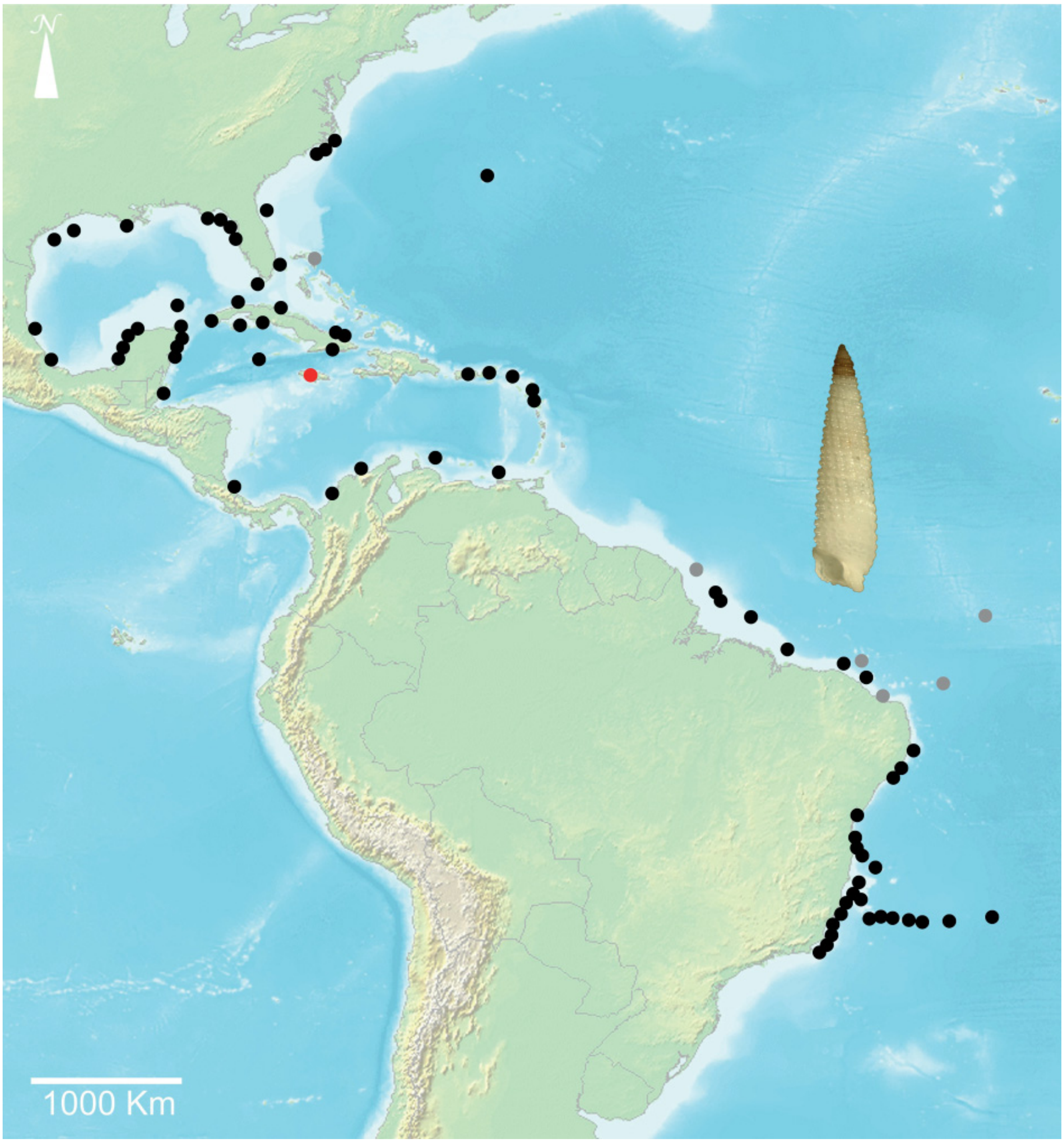

Fig. 32. Distribution map of *Cosmotriphora melanura* (C.B. Adams, 1850) (red circle = type locality), with gray circles representing the sympatry of *C. melanura* with atypical shells (*Cosmotriphora* cf. *melanura*).

Fig. 33. Distribution map of *Eutriphora auffenbergi* Rolán & Lee, 2008; red circle = type locality.

Fig. 34. Distribution map of *Eutriphora costai* Fernandes & Pimenta, 2015; red circle = type locality.

Fig. 35. Distribution map of *Inella apexbilirata* Rolán & Fernández-Garcés, 2008; red circle = type locality.

Fig. 36. Distribution map of "*Inella*" *differens* Rolán & Lee, 2008; red circle = type locality.

Fig. 37. Distribution map of "*Inella*" *euconfio* Fernandes & Pimenta, 2019; red circle = type locality.

Fig. 38. Distribution map of “*Inella*” *faberi* Rolán & Fernández-Garcés, 2008; red circle = type locality.

Fig. 39. Distribution map of "*Inella*" *faceta* Fernandes & Pimenta, 2019; red circle = type locality.

Fig. 40. Distribution map of “*Inella*” *galo* Fernandes & Pimenta, 2019; red circle = type locality.

Fig. 41. Distribution map of "*Inella*" *leucocephala* Fernandes & Pimenta, 2019; red circle = type locality.

Fig. 42. Distribution map of "*Inella*" *maculata* Fernandes & Pimenta, 2019; red circle = type locality.

Fig. 43. Distribution map of "*Inella*" *vanilla* Fernandes & Pimenta, 2019; red circle = type locality.

Fig. 44. Distribution map of *Inella* sp. 1.

Fig. 45. Distribution map of "*Inella*" sp. 2.

Fig. 46. Distribution map of "*Inella*" sp. 3.

Fig. 47. Distribution map of "*Inella*" sp. 4.

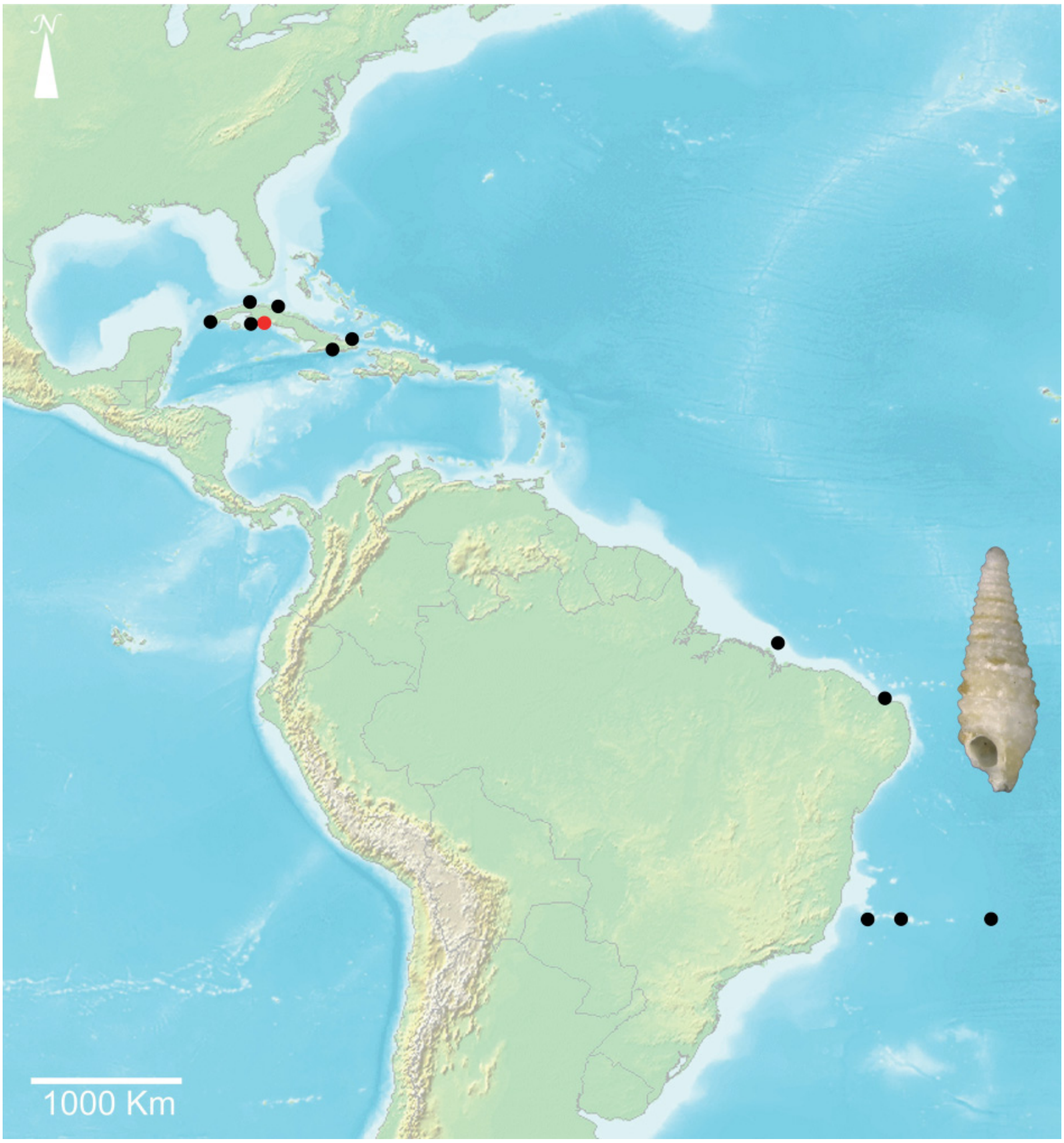

Fig. 48. Distribution map of *Iniforis carmelae* Rolán & Fernández-Garcés, 1993; red circle = type locality.

Fig. 49. Distribution map of *Iniforis pseudothomae* Rolán & Fernández-Garcés, 1993; red circle = type locality.

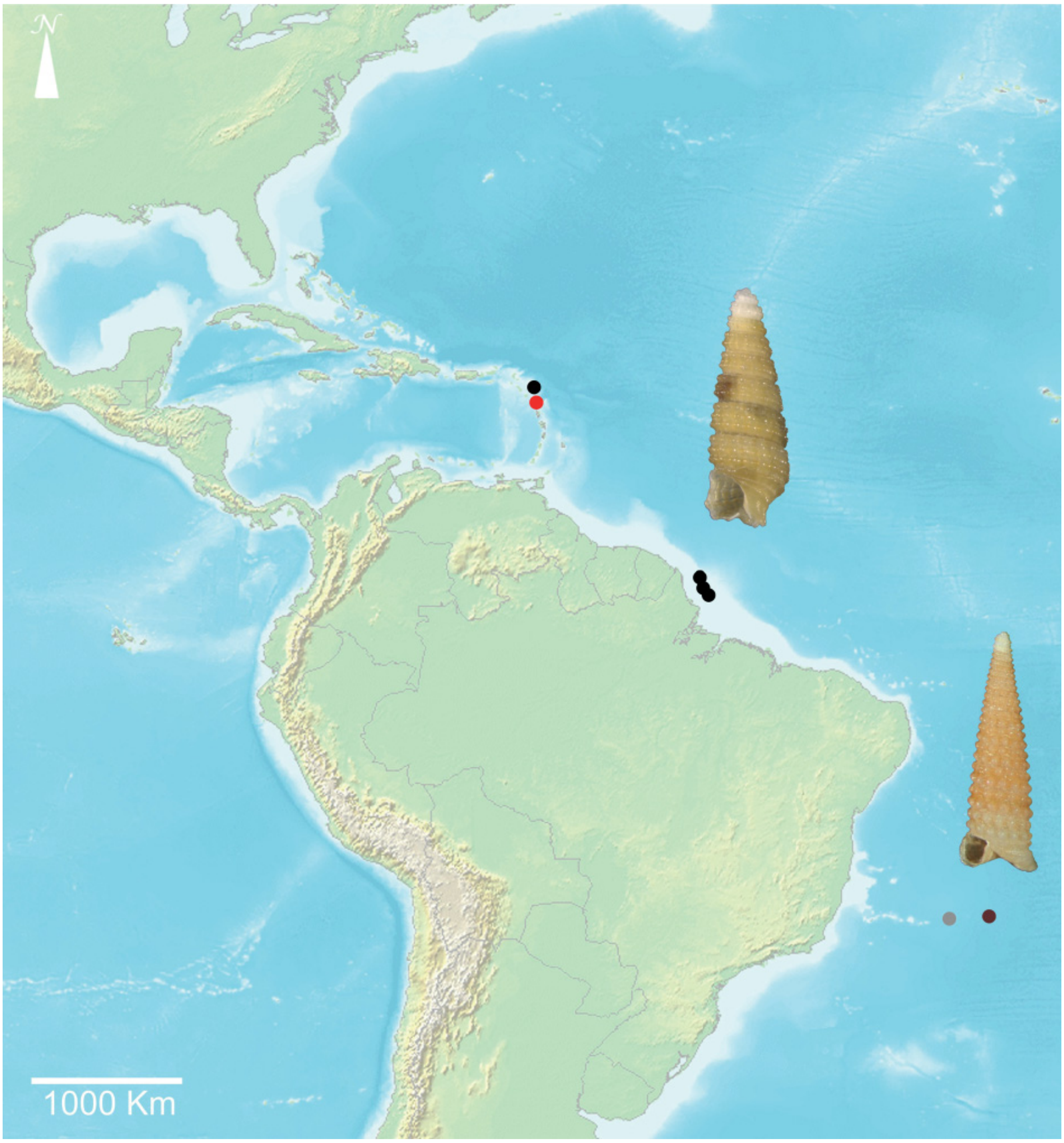

Fig. 50. Distribution map of *Isotriphora tricingulata* Rolán & Fernández-Garcés, 2015 (red circle = type locality; black circles = additional localities) and *Isotriphora onca* Fernandes, Pimenta & Leal, 2013 (brown circle = type locality; gray circle = additional locality).

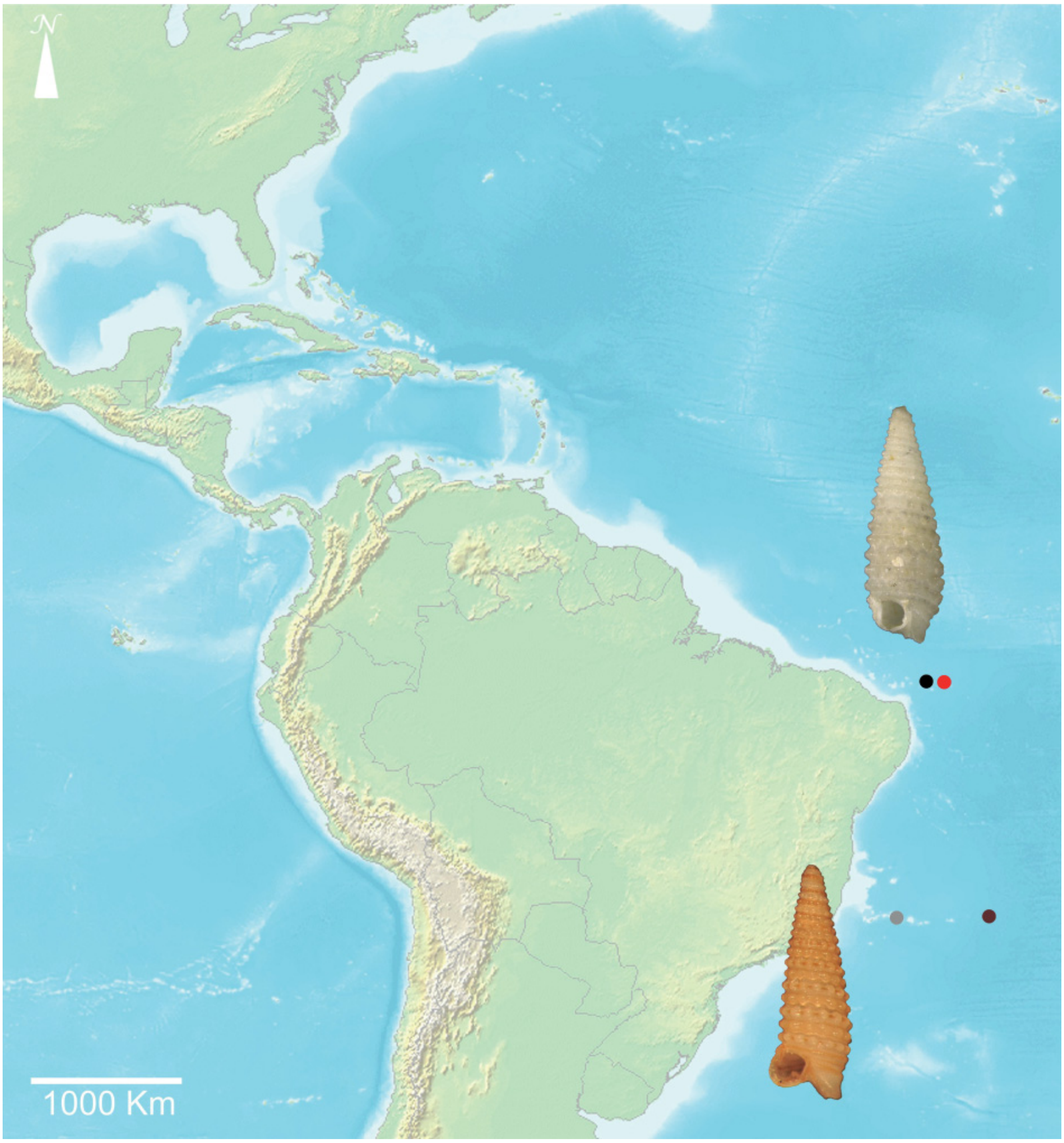

Fig. 51. Distribution map of *Isotriphora uncia* sp. nov. (red circle = type locality; black circle = additional locality) and *Isotriphora tigrina* Fernandes, Pimenta & Leal, 2013 (brown circle = type locality; gray circle = additional locality).

Fig. 52. Distribution map of *Isotriphora* sp. 1 (gray circle) and *Isotriphora leo* sp. nov. (red circle).

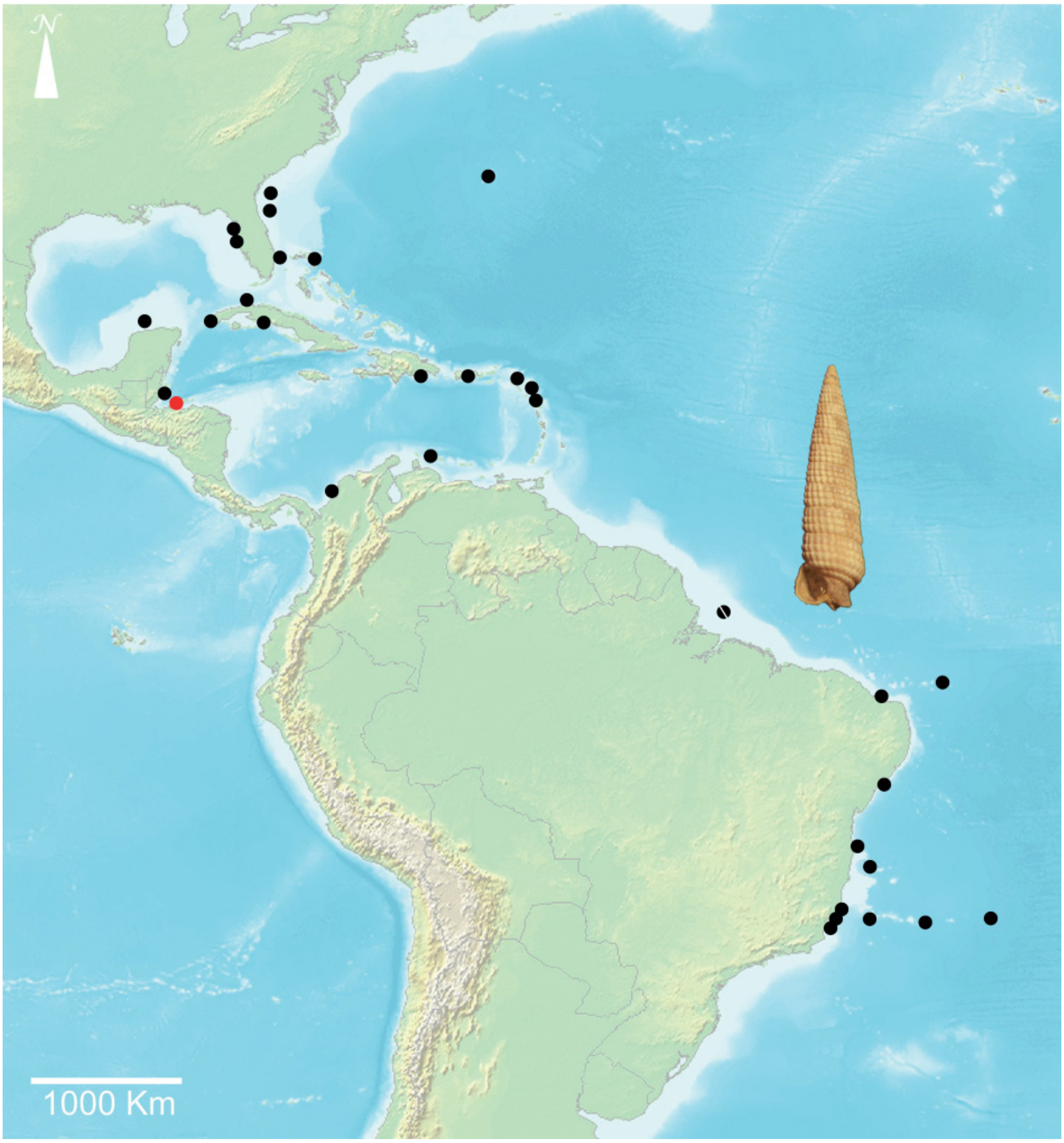

Fig. 53. Distribution map of *Latitriphora albida* (A. Adams, 1854); red circle = type locality.

Fig. 54. Distribution map of *Marshallora ostenta* Rolán & Fernández-Garcés, 2008; red circle = type locality.

Fig. 55. Distribution map of *Marshallora* sp. 1.

Fig. 56. Distribution map of *Monophorus olivaceus* (Dall, 1889); red circle = type locality.

Fig. 57. Distribution map of *Monophorus caracca* (Dall, 1927) comb. nov. (red circle = type locality; black circle = additional locality) and *Monophorus verecundus* sp. nov. (brown circle = type locality; gray circles = additional localities).

Fig. 58. Distribution map of *Nanaphora leei* Fernandes & Pimenta, 2015; red circle = type locality.

Fig. 59. Distribution map of *Nanaphora verbernei* (Moolenbeek & Faber, 1989); red circle = type locality.

Fig. 60. Distribution map of *Nanaphora* sp. 1.

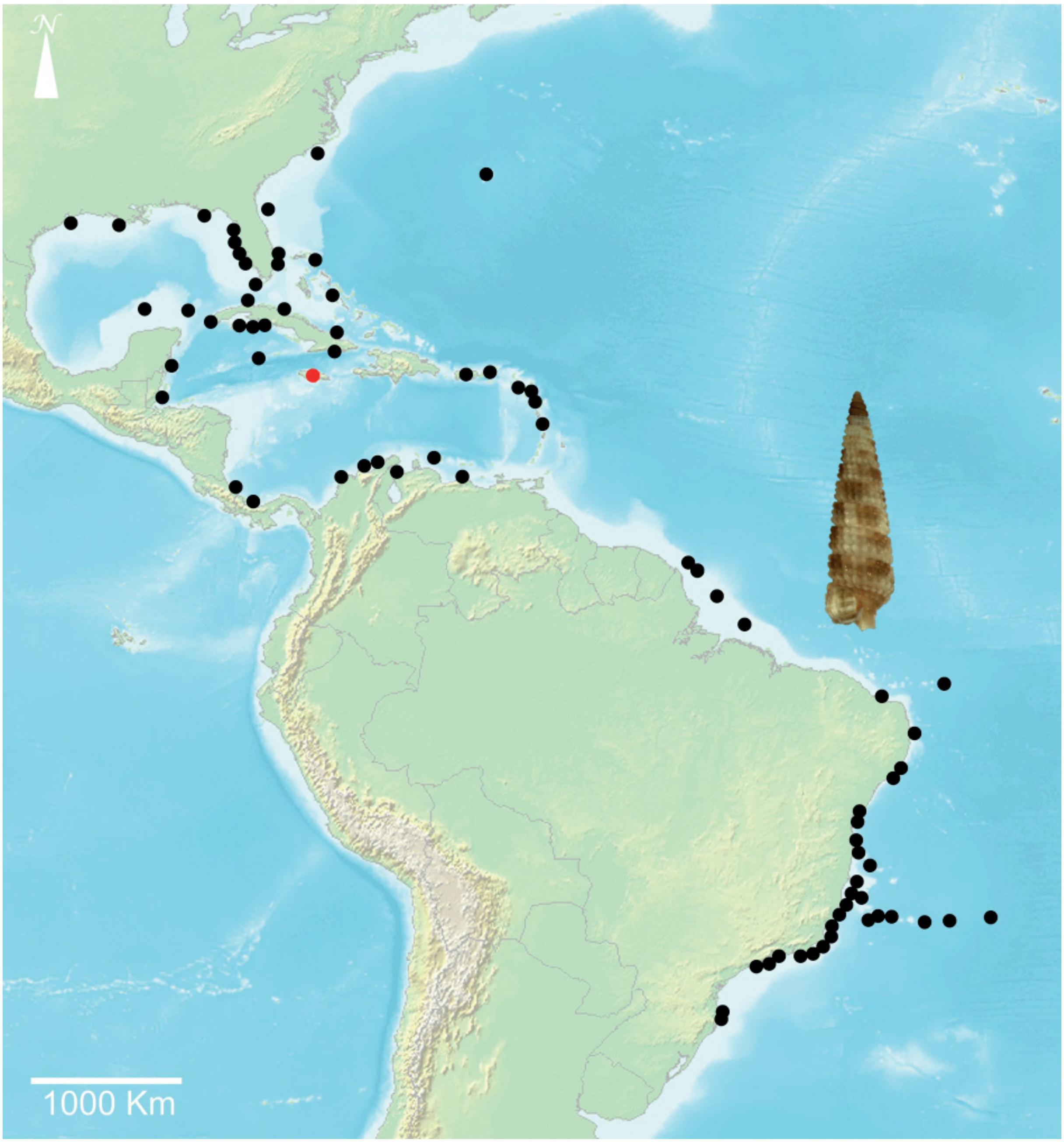

Fig. 61. Distribution map of *Nototriphora decorata* (C.B. Adams, 1850); red circle = type locality.

Fig. 62. Distribution map of *Sagenotriphora osclausum* (Rolán & Fernández-Garcés, 1995); red circle = type locality.

Fig. 63. Distribution map of *Sagenotriphora* sp. 1.

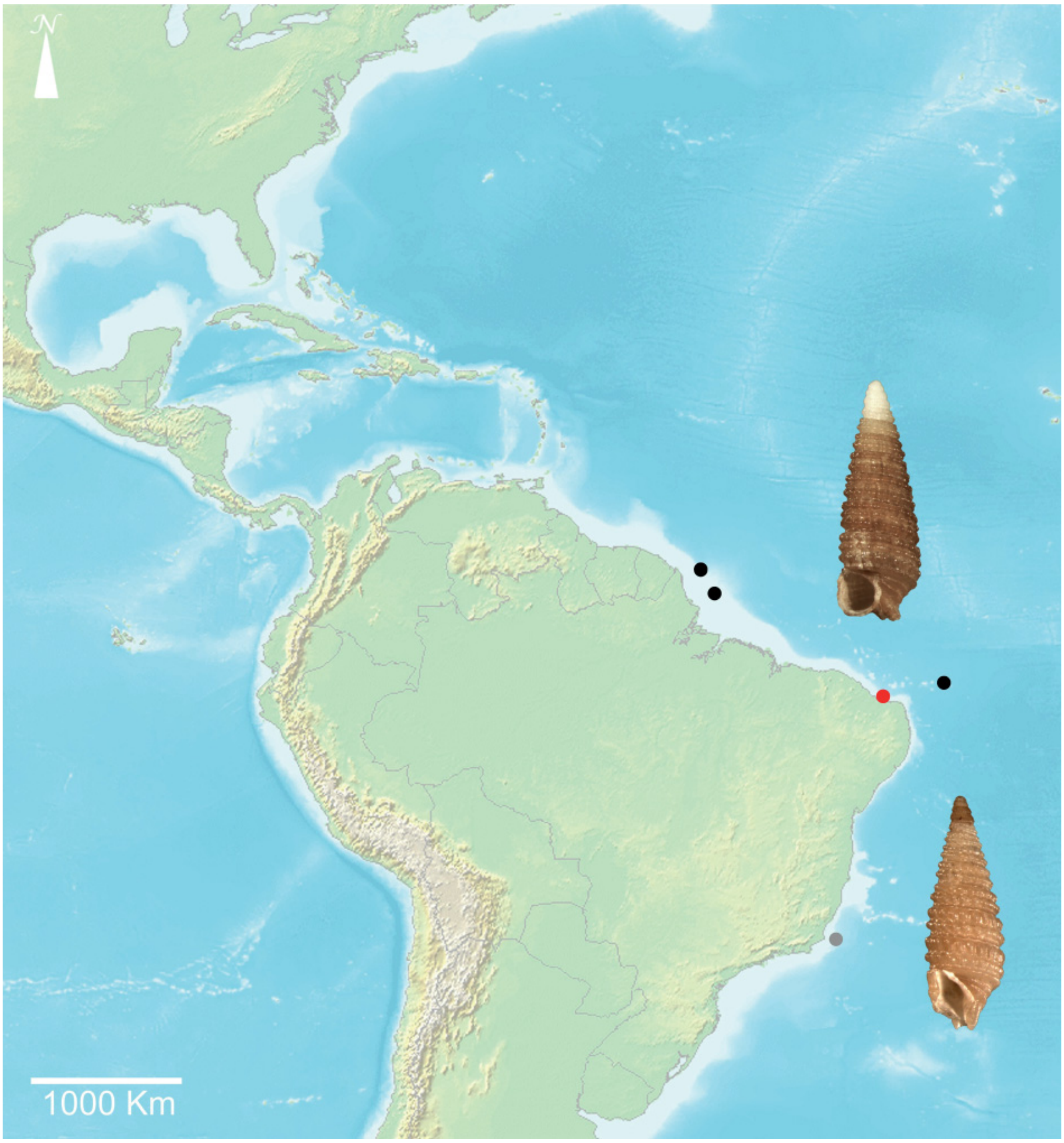

Fig. 64. Distribution map of *Sagenotriphora albocaput* sp. nov. (red circle = type locality; black circles = additional localities) and *Sagenotriphora* sp. 2 (gray circle).

Fig. 65. Distribution map of *Similiphora intermedia* (C.B. Adams, 1850); red circle = type locality.

Fig. 66. Distribution map of *Similiphora lucida* sp. nov.; red circle = type locality.

Fig. 67. Distribution map of *Similiphora* sp. 1.

Fig. 68. Distribution map of *Strobiligera delicata* Fernandes & Pimenta, 2014; red circle = type locality.

Fig. 69. Distribution map of *Strobiligera dinea* (Dall, 1927); red circle = type locality.

Fig. 70. Distribution map of *Strobiligera gaesona* (Dall, 1927); red circle = type locality.

Fig. 71. Distribution map of *Strobiligera inaudita* (Rolán & Lee, 2008); red circle = type locality.

Fig. 72. Distribution map of *Strobiligera unicornium* (Simone, 2006); red circle = type locality.

Fig. 73. Distribution map of *Strobiligera campista* Fernandes & Pimenta, 2019 (red circle = type locality; black circle = additional locality) and *Strobiligera santista* Fernandes & Pimenta, 2019 (brown circle = type locality; gray circles = additional localities).

Fig. 74. Distribution map of *Strobiligera* sp. 1.

Fig. 75. Distribution map of *Strobiligera* sp. 2.

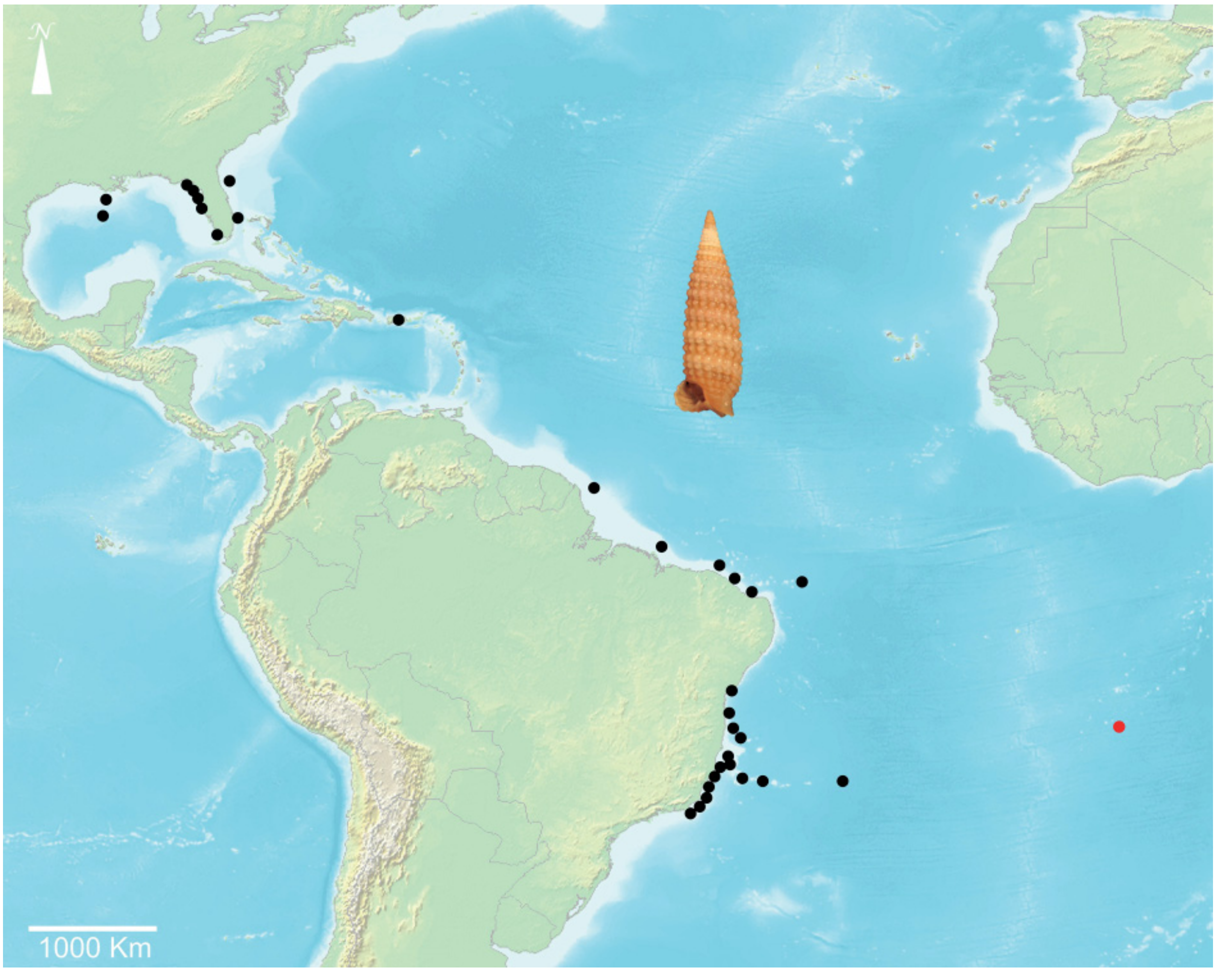

Fig. 76. Distribution map of *Triphora atlantica* Smith, 1890; red circle = type locality.

Fig. 77. Distribution map of *Triphora charybdis* Fernandes & Pimenta, 2015; red circle = type locality.

Fig. 78. Distribution map of *Triphora ellyae* De Jong & Coomans, 1988; red circle = type locality.

Fig. 79. Distribution map of *Triphora elvirae* De Jong & Coomans, 1988; red circle = type locality.

Fig. 80. Distribution map of *Triphora portoricensis* Rolán & Redfern, 2008; red circle = type locality.

Fig. 81. Distribution map of *Triphora scylla* Fernandes & Pimenta, 2015; red circle = type locality.

Discussion

After more than six decades of published records of triphorids from Brazil, since Lange-de-Morretes (1949), 13 species were known until 2010; this number actually decreases to 11 because two species with unknown apexes and, therefore, unsubstantiated identifications, were recorded by Rios (1975, 1985) (Fernandes & Pimenta 2019b). From 2011 to now, the number increased to 65, revealing the importance of taxonomic revisions to update our knowledge of the real diversity of regional biota. This is particularly evident when dealing with micromolluscs, which were often neglected in the past due to inherent difficulties in their study. Pending future thorough taxonomic revisions of "Caribbean" species to complement the study of Triphoridae from the western Atlantic, 31 of the 65 species (~48%) are presumably endemic from Brazil.

Several species distributed from the "Caribbean" to Brazil show distinct gaps in their known geographical range. In most cases, this does not reflect absence of occurrence but merely absence of studies. For example, the region comprising Mexico to Nicaragua has scattered records of triphorids (e.g., Vokes & Vokes 1983; Rolán & Cruz-Ábrego 1996; Rolán & Luque 1999), and certainly harbors more species than currently known. The arc of the Lesser Antilles, which provides an interesting comparison of triphorids shared with Puerto Rico and Hispaniola, is just recently being evaluated (e.g., Rolán & Fernández-Garcés 2015; Lamy & Pointier 2018). The most noticeable gap of knowledge comprises the region from Venezuela to the Guyanas, which is severely influenced by the freshwater discharge of the Orinoco-Amazon basin and is crucial to fulfill (or not) many gaps of geographical ranges of species shared between northwestern and southwestern Atlantic. Some gaps are also present in Brazil, since most taxonomic effort was concentrated in its southeastern region. The taxonomic descriptions of several triphorids from the western Atlantic in the last decades may explain some disjunct distributions, and material of these new species is possibly 'awaiting' to be analysed in scientific collections. However, the local absence of triphorids may also be related to the absence of specific sponge hosts in a certain area. It is also clear that some great disjunct ranges may be derived from the unrecognized existence of more than one species, although masked by a high similarity of shell features.

The Brazilian coast is subdivided into different provinces according to broad biogeographical analyses (references in Barroso *et al*. 2016). In a global comparison, Spalding *et al*. (2007) proposed the provinces of North Brazil Shelf-NBS (Orinoco-Amazon basin), Tropical Southwestern Atlantic-TSA (Piauí to Cabo Frio – northern Rio de Janeiro, southern Campos Basin) and Warm Temperate Southwestern Atlantic-WTSA (Cabo Frio to the mouth of Rio Negro, Argentina). The total number of triphorids in each province shows that 45 species (~69%) are tropical (occurring in NBS and/or TSA), 18 species (~28%) are tropical but extend southwards into subtropical waters, and only "*Inella*" sp. 3 and *Strobiligera santista* are restricted to the WTSA province (Fig. 82A). Species present in the "Caribbean" and here recorded only in TSA are presumed to also occur in NBS.ß

The majority (~79%) of the 33 planctotrophic species is distributed over two or three provinces in Brazil (Fig. 82B), whereas most (~56%) of the 32 non-planctotrophic species is limited to a single province or to oceanic islands (Fig. 82C); this follows the general trend that planctotrophic developers present a wider geographical range than non-planctotrophic ones (Jablonski & Lutz 1983; Nützel 2014). These figures may be misleading, however, because a widespread species occurring from the "Caribbean" to Rio de Janeiro will be counted for only two provinces, the same for a species that occurs for example from Maranhão to Ceará (i.e., *S. unicornium*; Fig. 72). The reduced number (11) of planctotrophic species common to all three provinces is possibly not related to limited larval spreading, but to survivorship outside optimal conditions (see below). The spreading of lecithotrophic species over two or three provinces may be misleading, because of uncertain taxonomic assignments due to the absence of available soft parts. The numbers of planctotrophic (33) and non-planctotrophic (32) species in Brazil

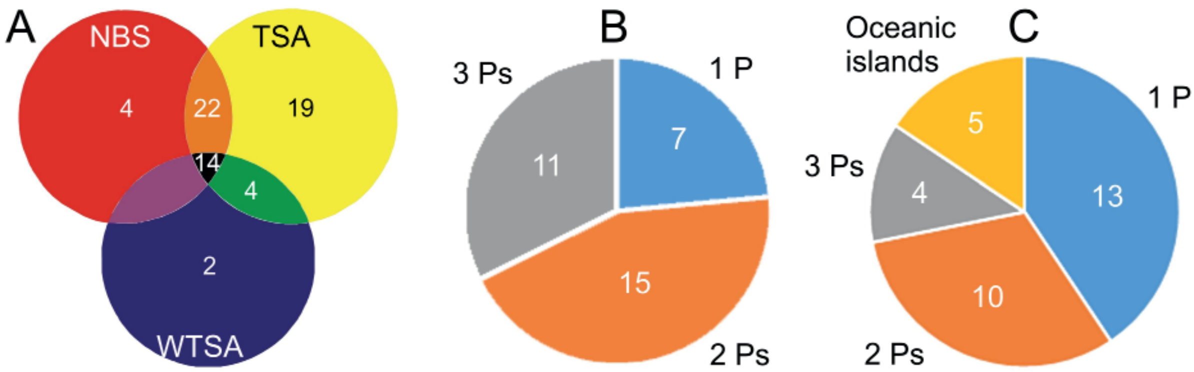

Fig. 82. Distribution of triphorids in Brazil according to the marine provinces of Spalding *et al*. (2007). **A**. Number of species in each province: NBS = North Brazil Shelf; TSA = Tropical Southwestern Atlantic; WTSA = Warm Temperate Southwestern Atlantic. **B**. Range of planctotrophic species in Brazil; '*n*' Ps refer to species present in *n* provinces. **C**. Range of lecithotrophic species in Brazil (those exclusively living near oceanic islands were set apart).

are very similar to the 67 species (34 planctotrophic, 33 non-planctotrophic) with known protoconch reported in southern Australia (Marshall 1983).

Campos Basin, in southeastern Brazil, comprises 42 of the 65 species (~65%) and may reflect a speciose ecosystem rather than an artifact of intensified sampling effort (Fernandes & Pimenta 2019b). Shallow and midwaters of the continental shelf of Campos Basin have a clear predominance of *Similiphora intermedia*, with *Inella apexbilirata* dominating the lower layers of the shelf. Perhaps the most evident spatial dominance of a triphorid in Brazil is observed in *Cosmotriphora melanura*, which is almost omnipresent along the seamounts of the Vitória-Trindade Chain (Fernandes *et al*. 2013), probably due to its longer larval duration (Fernandes & Pimenta 2017b). Other species seem to have patchy distributions, like *Iniforis pseudothomae*.

Barroso *et al*. (2016) proposed that a gradual faunal transition of marine 'prosobranchs' occurs between southern Bahia and Santa Catarina, instead of the abrupt transition zone at Campos Basin (Spalding *et al*. 2007: fig. 1). The mix of tropical and subtropical/upwelling waters in Campos Basin (between Espírito Santo and Rio de Janeiro), in addition to the considerable freshwater discharge and the complex marine environment (Barroso *et al*. 2016), abruptly limit the range of 10 tropical planctotrophic triphorids (Fig. 83). A gradual limitation of the range of other tropical species emerges southwards (Fig. 83), comprising the ecoregion referred to as "Southeastern Brazil" by Spalding *et al*. (2007), which is influenced by the water temperature decrease during winter south of Rio de Janeiro (Miloslavich *et al*. 2011). *Metaxia taeniolata*, *Monophorus verecundus* sp. nov. and *Triphora elvirae* apparently do not extend their ranges south of the vicinity of São Sebastião (São Paulo). Four other species, i.e., *Metaxia rugulosa*, *Monophorus olivaceus* (with a single and controversial southern record; see Appendix), *Sagenotriphora osclausum* and *Strobiligera inaudita* reach the continental shelf of southern São Paulo State, although their shells are often found in very worn conditions in this meridional limit. Another hypothesis for this ' Step-by-step' restriction in the range of triphorids may be related to the scarcity of particular sponge hosts rather than reduced low-temperature tolerance of triphorids. Several tropical sponge species are scarce or absent south of Bahia and Espírito Santo (Solé-Cava *et al*. 1981).

In contrast, summer field work conducted by the authors in Santa Catarina State (southern Brazil) revealed high densities of living specimens of *Marshallora* spp., *Nanaphora verbernei* (Fig. 84A) and

Nototriphora decorata (Fig. 84B), in addition to rare specimens of *Triphora ellyae* (Fig. 84C) and *Similiphora intermedia* (Fig. 84D, but with a hermit crab). Some species of Cerithiopsidae were also frequently sampled there. The local abundance of Triphoroidea suggests that these snails benefited

Fig. 83. Southern limits of planctotrophic, wide-range and tropical shallow-water triphorids from Brazil; the single exception is the lecithotrophic (but with a probable planctonic larva) *Metaxia rugulosa* (C.B. Adams, 1850). Illustrated shells are not necessarily from the southernmost end of their range. Species are cited from the left to the right, beginning with those situated at the top of each section: 1. *Iniforis pseudothomae* Rolán & Fernández-Garcés, 1993, *Latitriphora albida* (A. Adams, 1854), *Triphora atlantica* Smith, 1890, *Triphora scylla* Fernandes & Pimenta, 2015, *Metaxia excelsa* Faber & Moolenbeek, 1991, *Cheirodonta dupliniana* (Olsson, 1916), *Coriophora novem* (Nowell-Usticke, 1969), *Cosmotriphora melanura* (C.B. Adams, 1850), *Eutriphora costai* Fernandes & Pimenta, 2015, *Marshallora ostenta* Rolán & Fernández-Garcés, 2008. 2. *Metaxia taeniolata* (Dall, 1889), *Monophorus verecundus* sp. nov., *Triphora elvirae* De Jong & Coomans, 1988. 3. *Metaxia rugulosa*, *Monophorus olivaceus* (Dall, 1889), *Sagenotriphora osclausum* (Rolán & Fernández-Garcés, 1995), *Strobiligera inaudita* (Rolán & Lee, 2008). 4. *Cosmotriphora arnoldoi* Faber & Moolenbeek, 1991, *Nanaphora verbernei* (Moolenbeek & Faber, 1989), *Nototriphora decorata* (C.B. Adams, 1850), *Triphora ellyae* De Jong & Coomans, 1988, *Similiphora intermedia* (C.B. Adams, 1850). 5. *Triphora charybdis* Fernandes & Pimenta, 2015, *Marshallora* spp. Map adapted from Google Earth.

from the scarcity of predators in higher latitudes (Valentine *et al*. 2002) and/or that particular sponges (specific to these micropredatory snails) dominate local rocky shores, or even that the Triphoroidea species succeeding in southern Brazil have a more generalized rather than a specialized diet.

A worn shell of *Triphora charybdis* from Rio Grande do Sul is here illustrated (Fig. 84E), but the tropical triphorids that reach the southernmost range in the western Atlantic are *Marshallora* spp., one of which is represented by a single and moderately preserved shell in Parcel do Carpinteiro, near Rio Grande city (M.R. Fernandes, unpublished data). The long sandy beaches in Rio Grande do Sul preclude the establishment of *Marshallora* spp. and these snails may be restricted to colonize the scattered rocky and shallow surfaces of 'parcéis' (outcrops). This genus is present as subfossils only in the mouth of Río de la Plata, between Uruguay and Argentina (Fig. 84F–J), revealing a population retraction probably due to the weakening of the warm Brazil Current during the Quaternary (Aguirre 1993; Martínez *et al*. 2006, 2013). Forcelli & Narosky (2015) recorded the name *M. nigrocincta* for Uruguay, but illustrated a shell of *Similiphora intermedia*, not having detailed its origin or voucher material; the illustrated shell

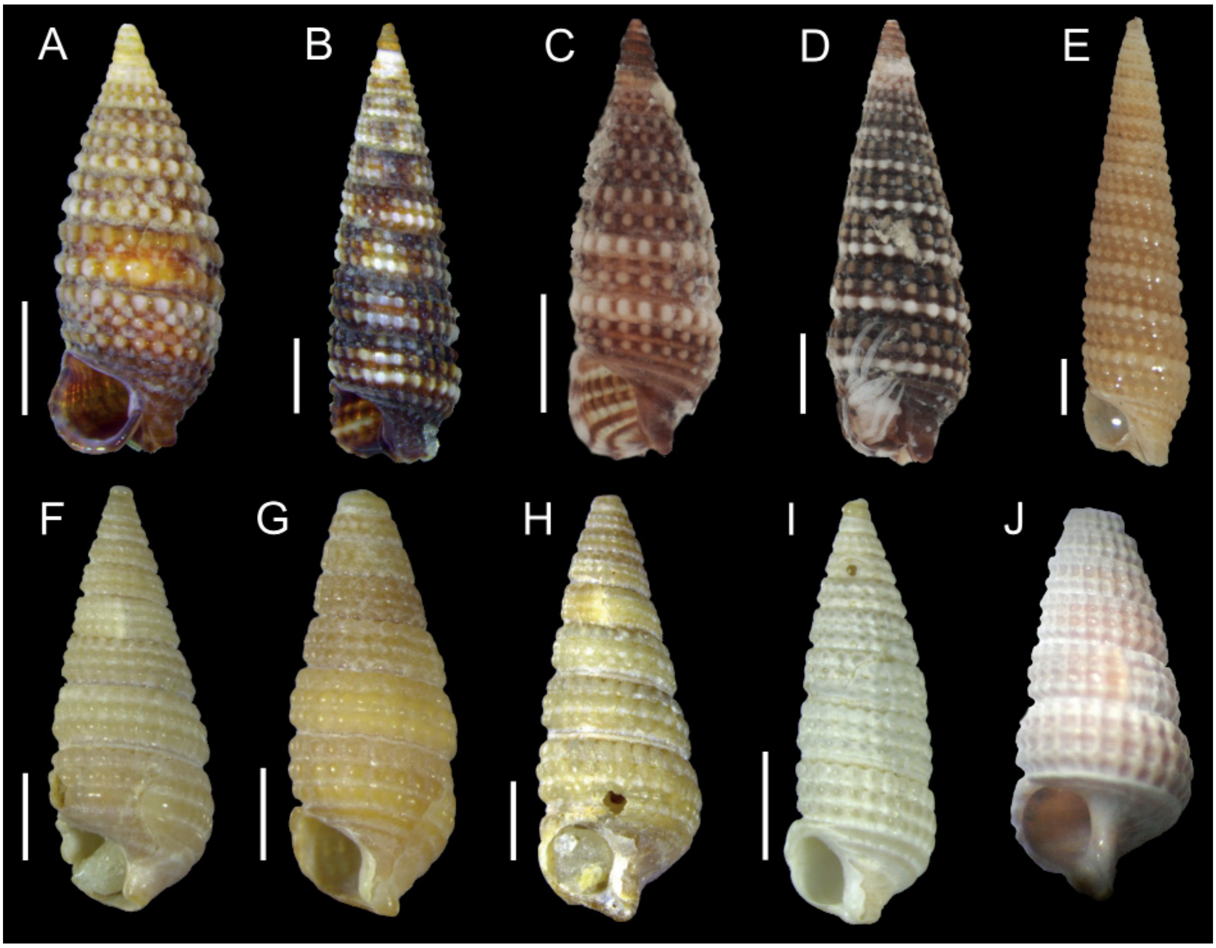

Fig. 84. Fresh and worn specimens found in southern Brazil and Uruguay/Argentina. **A**. *Nanaphora verbernei* (Moolenbeek & Faber, 1989), MNRJ 28956*. **B**. *Nototriphora decorata* (C.B. Adams, 1850), MNRJ 28941*. **C**. *Triphora ellyae* De Jong & Coomans, 1988, MNRJ 23259. **D**. *Similiphora intermedia* (C.B. Adams, 1850), MNRJ 23366. **E**. *Triphora charybdis* Fernandes & Pimenta, 2015, MZSP 19331. **F–J**. *Marshallora* sp. **F–I**. MNHN-Mo 12959*, La Paloma, Rocha, Uruguay, E. Duarte leg., 6 Apr. 1959. **J**. MLP 26399, Cantera La Elvira, Buenos Aires Province, Argentina, M. Aguirre leg., 1983. Scale bars: 1 mm.; J not to scale.

might have been sampled in tropical waters, outside Uruguay. *Similiphora intermedia* was originally recorded from Uruguay by Figueiras & Sicardi (1972) under the erroneous name *Triphora pulchella* (C.B. Adams, 1850), but then, all records of this species in Uruguay are doubtful and based on worn material.

At the other extremity of the western Atlantic, it seems that northeastern Florida (USA) represents the northernmost limit to several tropical and widespread triphorids. The well-recognized transition zone of Cape Hatteras, in North Carolina, seems to be the last frontier for the remaining tropical species (except *Cheirodonta dupliniana*, occurring northwards until Connecticut, USA (Fig. 29), and *Marshallora nigrocincta*), preventing them to reach the Cold Temperate Northwest Atlantic Province (Spalding *et al*. 2007). Similarly, some species have extended ranges in both extremities of the subtropical western Atlantic (e.g., *M. rugulosa*, *M. taeniolata*, *N. decorata*, *S. osclausum* and *S. intermedia*), although others inhabit subtropical waters only in the northwestern Atlantic (e.g., *C. dupliniana*, *C. melanura* and *L. albida*) or in the southwestern Atlantic (e.g., *C. arnoldoi*, *S. inaudita* and *T. ellyae*).

Several planctotrophic triphorids in northeastern Florida also colonized Bermuda, except *Metaxia taeniolata*, *Cheirodonta dupliniana* (which was often overlooked), *Sagenotriphora osclausum* and *Similiphora intermedia*; the three latter species did not spread over the Vitória-Trindade Chain either, in southeastern Brazil. The fast-flowing Gulf Current facilitates larval dispersal to Bermuda, albeit a reassessment of the material listed in Jensen & Pearce (2009) may reveal species different from those currently recognized there, such as, for example, the erroneous identification of *Marshallora nigrocincta* (M.R. Fernandes, unpublished data). *Metaxia rugulosa*, which has a short-lived larva inferred from the protoconch morphology, might have been erroneously identified by Jensen & Pearce (2009) for Bermuda regarding the previous description of *Metaxia prompta* by Rolán & Fernández-Garcés (2008). Caution must be given to the record of *Metaxia prompta* from the Vitória-Trindade Chain (Fernandes & Pimenta 2011), which could be an unnamed new species with a paucispiral protoconch very similar to that of the species from Bermuda, but originated from a different plancto-lecithotrophic transition. Similarly, records of *Iniforis carmelae* from Brazil could actually be derived from different ancestral populations of the planctotrophic species *I. pseudothomae*, which would have acquired lecithotrophy in oceanic islands or distant rocky outcrops. Without the knowledge of soft parts, shell features do not provide enough evidences to such ideas.

Several factors may trigger the plancto-lecithotrophic transition, such as the presence on isolated islands, in coastal lagoons, in the deep sea, narrow bathymetric ranges, strong offshore currents and much oligotrophic waters (which may hamper planctotrophic development) (Ellingson & Krug 2016; Fernandes & Pimenta 2019b). Hypothetical scenarios such as the replacement of planctotrophic individuals by non-planctotrophic ones or even long-lasting sympatry with lack (speciation) or maintenance of gene flow between individuals of different development modes (poecilogony) form an interesting field of research. The rare occurrence of poecilogony is regarded as representing brief periods of larval evolutionary transitions, or as a stable strategy for some species (Collin 2012; Knott & McHugh 2012; Ellingson & Krug 2016). The recent discovery of poecilogony in a few caenogastropod species (McDonald *et al*. 2014; Russini *et al*. 2020) provides a new stimulus for research in other families. Substantial modifications in the alpha-taxonomy of triphorids would be required if currently recognized planctotrophic and lecithotrophic sibling species are actually conspecific. Yet, until compelling evidence indicates otherwise, sibling species of Triphoridae are considered to reflect possible past poecilogonic events that led to the current species level divergence.

Species of *Isotriphora* are recognized by their typical paucispiral protoconch, indicative of intracapsular metamorphosis. With the exception of *I. tricingulata*, all species of *Isotriphora* that occur in Brazil are restricted to oceanic islands, and their development favours larval retention and increases selfrecruitment and allopatric speciation (Leal 2000; Fedosov & Puillandre 2012). However, it is intriguing to imagine a scenario in which a genus that acquired intracapsular metamorphosis spreads among isolated islands thus promoting subsequent speciation. This is the more surprising since *Isotriphora* is absent in the continental shelf of northeastern and southeastern Brazil. It seems more plausible that ancestral planctotrophic lineage(s) may have reached oceanic islands, and the simplification to a similar (but convergent) protoconch emerged. Once lecithotrophy emerges in gastropod lineages its reversion to planctotrophy is believed to be precluded (Bouchet & Warén 1994), in spite of rare exceptions (Collin *et al*. 2007), thus the great evolutionary flexibility of the larval development of triphorids seems unidirectional. This hypothesis agrees with the existence of different types of teleoconch in species of *Isotriphora* from Brazil, with some of them showing late (*I. onca*, *I. tigrina* and *I. uncia* sp. nov.) or early (*I. tricingulata* and *Isotriphora* sp. 1) emergence of the median spiral cord, whereas *I. leo* sp. nov. has a late adapical cord, evidently reflecting different groups which are united by convergent larval development (Marshall 1983: 56). The polyphyly of *Isotriphora* will probably be confirmed after a comprehensive phylogeny.

The present study confirms or records for the first time the occurrence of several planctotrophic triphorids in the archipelagos of Fernando de Noronha or Atol das Rocas: *M. excelsa*, *C. dupliniana*, *C. melanura*, *L. albida*, *M. olivaceus*, *N. decorata*, *S. albocaput* sp. nov., *T. atlantica* and *T. elvirae*. In this case, absence of records evidently does not mean absence of occurrence, because the sampling of triphorids in Fernando de Noronha/Atol das Rocas was very sparse. *Cosmotriphora melanura* is the single triphorid that reached the isolated archipelago of São Pedro e São Paulo, which is possible by the supposedly prolonged larval development of this species (Fernandes & Pimenta 2017b).

Two species from the continental shelf, *Sagenotriphora albocaput* sp. nov. and *Similiphora lucida* sp. nov., are apparently restricted to the region comprising the mouth of the Amazon River to Rio Grande do Norte State, agreeing with the Cearaian subprovince of Petuch (2013). These species do not extend their range northwards, because of the totally different environmental conditions (see below), and southwards their larvae may be not able to overcome the counter flow of the North Brazil Current, which sweeps the continental shelf above Paraíba State (Miloslavich *et al*. 2011). *Strobiligera gaesona* may adopt the deep waters of the Canopus Bank and adjacent seamounts in Ceará and Rio Grande do Norte as southernmost refuges. The rare newtoniellid *Cerithiella sigsbeana* (Dall, 1881) presents a similar geographical range to *S. gaesona*, recorded only from its distant type locality and to the Canopus Bank (Fernandes *et al*. 2015). Other deep-sea gastropods seem to be restricted from the northwestern Atlantic to Ceará/Rio Grande do Norte (Daniel Cavallari, pers. comm.), agreeing with the lower bathyal North Atlantic province of Watling *et al*. (2013).

The mouth of the Amazon River and the entire North Brazil Shelf province of Spalding *et al*. (2007) provide an interesting scenario for triphorids. Several species widespread in the western Atlantic are found there, apparently allowing a gene flow between northwestern and southwestern Atlantic populations. Two species ("*Inella*" *vanilla* and "*Inella*" sp. 4) are mainly or strictly found there, and two others (*Sagenotriphora* sp. 1 and *Similiphora* sp. 1) might be atypical morphs related to species with wide ranges in the western Atlantic (*Sagenotriphora osclausum* and *Similiphora intermedia*, respectively, both also present in the North Brazil Shelf province). The atypical marine conditions of this region include reduced superficial salinity levels over a wide range, the presence of mangroves along the shore, low light and oxygen levels, extremely high sedimentation and consequent dominance of soft/unstable substrata. The North Brazil Current attains a great speed near the Amazon River mouth, reducing sedimentation over the bottom; this, coupled with the scarcity of zooxanthelate corals in this region, enabled the formation of an extensive carbonate reef (with several endemic sponges) in the mid/outer continental shelf of this area, from Oiapoque (Amapá) to Parcel Manuel Luís (Maranhão) (Moura *et al*. 2016; Francini-Filho *et al*. 2018). This reef lies at a depth of 70–220 m (Francini-Filho *et al*. 2018), occasionally up to a depth of 30 m (Moura *et al*. 2016), not being reachable to shore species such as *Marshallora* spp., although it may function as a biogeographical corridor to species common to the northwestern and southwestern Atlantic (Moura *et al*. 2016). Particularly for *S. osclausum* vs *Sagenotriphora* sp. 1 and *S. intermedia* vs *Similiphora* sp. 1, three hypothetical scenarios seem likely: (1) *Sagenotriphora* sp. 1 and *Similiphora* sp. 1 are merely ecological forms resulting from the interference of atypical environmental conditions in the normal production of the shell of *S. osclausum* and *S. intermedia*, e.g., phenotypic plasticity; or (2) they are new species, adapted to feed on specific endemic sponges; or (3) the reef is promoting a parapatric process, allowing a restricted gene flow between slightly divergent populations (Moura *et al*. 2016), with the emergence of a hybrid zone.

Of the 65 triphorid species in Brazil, 58 species (~89%) inhabit the continental shelf, contrasting with only seven (~11%) from the continental slope. Two of the 33 planctotrophic species (6%) are restricted to the continental slope, whereas five of the 32 lecithotrophic species (~16%) are mainly found in the deep sea. The depth range of some species may be much wider than suggested here owing to limited sampling, whereas the depth range of others might have been erroneously exaggerated due to *post mortem* displacement (this error was minimized by disregarding depth records of worn shells) or by lumping different species under a single name. Notwithstanding this, it is clear that several triphorids are present in a large extension of the continental shelf (0–150/200 m), whereas others are restricted to narrow ranges in the shore or in mid/outer layers of the continental shelf (Fig. 85). Brazilian coastal waters present a thermocline between 50–100 m (Miloslavich *et al*. 2011), which, coupled to the generalized

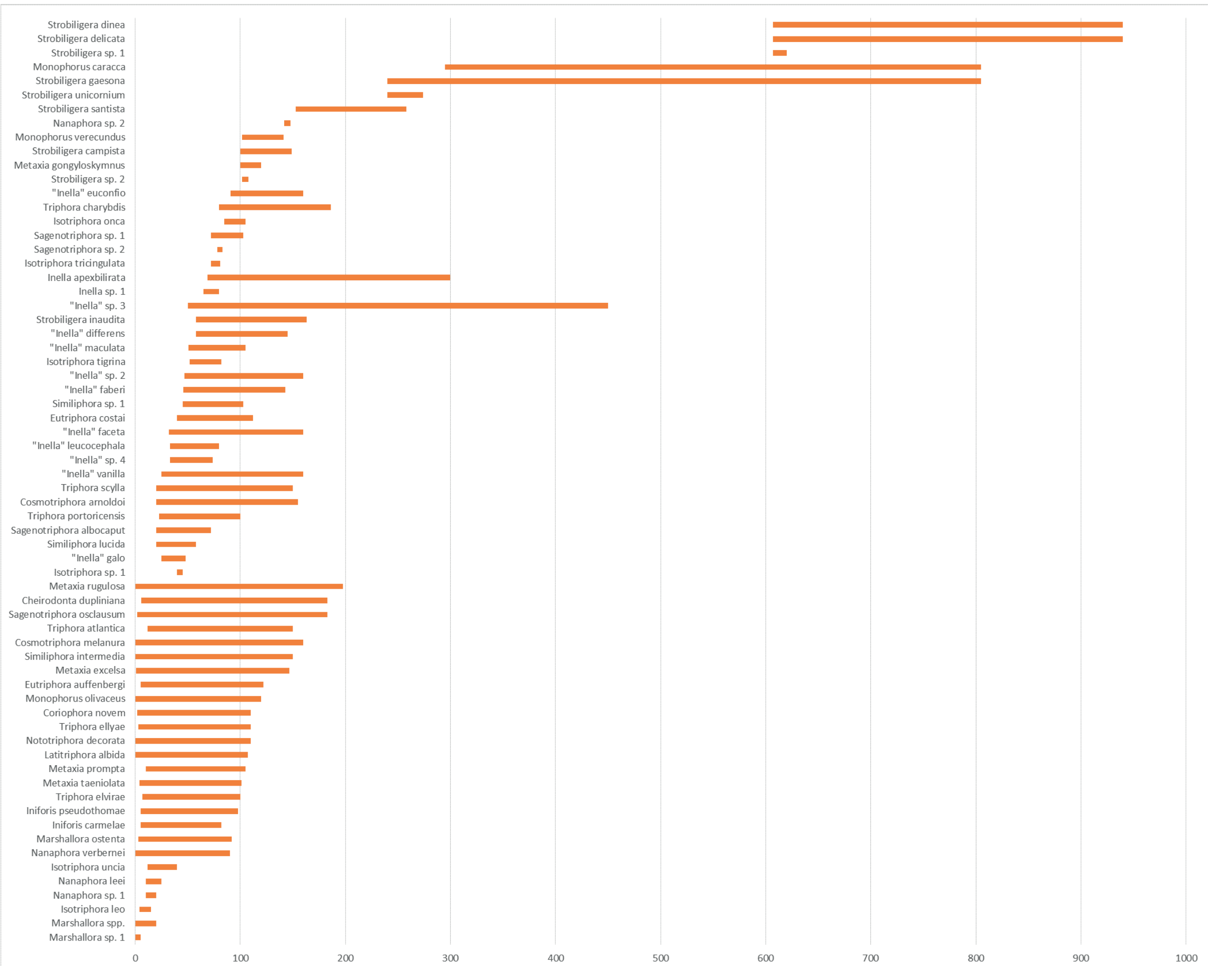

Fig. 85. Bathymetric range of triphorids from Brazil.

transition of fauna occurring near the 'twilight zone' (Pyle 2001), seems to restrict several triphorids to mid or deeper layers of the shelf. Depth zonation also evidences that many species can be sampled by free diving, whereas many others require SCUBA diving and/or dredging (Fig. 85).

Perspectives

The daunting task to review the taxonomy of speciose families of marine molluscs demands a complete survey of malacological collections and an extensive search for specialized literature. Even when a taxonomic revision is supposedly concluded, it is certain that some species will still be discovered in the near future. Currently, 65 species of Triphoridae are known from Brazil, although some of them still require a greater amount of material to enable formal descriptions. This high number of species is below or similar to that of other speciose (and taxonomically evaluated) families of parasite/micropredator gastropods in Brazil, like Pyramidellidae (140 species, Alexandre Pimenta, pers. comm.), Eulimidae (about 120 species, Leonardo Souza, pers. comm.) and Epitoniidae (64 species, Andrade 2017).

Some perspectives for the study of Triphoridae will be discussed in the following pages, encompassing urgently required efforts and ideas to be developed in the next decades.

(1) Phylogeny

Several parts of this study emphasized the urgent need of phylogenies to solve complicated situations related to genus or species delimitations. A single morphological attempt to resolve the phylogeny of triphorids was made by Kosuge (1966), who relied mainly on radular characters to organize some groups of Triphoridae. Nützel (1998) studied the phylogeny of the "Ptenoglossa", a group currently considered polyphyletic (Ponder *et al*. 2008), and suggested that the dextral species of the so-called "Triforidae" (i.e., *Trituba* Jousseaume, 1884) are the sister-group to Triphoridae. The astonishing similarity between *Trituba* and triphorid fossil genera such as *Epetrium* Harris & Burrows, 1891 does suggest this relationship.

As argued by Marshall (1983: 19) "as presently understood, triphorines exhibit a character mosaic of such intricate complexity that it would be unwise to attempt separation of further subfamilies with our present limited state of knowledge". Supposed primitive features such as multispiral protoconchs with a smooth spiral zone, teleoconch with late adapical spiral cord, operculum with nucleus slightly eccentric and undifferentiated teeth of radula are present in species of the "*Inella* group" (Marshall 1983). Another main group of Triphoridae seems to be defined by the development of long and closed tubular canals, distinct microsculpture in the teleoconch, very late emergence of median spiral cord of the teleoconch and operculum with a peculiar peg-like projection in some species. Genera such as *Iniforis*, *Coriophora*, *Mastonia* and *Mastoniaeforis* belong to this group, and a future revalidation of the subfamily Iniforinae Kosuge, 1966 may be considered. The undifferentiated teeth morphology of *Iniforis* (and the possibly related *Isotriphora*) is also regarded as a primitive condition. Clearly, without any objective phylogenetic investigation, these ideas are meaningless.

(2) Biogeography

The assessment of the biogeography of triphorids at local or regional scales can only be achieved once the species-specific associations of these micropredators/parasites to the particular sponges that serve as preys/hosts are better known. Citing two examples from Brazil, it is uncertain if some species of Triphoridae are absent from the Vitória-Trindade Chain or below Campos Basin respectively because of limited larval dispersal or limited tolerance to subtropical waters, or merely because their primary sponges are not present in these regions. On the other hand, the sharing of a species between the continent and oceanic islands means that the triphorid has feeding options in both localities, its pelagic larval development lasts long enough to disperse across the ocean, and that distinct abiotic and biotic factors do not limit its survivorship and reproduction.

Some interesting patterns emerge when considering triphorids on a global scale. Several well-recognized genera are restricted to the Indian Ocean and the western/central Pacific, such as *Euthymella*, *Mastonia*, *Mastoniaeforis* and *Viriola*, many of them possibly related to the hypothetical "*Iniforis* group". Conversely, genera such as *Cosmotriphora*, *Marshallora* and *Similiphora* are known only from the Atlantic Ocean. All these genera may have had a 'recent' formation suggested by their differentiated teeth morphology (Marshall 1983), having originated after or during the closure of the Tethys Sea (i.e., between the Late Oligocene and Early Miocene), an event that separated the marine fauna of the Indo-Pacific and the Atlantic (Vermeij 2012). The opposite is seen for supposed old/middle-aged genera such as *Inella*, *Monophorus*, *Iniforis* and *Isotriphora*, which are present worldwide and show a more or less undifferentiated teeth morphology.

(3) Alpha-taxonomy

The taxonomy of triphorids is poorly studied in several regions of the globe. For example, the two African coasts (except South Africa) and the Indian coast were never target of revisions. Even the Coral Triangle, which lies between the well-studied areas of Japan (e.g., Kosuge 1966) and Australia (e.g., Laseron 1958; Marshall 1983), will certainly reveal new data after a comprehensive revision. A notorious case is the eastern Pacific, with several old and worn types that require a complete investigation prior to the descriptions of new species (Fernandes & Araya 2019).

Most descriptions of triphorids in the last decades came from the western Atlantic, despite the huge diversity of these snails in the western and central Pacific. Other families of microgastropods that constitute the so-called 'Big Five' are being intensively studied from this region in the last years (e.g., Peñas & Rolán 2010; Cecalupo & Perugia 2013), especially after the great amount of material sampled by the expeditions conducted by the MNHN team. The chaotic situation and high numbers of already described triphorids of the western and central Pacific, in many cases avoiding a link between worn types and newly sampled specimens, encouraged the current reevaluation of types described from these regions (e.g., Albano & Bakker 2016; Albano *et al*. 2019). The same problem applies to the well-known "Caribbean" triphorid fauna, where several species are exclusively recognized by their old and worn types, requiring reevaluations and much more samplings.

Species shared between Brazil and the "Caribbean" are prone to have their DNA analysed in order to clarify if there is any genetic break along their distributional range, as observed in a complex of species in *Marshallora* (M.R. Fernandes, unpublished data). The study of fossils/subfossils from Brazil (Fig. 86A–E) may also reveal new findings: no fossil species of Triphoridae was recorded so far (Maury 1988; Simone & Mezzalira 1994), but this is probably a result of the scarcity of paleontological studies focusing on the discovery of microgastropods in Brazil.

(4) Anatomy

The image reconstruction of the internal anatomy of triphorids by micro-tomography and histological serial sectioning is a step forward to the unraveling of the morphological diversity of this speciose family. Although these techniques may demand a reduced working time if compared to classical drawings on camera lucida, they have particular technical issues and require great financial support.

A possible anatomical contribution to the biology of triphorids is the histology of female gonads to determine whether a continuous or seasonal reproduction occurs, especially when applied concomitantly to population dynamics procedures. Regarding the histology of male gonads, the ultrastructure investigation of the triphorid spermatozeugmata may reveal another level of generic comparisons (Healy 1990), especially if different triphorid genera indeed show an exclusive presence of spermatozeugmata or of true spermatophores (Robertson 2007).

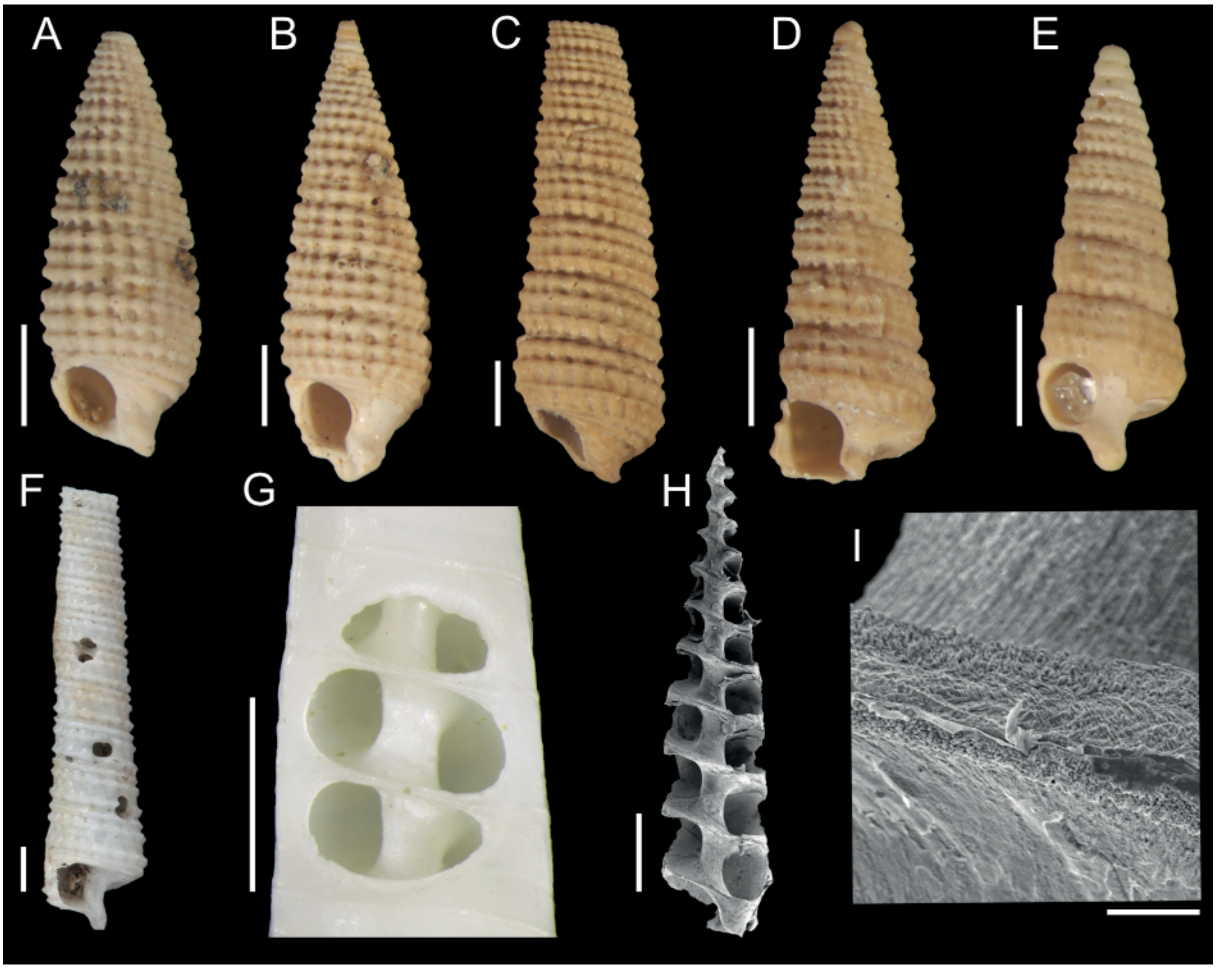

Fig. 86. Some perspectives of studies with triphorids. **A–E**. Subfossils of '*Triphora*' spp. from the place currently known as 'Aterro do Flamengo', Rio de Janeiro, Brazil: MZSP 83618 (A), MZSP 42715 (B–E). **F**. Shell of *Inella gigas* (Hinds, 1843) with predation marks, obtained from Fernandes & Pimenta (2019b). **G**. Shell of *Strobiligera gaesona* (Dall, 1927) with a large predation mark. **H**. SEM micrograph of the columella of *Cosmotriphora melanura* (C.B. Adams, 1850), MNRJ 33138*. **I**. SEM micrograph of shell layers of the columella of *Nototriphora decorata* (C.B. Adams, 1850), MNRJ 32763*. Scale bars: A–H = 1 mm; I = 50 µm.

(5) Spongivory

We completely ignore the relationships of species of Triphoridae with particular sponges except for a few records and unpublished photographs. It is uncertain, for example, whether most triphorids are truly specialized on one or a few species of Porifera or whether they are generalists (Marshall 1983: 7). The observation of triphorids moving between one and another sponge may confirm their micropredatory performance (suggested by gonochorism and the ubiquitous presence of a radula), whereas the observation of a more sedentary triphorid on a particular sponge specimen will advocate for the habit of parasitism (Poulin 2011). The discovery of other feeding modes in Triphoridae beyond spongivory would not be a surprise; for example, Warén & Bouchet (2001) suggested that a deep-water cerithiopsid may have a modified feeding on tube worms living in hydrothermal vents. Nützel (1998) suggested that Triphoridae and Cerithiopsidae may occupy different sponge hosts, which would have originated divergent radular and other alimentary traits.

A study aiming at detecting what sponges are preferred in the diet of triphorids should employ complementary techniques beyond fortunate *in situ* records of associations, such as: selective samplings, with the material brushed from particular sponge species being held in separate devices; histology of the stomach content (or fecal pellets) of triphorids in search of spicules; laboratory experiments to test the preference of triphorids for different preys/hosts; the analysis of Porifera collections in search for associated triphorids. Ideally, traps encompassing large blocks of sponges could be designed to evaluate larval settlement of triphorids. The observation of the mechanism employed during feeding may reveal strategies other than the penetration of the proboscis into the osculum, like the excavation of large holes in the sponge (Marshall 1983).

(6) Defensive mechanisms

Triphorids display distinct defensive mechanisms, such as the nodulose teleoconch sculpture (probably reducing shell damage and drilling), a small aperture, a deep withdraw into the posterior whorls of the shell when threatened (reducing shell entry attacks), and they possibly obtain refuge in the canals of sponges. An interesting consequence of their sinistral configuration might be a greater avoidance of predation by right-handed crabs (Dietl & Hendricks 2006; Vermeij 2015). Laboratory tests can be conducted to compare similar triphorids and cerithiopsids facing dextral and sinistral crabs (Shigemiya 2003).

A comparison of predation marks in shells of Triphoridae species from shallow and deep water, whether they are drill holes or repaired peristomes, would be interesting. Some species from the Brazilian slope seem to be particularly affected by drill holes, especially *Strobiligera gaesona* (Fig. 86G), which has a smooth shell and may be consequently more prone to be attacked by drilling gastropods (Fernandes & Pimenta 2019b).

Despite all possible benefits that small-sized gastropod lineages may obtain after acquiring larger dimensions in the deep sea, such as higher reproductive output (McClain & Crouse 2006; McClain *et al*. 2006), deep-sea triphorids may acquire particular gains when evolving gigantism (Fernandes & Pimenta 2017a). An extremely high-spired shell may facilitate a deep withdraw into the posterior whorls of the shell, reducing predation risks, and may hamper the chance of being dislodged from its prey/host (McClain & Crouse 2006). In fact, McClain *et al*. (2012) found that the biovolume of triphorids seems to be slightly greater in regions with reduced carbon flux (like the deep sea) than in productive regions in the northwestern Atlantic.

The interspecific variation in shell color of triphorids is remarkable, not only the tonality but especially the coloration pattern (e.g., axially or spirally stained, uniformly or sparsely distributed). One logical explanation to such variation is the camouflage of these snails in particular sponges, avoiding their detection by visual predators. Pigments aligned with spiral or axial cords were also suggested to be a proper cost/benefit ratio related to energy production and shell strenghtening (Rosenberg 1997). The widespread occurrence of brown shells of triphorids in shallow subtidal zones, however, could be related to specific shell pigments that may offer protection against light damage (Williams *et al*. 2016).

(7) Shell morphology

The diversified shell shape of triphorid genera (from small and globose to fusiform and extremely elongated forms) are suitable for 3D morphometry, which may be able to detect shifts between species or genera. In addition, the study of the columella without damaging the shell (Fig. 86H) is possible by micro-tomography, which, complemented by SEM/TEM images of the deposition of shell layers (Fig. 86I), may provide important insights into the taxonomy of this family.

(8) Sexual dimorphism

Marshall (1983: 3) indicated that some species of Triphoridae present two distinct size classes, suggesting that sexual dimorphism may play an important role in shell shape, a common feature observed in many other gastropods. We know nothing about sexual dimorphisms in Triphoridae, raising doubts as to what extent radular variation may reflect differences between sexes, e.g., as observed for Strombidae (Mutlu 2004), Muricidae (Fujioka 1982), Buccinidae (Matthews-Cascon *et al*. 2005) and Columbellidae (deMaintenon 2004), although sex differentiation of triphorids requires the study of their internal anatomy because males are aphallic (Kosuge 1966). To link a possible morphological sexual dimorphism to ecological differences (e.g., host preference) between males and females is another interesting subject to be explored.

(9) Larva and early ontogeny

Fernandes & Pimenta (2017b) raised hypotheses for the larval development of triphorids, including: modifications of the larval shell color of some species by reduced available food during the planctonic stage; some species seem to have a prolonged larval development; and spontaneous metamorphosis may proceed without any substrate in some species. A few studies described the early ontogeny of cerithiopsids (Cipriani *et al*. 1994; Collin 2004), but data about the spawning and rearing of triphorids are limited to the observations of Pelseneer (1926), Lebour (1933) and Fernandes & Pimenta (2019b). The description of the sequential stages of the triphorid development is entirely lacking, just like studies on triphorid larval ecology.

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Appendix

The following is a list of ordinary material examined and not published elsewhere. Some species which were not fully illustrated in previous works from Brazil are also figured herein.

Metaxia excelsa Faber & Moolenbeek, 1991

Cerithium exile C.B. Adams, 1850 non Eichholtz, 1829: 120.
Metaxia excelsa Faber & Moolenbeek, 1991: 83.

Cerithium exile – Clench & Turner 1950: 279, pl. 38 fig. 8.
Cerithiopsis exile – Parker & Curray 1956: 2433. — Robinson & Montoya 1987: 383.
Cerithiopsis exilis – Rios 1970: 44; 1975: 48, pl. 13 fig. 175; 1985: 50, pl. 19 fig. 223.
Metaxia exilis – De Jong & Coomans 1988: 51. — Leal 1991: 124, pl. 17 figs e–f. — Rios 1994: 95, pl. 31 fig. 381; 2009: 175, fig. 420. — Absalão *et al*. 2006: 238. — Gomes *et al*. 2006: 187.
Metaxia excelsa – Rolán & Fernández-Garcés 1992: 172, figs 1, 7; 2007: pl. IV fig. 68; 2015: 54, pl. 4 fig. f. — Redfern 2001: 69, pl. 34 fig. 291; 2013: 131, fig. 375. — Sevilla *et al*. 2003: 343. — Lee 2009: 90. — Fernandes & Pimenta 2011: 820, figs 1–6; 2019a: 7, figs 2a, 3. — Zhang 2011: 103, fig. 309. — Espinosa *et al*. 2012: 258. — García 2016: 106 — Lamy & Pointier 2018: 287, pl. 92 fig. 2.

Material examined

BONAIRE • 1 spec.; Nukove; depth 21 m; 14 Feb. 1998; MNRJ 32361*.

BRAZIL – **North Brazil** • 1 spec.; REVIZEE-Norte III st. 211A; UFMA*. – **Rio Grande do Norte** • 9 specs; BPot 1-MR32; MNRJ 32057* • 3 specs; BPot 1-MR41; MNRJ 31454* • 2 specs; BPot 1-MR42; MNRJ 31459* • 7 specs; BPot 1-MR43; MNRJ 31456* • 4 specs; BPot 2-MR42; MNRJ 31455* • 9 specs; BPot 2-MR44; MNRJ 31457* • 7 specs; BPot 2-MR45; MNRJ 31458*. – **Sergipe** • 1 spec.; Petro/UFS st. E6-A2; UFS. – **Bahia** • 7 specs; Baía de Todos os Santos; Jun. 1997; MNRJ 34425* • 1 spec.; 13º29′41″ S, 38º49′07″ W; Mar. 2006; MNRJ 32606* • 6 specs; Ilhéus; MNRJ 32375* • 8 specs; Ilhéus; MNRJ 32972*. – **Vitória-Trindade Chain** • 1 spec.; REVIZEE-Central C1-C61; MORG 40317. – **Espírito Santo** • 1 spec.; 19º25′34″ S, 39º22′16″ W; depth 42 m; Oct. 2003; MNRJ 19317* • 1 spec.; 19º26′19″ S, 39º15′17″ W; depth 53 m; Oct. 2003; MNRJ 19043*.

Metaxia gongyloskymnus Fernandes & Pimenta, 2011

Metaxia gongyloskymnus Fernandes & Pimenta, 2011: 826, figs 25–31.

Material examined

BRAZIL – **Rio de Janeiro** • 1 spec.; 23º05′ S, 40º58′ W; depth 100 m; MNRJ 17225* • 4 specs; 23º05′ S, 40º58′ W; depth 100 m; MNRJ 26600* • 2 specs; 23º05′ S, 40º58′ W; depth 100 m; MNRJ 33114* • 1 spec.; 23º05′ S, 40º58′ W; depth 100 m; MNRJ 35544*.

Metaxia rugulosa (C.B. Adams, 1850)

Cerithium rugulosum C.B. Adams, 1850: 121–122.
Cerithiopsis bermudensis Verrill & Bush, 1900: 536, pl. 65 fig. 20. Synonymy uncertain.

Metaxia rugulata [sic] – Espinosa *et al*. 2012: 258.
Cerithium rugulosum – Clench & Turner 1950: 339, pl. 38 fig. 17.
Cerithiopsis rugulosum – Olsson & McGinty 1958: 13. — Houbrick 1968: 14. — Abbott 1974: 109. — Vokes & Vokes 1983: 18, pl. 27 fig. 8. — Robinson & Montoya 1987: 383. — Díaz 1994: 33.

Metaxia rugulosa – Marshall 1977: 113. — Reed & Mikkelsen 1987: 108. — De Jong & Coomans 1988: 51. — Rolán & Fernández-Garcés 1992: 170, 172, figs 2, 9; 2007: pl. IV figs 15–18. — Rolán & Redfern 1996. — Redfern 2001: 69–70, pl. 34 fig. 292, pl. 109 fig. 292; 2013: 131, fig. 376. — Sevilla *et al*. 2003: 343. — Lee 2009: 90. — Tunnell *et al*. 2010: 206. — Fernandes & Pimenta 2011: 822, figs 12–19; 2019a: 10, figs 2b, 4. — Daccarett & Bossio 2011: 91, fig. 415. — Zhang 2011:101, fig.308.

Material examined

BRAZIL – **Amapá** • 2 specs; 04º27′54″ N, 49º58′05″ W, off Oiapoque; depth 160 m; 13 Oct. 2000; MNRJ 26610*. – **Maranhão** • 1 spec.; Parcel Manuel Luís; 1 Jun. 1993; UFMA* • 2 specs; 02º06′54″ S, 44º01′15″ W; depth 13 m; MNRJ 15306*. – **Bahia** • 1 spec.; JOPS st. 3238; MNRJ 33808*. – **Campos Basin** (Espírito Santo/Rio de Janeiro) • 8 specs; 22º42′ S, 40º40′ W; depth 10 m; 2006; MNRJ 32352* • 2 specs; 22º42′ S, 40º40′ W; depth 110 m; MNRJ 19477* • 1 spec.; 22º42′ S, 40º40′ W; depth 110 m; MNRJ 30903* • 2 specs; 22º42′ S, 40º40′ W; 110 m; MNRJ 31105* • 2 specs; 22º42′ S, 40º40′ W; depth 110 m; MNRJ 31123* • 1 spec.; 23º05′ S, 40º59′ W; depth 100 m; May 2009; MNRJ 32396* • 1 spec.; 23º05′ S, 40º58′ W; depth 100 m; 2004; MNRJ 30895* • 3 specs; 23º05′ S, 40º58′ W; depth 100 m; 2004; MNRJ 32638* • 8 specs; 23º05′ S, 40º58′ W; depth 100 m; 2004; MNRJ 32538* • 2 specs; 23º05′ S, 40º58′ W; depth 100 m; 2004; MNRJ 35543* • 1 spec.; 23º06′00″ S, 41º06′00″ W; depth 88 m; Oct. 2008; MNRJ 32037*. – **São Paulo** • 1 spec.; Ubatuba, Enseada do Flamengo; 25 Jun. 1956; C. de Jesus leg.; MZSP 52120 • 3 specs; PADCT st. 6571; MNRJ 29368* • 1 spec.; PADCT st. 6571; MZSP 133491 • 2 specs; REVIZEE-Sul st. 6666; MZSP 133500 • 5 specs; PADCT st. 6573; MNRJ 27849* • 1 spec.; REVIZEE-Sul st. 6678; MNRJ 29369* • 2 specs; REVIZEE-Sul st. 6676; MZSP 133503 • 10 specs; PADCT st. 6577; MNRJ 29370* • 2 specs; REVIZEE-Sul st. 6646; MNRJ 29367* • 1 spec.; PADCT st. 6641; MNRJ 60194 • 2 specs; PADCT st. 6642; MNRJ 27848*.

UNITED STATES OF AMERICA – **North Carolina** • 3 specs [this lot also contains paralectotypes of *Metaxia taeniolata*, listed below]; south of Cape Lookout; depth 95 m; R/V Albatross leg.; 19 Oct. 1885; USNM 92745. – **Louisiana** • 3 specs; 55–65 m; BMSM 67395.

Metaxia taeniolata (Dall, 1889)

Cerithiopsis metaxae var. *taeniolata* Dall, 1889: 256.
Cerithiopsis metaxae var. *taeniolata* – Dall 1892: 270. — Abbott 1974: 109.

Metaxia taeniolata – Rolán & Fernández-Garcés 1992: 173–174, figs 3, 8; 2007: pl. IV figs 13–14. — Fernandes & Pimenta 2011: 822, figs 7–11. — Fernandes & Segadilha 2019: 133, fig. 3f.

Metaxia exilis non C.B. Adams, 1850 – Odé 1989: 105, fig. 1.
Cerithiopsis rugulosum non C.B. Adams, 1850 – Merlano & Hegedus 1994: 146, pl. XLVI fig. 512.
Metaxia excelsa non Faber & Moolenbeek, 1991 – Tunnell *et al*. 2010: 205.
Metaxia rugulosa non C.B. Adams, 1850 – Rolán & Fernández-Garcés 2015: 54, pl. 4 fig. g. — Lamy & Pointier 2018: 287, pl. 92 fig. 3.

Material examined

BRAZIL – **North Brazil** • 1 spec.; REVIZEE-Norte III st. 175; UFMA* • 6 specs; REVIZEE-Norte III st. 176; UFMA*. – **Rio Grande do Norte** • 1 spec.; BPot 1-MR25; MNRJ 31453*. – **Bahia** • 23 specs; Baía de Todos os Santos; Jun. 1997; MNRJ 34426* • 2 specs; Ilhéus; MNRJ 32380* • 9 specs; Ilhéus; MNRJ 32971*. – **Espírito Santo** • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; MNRJ 31058* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; MNRJ 31082* • 3 specs; Porto de Ubú; 20º47′ S, 40º32′ W; MNRJ 32415*. – **Vitória-Trindade Chain** • 2 specs; REVIZEE-Central C2-22R; MORG 41675. –

São Paulo • 1 spec.; Ubatuba, Praia da Enseada; MZSP 51948 • 1 spec.; Guarujá; M.A. Cardoso leg.; MZSP 17753.

UNITED STATES OF AMERICA – **North Carolina** • 3 specs [paralectotypes; this lot also contains shells of *Metaxia rugulosa*, listed above]; south of Cape Lookout; depth 95 m; R/V Albatross leg.; 19 Oct. 1885; USNM 92745. – **South Carolina** • 1 spec., lectotype; depth 33 m; R/V Albatross leg.; 20 Oct. 1885; USNM 92746.

Cosmotriphora arnoldoi Faber & Moolenbeek, 1991
Fig. 87

Cosmotriphora arnoldoi Faber & Moolenbeek, 1991: 81, figs 1–2.

Triphora sp. D – Rice & Kornicker 1962: 120, pl. 2 fig. 17.
Cosmotriphora arnoldoi – Rolán & Fernández-Garcés 1994: 20, figs 12–15; 2007: 20, pl. 1 figs 19–21. — Lee 2009: 88. — Garcia & Lee 2011. — Fernandes *et al*. 2013: 4, figs 2, 18, 29.

Material examined

BRAZIL – **Rio Grande do Norte** • 2 specs; BPot 1-MR42; MNRJ 31497* • 1 spec.; 04º44′53″ S, 36º25′27″ W; depth 102–108 m; 23 May 2011; MNRJ 35117*. – **Sergipe** • 1 spec.; Petro/UFS st. 12.1; UFS • 2 specs; Petro/UFS st. 18.1; UFS. – **Bahia** • 3 specs; Ilhéus; MNRJ 32378* • 1 spec.; Canavieiras; Apr. 2011; MNRJ 30756*. – **Espírito Santo** • 2 specs; REVIZEE-Central C1-C65; MORG 52597 • 9 specs; REVIZEE-Central C1-VV38; IBUFRJ 19501 • 9 specs; REVIZEE-Central C1-VV38; IBUFRJ 19608 • 3 specs; REVIZEE-Central C1-VV38; MORG 40339 • 1 spec.; 19º26′03″ S, 39º22′35″ W; depth 44 m; Oct. 2003; MNRJ 32837*. – **Campos Basin** (Espírito Santo/Rio de Janeiro) • 3 specs; REVIZEE-Central C1-VV16; IBUFRJ 19487 • 1 spec.; REVIZEE-Central C1-VV21; IBUFRJ 19543 • 1 spec.; 20º42′ S, 40º06′ W; 27 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 19549 • 6 specs; REVIZEE-Central C1-D3; IBUFRJ 19584 • 1 spec.; HAB 13-H4; MNRJ 17945* • 1 spec.; HAB 16-H3; MNRJ 18437* • 2 specs; HAB 17-I3; MNRJ 18438* • 4 specs; HAB 17-I2; MNRJ 18439* • 1 spec.; HAB 13-I2; MNRJ 18675* • 1 spec.; HAB 13-H3; MNRJ 18676* • 1 spec.; HAB 11-G4; MNRJ 18681* • 1 spec.; 23º04′ S, 40º59′ W; 17 Jul. 2004; MNRJ 18967* • 1 spec.; Campos Basin; May 2009; MNRJ 32395* • 1 spec.; 23º04′ S, 40º59′ W; MNRJ 32626* • 3 specs; 23º04′ S, 40º59′ W; depth 100 m; 17 Jul. 2004; MORG 52214 • 6 specs; 23º05′ S, 40º58′ W; depth 100 m; Jun. 2004; MNRJ 35517* • 1 spec.; Campos Basin; 2003; MORG 52231. – **Rio de Janeiro** • 1 spec.; 24º12′20″ S, 44º16′34″ W; depth 148 m; Oct. 2008; MNRJ 32041* • 3 specs; REVIZEE-Sul st. 6662; MNRJ 29383*. – **São Paulo** • 5 specs; PADCT st. 6571; MNRJ 29381* • 5 specs; PADCT st. 6571; MNRJ 60190 • 1 spec.; PADCT st. 6579; MNRJ 29371* • 1 spec.; PADCT st. 6573; MNRJ 29376* • 1 spec.; REVIZEE-Sul st. 6676; MZSP 133502 • 2 specs; REVIZEE-Sul st. 6678; MNRJ 29384* • 2 specs; PADCT st. 6577; MZSP 133493 • 1 spec.; REVIZEE-Sul st. 6669; MNRJ 29375* • 1 worn spec.; REVIZEE-Sul st. 6669; MNRJ 60186. – **Santa Catarina** • 1 worn spec.; PADCT st. 6635; MNRJ 27845*.

UNITED STATES OF AMERICA – **Florida** • 1 spec.; 28º33′24″ N, 84º16′28″ W, off Saint Petersburg; 24 May 2012; G. Paulay leg.; with soft part preservation; FLMNH 450465.

Remarks

Some shells of *C. arnoldoi* from Brazil reach 5.0 mm in length, which is smaller than the 6.0 mm length attained by shells from Cuba (Rolán & Fernández-Garcés 1994). The holotype, an adult shell from Bonaire, measures only 2.8 mm long (Faber & Moolenbeek 1991), similar to the 2.34 mm length of an adult shell from Bahia (Brazil) (Fig. 87D). The hypothesis of sexual dimorphism in *C. arnoldoi* should be investigated.

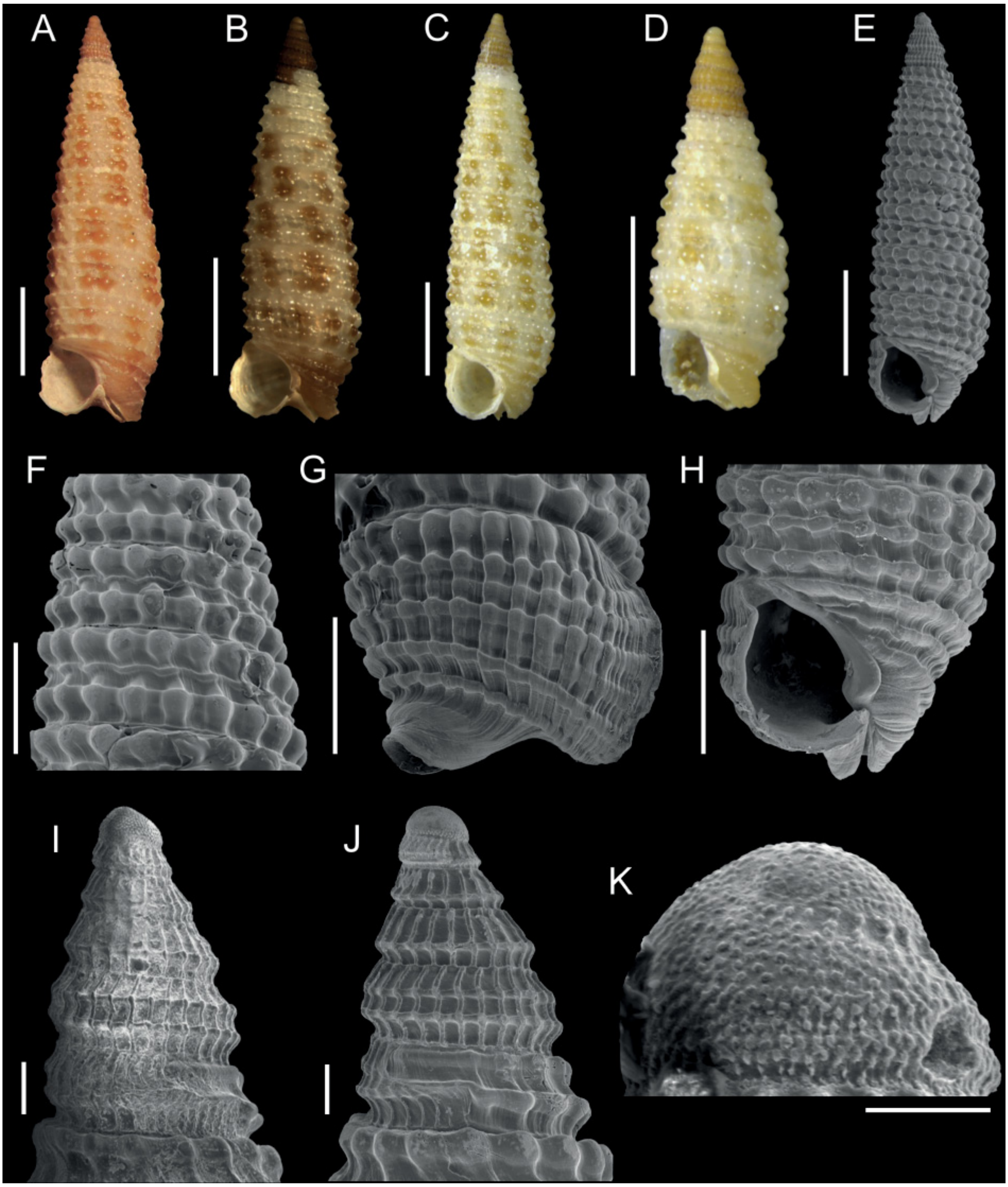

Fig. 87. *Cosmotriphora arnoldoi* Faber & Moolenbeek, 1991. **A**. MNRJ 18675*, 4.62 mm. **B**. MNRJ 18681*, 3.47 mm. **C**. MNRJ 30756*, 4.37 mm. **D**. MNRJ 32378*, 2.34 mm. **E**. MNRJ 18439*, 3.93 mm. **F–H, J**. Same shell as E. **I**. Same shell as C. **K**. Same shell as B. Scale bars: A–E = 1 mm; F–H = 500 µm; I–J = 100 µm; K = 50 µm.

Cosmotriphora melanura (C.B. Adams, 1850)
Fig. 88

Cerithium melanura C.B. Adams, 1850: 117.
Cerithium moniliferum Lea, 1843 non Deshayes, 1833: 269, pl. 37 fig. 92.
Cerithium dealbatum C.B. Adams, 1850: 117. New synonymy.
Cerithium submoniliferum d'Orbigny, 1852: 83.
Triforis grimaldii Dautzenberg & Fischer, 1906: 41, pl. 3 figs 9–10. Uncertain synonymy.

Triforis melanura – Smith 1890: 291 (it requires confirmation). — Dall 1892: 264. — Dall & Simpson 1901: 423, pl. 58 fig. 7.
Cerithium melanura – Clench & Turner 1950: 307, pl. 38 fig. 10.
Cerithium dealbatum – Clench & Turner 1950: 271, pl. 38 fig. 3.
Triphora melanura – Parker & Curray 1956: 2434. — Warmke & Abbott 1962: 76, pl. 13 fig. l. — Rice & Kornicker 1962: 120, pl. 2 fig. 13. — Rios 1970: 45; 1975: 50, pl. 13 fig. 187; 1985: 161, pl. 53 fig. 761; 1994: 94, pl. 31 fig. 374; 2009: 172. — Abbott 1974: 111, fig. 1134. — Ekdale 1974: 644. — Vokes & Vokes 1983: 18, pl. 27 fig. 14. — De Jong & Coomans 1988: 49. — Absalão 1989: 3. — Díaz 1994: 33. — Hess & Abbott 1994: 147. — Merlano & Hegedus 1994: 148, pl. 46 fig. 524. — Rocha *et al*. 1997: 23. — Barros *et al*. 2002: 31. — Coelho-Filho 2004: 25. — Absalão *et al*. 2006: 238, fig. 9. — Gomes *et al*. 2006: 188. — Montagna 2006: 23. — Daccarett & Bossio 2011: 92, fig. 420.
Triphora dealbatum – Treece 1980: 560.
Triphora (*Cosmotriphora*) *melanura* – Odé 1989: 109, fig. 3.
Cosmotriphora melanura – Marshall 1983: 110, pl. 27 figs d–f. — Bouchet 1985: 35, figs 2, 16, 27 (it requires confirmation). — Fernandes & Rolán 1988: 22, pl. 1 fig. 1, pl. 2 fig. 2 (it requires confirmation); 1993: 35 (it requires confirmation). — Leal 1991: 120, pl. 16 figs f–g. — Rolán & Fernández-Garcés 1994: 19, figs 11, 25–26, 30 CM; 2007: 20, pl. 1 figs 14–16; 2015: 54, pl. 4 fig. c. — Redfern 2001: 65, pl. 32 fig. 274; 2013: 128, fig. 362. — Espinosa & Ortea 2001: 20. — Ardovini & Cossignani 2004: 134 (it requires confirmation). — Rolán 2005: 106, pl. 30 fig. 438 (it requires confirmation). — Cruz & Gándara 2006: 132. — Jensen & Pearce 2009: 128. — Lee 2009: 88. — Oliveira *et al*. 2009: 180. — Tunnell *et al*. 2010: 204. — Garcia & Lee 2011. — Zhang 2011: 99, fig. 290. — Espinosa *et al*. 2012: 257. — García & Capote 2012: 22; 2013: 29. — Fernandes *et al*. 2013: 5, figs 3, 19, 30. — Lamy & Pointier 2018: 284, pl. 91 fig. 5a–b. — Fernandes & Pimenta 2019a: 15, figs 2c, 7–8.

Material examined

BAHAMAS • 1 spec.; Abaco; C. Redfern leg.; BMSM 55420 • 5 specs; Abaco; C. Redfern leg.; BMSM 55422 • 8 specs; Abaco; C. Redfern leg.; BMSM 55423 • 7 specs; Abaco; C. Redfern leg.; BMSM 55424.

BRAZIL – **North Brazil** • 2 specs; REVIZEE-Norte III st. 176; UFMA* • 5 specs; REVIZEE-Norte III st. 211A; UFMA*. – **Amapá** • 1 spec.; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32572* • 1 spec.; AMASSEDS st. 4134; MNRJ 34459* • 2 specs; 02º11′18″ N, 47º49′18″ W; depth 75–80 m; 8 Nov. 2008; OC. Ship Amorim do Valle leg.; MZSP 95756 • 1 spec.; 01º44′47″ N, 47º54′42″ W; depth 50–63 m; 10 Nov. 2008; OC. Ship Amorim do Valle leg.; with soft part preservation; MZSP 94628. – **Pará** • 6 specs; 00º48′ N, 45º36′ W; depth 55 m; Jan. 1981; MORG 21711. – **Maranhão** • 1 spec.; 01º30′33″ S, 43º20′28″ W; depth 59 m; 22 Nov. 2008; OC. Ship Amorim do Valle leg.; MZSP 94407. – **Ceará** • 1 spec.; 02º32′00″ S, 39º22′00″ W; depth 48 m; 7 Nov. 1990; OC. Ship Victor Hensen leg.; UFC 483 • 1 spec.; 03º35′ S, 37º57′ W; depth 43 m; 17 Apr. 1968; OC. Ship Almirante Saldanha leg.; MORG 13105 • 3 specs; 03º35′ S, 38º19′ W; depth 27 m; 17Apr. 1968; OC. Ship Almirante Saldanha leg.; MORG 14781. – **Rio Grande do Norte** • 3 specs; BPot 1-MR31; MNRJ 31498* • 2 specs;

BPot 1-MR32; MNRJ 31499* • 12 specs; BPot 1-MR41; MNRJ 31500* • 17 specs; BPot 1-MR42; MNRJ 31501* • 18 specs; BPot 1-MR43; MNRJ 31502* • 9 specs; BPot 1-MR44; MNRJ 31503* • 11 specs; BPot 1-MR45; MNRJ 31504* • 10 specs; BPot 2-MR42; MNRJ 31505* • 22 specs; BPot 2-MR44; MNRJ 31506* • 18 specs; BPot 2-MR45; MNRJ 31507* • 1 spec.; 04º33′17″ S, 36º56′35″ W;

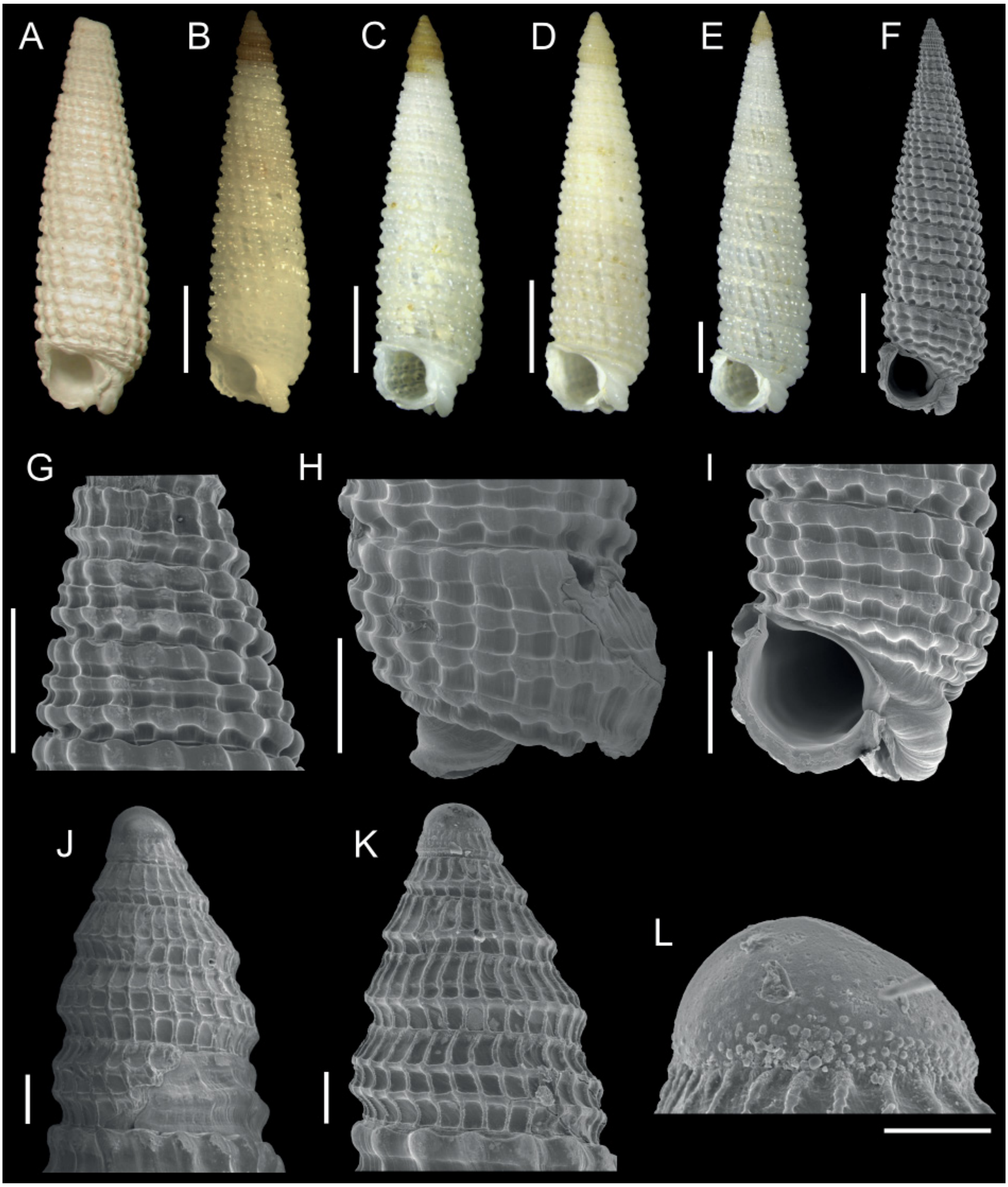

Fig. 88. *Cosmotriphora melanura* (C.B. Adams, 1850). **A**. Lectotype, MCZ 186159. **B**. MNRJ 18409*, 4.64 mm. **C**. MNRJ 31498*, 4.68 mm. **D**. MNRJ 32607*, 4.36 mm. **E**. MNRJ 32996*, 7.87 mm. **F**. MNRJ 18409*, 5.06 mm. **G–I, K–L**. Same shell as F. **J**. Same shell as E. Scale bars: B–F = 1 mm; G–I = 500 µm; J–K = 100 µm; L = 50 µm.

depth 130–160 m; 21 May 2011; MNRJ 35178* • 1 spec.; 04º36′43″ S, 36º46′45″ W; depth 140 m; 22 May 2011; MNRJ 35176* • 1 spec.; 04º44′11″ S, 36º24′55″ W; depth 425–450 m; 7 May 2011; MNRJ 35111* • 4 specs; 04º44′53″ S, 36º25′27″ W; depth 102–108 m; 23 May 2011; MNRJ 35115*. – **Fernando de Noronha Archipelago** • 1 spec.; Buraco do Inferno; 03º48′30″ S, 32º22′42″ W; 3 May 2005; L.R.L. Simone leg.; MZSP 49038. – **Pernambuco** • 2 specs; 08º42′ S, 34º44′ W; depth 480 m; 30 Jan. 2001; OC. Ship Antares leg.; MORG 49346*. – **Alagoas** • 1 spec.; Ponta Verde, Maceió; P. Cardoso leg.; FLMNH 151634 • 1 spec.; Ponta Verde, Maceió; P. Cardoso leg.; MORG 33739 • 2 specs; Jaraguá, Maceió; MNRJ 18609* • 4 specs; Jaraguá, Maceió; MORG 18262 • 56 specs; Jaraguá, Maceió; MORG 33737 • 1 spec.; Petro/MAR st. 19; UFS • 14 specs; Petro/MAR st. 21; UFS. – **Sergipe** • 2 specs; Petro/UFS st. E5-A1; with soft part preservation; UFS • 3 specs; Petro/UFS st. E5-A2; with soft part preservation; UFS • 36 specs; Petro/UFS st. E6-A1; UFS • 1 spec.; Petro/UFS st. E6-A2; with soft part preservation; UFS • 38 specs; Petro/UFS st. 15.3; UFS • 19 specs; Petro/UFS st. 18.1; UFS. – **Bahia** • 7 specs; Salvador, Itapuã; MNRJ 41469* • 36 specs; Salvador, Itapuã; MORG 33728 • 4 specs; Salvador, Itapuã; MZSP 133320 • 3 specs; Salvador, Itapuã; 17 Jul. 1967; E. Rios leg.; MORG 13821 • 11 specs; Salvador, Itapuã; 17 Jul. 1967; E. Rios leg.; MORG 16398 • 30 specs; Salvador, intertidal pool; May 1982; G. Oliveira leg.; MNRJ 21362* • 15 specs; Salvador, intertidal pool; Nov. 1991; G. Oliveira leg.; MORG 41454 • 5 specs; Salvador; MZSP 64873 • 2 specs; off Camamú; depth 52 m; 11 Dec. 2002; MORG 52617 • 5 specs; 13º28′16″ S, 38º48′43″ W; depth 35 m; 24 Nov. 2007; MNRJ 32607* • 2 specs; 13º28′16″ S, 38º48′43″ W; depth 35 m; 25 Nov. 2010; MNRJ 32996* • 2 specs; 13º28′54″ S, 38º49′08″ W; depth 30 m; Sep. 2007; MNRJ 32610* • 2 specs; 13º28′50″ S, 38º48′08″ W; depth 33 m; Sep. 2007; MNRJ 32612* • 1 spec.; 13º35′24″ S, 38º44′50″ W; depth 40 m; May 2009; MNRJ 32928* • 2 specs; Boipeba;13º35′44″ S, 38º49′04″ W; 31 Mar. 2003; MNRJ 17254* • 1 spec.; Baía de Camamu; M. Ximenes and V. Abud leg.; Dec. 2001; MNRJ 18945* • 1 spec.; 15º34′ S, 38º40′ W; depth 54 m; Oct. 2005; MNRJ 30699* • 53 specs; Ilhéus; MNRJ 32369* • 2 specs; Canavieiras; Apr. 2011; MNRJ 30722* • 1 spec.; Canavieiras; Apr. 2011; MNRJ 32364* • 2 specs; off Belmonte; depth 48 m; Sep. 1968; OC. Ship Almirante Saldanha leg.; MORG 13794 • 1 spec.; Minerva Bank; 17º06′ S, 37º38′ W; depth 120 m; Aug. 2012; MZSP 110974 • 1 spec.; REVIZEE-Central C1-C76; IBUFRJ 9686 • 59 specs; REVIZEE-Central C5-7R; IBUFRJ 14378 • 6 specs; REVIZEE-Central C2-7R; MNRJ 12739* •2 specs; REVIZEE-Central C5-13R; IBUFRJ 13317 • 5 specs; REVIZEE-Central C5-12R; MNRJ 12777* • 3 specs; REVIZEE-Central C2-10R; IBUFRJ 10631 • 2 specs; Abrolhos; Jan. 1985; MORG 38626. – **Espírito Santo** • 1 spec.; REVIZEE-Central C1-C65; IBUFRJ 12889 • 4 specs; REVIZEE-Central C1-C64; IBUFRJ 12888 • 1 spec.; REVIZEE-Central C1-C64; IBUFRJ 19493 • 1 spec.; REVIZEE-Central C5-20R; IBUFRJ 13316 • 12 specs; REVIZEE-Central C1-VV38; IBUFRJ 12890 • 1 spec.; 19º25′34″ S, 39º22′16″ W; depth 42 m; Oct. 2003; MNRJ 32602* • 1 spec.; 19º26′ S, 39º22′ W; depth 46 m; Oct. 2003; MNRJ 30706* • 1 spec.; 19º26′ S, 39º22′ W; depth 46 m; Oct. 2003; MNRJ 30725* • 2 specs; 19º26′ S, 39º22′ W; depth 46 m; Oct. 2003 MNRJ 32839* • 1 spec.; 19º26′19″ S, 39º15′17″ W; depth 53 m; Oct. 2003; MNRJ 30713* • 2 specs; REVIZEE-Central C1-VV24; IBUFRJ 12887 • 1 spec.; REVIZEE-Central C1-VV24; MORG 52257 • 4 specs; 20º18′ S, 40º14′ W; Mar. 1993; V. Abud leg.; MORG 40030 • 1 spec.; Guarapari; 1970; MORG 22003 • 4 specs; Piúma; 1993; IBUFRJ 8584. – **Vitória-Trindade Chain** • 2 specs; Trindade Island; depth 10 m; Mar. 1986; MORG 24415 • 1 spec.; Trindade Island, Praia dos Portugueses; depth 12–18 m; 21 May 1950; MNHN-Mo 8010* • 2 specs; Trindade Island, Fundeadouro; depth 12 m; 15 Sep. 1987; L. Barcellos and L. Laurino leg.; MORG 25579 • 1 spec.; Trindade Island; 20º29′40″ S, 29º20′33″ W; depth 12 m; 2 Apr. 2014; J. Mendonça leg.; MZSP 122246 • 1 spec.; 20º29′52″ S, 29º19′15″ W; depth 14 m; 22 Apr. 2014; J. Braga leg.; with soft part preservation; MZSP 118269 • 1 spec.; Trindade Island; 20º30′21″ S, 24º18′44″ W, depth 13 m; 18 Jul. 2013; D. Abbate leg.; MZSP 115553 • 1 spec.; Trindade Island, Ilha da Racha; 20º30′26″ S, 29º20′48″ W; depth 22 Jun. 2012; with soft part preservation; MZSP 109631 • 2 specs; Trindade Island, Praia da Calheta; 20º30′26″ S, 29º18′44″ W; 18 Jun. 2012; MZSP 109764. – **Campos Basin** (Espírito Santo/Rio de Janeiro) • 2 specs; 20º42′ S, 40º06′ W; 28 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 7567 • 4 specs; REVIZEE-Central C6-Y7; MNRJ 33789* • 1 spec.; 21º09′ S, 40º31′ W;

27 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 7669 • 1 spec.; REVIZEE-Central C2-36R; IBUFRJ 10703 • 1 spec.; REVIZEE-Central C1-VV22; IBUFRJ 11367 • 1 spec.; REVIZEE-Central C1-VV22; MORG 41734 • 1 spec.; 21º15′ S, 40º20′ W; 28 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 19513 • 2 specs; 20º53′ S, 40º12′ W; 26 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 19518 • 8 specs; REVIZEE-Central C1-VV21; IBUFRJ 19537 • 11 specs; REVIZEE-Central C1-VV21; MNRJ 33794* • 1 spec.; REVIZEE-Central C1-VV17; IBUFRJ 19560 • 3 specs; 22º42′ S, 40º40′ W; depth 5–10 m; Mar. 2007; MNRJ 15401* • 1 spec.; HAB 13-H1; MNRJ 17963* • 2 specs; HAB 13-H2; MNRJ 17975* • 3 specs; HAB 13-I2; MNRJ 17978* • 1 spec.; HAB 11-G4; MNRJ 17979* • 1 spec.; HAB 11-C4; MNRJ 17981* • 1 spec.; HAB 16-B4; MNRJ 18367* • 2 specs; HAB 16-H2; MNRJ 18404* • 6 specs; HAB 17-I2; MNRJ 18409* • 3 specs; HAB 16-H3; MNRJ 18417* • 1 spec.; 23º04′ S, 40º59′ W; 17 Dec. 2004; MNRJ 18970* • 1 spec.; 23º05′ S, 40º58′ W; depth 100 m; 2004; MNRJ 30866* • 2 specs; 23º05′ S, 40º58′ W; depth 100 m; 2004; MNRJ 32639* • 1 spec.; 23º09′00″ S, 41º02′06″ W; Oct. 2008; MNRJ 32076* • 1 spec.; REVIZEE C1-VV21; MORG 52202 • 1 spec.; Campos Basin; 2003; MORG 52232. – **Rio de Janeiro** • 1 spec.; Búzios, Praia da Ferradura; MNRJ 18598*.

COLOMBIA • 1 spec.; Tayrona, Cabo de la Aguja; 11º18′17″ N, 74º11′25″ W; depth 8–17 m; 30 Dec; 1988; L. Escobar leg.; INV MOL950 • 1 spec.; Archipiélagos Coralinos; 09º50′19″ N, 76º10′19″ W; depth 98 m; 30 Apr. 2005; A. Clavijo leg.; INV MOL6537.

VENEZUELA • 2 specs; Isla Margarita, Los Roques; depth 60 m; Dec. 2004; MZSP 65903.

UNITED STATES OF AMERICA – **Florida** • 3 specs; off Boynton Beach; depth 27–58 m; Sep. 1967 • 1 spec.; Deerfield Beach; depth 3–5 m; Jun. 1998; P. Souza leg.; MZSP 42454. – **Louisiana** • 1 spec.; depth 55–65 m; BMSM 51053.

Remarks

Rolán & Fernández-Garcés (2008) suspected that *Triphora dealbata* (C.B. Adams, 1850) could be related to *C. melanura* (C.B. Adams, 1850), both described from Jamaica. The lectotype of *T. dealbata* is broken, without apex (Clench & Turner 1950: pl. 38 fig. 3), but its teleoconch is equal to that of *C. melanura*. Because *C. melanura* has priority over *T. dealbata*, appearing at the top of the same page on which *T. dealbata* was described, *T. dealbata* is regarded as a junior synonym.

Eutriphora costai Fernandes & Pimenta, 2015

Eutriphora costai Fernandes & Pimenta, 2015: 498, fig. 3.

Material examined

BRAZIL – **Bahia** • 5 specs; Baía de Todos os Santos; Jun. 1997; MNRJ 34422*.

Iniforis pseudothomae Rolán & Fernández-Garcés, 1993
Fig. 89

Iniforis pseudothomae Rolán & Fernández-Garcés, 1993: 100, figs 5–8, 22–23.

Iniforis pseudothomae – Rolán & Fernández-Garcés 2007: 21, pl. 2 figs 9–12. — Espinosa *et al*. 2007: 74; 2012: 257. — Fernandes *et al*. 2013: 7, figs 5, 21, 32. — García 2016: 106. — Lamy & Pointier 2018: 286, pl. 91 fig. 12. — Fernandes & Pimenta 2019a: 18, figs 2d, 9–11.
Triphora sp. 2 – Leal 1991: 123, pl. 16 figs l–m.
Iniforis cf. *pseudothomae* – Rolán & Fernández-Garcés 2015: 54, pl. 4 fig. j.
Triphora turristhomae non Holten, 1802 – Rios 2009: 173.

Material examined

BRAZIL – **Amapá** • 2 specs; AMASSEDS st. 4134; MORG 43261. – **Ceará** • 1 spec.; 03º35′ S, 38º19′ W; depth 27 m; 17 Apr. 1968; OC. Ship Almirante Saldanha leg.; MORG 14978. – **Rio Grande**

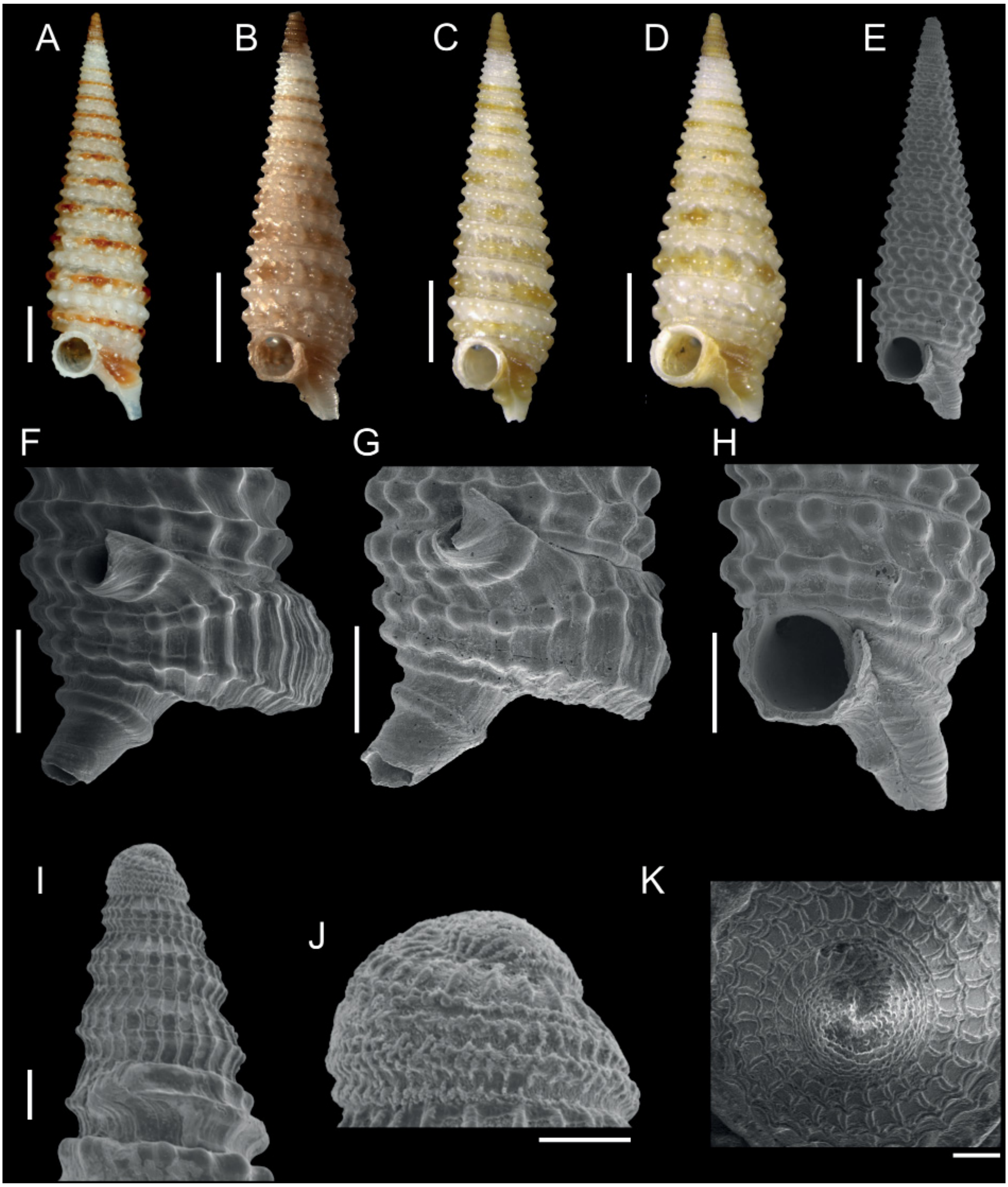

Fig. 89. *Iniforis pseudothomae* Rolán & Fernández-Garcés, 1993. **A**. Holotype, MNCN 15.05/6820. **B**. IBUFRJ 19585, 4.58 mm. **C**. MNRJ 31517*, 5.05 mm. **D**. MNRJ 32973*, 4.60 mm. **E, G–H**. Same shell as B. **F, K**. Same shell as C. **I–J**. MNRJ 18303. Scale bars: A–E = 1 mm; F–H = 500 µm; I, K = 100 µm; J = 50 µm. Photo credits A: Rafael Araujo (MNCN).

do Norte • 1 spec.; BPot 1-MR32; MNRJ 31508* • 2 specs; BPot 1-MR41; MNRJ 31509* • 28 specs; BPot 1-MR42; MNRJ 31510* • 16 specs; BPot 1-MR43; MNRJ 31511* • 4 specs; BPot 1-MR44; MNRJ 31512* • 3 specs; BPot 1-MR45; MNRJ 31513* • 1 spec.; BPot 2-MR32; MNRJ 31514* • 20 specs; BPot 2-MR42; MNRJ 31515* • 21 specs; BPot 2-MR44; MNRJ 31516* • 7 specs; BPot 2-MR45; MNRJ 31517*. – **Alagoas** • 2 specs; Maceió, Ponta Verde; FLMNH 507942 • 1 spec.; Maceió, Ponta Verde; MNRJ 56461* • 1 spec.; Maceió, Ponta Verde; MORG 12502 • 3 specs; Maceió, Ponta Verde; MORG 33726 • 3 specs; Maceió, Jaraguá; MNRJ 18607* • 3 specs; Maceió, Jaraguá; MORG 18263 • 85 specs; Maceió, Jaraguá; MORG 33730 • 25 specs; Maceió, Jaraguá; MORG 39255 • 4 specs; Petro/MAR st. 21; UFS. – **Sergipe** • 1 spec.; Petro/UFS st. 12.1; UFS • 1 worn spec.; 11º30′42″ S, 36º35′23″ W, MARSEAL st. EN9-R2; depth 300 m; UFS. – **Bahia** • 1 spec.; Praia do Forte; L. Barcellos leg.; May 1987; MORG 25290 • 4 specs; Itapuã, Salvador; MORG 33749 • 4 specs; Baía de Todos os Santos; Jun. 1997; MNRJ 34427* • 1 spec.; off Boipeba; 13º35′ S, 38º50′ W, depth 35–55 m; Dec. 2002; M. Ximenez leg.; MORG 43758 • 1 spec.; Baía de Camamu; Dec. 2001; M. Ximenes and V. Abud leg.; MNRJ 18944* • 79 specs; Ilhéus; MNRJ 32368* • 18 specs; Ilhéus; MNRJ 32973* • 55 specs; Ilhéus; MNRJ 32976* • 2 specs; Canavieiras; Apr. 2011; MNRJ 30723* • 3 specs; REVIZEE-Central C1-C76; IBUFRJ 10784 • 1 spec.; REVIZEE-Central C5-13R; IBUFRJ 14716 • 1 spec.; Abrolhos; Feb. 1978; MORG 52608 • 1 spec.; Abrolhos; Jan. 1985; MORG 23826 • 1 spec.; Abrolhos; Jan. 1985; MORG 52605* • 1 spec.; Abrolhos, Parcel Paredes; Jan. 1985; MORG 23281 • 2 specs; Abrolhos; depth 10–15 m; Jan. 1985; MORG 21230. – **Espírito Santo** • 2 specs; REVIZEE-Central C1-C65; IBUFRJ 19461 • 4 specs; REVIZEE-Central C1-C65; MORG 52600 • 1 spec.; REVIZEE-Central C1-C64; IBUFRJ 9523 • 1 spec.; REVIZEE-Central C1-C64; IBUFRJ 12882 • 1 spec.; REVIZEE-Central C1-C63; IBUFRJ 9269 • 1 spec.; REVIZEE-Central C1-VV38; IBUFRJ 19505 • 3 specs; REVIZEE-Central C1-VV38; IBUFRJ 19611 • 1 spec.; REVIZEE-Central C1-VV24; MORG 52256 • 1 spec.; Vitória; 20º18′ S, 40º14′ W; Mar. 1993; V. Abud leg.; MORG 52264 • 1 spec.; Ilha Escalvada, Guarapari; 2012; W. Vieira leg.; MNRJ 34030* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; 2007; MNRJ 30896* • 3 specs; Porto de Ubú; 20º47′ S, 40º32′ W; 2007; MNRJ 32417*. – **Vitória-Trindade Chain** • 18 specs; REVIZEE-Central C2-22R; MORG 41746. – **Campos Basin** (Espírito Santo/Rio de Janeiro) • 3 specs; REVIZEE-Central C1-VV21; IBUFRJ 19542 • 6 specs; REVIZEE-Central C1-D3; IBUFRJ 19585 • 1 spec.; HAB 13-H1; MNRJ 17942* • 1 spec.; HAB 13-I2; MNRJ 17947* • 2 specs; HAB 17-I2; MNRJ 18628* • 1 spec.; REVIZEE-Central C1-VV22; MORG 40399. – **Rio de Janeiro** • 1 spec.; off Arraial do Cabo; depth 25–30 m; Mar. 2003; P. Gonçalves leg.; CHL.

Isotriphora tigrina Fernandes, Pimenta & Leal, 2013

Isotriphora tigrina Fernandes, Pimenta & Leal, 2013: 8, figs 7–8, 39–44.

Material examined

BRAZIL – **Vitória-Trindade Chain** • 1 spec.; REVIZEE-Central C5-23R; MNRJ 34257*.

Latitriphora albida (A. Adams, 1854)
Fig. 90

Triphoris albidus A. Adams, 1854: 278.
Triforis (*Sychar*) *samanae* Dall, 1889: 248.

Triforis (*Sychar*) *samanae* – Dall & Simpson 1901: 423, pl. 54 fig. 18.
Triphora samanae – Warmke & Abbott 1962: 77. — De Jong & Coomans 1988: 51, pl. 34 fig. 245.
Triphora sp. 5 — Leal 1991: 124.
Latitriphora albida — Rolán & Fernández-Garcés 1995: 14, figs 29–32; 2007: 22, pl. 3 figs 8–9; 2015: 53, fig. 4s. — Redfern 2001: 67, pl. 33 fig. 280; 2013: 128, fig. 365. — Espinosa *et al*. 2007:

74; 2012: 257. — Lee 2009: 89. — Jensen & Pearce 2009: 129. — Zhang 2011: 99, fig. 297. — Fernandes *et al*. 2013: 10, figs 11, 22. — Hewitt & van Leeuwen 2017: 54. — Lamy & Pointier 2018: 286, pl. 91 fig. 15. — Fernandes & Pimenta 2019a: 21, figs 2e, 12–13.

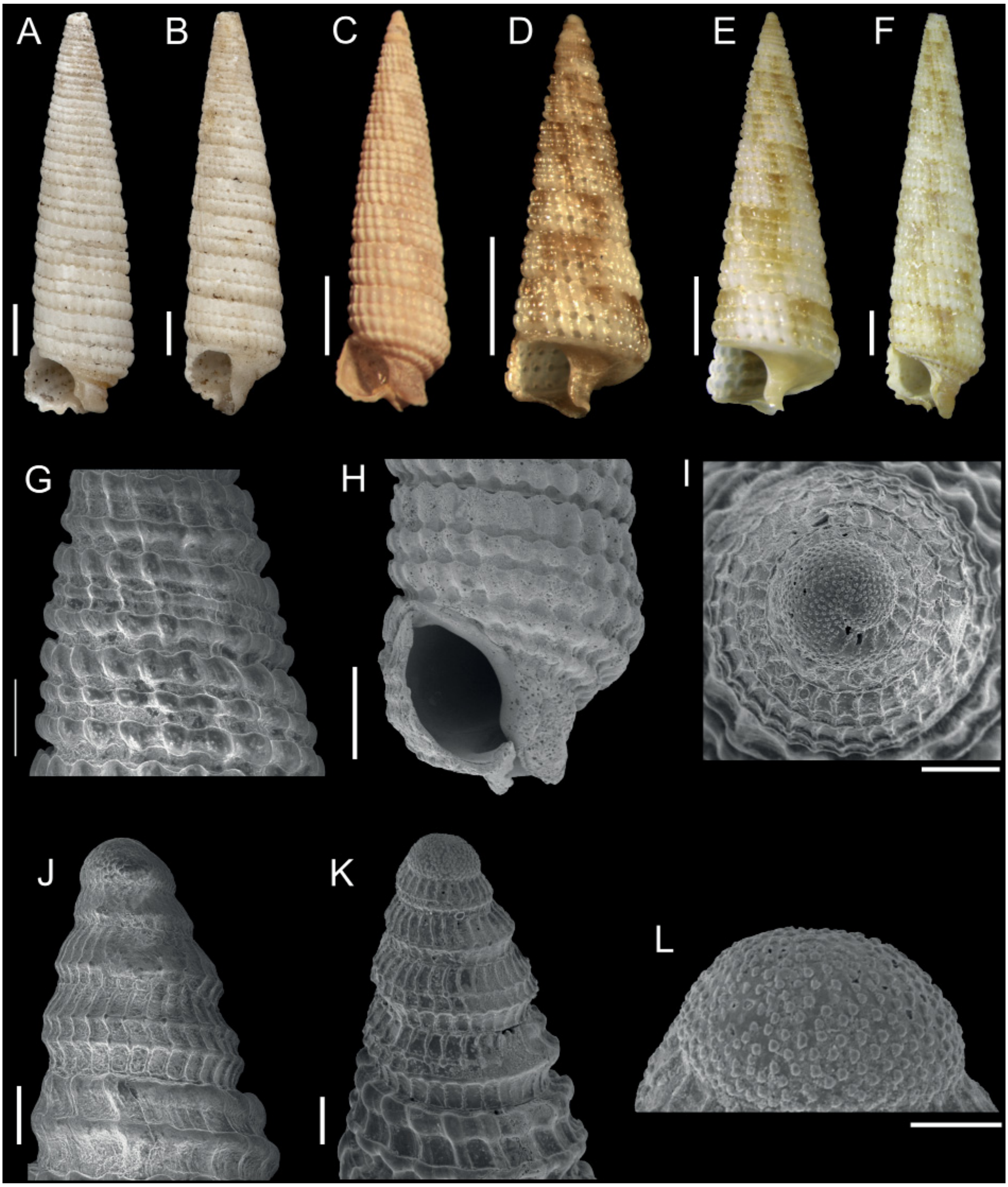

Fig. 90. *Latitriphora albida* (A. Adams, 1854). **A**. Syntype, NHM 196563. **B**. Syntype, NHM 196564. **C**. MNRJ 18625*, 5.12 mm. **D**. MNRJ 31525*, 3.43 mm. **E**. MNRJ 34825*, 5.17 mm. **F**. MNRJ 33123*, 9.08 mm. **G, J**. Same shell as E. **H**. Same shell as C. **I, K–L**. Same shell as D. Scale bars: A–F = 1 mm; G = 200 µm; H = 500 µm; I–K = 100 µm; L = 50 µm. Photo credits A–B: Andreia Salvador (NHM).

Material examined

BRAZIL – **North Brazil** • 1 spec.; REVIZEE-Norte III st. 150; UFMA* • 3 specs; REVIZEE-Norte III st. 176; UFMA*. – **Rio Grande do Norte** • 1 spec.; BPot 1-MR25; MNRJ 31518* • 3 specs; BPot 1-MR32; MNRJ 31519* • 1 spec.; BPot 1-MR42; MNRJ 31520* • 1 spec.; BPot 1-MR43; MNRJ 31521* • 1 spec.; BPot 2-MR41; MNRJ 31522* • 1 spec.; BPot 2-MR42; MNRJ 31523* • 1 spec.; BPot 2-MR44; MNRJ 31524* • 1 spec.; BPot 2-MR45; MNRJ 31525*. – **Fernando de Noronha Archipelago** • 2 specs; Porto; depth 6 m; 20 Jul. 1999; P. Souza and L. Simone leg.; MZSP 31996. – **Sergipe** • 1 spec.; Petro/UFS st. 18.1; UFS. – **Bahia** • 1 spec.; Canavieiras; Apr. 2011; MNRJ 33123* • 1 spec.; REVIZEE-Central C5-12R; IBUFRJ 12112. – **Espírito Santo** • 1 spec.; 19º40′26″ S, 39º36′19″ W; depth 40 m; 2 Dec. 2011; OC. Ship Seward Johnson leg.; MNRJ 34825*. – **Campos Basin** (Espírito Santo/Rio de Janeiro) • 1 spec.; REVIZEE-Central C1-VV21; MNRJ 33796* • 1 spec.; HAB 17-I1; MNRJ 18625*.

MEXICO • 1 spec.; Yucatan; depth 107 m; BMSM 67512.

UNITED STATES OF AMERICA – **Florida** • 1 spec.; Deerfield Beach, Brower County; depth 3–4 m; Jul. 1998; P. Souza leg.; MZSP 41486 • 1 spec.; off Cristal River, Citrus County; BMSM 107189 • 1 spec.; off Cristal River, Citrus County; 55 m; BMSM 107194.

Monophorus olivaceus (Dall, 1889)
Fig. 91

Triforis decorata var. *olivacea* Dall, 1889: 244.

Triphora ornata auct. non Deshayes, 1832. – Olsson & McGinty 1958: 13. — Warmke & Abbott 1962: 76, pl. 13 fig. i. — Houbrick 1968: 14. — Rios 1970: 45; 1975: 51, pl. 13 fig. 189; 1985: 161, pl. 53 fig. 763; 1994: 95, pl. 31 fig. 376; 2009: 173. — Kobluk & Lysenko 1986: 660. — Robinson & Montoya 1987: 384. — De Jong & Coomans 1988: 50. — Absalão 1989: 3. — Díaz 1994: 33. — Merlano & Hegedus 1994: 149, pl. 46 fig. 527. — Paranaguá *et al*. 1999: 62. — Barros *et al*. 2002: 31. — Sevilla *et al*. 2003: 342. — Absalão & Pimenta 2005: 29, fig. 64. — Absalão *et al*. 2006: 238. — Gomes *et al*. 2006: 187. — Daccarett & Bossio 2011: 92, fig. 421.
Triphora (*Cosmotriphora*) *ornata* auct. non Deshayes, 1832 – Odé 1989: 110.
Triphora sp. 1 – Leal 1991: 122.
Monophorus olivaceus – Rolán & Fernández-Garcés 1994: 17, figs 1–3, 6, 8, 30 MO; 2007: 23, pl. 4 figs 23–27; 2008: 87, fig. 4 b–f, h–k; 2015: 54, pl. 4, fig. h. — Redfern 2001: 67, pl. 33 fig. 284; 2013: 130, fig. 369. — Espinosa & Ortea 2001: 20. — Lee 2009: 90. — Garcia & Lee 2011. — Zhang 2011: 101, fig. 301. — Espinosa *et al*. 2012: 257. — García & Capote 2013: 29. — Fernandes *et al*. 2013: 13, figs 13, 24, 34. — Lamy & Pointier 2018: 287, pl. 92 fig. 6a–b. — Fernandes & Pimenta 2019a: 24, figs 2f, 14–18.
Cosmotriphora ornata – Tunnell *et al*. 2010: 204. — Gracia *et al*. 2013: 383.

Material examined

BRAZIL – **Amapá** • 2 specs; Cabo Orange; depth 103 m; Nov. 1968; OC. Ship Almirante Saldanha leg.; MORG 14450 • 2 specs; AMASSEDS st. 4134; MORG 42254 • 1 spec.; off Amapá; depth 43 m; 17 Apr. 1968; OC. Ship Almirante Saldanha leg.; MORG 19529. – **Pará** • 1 spec.; off Caviana; depth 78–80 m; Mar. 1968; OC. Ship Almirante Saldanha leg.; MORG 15949 • 2 specs; off Caviana; depth 78–80 m; Mar. 1968; OC. Ship Almirante Saldanha leg.; MORG 19447 • 1 spec.; GEOMAR II st. 99; MORG 15768 • 2 specs; off Salinópolis; 00º47′ N, 46º40′ W; 50 m; 26 Apr. 1968; OC. Ship Almirante Saldanha leg.; MORG 13158. – **Maranhão** • 1 spec.; off São Luiz; 01º20′ S, 43º33′ W; 50 m; 23 Apr. 1968; OC. Ship Almirante Saldanha leg.; MORG 13122 • 2 specs; 01º49′45″ S, 42º55′35″ W; 22 Nov. 2008; OC. Ship

Amorim do Valle leg.; MZSP 92850. – **Piauí** • 4 specs; 02º10′ S, 41º21′ W; depth 63 m; 30 Oct. 1967; OC. Ship Almirante Saldanha leg.; MORG 14641. – **Ceará** • 1 spec.; 03º35′ S, 38º19′ W; depth 27 m; 17 Apr. 1968; OC. Ship Almirante Saldanha leg.; MORG 14977 • 1 spec.; off Fortaleza; UFC 191 • 1 spec.; off Icapuí; Dec. 2000; MNRJ 32588*. – **Rio Grande do Norte** • 1 spec.; BPot 1-MR34; MNRJ 31548*

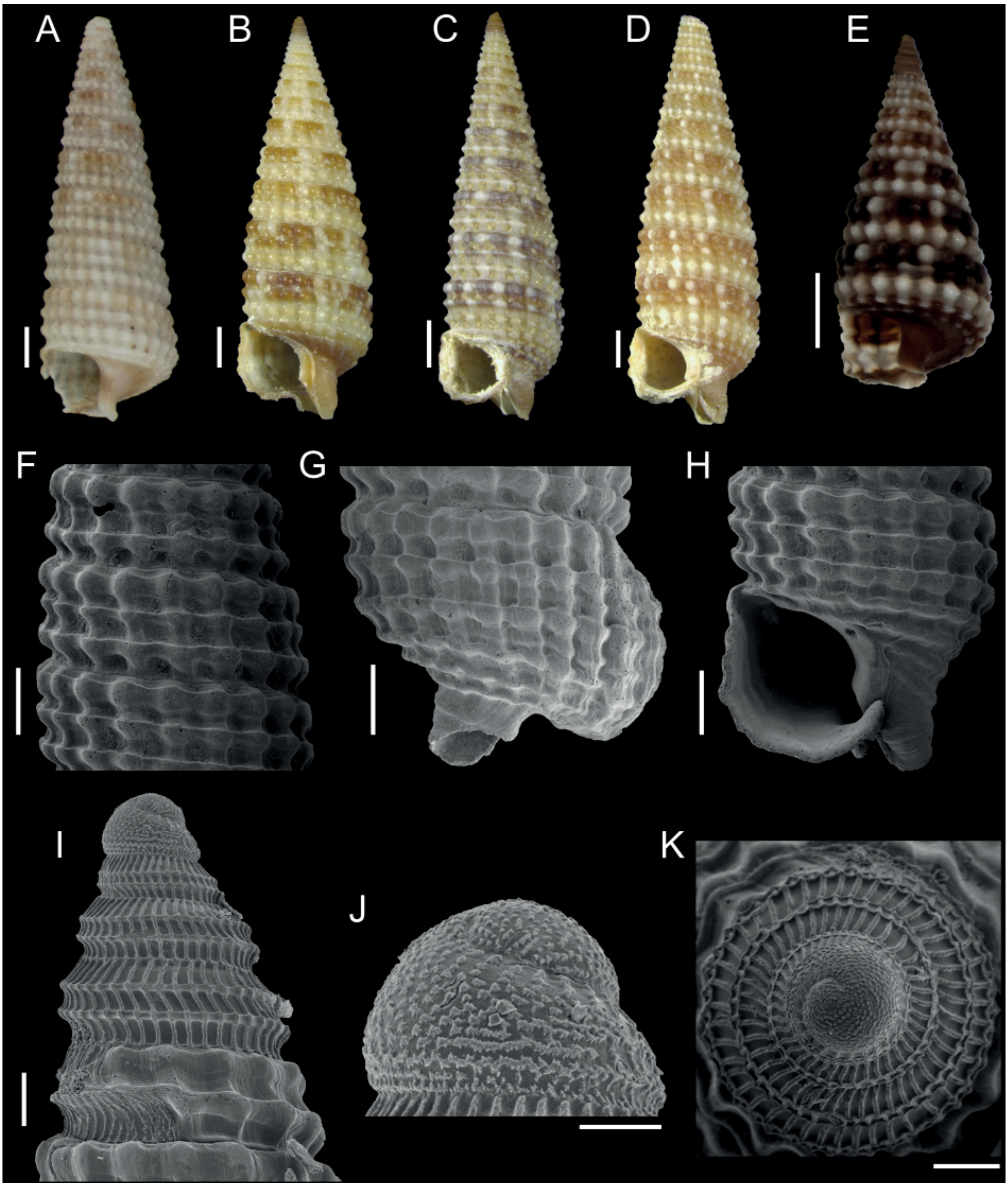

Fig. 91. *Monophorus olivaceus* (Dall, 1889). **A**. Lectotype, MCZ 7379. **B**. MNRJ 32550*, 9.90 mm. **C**. MNRJ 32925*, 8.66 mm. **D**. MNRJ 32990*, 11.05 mm. **E**. MNRJ 18741*, 4.74 mm. **F–H**. MNRJ 32075*. **I–K**. MNRJ 17988*. Scale bars: A–E = 1 mm; F–H = 500 µm; I, K = 100 µm; J = 50 µm.

• 8 specs; BPot 1-MR41; MNRJ 31549* • 15 specs; BPot 1-MR42; MNRJ 31550* • 4 specs; BPot 1-MR43; MNRJ 31551* • 6 specs; BPot 1-MR44; MNRJ 31552* • 5 specs; BPot 1-MR45; MNRJ 31553* • 2 specs; BPot 2-MR32; MNRJ 31554* • 3 specs; BPot 2-MR42; MNRJ 31555* • 21 specs; BPot 2-MR44; MNRJ 31556* • 2 specs; BPot 2-MR45; MNRJ 31557* • 1 spec.; Natal; MZSP 86297. – **Fernando de Noronha Archipelago** • 1 spec.; Ressurreta; depth 12 m; 17–18 Jun. 2000; P.M.S. Costa leg.; MNRJ 11347* • 1 spec.; Ressurreta; depth 12 m; 17–18 Jun. 2000; P.M.S. Costa leg.; MNRJ 14772* • 1 spec.; Buraco do Inferno; depth 12–18 m; 19 Jun. 2000; P.M.S. Costa leg.; MNRJ 14761* • 1 spec.; Praia do Cachorro; depth 10 m; 10 Jul. 1999; MNRJ 33799* • 1 spec.; Cabeço da Sapata; depth 40 m; 5 Jul. 1985; M. Cabeda leg.; MORG 24604 • 1 spec.; canal between Ilha do Meio and Ilha Rasa; depth 10 m; 21 Jul. 1999; L.R.L. Simone and P. Souza leg.; MZSP 30997 • 1 spec.; Jan. 1979; MORG 20633. – **Paraíba** • 2 specs; 06º59′01″ S, 34º45′12″ W; depth 20 m; 7 Mar. 2006; P. Riul leg.; UEPB. – **Alagoas** • 1 spec.; Jaraguá, Maceió; MNRJ 18606* • 6 specs; Jaraguá, Maceió; MORG 33733. – **Sergipe** • 2 specs; Petro/UFS st. E5-A1; with soft part preservation; UFS • 2 specs; Petro/UFS st. E6-A1; UFS • 1 spec.; Petro/UFS st. 18.1; UFS. – **Bahia** • 9 specs; Salvador, Itapuã; MNRJ 41468* • 8 specs; Salvador, Itapuã; MORG 16596 • 7 specs; Salvador, Itapuã; MORG 33744 • 1 spec.; Salvador, Itapuã; MZSP 33740 • 1 spec.; Itapuã, Salvador; MZSP 33765 • 1 spec.; Salvador, Itapuã; MZSP 133317 • 1 spec.; Salvador, Praia da Pituba; FLMNH 361671 • 1 spec.; Salvador; MZSP 64886 • 1 spec.; 13º27′43″ S, 38º49′27″ W; depth 26 m; 2010; MNRJ 32990* • 1 spec.; 13º28′17″ S, 38º48′43″ W; depth 35 m; 25 Nov. 2010; MNRJ 31032* • 1 spec.; REVIZEE-Central C5-4R; IBUFRJ 12286 • 1 spec.; REVIZEE-Central C1-C76; IBUFRJ 9173 • 1 spec.; REVIZEE-Central C5-7R; IBUFRJ 12080 • 1 spec.; REVIZEE-Central C5-13R; IBUFRJ 19574 • 1 spec.; Belmonte; 21 Jul. 2008; MNRJ 32925* • 1 spec.; off Belmonte; depth 48 m; Nov. 1968; OC. Ship Almirante Saldanha leg.; MORG 13792 • 1 spec.; Minerva Bank; 17º06′ S, 37º38′ W; depth 120 m; Aug. 2012; MZSP 110921 • 2 specs; Parcel Paredes, Abrolhos; Jan. 1985; MORG 23256 • 1 spec.; JOPS st. 3235; MNRJ 33814*. – **Espírito Santo** • 1 spec.; REVIZEE-Central C1-C65; IBUFRJ 12885 • 1 spec.; REVIZEE-Central C1-VV38; IBUFRJ 19618 • 1 spec.; 19º25′ S, 39º22′ W; depth 55 m; Oct. 2003; MNRJ 30715* • 1 spec.; 19º25′ S, 39º22′ W; depth 55 m; Oct. 2003; MNRJ 30762* • 2 specs; 19º25′05″ S, 39º15′54″ W; depth 65 m; Oct. 2003; MNRJ 30703* • 2 specs; 19º25′05″ S, 39º15′54″ W; depth 65 m; Oct. 2003; MNRJ 30767* • 1 spec.; REVIZEE-Central C1-VV24; IBUFRJ 19475 • 5 specs; 20º18′ S, 40º14′ W; Mar. 1993; V. Abud leg.; MORG 40033 • 2 specs; off Conceição da Barra; depth 60–80 m; Aug. 2006; C. Lyra leg.; MZSP 69565 • 3 specs; Vitória, Praia de Camburi; 19 Mar. 1993; IBUFRJ 6006 • 1 spec.; Ilha Escalvada, Guarapari; BMSM 45679 • 1 spec.; Ilha Escalvada, Guarapari; depth 25–30 m; May 1998; A. Bodart leg.; MZSP 53508 • 1 spec.; Ilha Escalvada, Guarapari; J. Coltro leg.; MZSP 91140 • 1 spec.; Guarapari canal; Apr. 1992; MZSP 78376 • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; MNRJ 31051* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; MNRJ 31062* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; MNRJ 31064* • 5 specs; Porto de Ubú; 20º47′ S, 40º32′ W; MNRJ 32416* • 5 specs; Piúma; 1993; IBUFRJ 8590. – **Campos Basin** (Espírito Santo/Rio de Janeiro) • 1 spec.; REVIZEE-Central C1-D1-2; IBUFRJ 19529 • 1 spec.; 20º42′ S, 40º06′ W; 27 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 19550 • 2 specs; REVIZEE-Central C1-VV22; IBUFRJ 19569 • 1 spec.; 22º42′ S, 40º40′ W; depth 5–10 m; 20 Dec. 2007; MNRJ 17917* • 1 spec.; HAB 13-I2; MNRJ 17987* • 1 spec.; HAB 13-H3; MNRJ 17988* • 1 spec.; HAB 11-G3; MNRJ 17989* • 1 spec.; HAB 16-H3; MNRJ 18366* • 1 spec.; 22º42′ S, 40º40′ W; depth 12 m; Oct. 2005; MNRJ 32620* • 3 specs; 22º42′ S, 40º40′ W; 2006; MNRJ 18741* • 2 specs; 23º09′00″ S, 41º02′06″ W; Oct. 2008; MNRJ 32075* • 1 spec.; 23º05′ S, 40º58′ W; depth 100 m; 2004 MNRJ 32550* • 1 spec.; 23º05′ S, 40º58′ W; depth 100 m; 2004; MNRJ 32628* • 1 spec.; 23º18′ S, 41º14′ W; depth 120 m; 20 Nov. 2004; OC. Ship Almirante Câmara leg.; MORG 50199. – **Rio de Janeiro** • 1 spec.; Búzios, Praia da Ferradura; MNRJ 18597* • 3 specs; Búzios, Praia de Manguinhos; Apr. 1985; L. Tostes leg.; MNRJ 34112* • 1 spec.; Cabo Frio, Praia das Conchas; Jan. 1979; L. Tostes leg.; MNRJ 34111* • 3 specs; Cabo Frio, Praia das Conchas; 23 Apr. 2005; V. Padula and F. Santos leg.; MNRJ 33004* • 1 spec.; Cabo Frio; 17 Feb. 1970; J. Colella leg.; MZSP 57206 • 1 spec.; Cabo Frio, Praia do Forte; Jan. 1988; P.M.S. Costa leg.; MNRJ 20386* • 2 specs; Cabo Frio, Praia do Forte; 16 Jul. 1988; P.M.S. Costa leg.; MNRJ 20508* •

1 spec.; Arraial do Cabo, Prainha; depth 3 m; Feb. 1984; M. Sá and G. Nunan leg.; MNRJ 17921*. – **São Paulo** • 1 worn spec.; Ilha da Queimada Pequena, Itanhaém; depth 0–12 m; 28 Feb. 2007; MZSP 84998. The latter record must be regarded with caution, because it considerably extends the geographic range of *M. olivaceus*; more specimens are needed to confirm its presence in São Paulo State.

COLOMBIA • 2 specs; Plataforma Chuchupa, La Guajira; 11º49′31″ N, 72º49′39″ W; depth 12 m; 30 Oct. 2004; J. Reyes and A. Clavijo leg.; INV MOL7919 • 1 spec.; Plataforma Chuchupa, La Guajira; 11º47′15″ N, 72º46′50″ W; depth 9 m; 3 Nov. 2004; J. Reyes and A. Clavijo leg.; INV MOL7918 • 2 specs; 11º47′11″ N, 72º46′50″ W, Plataforma Chuchupa, La Guajira; depth 18 m; 3 Nov. 2004; J. Reyes and A. Clavijo leg.; INV MOL7921 • 1 spec.; Archipiélagos Coralinos; 09º46′26″ N, 76º13′54″ W; depth 117 m; 1 May 2005; A. Clavijo leg.; INV MOL6536.

CURAÇAO • 1 spec.; Santa Marta Bay; depth 1 m; Jul. 1992; BMSM 67464.

GRENADA • 1 spec.; 12º01′04″ N, 61º45′40″ W, Belmont, Saint George; depth 3–6 m; 7 Oct. 2012; MZSP 109728.

UNITED STATES OF AMERICA – **Florida** • 1 spec.; Deerfield Beach, Brower County; depth 3–5 m; Jun. 1998; P. Souza leg.; MZSP 133325 • 1 spec.; Pickles reef, Key Largo, Florida Keys; depth 3–5 m; BMSM 45686 • 1 spec.; Egmont Key, St. Petersburg; BMSM 67420 • 1 spec.; off Cristal River, Citrus County; BMSM 67459.

Nanaphora verbernei (Moolenbeek & Faber, 1989)

Triphora verbernei Moolenbeek & Faber, 1989: 77, figs 6–8.

Cheirodonta verbernei – Rolán & Fernández-Garcés 1994: 20, figs 17–18, 22, 30 CV. — Zhang 2011: 99, fig. 288.
Cosmotriphora verbernei – Rolán & Fernández-Garcés 2007: 20, pl. 1 figs 17–18.
Nanaphora verbernei – Fernandes & Pimenta 2015: 500, fig. 4; 2019a: 30, figs 2g, 19–20. — Rolán & Fernández-Garcés 2015: 53, fig. 4w.

Material examined

BRAZIL – **Rio Grande do Norte** • 2 specs; BPot 1-MR23; MNRJ 31545*. – **Alagoas** • 1 spec.; Barra de São Miguel; 09º50′09″ S, 35º53′05″ W; depth 0–3 m; 1 Dec. 2018; M.R. Fernandes and L.S. Souza leg.; with soft part preservation; MNRJ 60029 • 2 specs; Petro/MAR st. 19; UFS. – **Bahia** • 1 spec.; Salvador, Itapuã; 17 jul. 1967; E. Rios leg.; MORG 52624. – **Espírito Santo** • 1 spec.; 20º18′ S, 40º14′ W; Mar. 1993; V. Abud leg.; MORG 40032. – **São Paulo** • 1 spec.; Ubatuba; FLMNH 363884 • 1 spec.; Ubatuba, Enseada do Flamengo; W. Narchi leg.; 7 Jan. 1956; MNHN-Mo 7640* • 1 spec.; São Sebastião, Praia do Guaecá; 23º49′14″ S, 45º27′45″ W; 9 Aug. 2011; MZSP 133339 • 1 spec.; Guarujá; M.A. Cardoso leg.; MZSP 17890.

Nototriphora decorata (C.B. Adams, 1850)
Fig. 92

Cerithium decoratum C.B. Adams, 1850: 117.
Triphoris variegatus A. Adams, 1854: 277.
Triforis arthuri Jousseaume, 1884: 221.

Triforis decorata – Dall 1892: 265.

Cerithium decoratum – Clench & Turner 1950: 272, pl. 38 fig. 2.
Triphora decorata – Olsson & McGinty 1958: 13. — Porta & Porta 1960: 42. — Rice & Kornicker 1962: 372, pl. 4 fig. 4. — Rios 1970: 45; 1975: 50, pl. 13 fig. 186; 1985: 160, pl. 53 fig. 760; 1994: 94, pl. 31 fig. 373; 2009: 172. — Abbott 1974: 111, fig. 1133. — De Jong & Coomans 1988: 51.

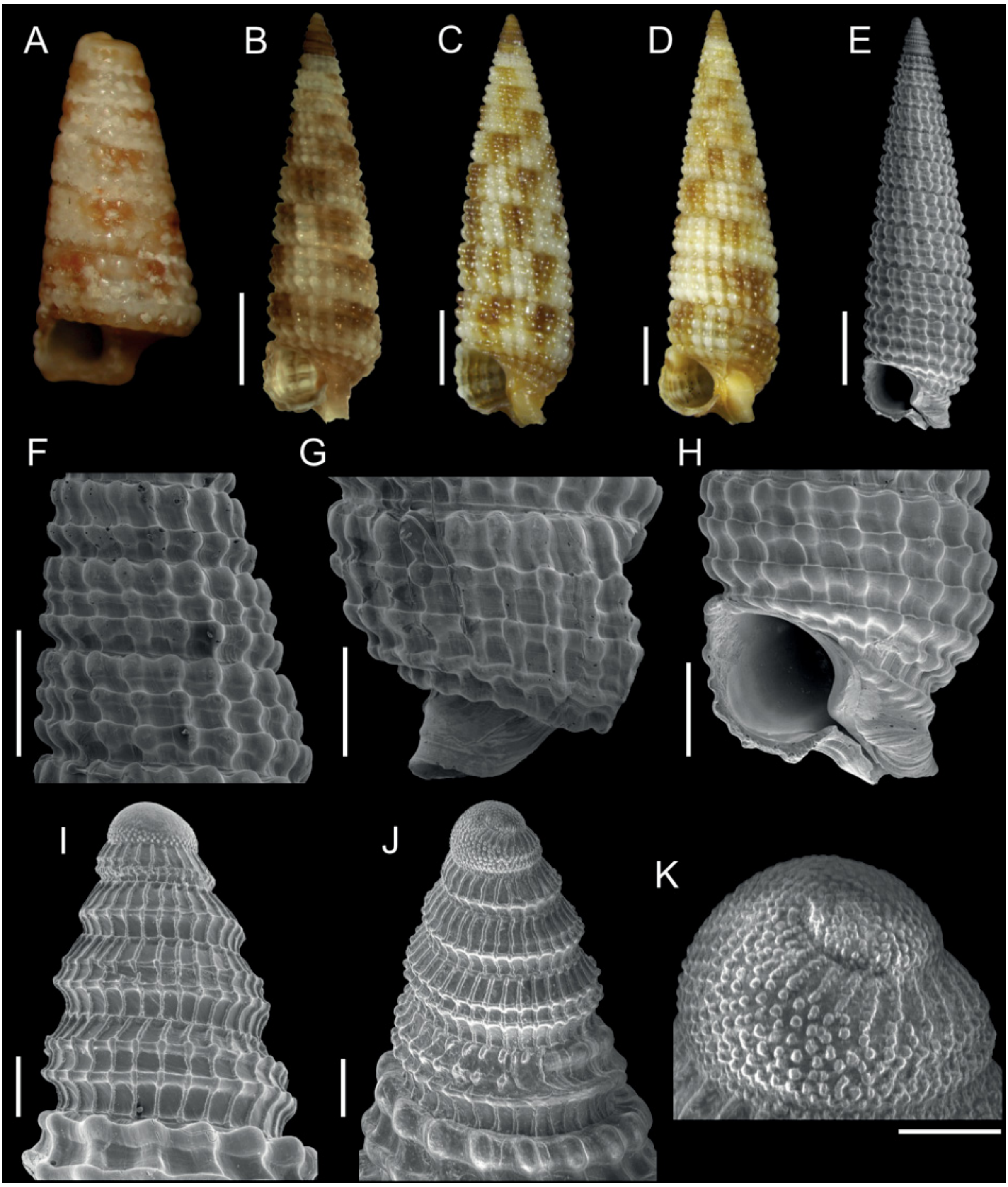

Fig. 92. *Nototriphora decorata* (C.B. Adams, 1850). **A**. Lectotype, MCZ 186178. **B**. MNRJ 18410*, 4.47 mm. **C**. MNRJ 18954*, 5.53 mm. **D**. MNRJ 34109*, 7.12 mm. **E**. MNRJ 17990*, 5.61 mm. **F–H**. Same shell as E. **I**. MNRJ 18398*. **J–K**. Same shell as C. Scale bars: B–E = 1 mm; F–H = 500 µm; I–J = 100 µm; K = 50 µm.

— Absalão 1989: 3. — Leal 1991: 122, pl. 16 figs j–k. — Díaz 1994: 33. — Hess & Abbott 1994: 147. — Merlano & Hegedus 1994: 148, pl. 46 fig. 521. — Coelho-Filho 2004: 25. — Absalão *et al*. 2006: 238. — Gomes *et al*. 2006: 187. — Gutiérrez-Salcedo *et al*. 2007: 316. — Santos *et al*. 2007: 226. — Daccarett & Bossio 2011: 91, fig. 416.
Triphora (*Cosmotriphora*) *decorata* – Odé 1989: 110, fig. 5.
Nototriphora decorata – Rolán & Fernández-Garcés 1994: 19, figs 10, 14, 16, 30 ND; 2007: 24, pl. 5 figs 1–5; 2015: 54, pl. 4 fig. d. — Redfern 2001: 68, pl. 33 fig. 285; 2013: 130, fig. 370. — Espinosa & Ortea 2001: 20. — Dowgiallo 2004: 93. — Lee 2009: 91. — Jensen & Pearce 2009: 129. — Tunnell *et al*. 2010: 206. — Zhang 2011: 101, fig. 302. — Espinosa *et al*. 2012: 257. — García & Capote 2012: 22; 2013: 29. — Fernandes *et al*. 2013: 14, figs 14, 25, 35. — Gracia *et al*. 2013: 383. — Longo *et al*. 2014: 4, fig. 4b. — Lamy & Pointier 2018: 287, pl. 92 figs 7a–b. — Fernandes & Segadilha 2019: 134, figs 4a, g. — Fernandes & Pimenta 2019a: 33, figs 2h, 21–23.
Triphora ecorate [sic] – Reyes *et al*. 2007: 383.

Material examined

BRAZIL – **North Brazil** • 2 specs; REVIZEE-Norte III st. 150; UFMA* • 8 specs; REVIZEE-Norte III st. 176; UFMA* • 1 spec.; REVIZEE-Norte III st. 192; UFMA* • 1 spec.; REVIZEE-Norte III st. 211A; UFMA*. – **Amapá** • 2 specs; off Cabo Orange; depth 103 m; 29 Nov. 1968; OC. Ship Almirante Saldanha leg.; MORG 14449 • 9 specs; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32559* • 1 spec.; AMASSEDS st. 4134; MNRJ 34460*. – **Pará** • 1 spec.; off Salinópolis; depth 27 m; 26 Apr. 1968; OC. Ship Almirante Saldanha leg.; MORG 13692. – **Rio Grande do Norte** • 1 spec.; BPot 1-MR11; MNRJ 31558* • 2 specs; BPot 1-MR26; MNRJ 31559* • 2 specs; BPot 1-MR31; MNRJ 31560* • 15 specs; BPot 1-MR32; MNRJ 31561* • 12 specs; BPot 1-MR41; MNRJ 31562* • 36 specs; BPot 1-MR42; MNRJ 31563* • 20 specs; BPot 1-MR43; MNRJ 31564* • 11 specs; BPot 1-MR44; MNRJ 31565* • 14 specs; BPot 1-MR45; MNRJ 31566* • 2 specs; BPot 2-MR22; MNRJ 31567* • 9 specs; BPot 2-MR32; MNRJ 31568* • 1 spec.; BPot 2-MR33; MNRJ 31569* • 2 specs; BPot 2-MR34; MNRJ 31570* • 1 spec.; BPot 2-MR41; MNRJ 31571* • 13 specs; BPot 2-MR42; MNRJ 31572* • 24 specs; BPot 2-MR44; MNRJ 31573* • 15 specs; BPot 2-MR45; MNRJ 31574* • 1 spec.; 04º44′11″ S, 36º24′55″ W; depth 425–450 m; 7 May 2011; MNRJ 35110*. – **Fernando de Noronha Archipelago** • 1 spec.; 03º51′ S, 35º25′ W; 1998; L.R.L. Simone leg.; MZSP 100283. – **Paraíba** • 1 spec.; 07º06′59″ S, 34º46′04″ W; 14 Mar. 2006; P. Riul leg.; UEPB. – **Alagoas** • 3 specs; Maceió, Jaraguá; MNRJ 18608* • 35 specs; Maceió, Jaraguá; MORG 33732 • 1 spec.; Petro/MAR st. 21; UFS. – **Sergipe** • 1 spec.; Petro/UFS st. E5-A2; with soft part preservation; UFS • 1 spec.; Petro/UFS st. E6-A1; UFS • 6 specs; Petro/UFS st. 15.3; UFS • 15 specs; Petro/UFS st. 18.1; UFS. – **Bahia** • 2 specs; Salvador, Itapuã; 17 Jul. 1967; E. Rios leg.; MORG 13822 • 14 specs; Salvador, Itapuã; 17 Jul. 1967; E. Rios leg.; MORG 16374 • 21 specs; Salvador, Itapuã; 17 Jul. 1967; E. Rios leg.; MORG 33722 • 3 specs; Salvador, Itapuã; May 1974; L. Ferreira leg.; MORG 22048 • 1 spec.; Salvador, Itapuã; L. Tostes leg.; MNRJ 41721* • 6 specs; Salvador, Itapuã; MZSP 34321 • 1 spec.; Salvador, Itapuã; MZSP 133314 • 18 specs; Salvador; intertidal; Apr. 1981; G. Oliveira leg.; MNRJ 21356* • 30 specs; Salvador; intertidal; Apr. 1981; G. Oliveira leg.; MORG 31931 • 5 specs; Baía de Todos os Santos; Jun. 1997; MNRJ 34423* • 2 specs; 13º28′ S, 38º48′ W; depth 30 m; Sep. 2007; MNRJ 32613* • 1 spec.; 13º28′17″ S, 38º48′43″ W; depth 35 m; MNRJ 31031* • 5 specs; 13º28′17″ S, 38º48′43″ W; depth 35 m; MNRJ 32608* • 3 specs; 13º29′44″ S, 38º48′19″ W; depth 33 m; 25 Nov. 2010; MNRJ 32991* • 6 specs; 13º30′27″ S, 38º48′45″ W; 24 Nov. 2007; MNRJ 32898* • 3 specs; off Camamú; depth 52 m; 11 Dec. 2002; MORG 45532 • 1 spec.; Cairu, Morro de São Paulo, Praia de Garapuá; depth 5 m; 2011; P. Coelho-Filho leg.; with soft part preservation; MZSP 100930 • 2 specs; Ilhéus; MNRJ 32370* • 1 spec.; off Canavieiras; Apr. 2011; MNRJ 32961* • 3 specs; REVIZEE-Central C5-7R; MNRJ 17919* • 3 specs; REVIZEE-Central C5-7R; IBUFRJ 14700 • 1 spec.; REVIZEE-Central C5-13R; IBUFRJ 11957 • 1 spec.; REVIZEE-Central C5-13R; IBUFRJ 13318 • 5 specs; REVIZEE-Central C5-13R; IBUFRJ 13319 • 1 spec.; REVIZEE-Central C1-C66; IBUFRJ 9674 • 2 specs; Abrolhos; depth 5 m; L.C. Araujo leg.; Jul. 1972; MORG 18057 • 1 spec.;

Abrolhos; Jan. 1985; MORG 52622. – **Espírito Santo** • 2 specs; REVIZEE-Central C1-VV31; IBUFRJ 11403 • 1 spec.; REVIZEE-Central C1-C65; IBUFRJ 9482 • 1 spec.; REVIZEE-Central C1-C65; IBUFRJ 12893 • 1 spec.; REVIZEE-Central C1-C65; IBUFRJ 19462 • 2 specs; REVIZEE-Central C1-C65; MORG 33530 • 1 spec.; REVIZEE-Central C1-C64; IBUFRJ 9245 • 15 specs; REVIZEE-Central C1-VV38I; BUFRJ 12894 • 4 specs; REVIZEE-Central C1-VV38I; BUFRJ 19610 • 3 specs; REVIZEE-Central C1-VV38; MORG 40340 • 1 spec.; 19º25′05″ S, 39º15′54″ W; depth 65 m; Oct. 2003; MNRJ 30702* • 2 specs; 19º25′08″ S, 39º15′59″ W; depth 65 m; Oct. 2003; MNRJ 30769* • 1 spec.; 19º25′34″ S, 39º22′16″ W; depth 42 m; Oct. 2003; MNRJ 31164* • 1 spec.; 19º26′33″ S, 39º22′02″ W; depth 50 m; Oct. 2003; MNRJ 30714* • 2 specs; 19º40′26″ S, 39º36′19″ W; depth 40 m; 2 Dec. 2011; OC. Ship Seward Johnson leg.; MNRJ 34826* • 2 specs; REVIZEE-Central C1-VV24; IBUFRJ 19474 • 1 spec.; REVIZEE-Central C1-VV24; MORG 52254 • 1 spec.; 20º18′ S, 40º14′ W; Mar. 1993; V. Abud leg.; MORG 39972 • 5 specs; 20º18′ S, 40º14′ W; Mar. 1993; V. Abud leg.; MORG 40026 • 1 spec.; Ilha Escalvada, Guarapari; depth 20–22 m; May 1994; A. Bodart leg.; CHL • 2 specs; Ilha Escalvada, Guarapari; 2012; W. Vieira leg.; MNRJ 34032* • 3 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Nov. 2007; MNRJ 32411* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31048* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31057* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31079* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31093* • 17 specs; Piúma; 1993; IBUFRJ 8574. – **Vitória-Trindade Chain** • 2 specs; Trindade Island; depth 10 m; Mar. 1986; MORG 24410. – **Campos Basin** (Espírito Santo/Rio de Janeiro) • 1 spec.; 21º17′ S, 40º18′ W; 26 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 7563 • 10 specs; REVIZEE-Central C1-VV21; IBUFRJ 12883 • 3 specs; REVIZEE-Central C1-VV16; IBUFRJ 12892 • 3 specs; 20º53′ S, 40º12′ W; 26 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 19517 • 1 spec.; REVIZEE-Central C1-D1-2; IBUFRJ 19530 • 7 specs; REVIZEE-Central C1-D3; IBUFRJ 19582 • 2 specs; HAB 11-G4; MNRJ 17946* • 1 spec.; HAB 13-H3; MNRJ 17973* • 1 spec.; HAB 13-H1; MNRJ 17984* • 5 specs; HAB 13-I2; MNRJ 17990* • 1 spec.; HAB 16-B4; MNRJ 18369* • 1 spec.; HAB 17-I3; MNRJ 18389* • 1 spec.; HAB 16-G4; MNRJ 18397* • 4 specs; HAB 16-G3; MNRJ 18398* • 15 specs; HAB 17-I2; MNRJ 18410* • 1 spec.; HAB 16-C4; MNRJ 18427* • 5 specs; HAB 16-H3; MNRJ 18435* • 1 spec.; HAB 16-H2; MNRJ 18436* • 2 specs; 22º42′ S, 40º40′ W; depth 110 m; 2006; MNRJ 18752* • 2 specs; 22º42′ S, 40º40′ W; depth 5–10 m; MNRJ 18954* • 2 specs; 23º02′ S, 40º20′ W; 30 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 7562 • 2 specs; 23º04′ S, 40º59′ W; 17 Dec. 2004; MNRJ 18968* • 2 specs; 22º42′ S, 40º40′ W; depth 110 m; 19 Sep. 2003; MNRJ 30904* • 1 spec.; 23º09′00″ S, 41º02′06″ W; Oct. 2008; MNRJ 32074* • 1 spec.; 22º42′ S, 40º40′ W; depth 12 m; Oct. 2005; MNRJ 32621* • 3 specs; REVIZEE-Central C1-VV22; MORG 40409 • 1 spec.; REVIZEE-Central C1-VV21; MORG 52204. – **Rio de Janeiro** • 1 spec.; Porto do Açu, São João da Barra; 21º49′04″ S, 41º00′04″ W; Jul. 2012; MZSP 111139 • 1 spec.; Rio das Ostras; 22º31′59″ S, 41º56′51″ W; depth 3 m; 21 Sep. 2007; J.B. Mendonça leg.; MZSP 97209 • 2 specs; Búzios, Praia da Ferradura; MNRJ 18596* • 3 specs; Cabo Frio, Praia do Peró; Apr. 1979; L. Tostes leg.; MNRJ 34109* • 2 specs; Cabo Frio, Praia das Conchas; Jan. 1979; L. Tostes leg.; MNRJ 34110* • 1 spec.; Ilha dos Porcos, Arraial do Cabo; depth 9 m; 17 Sep. 2009; P. Oristânio leg.; MZSP 92387 • 2 specs; Itaipú, Niterói; 1981; IBUFRJ 955 • 11 specs; Angra dos Reis, Praia da Figueira; 1998; C. Alvarenga leg.; IBUFRJ 13682 • 4 specs; Ilha Comprida, Angra dos Reis; RAP-BIG st. 19; UERJ 5744 • 1 spec.; Ilha da Murta, Angra dos Reis; RAP-BIG st. 20; UERJ 5848 • 2 specs; Ilha Itanhangá, Angra dos Reis; 22º59′23″ S, 44º24′32″ W; intertidal; 5 Aug. 2008; A. Breves leg.; with soft part preservation; MNRJ 19782* • 1 spec.; Ponta da Fortaleza, Angra dos Reis; 22º59′42″ S, 44º25′42″ W; intertidal; 16 Sep. 2008; A. Breves leg.; with soft part preservation; MNRJ 19786* • 3 specs; Ilha Peregrino, Angra dos Reis; 23º01′31″ S, 44º17′13″ W; intertidal; 23 Jun. 2008; A. Breves leg.; with soft part preservation; MNRJ 19783* • 1 spec.; Ilha da Gipóia, Ponta Escalvada; 23º01′52″ S, 44º22′39″ W; intertidal; 9 Apr. 2008; A. Breves leg.; with soft part preservation; MNRJ 19788* • 13 specs; Ilha da Gipóia, Ponta Escalvada; RAP-BIG st. 21; UERJ 5815 • 1 spec.; Paraty, Praia de São Gonçalinho; 23º03′05″ S, 44º36′49″ W; intertidal; 21 May 2008; A. Breves leg.; with soft part preservation; MNRJ 19787* • 7 specs; Ilha de Macacos, Angra dos Reis; RAP-BIG st. 30; UERJ 5559 • 2 specs; Laje do Coronel, Angra dos Reis; RAP-BIG st. 24; UERJ 4938 • 1 spec.; Ilha da Gipóia, Angra dos Reis; RAP-BIG st. 22; UERJ 7543 • 2 specs; Angra dos Reis, Ponta Grande; RAP-BIG st. 17; UERJ 7545 • 3 specs; Ilha Grande, Praia dos Morcegos; RAP-BIG st. 32; with soft part preservation; UERJ 5591 • 3 specs; Ilha Grande, Ponta do Guriri, Angra dos Reis; 23º10′24″ S, 44º05′33″ W; intertidal; 19 Sep. 2009; A. Breves leg.; MNRJ 19784* • 1 spec.; Ilha Grande, Enseada do Abraão, Angra dos Reis; 18 Mar. 1979; MNRJ 17927* • 3 specs; Ilha Grande, Ponta da Enseada; RAP-BIG st. 31; UERJ 5181 • 3 specs; Ilha Grande, Ponta Longa; RAP-BIG st. 39; UERJ 7546 • 11 specs; Ilha Grande; RAP-BIG st. 40; UERJ 4331 • 3 specs; Ilha Grande, Enseada de Lopes Mendes; RAP-BIG st. 34; UERJ 5236 • 11 specs; Ilha Grande, Enseada Dois Rios; 20 Nov. 1996; UERJ 7544 • 1 spec.; Ilha Grande, Ponta Alta de Parnaioca; RAP-BIG st. 36; UERJ 4919 • 2 specs; Ilha Rapada, Paraty; RAP-BIG st. 12; UERJ 5632 • 5 specs; Paraty, Praia Vermelha; RAP-BIG st. 10; UERJ 3792 • 1 spec.; Paraty, Praia da Sapeca; J. Tarasconi leg.; 10 Feb. 2004; MORG 46653 • 2 specs; Ilha Jorge Grego; RAP-BIG st. 35; UERJ 3660 • 6 specs; Paraty, Ponta do Buraco; 23º14′16″ S, 44º35′58″ W; depth 4.5 m; 14 Nov. 2003; UERJ 5891 • 1 spec.; Paraty, Cajaíba, Praia Grande; RAP-BIG st. 3; UERJ 7542 • 1 spec.; Paraty, Ponta de Juatinga; RAP-BIG st. 1, UERJ 3741. – **São Paulo** • 3 specs; Ubatuba, Praia da Enseada; Jul. 1958; C. Garcia leg.; MNHN-Mo 3796* • 2 specs; Ubatuba, Enseada do Flamengo; 24–25 Jun. 1956; C. Jesus and P. Cardoso leg.; MNRJ 55815* • 3 specs; Ubatuba, Enseada do Flamengo; 24–25 Jun. 1956; C. Jesus and P. Cardoso leg.; MZSP 24653 • 2 specs; Ubatuba, Enseada do Flamengo; 24–25 Jun. 1956; C. Jesus and P. Cardoso leg.; MNHN-Mo 3781* • 2 specs; Ubatuba, Enseada do Flamengo; 7 Jan. 1956; W. Narchi leg.; MNHN-Mo 7640* • 1 spec.; Ubatuba, Itaguá; Oct. 1991; IBUFRJ 6093 • 1 spec.; Ubatuba; 23º22′ S, 44º51′ W; 28 Sep. 2001; MZSP 40205 • 1 spec.; São Sebastião, Ilha de Búzios, Parcel da Pedra Lisa; 23º47′27″ S, 45º08′42″ W; depth 5 m; 18 Jan. 2012; with soft part preservation; MZSP 105975 • 5 specs; São Sebastião, Ilha de Búzios; 24 Oct. 2012; A.P. Dornellas leg.; MZSP 109516 • 1 spec.; São Sebastião, Praia do Guaecá; 23º49′14″ S, 45º27′45″ W; 9 Aug. 2011; MZSP 118847 • 2 specs; São Sebastião; MZSP 64363 • 1 spec.; Guarujá; M.A. Cardoso leg.; MZSP 133309. – **Santa Catarina** • 1 spec.; Florianópolis, Barra da Lagoa; 16 Feb. 1986; G. Nunan leg.; MNRJ 33314*.

COLOMBIA • 1 spec.; La Guajira, Plataforma Chuchupa; 11º47′15″ N, 72º46′50″ W; depth 18 m; J. Reyes and A. Clavijo leg.; 3 Nov. 2004; INV MOL7920 • 1 spec.; Tayrona, Bahía de Nenguange; 11º19′16″ N, 74º05′09″ W; depth 40–50 m; 1 Apr. 1980; M. Aubad and B. Echeverry leg.; INV MOL705 • 1 spec.; El Morrito, Bahía de Santa Marta; 11º15′06″ N, 74º13′22″ W; depth 8 m; 30 Dec. 1988; L. Escobar leg.; INV MOL969.

CURAÇAO • 1 spec.; Newport; 12º05′ N, 68º49′ W; depth 5–15 m; Mar. 2004; MZSP 116109.

UNITED STATES OF AMERICA – **Florida** • 1 spec.; Deerfield Beach, Brower County; depth 3–5 m; P. Souza leg.; Jun. 1998; MZSP 42450 • 1 spec.; South Point Beach, Miami; 25º45′ N, 80º07′ W; 23 Jun. 2016; M.R. Fernandes leg.; with soft part preservation; MNRJ 35953* • 1 spec.; Little Torch Key; 15 Jul. 1977; M. Teskey leg.; FLMNH 507938.

Sagenotriphora osclausum (Rolán & Fernández-Garcés, 1995)
Fig. 93

Triphora osclausum Rolán & Fernández-Garcés, 1995: 15, figs 36–38.

Triphora osclausum – Rolán & Fernández-Garcés 2007: 24, pl. 5 figs 26–27. — Redfern 2001: 69, pl. 33 fig. 288. — Lamy & Pointier 2018: 289, pl. 92 fig. 10.
Sagenotriphora osclausum – Rolán & Fernández-Garcés 2008: 132, fig. 22 A-I. — Lee 2009: 91. — Zhang 2011: 101, fig. 304. — Redfern 2013: 130, fig. 371. — Fernandes & Pimenta 2019a: 37, figs 2i, 24.

Material examined

BRAZIL – **North Brazil** • 7 specs; REVIZEE-Norte III st. 176; UFMA*. – **Maranhão** • 1 spec.; Parcel Manuel Luís; 6 Apr. 1994; UFMA*. – **Rio Grande do Norte** • 6 specs; BPot 1-MR32; MNRJ 31575*

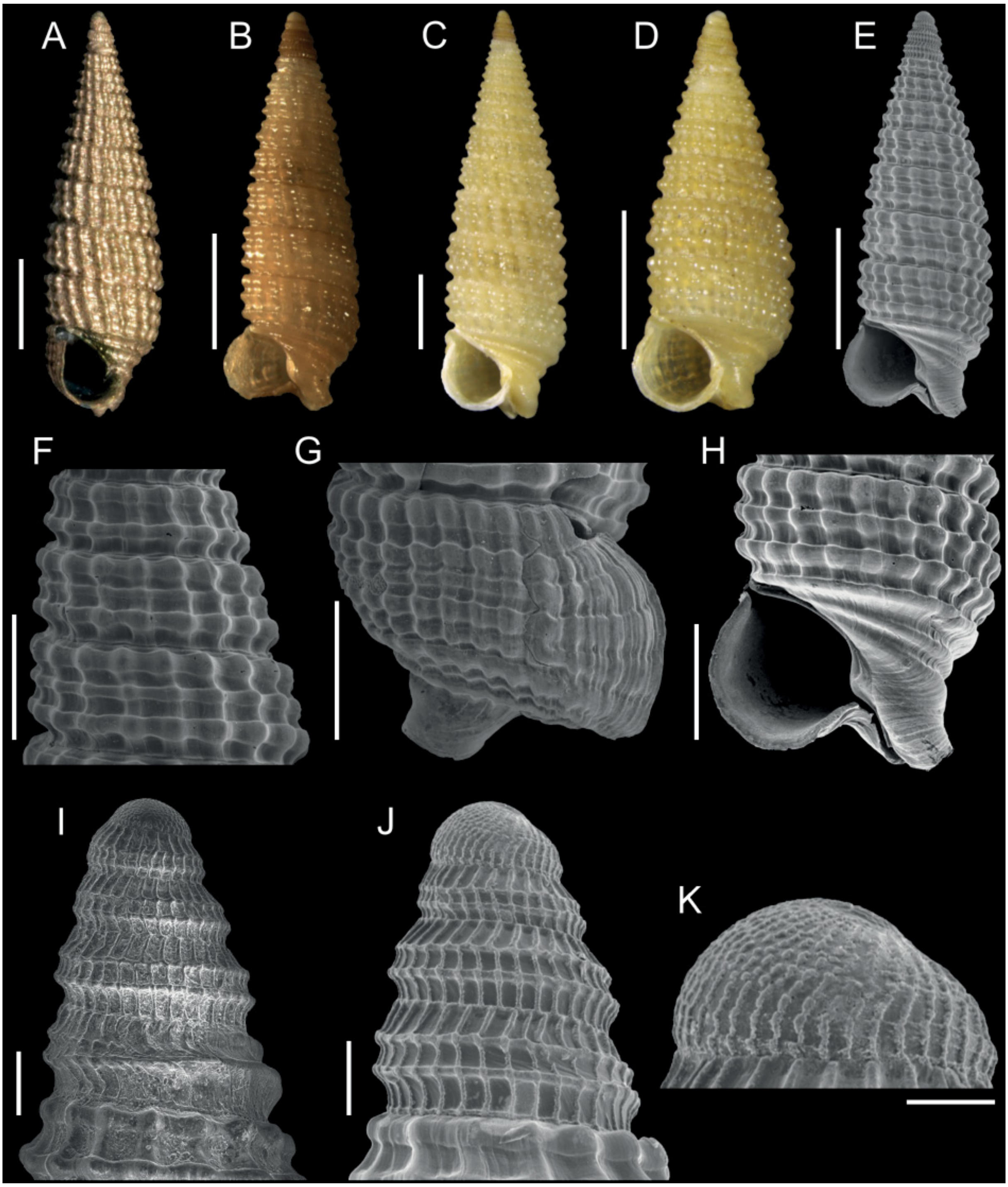

Fig. 93. *Sagenotriphora osclausum* (Rolán & Fernández-Garcés, 1995). **A**. Holotype, MNCN 15.05/17224. **B**. MNRJ 17956*, 3.46 mm. **C**. MNRJ 18964*, 5.48 mm. **D**. MNRJ 18946*, 2.91 mm. **E**. MNRJ 18381*, 3.35 mm. **F–G**. MNRJ 17970*. **H, J–K**. Same shell as E. **I**. Same shell as C. Scale bars: A–E = 1 mm; F–H = 500 µm; I–J = 100 µm; K = 50 µm. Photo credits A: Rafael Araujo (MNCN).

• 15 specs; BPot 1-MR41; MNRJ 31576* • 15 specs; BPot 1-MR42; MNRJ 31577* • 17 specs; BPot 1-MR43; MNRJ 31578* • 6 specs; BPot 1-MR44; MNRJ 31579* • 3 specs; BPot 1-MR45; MNRJ 31580* • 1 spec.; BPot 2-MR32; MNRJ 31581* • 1 spec.; BPot 2-MR41; MNRJ 31582* • 10 specs; BPot 2-MR42; MNRJ 31583* • 5 specs; BPot 2-MR44; MNRJ 31584* • 4 specs; BPot 2-MR45; MNRJ 31585* • 1 spec.; 04º48′26″ S, 36º10′52″ W; depth 178–193 m; 23 May 2011; MNRJ 35112*. – **Pernambuco** • 1 spec.; Ipojuca, Porto de Galinhas; 28 Mar. 1983; UFRPE. – **Alagoas** • 2 specs; Maceió, Ponta Verde; FLMNH 507928 • 1 spec.; Maceió, Ponta Verde; MORG 52628 • 1 spec.; Petro/MAR st. 19; UFS. – **Sergipe** • 6 specs; Petro/UFS st. E5-A1; UFS • 1 spec.; Petro/UFS st. E6-A1; with soft part preservation; UFS • 2 specs; Petro/UFS st. 15.3; with soft part preservation; UFS. – **Bahia** • 1 spec.; Salvador; Apr. 1981; J.C. Tarasconi leg.; CHL • 1 spec.; Salvador; MZSP 133334 • 2 specs; Baía de Camamú; Dec. 2001; M. Ximenes and V. Abud leg.; MNRJ 18946* • 1 spec.; 13º29′43″ S, 38º49′08″ W; Aug. 2007; MNRJ 32902* • 1 spec.; 13º35′24″ S, 38º44′50″ W; Jan. 2007; MNRJ 32927* • 1 spec.; 13º35′44″ S, 38º49′04″ W; 31 Mar. 2003; MNRJ 17255* • 1 spec.; Ilhéus;14º48′23″ S, 39º01′61″ W; Sep. 2008; T. Ourives leg.; MZSP 91657 • 2 specs; Ilhéus; MNRJ 32373* • 2 specs; Santa Cruz Cabrália; depth 3 m; 19 Jan. 2000; MZSP 57222 • 1 spec.; REVIZEE-Central C5-16R; IBUFRJ 14342 • 6 specs; JOPS st. 3236; MNRJ 33807*. – **Espírito Santo** • 4 specs; REVIZEE-Central C1-C65; IBUFRJ 9493 • 2 specs; REVIZEE-Central C1-C65; IBUFRJ 12879 • 1 spec.; REVIZEE-Central C1-C65; IBUFRJ 19464 • 2 specs; REVIZEE-Central C1-C65; IBUFRJ 19495 • 8 specs; REVIZEE-Central C1-C65; MORG 52601 • 4 specs; REVIZEE-Central C1-VV38; IBUFRJ 19609 • 1 spec.; 19º25′ S, 39º22′ W; depth 55 m; Oct. 2003; MNRJ 30716* • 1 spec.; 19º25′05″ S, 39º15′54″ W; depth 65 m; Oct. 2003; MNRJ 30704* • 2 specs; 19º25′34″ S, 39º22′16″ W; depth 42 m; Oct. 2003; MNRJ 32835* • 1 spec.; 19º25′37″ S, 39º22′22″ W; depth 43 m; Oct. 2003; MNRJ 30751* • 2 specs; 19º25′45″ S, 39º24′58″ W; depth 50 m; Oct. 2003; MNRJ 30758* • 1 spec.; 19º26′03″ S, 39º22′35″ W; depth 44 m; Oct. 2003; MNRJ 32836* • 4 specs; REVIZEE-Central C1-VV24; IBUFRJ 19473 • 2 specs; Porto de Ubú; 20º47′ S, 40º32′ W; MNRJ 30899* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; MNRJ 30900* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; MNRJ 31020* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; MNRJ 31076* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; MNRJ 31132* • 2 specs; Porto de Ubú; 20º47′ S, 40º32′ W; MNRJ 32420*. – **Champlain Seamount** • 1 spec.; REVIZEE-Central C5-28R; IBUFRJ 14669. – **Campos Basin** (Espírito Santo/Rio de Janeiro) • 5 specs; 21º15′ S, 40º20′ W; 28 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 7559 • 1 spec.; 20º38′ S, 40º08′ W; 26 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 19507 • 1 spec.; Campos Basin; 26 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 19510 • 3 specs; 20º53′ S, 40º12′ W; 26 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 19515 • 2 specs; REVIZEE-Central C1-D1-2; IBUFRJ 19531 • 4 specs; REVIZEE-Central C1-VV21; MNRJ 33795* • 4 specs; REVIZEE-Central C1-VV21 IBUFRJ 19540 • 2 specs; REVIZEE-Central C1-D3; IBUFRJ 19555 • 4 specs; REVIZEE-Central C1-D3; IBUFRJ 19591 • 3 specs; HAB 13-H2; MNRJ 17952* • 3 specs; HAB 13-H2; MNRJ 17956* • 3 specs; HAB 13-H2; MNRJ 17970* • 2 specs; HAB 13-H2; MNRJ 17954* • 1 spec.; HAB 13-H2; MNRJ 17971* • 2 specs; HAB 11-G4; MNRJ 17966* • 1 spec.; HAB 13-H4; MNRJ 17980* • 5 specs; HAB 16-G3; MNRJ 18378* • 2 specs; HAB 16-B4; MNRJ 18381* • 1 spec.; HAB 16-C3; MNRJ 18384* • 2 specs; HAB 16-H2; MNRJ 18385* • 1 spec.; HAB 17-I4; MNRJ 18386* • 1 spec.; HAB 17-I1; MNRJ 18387* • 2 specs; HAB 16-H3; MNRJ 18388* • 1 spec.; HAB 16-G4; MNRJ 18401* • 1 spec.; HAB 16-C4; MNRJ 18430* • 2 specs; HAB 13-H2; MNRJ 18590* • 2 specs; 23º04′ S, 40º59′ W; 17 Dec. 2004; MNRJ 18964* • 1 spec.; HAB 13-H3; MNRJ 30827* • 1 spec.; 22º42′ S, 40º40′ W; depth 5–10 m; 14 Apr. 2005; MNRJ 32406* • 1 spec.; REVIZEE-Central C1-VV21; MORG 52203. – **Rio de Janeiro** • 4 specs; Búzios, Praia da Ferradura; MNRJ 18604* • 1 spec.; Ilha Grande, Ponta da Enseada; RAP-BIG st. 31; UERJ 5181 • 4 specs; Ilha Grande, Praia do Furtado; 22 Jul. 1966; MZSP 51995. – **São Paulo** • 1 spec.; Ubatuba; D. Fiore leg.; MZSP 24656 • 1 spec.; Ubatuba, Enseada do Flamengo; 7 Jan. 1956; W. Narchi leg.; MNHN-Mo 7640* • 1 spec.; Ubatuba; depth 9 m; 23 Mar. 1961; MZSP 52025 • 1 spec.; REVIZEE-Sul st. 6686; MZSP 133504.

CUBA • 1 spec.; Varadero, Matanzas; H. Monroe leg.; FLMNH 151638.

MEXICO • 1 spec.; Yucatan; depth 84–89 m; BMSM 107193.

UNITED STATES OF AMERICA – **North Carolina** • 2 specs; 33º38′00″ N, 77º36′00″ W; depth 27 m; 20 Oct. 1885; R/V Albatross leg.; USNM 1457216 • 1 spec.; 33º32′18″ N, 77º25′00″ W; depth 30 m; 21 Oct. 1981; with soft part preservation; USNM 850623. – **Florida** • 4 specs; Palm Beach County, off Lantana; 3 Aug. 1939; W. Lyman leg.; FLMNH 10241 • 1 spec.; Palm Beach County, off Boynton Inlet; H. Akers leg.; FLMNH 507934 • 1 spec.; Palm Beach County, Delray Beach; 1 Apr. 1979; J. Lightfoot leg.; FLMNH 507936.

Similiphora intermedia (C.B. Adams, 1850)
Fig. 94

Cerithium intermedium C.B. Adams, 1850: 119.

Triforis intermedius – Dautzenberg 1900: 195.
Triforis intermedia – Dall & Simpson 1901: 423.
Triphora pulchella auct. non C.B. Adams, 1850 – Lange-de-Morretes 1949: 80. — Parker & Curray 1956: 2434. — Porta & Porta 1960: 42. — Houbrick 1968: 14. — Rios 1970: 46; 1975: 51, pl. 13 fig. 190; 1985: 161, pl. 53 fig. 764; 1994: 95, pl. 31 fig. 377; 2009: 173. — Abbott 1974: 112, fig. 1135. — Vokes & Vokes 1983: 18, pl. 27 fig. 17. — Robinson & Montoya 1987: 384. — Absalão 1989: 3. — Absalão *et al*. 2006: 238. — Santos *et al*. 2007: 226. — Agudo-Padrón 2015: 65.
Cerithium intermedium – Clench & Turner 1950: 293, pl. 38 fig. 9.
Triphora intermedia – Parker & Curray 1956: 2434. — Warmke & Abbott 1962: 77. — Cooley 1978: 60. — Robinson & Montoya 1987: 384. — De Jong & Coomans 1988: 50. — Díaz 1994: 33. — Hess & Abbott 1994: 147.
Triphora sp. "C" – Rice & Kornicker 1962: 120, pl. 2 fig. 16.
Triphora (*Cosmotriphora*) *pulchella* – Odé 1989: 111, non C.B. Adams, 1850.
Similiphora intermedia – Rolán & Fernández-Garcés 1995: 12, figs 17–19; 2007: 24, pl. 5 figs 6–12; 2015: 54, pl. 4 figs m–n, not fig. k. — Redfern 2001: 68, pl. 33 fig. 286; 2013: 130, fig. 372. — Espinosa & Ortea 2001: 20. — Sevilla *et al*. 2003: 342. — Espinosa *et al*. 2007: 74, fig. 55; 2012: 257. — Lee 2009: 91. — Garcia & Lee 2011. — Zhang 2011: 101, fig. 303. — Lamy & Pointier 2018: 289, pl. 92 fig. 8. — Fernandes & Pimenta 2019a: 39, figs 2j, 25–27.

Material examined

BRAZIL – **North Brazil** • 2 specs; REVIZEE-Norte III st. 176; UFMA* • 1 spec.; REVIZEE-Norte III st. 211A; UFMA*. – **Pará** • 1 spec.; 00º10′ S, 46º00′ W; depth 35 m; Jan. 1981; MORG 52607. – **Rio Grande do Norte** • 1 spec.; BPot 1-MR11; MNRJ 31460* • 1 spec.; BPot 1-MR22; MNRJ 31461* • 1 spec.; BPot 1-MR23; MNRJ 31462* • 2 specs; BPot 1-MR25; MNRJ 31463* • 2 specs; BPot 1-MR31; MNRJ 31464* • 4 specs; BPot 1-MR32; MNRJ 31465* • 1 spec.; BPot 1-MR34; MNRJ 31466* • 9 specs; BPot 1-MR41; MNRJ 31467* • 5 specs; BPot 1-MR42; MNRJ 31468* • 3 specs; BPot 1-MR43; MNRJ 31469* • 1 spec.; BPot 1-MR45; MNRJ 31470* • 2 specs; BPot 2-MR22; MNRJ 31471* • 1 spec.; BPot 2-MR23; MNRJ 31472* • 4 specs; BPot 2-MR32; MNRJ 31473* • 1 spec.; BPot 2-MR33; MNRJ 31479* • 1 spec.; BPot 2-MR34; MNRJ 31474* • 2 specs; BPot 2-MR41; MNRJ 31475* • 3 specs; BPot 2-MR42; MNRJ 31476* • 4 specs; BPot 2-MR 44; MNRJ 31477* • 4 specs; BPot 2-MR45; MNRJ 31478* • 1 spec.; Genipabu; 1966; Cabral-Nasser leg.; MORG 12867. – **Alagoas** • 1 spec.; Maceió, Ponta Verde; 1992; IBUFRJ 4351 • 2 specs; Maceió, Jaraguá; MNRJ 18612* • 20 specs; Maceió, Jaraguá; MORG 33738 • 2 specs; Petro/MAR st. 21; UFS. – **Sergipe** • 1 spec.; Petro/UFS st. E5-A2; with soft part preservation; UFS • 1 spec.; Petro/UFS st. E6-A2; UFS. – **Bahia** • 3 specs; Salvador, Itapuã; Apr. 1982; G. Oliveira leg.; MORG 22195 • 1 spec.; Salvador, Itapuã; Feb. 1990; P.M.S. Costa leg.; MORG 27669 • 5 specs; Salvador, Itapuã; MORG 33731 • 3 specs; Salvador, Itapuã; MORG 52616 • 1 spec.; Salvador, Itapuã; MZSP 63878 • 1 spec.; Salvador, Itapuã; MZSP 133313 • 1 spec.; Salvador, Itapuã; MZSP 133318 • 1 spec.; 13º29′22″ S, 38º48′43″ W; Jun. 2007; MNRJ 32914* • 1 spec.; Cairu,

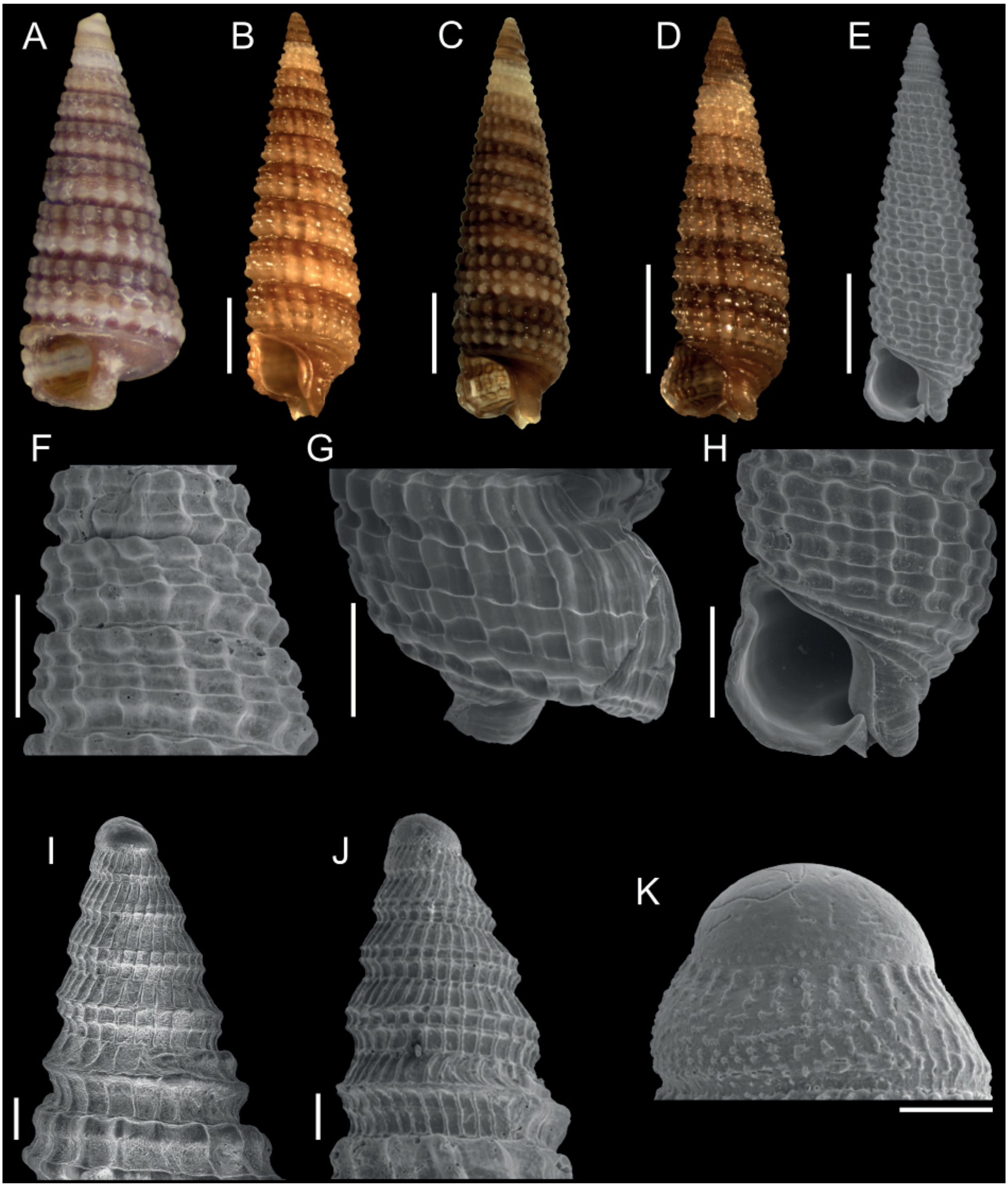

Fig. 94. *Similiphora intermedia* (C.B. Adams, 1850). **A**. Lectotype, MCZ 186161. **B**. MNRJ 17967*, 5.42 mm. **C**. MNRJ 29763*, 5.12 mm. **D**. MNRJ 18953*, 3.73 mm. **E, H**. Same shell as D. **F, J**. MNRJ 17976*. **G, K**. Same shell as C. **I**. MNRJ 34027*. Scale bars: A–E = 1 mm; F–H = 500 µm; I–J = 100 µm; K = 50 µm.

Morro de São Paulo, Praia de Garapuá; depth 5 m; 2011; P. Coelho-Filho leg.; with soft part preservation; MZSP 100746 • 1 spec.; off Boipeba; depth 35–55 m; Dec. 2002; M. Ximenez leg.; MORG 43762 • 7 specs; Ilhéus; MNRJ 32371* • 3 specs; Ilhéus; MNRJ 32974* • 1 spec.; off Canavieiras; Apr. 2011; MNRJ 30711* • 1 spec.; off Canavieiras; Apr. 2011; MNRJ 30721* • 1 spec.; off Canavieiras; Apr. 2011; MNRJ 30755* • 3 specs; off Canavieiras; Apr. 2011; MNRJ 33121* • 1 spec.; Abrolhos; Feb. 1978; MORG 52609 • 1 spec.; Abrolhos; Feb. 1978; MORG 20266 • 9 specs; Abrolhos; Jan. 1985; MORG 23827 • 1 spec.; Abrolhos; Jan. 1985; MORG 52606. – **Espírito Santo** • 9 specs; REVIZEE-Central C1-VV31; IBUFRJ 19483 • 1 spec.; REVIZEE-Central C1-VV33; MORG 39115 • 3 specs; REVIZEE-Central C1-C65; IBUFRJ 19460 • 1 spec.; REVIZEE-Central C1-C65; IBUFRJ 19498 • 1 spec.; REVIZEE-Central C1-C65; MORG 40895 • 7 specs; REVIZEE-Central C1-C65; MORG 52599 • 2 specs; REVIZEE-Central C1-C64; IBUFRJ 19494 • 1 spec.; REVIZEE-Central C1-VV38; IBUFRJ 19524 • 5 specs; REVIZEE-Central C1-VV38; IBUFRJ 19606 • 3 specs; 19º22′46″ S, 39º39′26″ W; depth 12 m; Oct. 2003; MNRJ 31166* • 1 spec.; 19º24′23″ S, 39º34′42″ W; depth 24 m; Oct. 2003; MNRJ 31162* • 6 specs; 19º24′52″ S, 39º22′00″ W; depth 42 m; Oct. 2003; MNRJ 30753* • 4 specs; 19º25′ S, 39º22′ W; depth 55 m; Oct. 2003; MNRJ 30763* • 3 specs; 19º25′05″ S, 39º15′54″ W; depth 65 m; Oct. 2003; MNRJ 30701* • 6 specs; 19º25′08″ S, 39º15′59″ W; depth 65 m; Oct. 2003; MNRJ 30768* • 3 specs; 19º25′34″ S, 39º22′16″ W; depth 42 m; Oct. 2003; MNRJ 30717* • 4 specs; 19º25′34″ S, 39º22′16″ W; depth 42 m; Oct. 2003; MNRJ 31163* • 9 specs; 19º25′37″ S, 39º22′22″ W; depth 43 m; Oct. 2003; MNRJ 30748* • 4 specs; 19º25′37″ S, 39º22′22″ W; depth 43 m; Oct. 2003; MNRJ 30764* • 1 spec.; 19º25′37″ S, 39º22′22″ W; depth 43 m; Oct. 2003; MNRJ 30891* • 2 specs; 19º25′45″ S, 39º24′58″ W; depth 35 m; Oct. 2003; MNRJ 30745* • 7 specs; 19º25′45″ S, 39º24′58″ W; depth 35 m; Oct. 2003; MNRJ 30759* • 1 spec.; 19º25′45″ S, 39º24′58″ W; depth 35 m; Oct. 2003; MNRJ 32126* • 10 specs; 19º25′54″ S, 39º24′58″ W; depth 50 m; Oct. 2003; MNRJ 30747* • 1 spec.; 19º26′ S, 39º22′ W; depth 46–55 m; Oct. 2003; MNRJ 30705* • 2 specs; 19º26′ S, 39º22′ W; depth 46–55 m; Oct. 2003; MNRJ 30724* • 7 specs; 19º26′ S, 39º22′ W; depth 46–55 m; Oct. 2003; MNRJ 30930* • 1 spec.; 19º26′ S, 39º22′ W; depth 46–55 m; Oct. 2003; MNRJ 32150* • 2 specs; 19º26′ S, 39º22′ W; depth 46–55 m; Oct. 2003; MNRJ 32163* • 3 specs; 19º26′ S, 39º22′ W; depth 46–55 m; Oct. 2003MNRJ 32165* • 3 specs; 19º26′03″ S, 39º22′35″ W; depth 44 m; Oct. 2003; MNRJ 32431* • 1 spec.; 19º26′03″ S, 39º22′35″ W; depth 44 m; Oct. 2003; MNRJ 32467* • 4 specs; 19º26′19″ S, 39º15′17″ W; depth 53 m; Oct. 2003; MNRJ 19035* • 1 spec.; 19º26′19″ S, 39º15′17″ W; depth 53 m; Oct. 2003; MNRJ 30712* • 2 specs; 19º26′22″ S, 39º15′22″ W; 51 m; Oct. 2003; MNRJ 31167* • 1 spec.; 19º26′36″ S, 39º22′02″ W; depth 50 m; Oct. 2003; MNRJ 30765* • 4 specs; REVIZEE-Central C6-R2#1-1; IBUFRJ 16257 • 6 specs; REVIZEE-Central C1-VV24; IBUFRJ 19471 • 6 specs; REVIZEE-Central C1-VV24; MORG 40544 • 5 specs; 19º40′26″ S, 39º36′19″ W; depth 40 m; 2 Dec. 2011; OC. Ship Seward Johnson; MNRJ 34829* • 1 spec.; 20º10′02″ S, 40º08′31″ W; depth 25 m; 2 Dec. 2011; OC. Ship Seward Johnson; MNRJ 34981* • 12 specs; 20º14′ S, 40º12′ W; Jun. 2008; MNRJ 32647* • 7 specs; 20º18′ S, 40º14′ W; Mar. 1993; V. Abud leg.; MORG 40025 • 4 specs; Guarapari; 1970; MORG 16296 • 2 specs; Guarapari; Jan. 2013; MNRJ 34027* • 1 spec.; Guarapari, off Meaípe; depth 20–25 m; Sep. 1997; A. Bodart leg.; MZSP 64403 • 2 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Sep. 2007; MNRJ 30836* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; Sep. 2007; MNRJ 30897* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; Sep. 2007; MNRJ 30907* • 26 specs; Porto de Ubú; 20º47′ S, 40º32′ W, Nov. 2007; MNRJ 32410* • 5 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Oct. 2008; MNRJ 31011* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; Oct. 2008; MNRJ 31013* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; Oct. 2008; MNRJ 31014* • 2 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Oct. 2008; MNRJ 31021* • 3 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Oct. 2008; MNRJ 31022* • 2 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Oct. 2008; MNRJ 31026* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; Nov. 2009; MNRJ 31006* • 4 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Nov. 2009; MNRJ 31008* • 2 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31035* • 3 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31037* • 3 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31049* • 2 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31055* • 2 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31059* • 4 specs;

Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31066* • 3 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31067* • 3 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31072* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31074* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31084* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31090* • 2 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31095* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31098* • 5 specs; Piúma; 1993; IBUFRJ 5595 • 29 specs; Piúma; 1993; IBUFRJ 8624 • 1 spec.; Piúma; 1998; L.R.L. Simone leg.; MZSP 84798. – **Campos Basin** (Espírito Santo/Rio de Janeiro) • 2 specs; 21º09′ S, 40º31′ W; 27 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 7557 • 4 specs; 20º47′ S, 40º26′ W; 29 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 7560 • 9 specs; 20º53′ S, 40º12′ W; 26 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 7561 • 3 specs; 20º42′ S, 40º06′ W; 27 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 7565 • 5 specs; 20º38′ S, 40º08′ W; 26 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 7566 • 1 spec.; 21º32′ S, 40º25′ W; 28 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 7634 • 1 spec.; 21º40′ S, 40º02′ W; 28 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 7684 • 4 specs; REVIZEE-Central C1-VV17; IBUFRJ 9643 • 1 spec.; REVIZEE-Central C1-VV22; IBUFRJ 11368 • 1 spec.; REVIZEE-Central C2-35R; IBUFRJ 12895 • 3], IBUFRJ 12896; 9], IBUFRJ 19489: REVIZEE-Central C1-VV16 • 3 specs; 21º15′ S, 40º20′ W; 28 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 19512 • 17 specs; REVIZEE-Central C1-D1-2; IBUFRJ 19528 • 4 specs; REVIZEE-Central C1-VV21; IBUFRJ 19541 • 3 specs; REVIZEE-Central C1-D3; IBUFRJ 19554 • 15 specs; REVIZEE-Central C1-D3; IBUFRJ 19588 • 1 spec.; REVIZEE-Central C1-VV22; IBUFRJ 19570 • 1 spec.; HAB 13-I4; MNRJ 17944* • 1 spec.; HAB 13-H4; MNRJ 17948* • 2 specs; HAB 11-G3; MNRJ 17949* • 1 spec.; HAB 11-G4; MNRJ 17950* • 4 specs; HAB 13-I2; MNRJ 17955* • 15 specs; HAB 13-H2; MNRJ 17967* • 2 specs; HAB 13-H3; MNRJ 17969* • 1 spec.; HAB 11-D3; MNRJ 17972* • 2 specs; HAB 11-C3; MNRJ 17974* • 4 specs; HAB 11-B5; MNRJ 17976* • 1 spec.; HAB 11-B4; MNRJ 17977* • 9 specs; HAB 13-H1; MNRJ 17982* • 2 specs; HAB 16-C4; MNRJ 18376* • 6 specs; HAB 16-C3; MNRJ 18380* • 1 spec.; HAB 16-G4; MNRJ 18396* • 15 specs; HAB 17-I2; MNRJ 18411* • 2 specs; HAB 16-H4; MNRJ 18413* • 3 specs; HAB 16-H3; MNRJ 18416* • 4 specs; HAB 16-G3; MNRJ 18418* • 8 specs; HAB 16-H2; MNRJ 18433* • 1 spec.; 22º42′ S, 40º40′ W; depth 5–10 m; 14 Apr. 2005; MNRJ 32405* • 4 specs; 22º42′ S, 40º40′ W; depth 12 m; Oct. 2005; MNRJ 32618* • 22 specs; 22º42′ S, 40º40′ W; depth 110 m; 2006; MNRJ 18751* • 3 specs; 22º42′ S, 40º40′ W; depth 5–10 m; Mar. 2007; MNRJ 15402* • 4 specs; 22º42′ S, 40º40′ W; depth 5–10 m; MNRJ 18953* • 3 specs; 23º04′ S, 40º59′ W; 17 Dec. 2004; MNRJ 18969* • 65 specs; 22º42′ S, 40º40′ W; 2007; MNRJ 29763* • 2 specs; 23º04′ S, 40º59′ W; 1 Apr. 2005; MNRJ 31111* • 1 spec.; 23º03′18″ S, 41º02′06″ W; Oct. 2008; MNRJ 32063* • 2 specs; 23º15′00″ S, 41º06′00″ W; Oct. 2008; MNRJ 32064* • 1 spec.; 23º04′ S, 40º59′ W; Jul. 2005; MNRJ 32353* • 3 specs; REVIZEE-Central C1-VV22; MORG 40425 • 1 spec.; REVIZEE-Central C1-VV22; MORG 52260 • 1 spec.; REVIZEE-Central C1-VV21; MORG 52201. – **Almirante Saldanha Seamount** • 3 specs; REVIZEE-Central C1-D1; MNRJ 33760. – **Rio de Janeiro** • 11 specs; 21º49′04″ S, 41º00′04″ W, São João da Barra, Porto do Açu; Jul. 2012; MZSP 111122 • 4 specs; 21º49′04″ S, 41º00′04″ W, São João da Barra, Porto do Açu; Jul. 2012; MZSP 111181 • 7 specs; Búzios, Praia da Ferradura; MNRJ 18602* • 1 spec.; Cabo Frio; 17 Feb. 1970; J. Colella leg.; MZSP 57208 • 1 spec.; Arraial do Cabo; depth 25–30 m; Aug. 2003; P. Gonçalves leg.; MZSP 39606 • 1 spec.; Ilha do Calombo, Angra dos Reis; RAP-BIG st. 26; UERJ 5394 • 1 spec.; Ilha de Búzios, Angra dos Reis; RAP-BIG st. 23; UERJ 5452 • 1 spec.; Ilha de Búzios, Angra dos Reis; RAP-BIG st. 23; UERJ 7567 • 1 spec.; RAP-BIG st. 22; UERJ 7557 • 1 spec.; Ilha Grande, Enseada de Lopes Mendes; RAP-BIG st. 34; UERJ 5297 • 1 spec.; Ilha Grande, Enseada de Lopes Mendes; RAP-BIG st. 34; UERJ 7547. – **São Paulo** • 1 spec.; Ubatuba; MZSP 78290 • 1 spec.; São Sebastião, Praia do Guaecá; 23º49′14″ S, 45º27′45″ W; 9 Aug. 2011; MZSP 118845 • 1 spec.; PADCT st. 6571; MZSP 133490 • 2 specs; PADCT st. 6577; MZSP 133494 • 5 specs; REVIZEE-Sul st. 6657; MNRJ 60193. – **Santa Catarina** • 2 specs; Bombinhas, Praia da Sepultura; 27º08′24″ S, 48º28′44″ W; depth 0–5 m; 17 Dec. 2019; M.R. Fernandes and A.D. Pimenta leg.; MNRJ 23366.

COLOMBIA • 1 spec.; Cartagena, Isla Baru, Playa Blanca; 10º10′38″ N, 75º39′06″ W; 21 Mar. 2011; MNRJ 18629*.

UNITED STATES OF AMERICA – **North Carolina** • 6 specs; 34º11′00″ N, 76º10′30″ W; depth 95 m; 19 Oct. 1885; R/V Albatross leg.; USNM 1438850 • 3 specs; 33º32′18″ N, 77º25′00″ W; depth 30 m; 21 Oct. 1981; with soft part preservation; USNM 850622 • 2 specs; 33º32′18″ N, 77º25′00″ W; depth 30 m; 21 Oct. 1981; with soft part preservation; USNM 850624. – **South Carolina** • 1 spec.; 32º48′36″ N, 78º39′36″ W; depth 34 m; 6 May 1981; Oregon R/V leg.; with soft part preservation; USNM 850958. – **Georgia** • 2 specs; 31º41′06″ N, 80º20′48″ W; depth 27 m; 14 May 1981; Bagby R/V leg.; with soft part preservation; USNM 850621. – **Florida** • 3 specs; off Boynton Beach; depth 27–55 m; Sep. 1967; BMSM 67476 • 1 spec.; Brower County, Deerfield Beach; depth 3–4 m; Jul. 1998; P. Souza leg.; MZSP 41482.

Remarks

The names *Cerithium pulchellum* C.B. Adams, 1850 or *Triphora pulchella* were used by many authors (e.g., Abbott 1974; Rios 2009). It is a junior homonym of *Cerithium pulchellum* Sowerby, 1832, a senior synonym of the cerithiopsid *Horologica pupa* (Dall & Simpson, 1901) (De Jong & Coomans 1988; Rolán & Espinosa 1992) and its type material is lost (Clench & Turner 1950). Thus, *C. pulchellum* C.B. Adams, 1850 is not a synonym of *S. intermedia*, as suggested by Rolán & Fernández-Garcés (2007, 2008), but *T. pulchella* auct. non C.B. Adams, 1850 is indeed a synonym.

Another problematic name is *Triphoris pulchellus* A. Adams, 1854, which Albano *et al*. (2019: 171) wrongly indicated was regarded as a synonym of *Similiphora intermedia* by Rolán & Fernández-Garcés (2008); actually, Rolán & Fernández-Garcés (2008) referred to the species of C.B. Adams (1850), not A. Adams (1854). Because the single type of *Triphoris pulchellus* A. Adams, 1854 has a broken apex (without protoconch, preventing a precise identification) and the type locality is unknown, it must be regarded as a *nomen dubium* (but not regarded as homonym of the cerithiopsid *Cerithium pulchellum* C.B. Adams, 1850). If this is indeed a Caribbean shell, the most similar species is *Triphora atlantica* Smith, 1890, although apparently without the spiral microsculpture observed in *T. pulchellus* A. Adams, 1854 (Albano *et al*. 2019: fig. 7h).

Strobiligera inaudita (Rolán & Lee, 2008)

Triphora inaudita Rolán & Lee in Rolán & Fernández-Garcés 2008: 150, fig. 26a–d.

Triphora inaudita – Garcia & Lee 2011.
Strobiligera inaudita – Fernandes & Pimenta 2014: 167, fig. 2.

Material examined

BRAZIL – **Rio de Janeiro** • 1 spec.; 23º05′ S, 40º58′ W; depth 100 m; Jun. 2004; MNRJ 32547* • 1 spec.; 23º05′ S, 40º58′ W; 100 m; Jun. 2004; MNRJ 33078* • 1 spec.; 23º41′06″ S, 41º28′12″ W; depth 163 m; Oct. 2008; MNRJ 32042*. – **São Paulo** • 1 spec.; REVIZEE-Sul st. 6666; MNRJ 29378* • 3 specs; PADCT st. 6573; MNRJ 27844* • 1 spec.; REVIZEE-Sul st. 6676; MZSP 133501 • 6 specs; PADCT st. 6577; MZSP 133492.

Triphora atlantica Smith, 1890
Fig. 95

Triforis atlantica Smith, 1890: 292, pl. 21 fig. 26.

Triphora atlantica – Rolán & Fernández-Garcés 2008: 146, fig. 25a–i. — Lee 2009: 92. — Garcia & Lee 2011. — Fernandes *et al*. 2013: 15, figs 15, 26, 36.

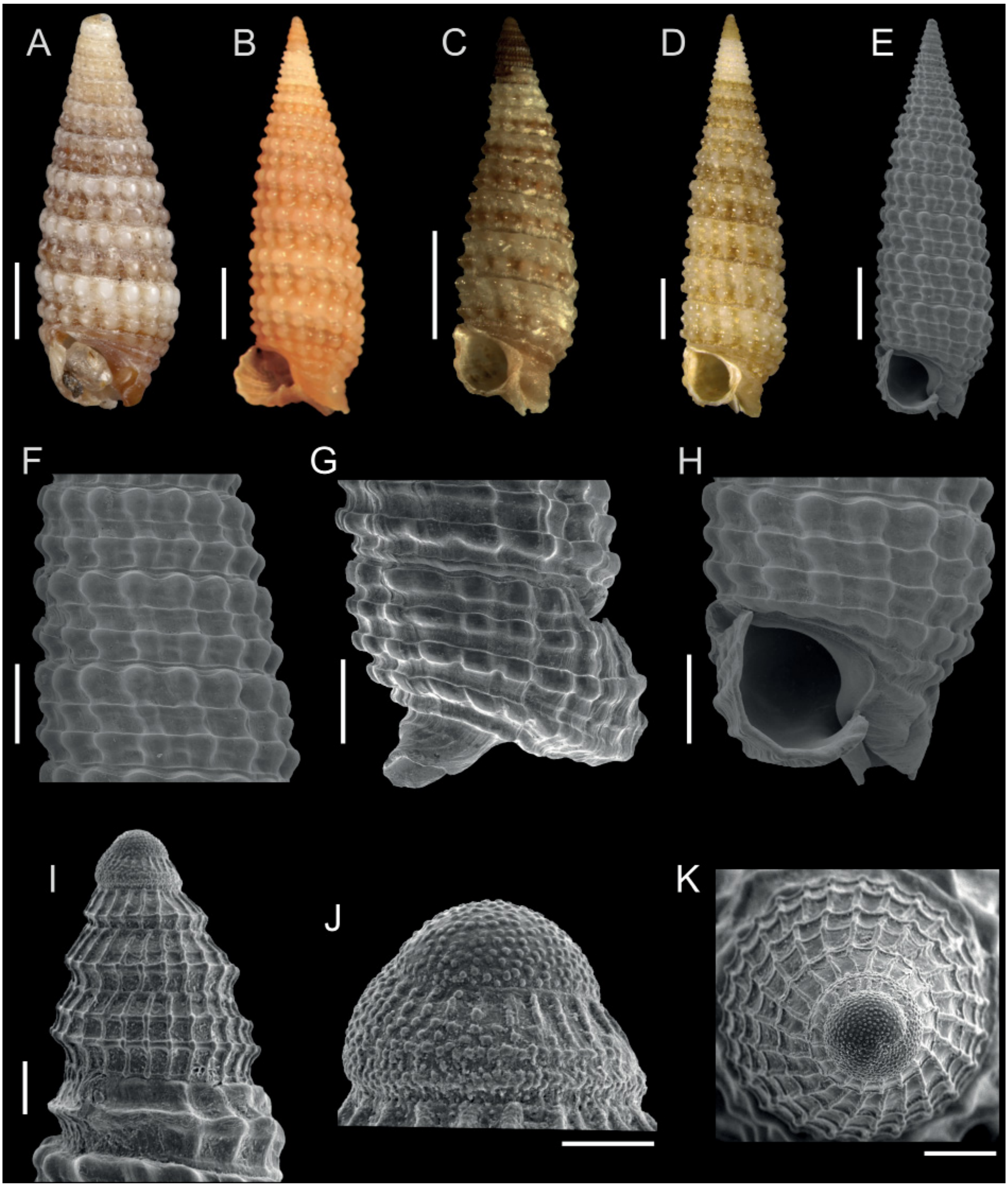

Fig. 95. *Triphora atlantica* Smith, 1890. **A**. Lectotype, NHM 1889.10.1.1374. **B**. MNRJ 18693*, 5.63 mm. **C**. MNRJ 18972*, 3.71 mm. **D**. MNRJ 31984*, 6.65 mm. **E–F, H**. Same shell as B. **G**. Same shell as D. **I–K**. Same shell as C. Scale bars: A–E = 1 mm; F–H = 500 µm; I, K = 100 µm; J = 50 µm. Photo credits A: Andreia Salvador (NHM).

Material examined

BRAZIL – **Amapá** • 1 spec.; 03º58′43″ N, 49º33′24″ W; 2001; MNRJ 32573*. – **Maranhão** • 1 spec.; Parcel Manuel Luís; Jul. 1992; UFMA*. – **Ceará** • 1 spec.; 02º36′05″ S, 39º25′02″ W; depth 39 m; 7 Nov. 1990; OC. Ship Victor Hensen leg.; UFC 573 • 1 spec.; 03º35′ S, 38º19′ W; depth 27 m; 17 Apr. 1968; OC. Ship Almirante Saldanha leg.; MORG 52619. – **Rio Grande do Norte** • 4 specs; BPot 1-MR32; MNRJ 31480* • 2 specs; BPot 1-MR41; MNRJ 31481* • 1 spec.; BPot 1-MR42; MNRJ 31482* • 4 specs; BPot 1-MR45; MNRJ 31483* • 4 specs; BPot 2-MR32; MNRJ 31484* • 1 spec.; BPot 2-MR33; MNRJ 31485* • 1 spec.; BPot 2-MR34; MNRJ 31486* • 1 spec.; BPot 2-MR42; MNRJ 31487* • 1 spec.; BPot 2-MR44; MNRJ 31488* • 9 specs; BPot 2-MR45; MNRJ 31489*. – **Fernando de Noronha Archipelago** • 2 specs; Baía Sueste; depth 17 m; Jan. 1979; MORG 52621*. – **Bahia** • 1 spec.; Salvador, Itapuã; MZSP 133315 • 1 spec.; 13º29′44″ S, 38º48′19″ W; depth 33 m; 25 Nov. 2010; MNRJ 33083* • 1 spec.; Ilhéus; MNRJ 32376* • 1 spec.; REVIZEE-Central C5-7R; MNRJ 18630* • 1 spec.; REVIZEE-Central C5-7R; IBUFRJ 19500 • 2 specs; REVIZEE-Central C5-13R; IBUFRJ 13320 • 3 specs; JOPS st. 3237; MNRJ 33812* • 3 specs; JOPS st. 3239; MNRJ 33804*. – **Espírito Santo** • 1 spec.; REVIZEE-Central C1-VV33; MORG 52596 • 3 specs; REVIZEE-Central C1-C65; IBUFRJ 9487 • 1 spec.; REVIZEE-Central C1-C65; IBUFRJ 19496 • 1 spec.; REVIZEE-Central C1-C65; IBUFRJ 19525 • 2 specs; REVIZEE-Central C1-C65; MORG 52598 • 3 specs; REVIZEE-Central C1-C64; IBUFRJ 19491 • 14 specs; REVIZEE-Central C1-VV38; IBUFRJ 19607 • 1 spec.; REVIZEE-Central C1-VV38; MORG 40338 • 1 spec.; 19º22′46″ S, 39º39′26″ W; 12 m; Oct. 2003; MNRJ 31165* • 1 spec.; 19º22′46″ S, 39º39′26″ W; depth 12 m; Oct. 2003; MNRJ 31984* • 1 spec.; 19º25′08″ S, 39º15′59″ W; depth 65 m; Oct. 2003; MNRJ 30770* • 1 spec.; 19º26′03″ S, 39º22′35″ W; depth 44 m; Oct. 2003; MNRJ 30746* • 1 spec.; 19º40′26″ S, 39º36′19″ W; depth 40 m; 2 Dec. 2011; MNRJ 34824* • 2 specs; 19º40′26″ S, 39º36′19″ W; depth 40 m; 2 Dec. 2011; MNRJ 34980* • 1 spec.; REVIZEE-Central C1-VV24; IBUFRJ 19470 • 1 spec.; REVIZEE-Central C1-VV24; MORG 52255 • 4 specs; 20º14′ S, 40º12′ W; Jun. 2008; MNRJ 32648* • 4 specs; 20º18′ S, 40º14′ W; Mar. 1993; V. Abud leg.; MORG 40024 • 1 spec.; Guarapari; 25–30 m; Mar. 1994; A. Bodart leg.; CHL • 1 spec.; Guarapari; depth 15–20 m; May 1994; A. Bodart leg.; CHL • 1 spec.; off Guarapari; 1998; MZSP 29033 • 2 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Sep. 2007; MNRJ 30835* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; Sep. 2007; MNRJ 30901* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; Oct. 2008; MNRJ 31023* • 3 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31036* • 2 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31038* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31042* • 3 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31050* • 2 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31068* • 2 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31075* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31078* • 3 specs; Porto de Ubú; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31086* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; Nov. 2011; MNRJ 31127* • 32 specs; Piúma; 1993; IBUFRJ 8593. – **Vitória-Trindade Chain** • 1 spec.; Trindade Island; 20º29′40″ S, 29º20′33″ W; 15 Jun. 2012; MZSP 109814. – **Campos Basin** (Espírito Santo/Rio de Janeiro) 2 specs; • 20º47′ S, 40º26′ W; 29 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 19522 • 2 specs; 20º53′ S, 40º12′ W; 26 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 19516 • 1 spec.; 21º22′ S, 40º50′ W; 27 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 7671 • 1 spec.; REVIZEE-Central C2-36R; IBUFRJ 10689 • 4 specs; REVIZEE-Central C1-VV22; IBUFRJ 11387 • 1 spec.; REVIZEE-Central C1-VV22; IBUFRJ 19508 • 2 specs; REVIZEE-Central C1-VV16; IBUFRJ 19488 • 7 specs; REVIZEE-Central C1-VV21; IBUFRJ 19538 • 2 specs; REVIZEE-Central C1-VV21; MORG 41237 • 2 specs; 20º42′ S, 40º06′ W; 27 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 19552 • 11 specs; REVIZEE-Central C1-D3; IBUFRJ 19586 • 2 specs; HAB 13-I2; MNRJ 17958* • 1 spec.; HAB 13-H4; MNRJ 17960* • 2 specs; HAB 13-H2; MNRJ 17968* • 1 spec.; HAB 11-C4; MNRJ 17986* • 1 spec.; HAB 17-I3; MNRJ 18392* • 8 specs; HAB 17-I2; MNRJ 18408* • 5 specs; HAB 16-H2; MNRJ 18432* • 1 spec.; HAB 16-G3; MNRJ 18634* • 1 spec.; HAB 17-I1; MNRJ 18635* • 2 specs; HAB 13-H1; MNRJ 18693* • 3 specs; 23º04′ S, 40º59′ W; 17 Dec. 2004; MNRJ 18972* • 1 spec.; 20º51′ S, 40º28′ W; 29 Oct. 2008; MZSP 89604. – **Rio de**

Janeiro • 1 spec.; Búzios, Praia da Ferradura; MNRJ 18601* • 1 spec.; Arraial do Cabo; 25–30 m; Mar. 2003; P. Gonçalves leg.; MZSP 73132 • 1 spec.; Arraial do Cabo; depth 25–30 m; Mar. 2003; P. Gonçalves leg.; MZSP 133324 • 1 spec.; Arraial do Cabo; depth 25–30 m; Mar. 2003; P. Gonçalves leg.; CHL.

SAINT HELENA ISLAND • 6 specs, all shells with broken apex; USNM 124068.

Triphora ellyae De Jong & Coomans, 1988
Fig. 96

Triphora ellyae De Jong & Coomans, 1988: 50, pl. 34 fig. 242.
Triphora orteai Espinosa, 2001: 21, fig. 7.

Triphora ellyae – Rolán & Fernández-Garcés 1995: 13, figs 23–25; 2007: pl. 5 figs 17–21. — Espinosa *et al*. 2007: 74; 2012: 258. — Lee 2009: 92. — Fernandes *et al*. 2013: 15, figs 16, 27, 37.
Triphora cf. *ellyae* – Reyes *et al*. 2007: 383.

Material examined

BRAZIL – **Rio Grande do Norte** • 1 spec.; BPot 1-MR32; MNRJ 31495 • 1 spec.; BPot 1-MR41; MNRJ 31496*. – **Bahia** • 1 spec.; Salvador, Itapuã; MORG 33723 • 2 specs; 13º28′17″ S, 38º48′43″ W; 35 m; 24 Nov. 2007; MNRJ 32609* • 3 specs; Ilhéus; MNRJ 32372*. – **Espírito Santo** • 1 spec.; REVIZEE-Central C1-C65; IBUFRJ 19526 • 5 specs; REVIZEE-Central C1-VV38; IBUFRJ 19612 • 1 spec.; REVIZEE-Central C1-VV38; MORG 52251 • 1 spec.; 19º26′16″ S, 39º15′22″ W; depth 52 m; Oct. 2003; MNRJ 32999* • 1 spec.; 20º14′ S, 40º12′ W; Jun. 2008; MNRJ 32654* • 1 spec.; Porto de Ubú; 20º47′ S, 40º32′ W; Sep. 2007; MNRJ 30834* • 7 specs; Piúma; 1993; IBUFRJ 19699. – **Campos Basin** (Espírito Santo/Rio de Janeiro) • 2 specs; REVIZEE-Central C1-D3; IBUFRJ 19590 • 9 specs; 22º42′ S, 40º40′ W; depth 5–10 m; Mar. 2007; MNRJ 15400* • 1 spec.; HAB 11-D3; MNRJ 17953* • 1 spec.; HAB 11-G3; MNRJ 17959* • 1 spec.; HAB 16-B4; MNRJ 18374* • 1 spec.; HAB 16-G3; MNRJ 18626* • 1 spec.; HAB 16-G3; MNRJ 18636* • 2 specs; HAB 16-H3; MNRJ 18632* • 5 specs; 22º42′ S, 40º40′ W; depth 110 m; 2006; MNRJ 18753* • 2 specs; 22º42′ S, 40º40′ W; depth 5–10 m; MNRJ 18955* • 1 spec.; 22º42′ S, 40º40′ W; depth 12 m; 22 Mar. 2004; MNRJ 30856* • 1 spec.; 22º48′ S, 40º45′ W; depth 110 m; 27 Jan. 1998; OC. Ship Astro Garoupa leg.; IBUFRJ 11699 • 1 spec.; 23º04′ S, 40º59′ W; 1 Apr. 2005; MNRJ 31112* • 5 specs; 22º42′ S, 40º40′ W; depth 12 m; Oct. 2005; MNRJ 32619* • 1 spec.; 23º04′ S, 40º59′ W; depth 100 m; 17 Dec. 2004; MORG 52219. – **Rio de Janeiro** • 1 spec.; Ilha da Gipóia, Angra dos Reis; RAP-BIG st. 22; UERJ 8686 • 2 specs; Ilha Grande, Ponta da Enseada; RAP-BIG st. 31; UERJ 5181 • 7 specs; Ilha Grande; RAP-BIG st. 40; UERJ 4343 • 2 specs; Ilha Grande, Praia dos Morcegos; RAP-BIG st. 32; UERJ 5583 • 1 spec.; Ilha Grande, Ponta Acaiá; RAP-BIG st. 38; UERJ 3840 • 1 spec.; Ilha Grande, Dois Rios; 20 Nov. 1996; UERJ 7470 • 2 specs; Ilha Grande, Ponta do Aventureiro; RAP-BIG st. 37; UERJ 4795 • 1 spec.; Ilha de Búzios, Angra dos Reis; RAP-BIG st. 23; UERJ 7889 • 1 spec.; Ilha do Araújo, Paraty; RAP-BIG st. 13; UERJ 4632 • 1 spec.; Ilha do Araújo, Paraty; RAP-BIG st. 13; UERJ 7584 • 3 specs; Paraty, Praia Vermelha; RAP-BIG st. 10; UERJ 3792 • 2 specs; Paraty, Ponta de Juatinga; RAP-BIG st. 1; UERJ 3761 • 1 spec.; Paraty, Ponta de Juatinga; RAP-BIG st. 1; UERJ 8685. – **São Paulo** • 1 spec.; Ubatuba, Praia da Enseada; 21 May 1950; L. Morretes leg.; MZSP 52022 • 1 spec.; São Sebastião, Barra do Una; Nov. 2003; MNRJ 34546*. – **Paraná** • 1 spec.; Ilha dos Ratos; O. de Fiore leg.; this is an old lot and its origin is uncertain whether indeed "Ilha dos Ratos" (25º29′ S, 48º42′ W, municipality of Antonina, a current low-salinity site) or "Ilha do Rato" (25º51′ S, 48º34′ W, municipality of Guaratuba, a near-marine site), both in Paraná state;

MZSP 52021. – **Santa Catarina** • 2 specs; Bombinhas, Praia da Conceição; 27º12′04″ S, 48º29′11″ W ; depth 0–5 m; 19 Dec. 2019; M.R. Fernandes leg.; MNRJ 23259 • 1 spec.; Bombinhas, Praia da Tainha; 27º13′02″ S, 48º30′29″ W ; depth 0–5 m; 20 Dec. 2019; M.R. Fernandes leg.; MNRJ 23346.

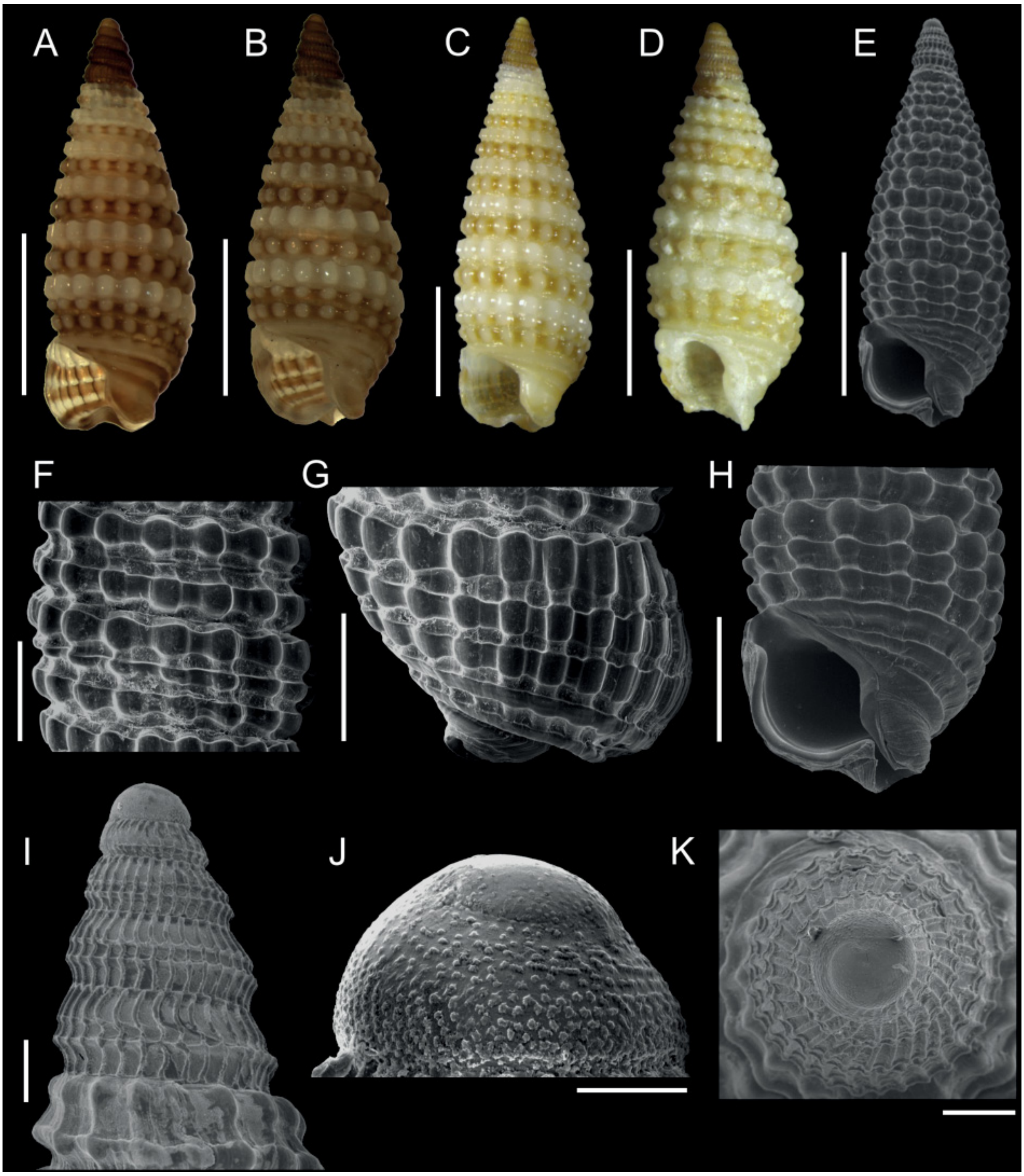

Fig. 96. *Triphora ellyae* De Jong & Coomans, 1988. **A–B**. MNRJ 15400*, 2.56 mm and 2.64 mm, respectively. **C**. MNRJ 32619*, 3.80 mm. **D**. UERJ 3840, 2.80 mm. **E**. MNRJ 18955*, 2.86 mm. **F–H, J–K**. Same shell as E. **I**. MNRJ 18626*. Scale bars: A–E = 1 mm; F–H = 500 µm; I, K = 100 µm; J = 50 µm.

Remarks

Shells of *T. ellyae* usually show the median spiral cord of the teleoconch emerging in the fifth/sixth whorl, rarely at the seventh whorl (Fernandes *et al*. 2013; Fernandes 2014). A few shells sampled from Baía da Ilha Grande (Rio de Janeiro State) and São Paulo State had the median cord emerging as early as the fourth whorl (Fig. 96D).

Triphora elvirae De Jong & Coomans, 1988
Fig. 97

Triphora elvirae De Jong & Coomans, 1988: 50, pl. 34 fig. 240.

Triphora elvirae – Rolán & Fernández-Garcés 1995: 13, figs 20–22; 2007: pl. 5 fig. 22–23. — Garcia & Lee 2011. — Fernandes *et al*. 2013: 16, figs 17, 28, 38. — Redfern 2013: 126, fig. 357.
Cosmotriphora elvirae – Redfern 2001: 65, pl. 32 fig. 273.

Material examined

BAHAMAS • 2 specs; Gorda Cay; 2005; B. Dietz leg.; MZSP 79472.

BRAZIL – **Maranhão** • 1 spec.; 01º30′33″ S, 43º20′28″ W; depth 59 m; 22 Nov. 2008; OC. Ship Amorim do Valle leg.; MZSP 94408. – **Rio Grande do Norte** • 1 spec.; BPot 1-MR32; MNRJ 31490* • 1 spec.; BPot 1-MR41; MNRJ 31491* • 4 specs; BPot 1-MR42; MNRJ 31492* • 1 spec.; BPot 1-MR45; MNRJ 31493* • 1 spec.; BPot 2-MR44; MNRJ 31494*. – **Atol das Rocas** • 1 spec.; Feb. 1977; in broken coral; MORG 52623*. – **Bahia** • 1 spec.; Salvador, Itapuã; MORG 13823 • 2 specs; Salvador, Itapuã; MORG 33757 • 1 spec.; Salvador; MZSP 133336 • 2 specs; Ilhéus; MNRJ 32379* • 1 spec.; REVIZEE-Central C5-13R; IBUFRJ 19575 • 2 specs; JOPS st. 3237; MNRJ 33813*. – **Espírito Santo** • 2 specs; REVIZEE-Central C1-C64; IBUFRJ 19492 • 3 specs; REVIZEE-Central C1-VV38; IBUFRJ 12886 • 2 specs; REVIZEE-Central C1-VV38; IBUFRJ 19617 • 1 spec.; 19º25′05″ S, 39º15′54″ W; depth 65 m; Oct. 2003; MNRJ 32595* • 1 spec.; 19º26′00″ S, 39º22′30″ W; depth 55 m; Oct. 2003; MNRJ 32176* • 1 spec.; 19º26′03″ S, 39º22′35″ W; depth 44 m; Oct. 2003; MNRJ 30951* • 1 spec.; REVIZEE-Central C1-VV24; IBUFRJ 19451 • 2 specs; 20º14′ S, 40º12′ W; Jun. 2008; MNRJ 32649* • 3 specs; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31069* • 1 spec.; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31073* • 1 spec.; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31088* • 1 spec.; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31054* • 1 spec.; 20º47′ S, 40º32′ W; Mar. 2010; MNRJ 31061* • 6 specs; Piúma; 1993; IBUFRJ 8640. – **Campos Basin** (Espírito Santo/Rio de Janeiro) • 1 spec.; 21º40′ S, 40º02′ W; 28 Aug. 1979; OC. Ship Almirante Câmara leg.; IBUFRJ 7681 • 1 spec.; HAB 13-I2; MNRJ 17957* • 2 specs; HAB 17-I2; MNRJ 18616* • 1 spec.; HAB 17-I2; MNRJ 18617* • 2 specs; HAB 17-I2; MNRJ 18619* • 2 specs; 23º05′ S, 40º58′ W; depth 100 m; 17 Sep. 2004; MNRJ 31138* • 1 spec.; 23º04′ S, 40º59′ W; depth 100 m; 17 Dec. 2004; MORG 52218. – **Rio de Janeiro** • 1 spec.; Ilha de Macacos, Angra dos Reis; RAP-BIG st. 30; UERJ 5542.

UNITED STATES OF AMERICA – **Florida** • 2 specs; off Boynton Beach; depth 27–36 m; Apr. 1970; BMSM 129122.

Triphora portoricensis Rolán & Redfern, 2008

"*Triphora*" *portoricensis* Rolán & Redfern in Rolán & Fernández-Garcés 2008: 158, fig. 32a-e.

"*Triphora*" *portoricensis* – Redfern 2013: 127, fig. 358a–b. — Fernandes & Pimenta 2015: 505, fig. 6.

Iniforis sp. – Redfern 2001: 66, pl. 33 fig. 278a–b.

Material examined

BRAZIL – **Sergipe** • 1 worn spec.; Petro/UFS st. 18.1; UFS.

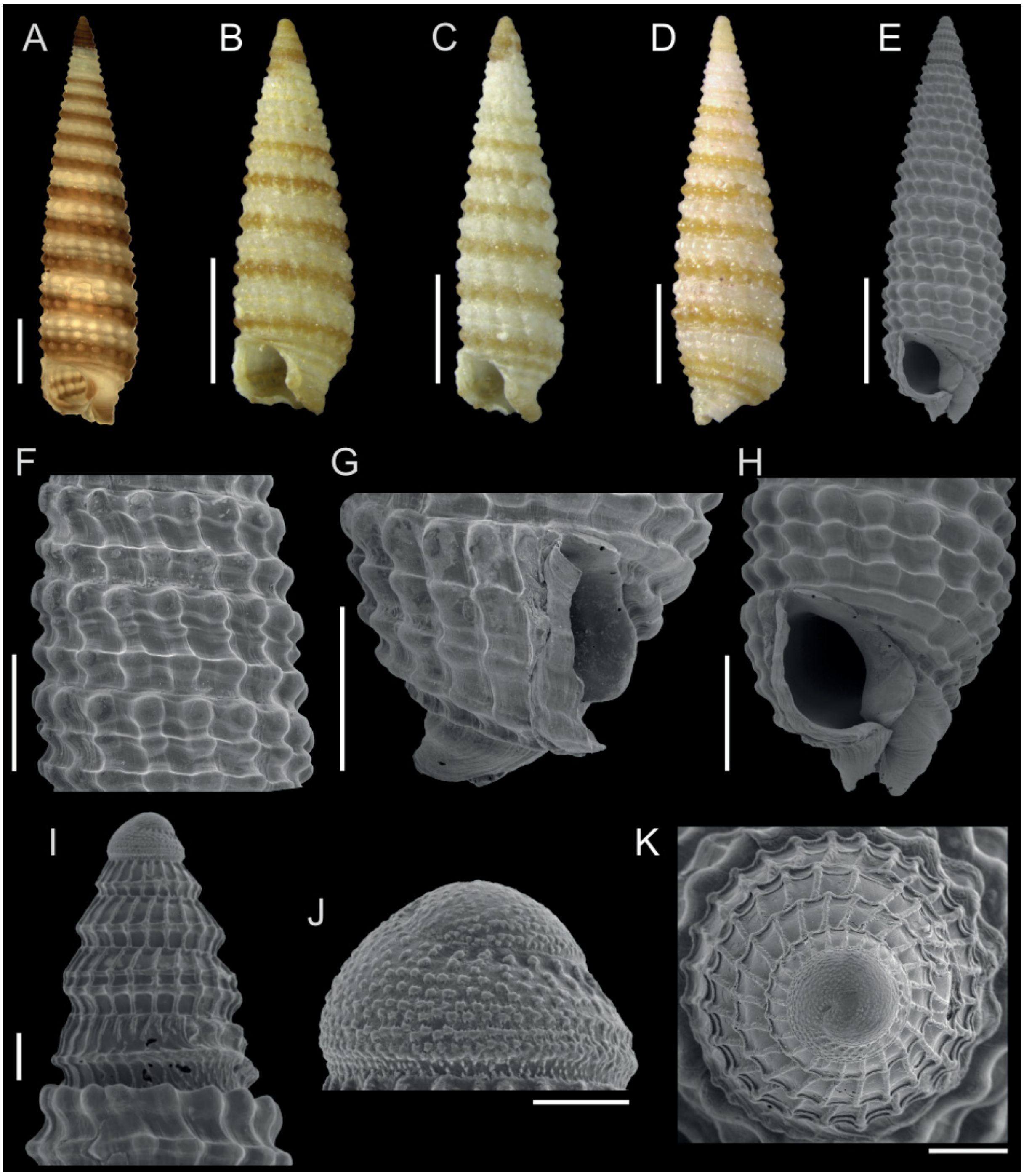

Fig. 97. *Triphora elvirae* De Jong & Coomans, 1988. **A**. MNRJ 18619*, 6.32 mm. **B**. MNRJ 31069*, 3.16 mm. **C**. MNRJ 31493*, 3.73 mm. **D**. MNRJ 33813*, 4.12 mm. **E**. MNRJ 18617*, 3.87 mm. **F–G**. MNRJ 18754*. **H–K**. Same shell as E. Scale bars: A–E = 1 mm; F–H = 500 µm; I, K = 100 µm; J = 50 µm.

Triphora scylla Fernandes & Pimenta, 2015

Triphora scylla Fernandes & Pimenta, 2015: 509, fig. 8.

Material examined

BRAZIL – **Rio Grande do Norte** • 1 spec.; 04º33′17″ S, 36º56′35″ W; depth 130–160 m; 21 May 2011; MNRJ 35179*. – **Sergipe** • 2 specs; Petro/UFS st. E5-A1; with soft part preservation; UFS • 1 spec. ; Petro/UFS st. E6-A4; with soft part preservation; UFS • 7 specs; Petro/UFS st. 15.3; UFS • 1 spec.; Petro/UFS st. 18.1; UFS. – **Espírito Santo** • 1 spec.; 19º40′26″ S, 39º36′19″ W; depth 40 m; 2 Dec. 2011; OC. Ship Seward Johnson leg.; MNRJ 34827*.