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Triphoridae (Gastropoda) from Martinique sampled by the MADIBENTHOS expedition, with notes on shallow-water species from Guadeloupe

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ABSTRACT
This study aims to evaluate the taxonomic composition of triphorids from Martinique obtained by the MADIBENTHOS expedition, which comprised more than 500 marine sampling events. In addition, some identifications of shallow-water triphorids from Guadeloupe (based on recent works) are corrected. After the analysis of 1615 specimens, 33 triphorid species were found in the shallow waters of Martinique, of which *Inella spinosa* n. sp., *Isotriphora pardus* n. sp. and *Metaxia discus* n. sp. are described as new species. New records are given for the Lesser Antilles, such as *Cheirodonta dupliniana* (Olsson, 1916), *Strobiligera inaudita* (Rolán & Lee, 2008) and *Triphora martii* Rolán & Fernández-Garcés, 1995. The taxonomy of some species is discussed (mainly on *Nanaphora* Laseron, 1958), and new generic allocations are proposed: *Marshallora abacoensis* (Rolán & Redfern, 2008) n. comb., *Marshallora armandoi* (Espinosa & Ortea, 2020) n. comb., *Marshallora grenadensis* (Rolán & Lee, 2008) n. comb., *Marshallora monteiroi* (Rolán & Fernández-Garcés, 2015) n. comb. The individual rarefaction curve of triphorids from MADIBENTHOS is nearly saturated but did not reach the asymptote. Seven species (all with planktotrophic development) were considered abundant or much abundant, whereas eight species (with planktotrophic or non-planktotrophic development) were represented by singletons or doubletons. Brushing and suction were efficient methods to obtain triphorids, and some dredging events recovered up to 13 species (mainly deeper than 50 m). More species were sampled in the Atlantic side of Martinique, but hyper-diverse stations were widespread along the island. The abundance of triphorids and species composition change in Martinique along the depth gradient; *Iniforis turristhomae* (Holten, 1802) is the most abundant triphorid between 0-30 m, but *Cosmotriphora melanura* (C.B. Adams, 1850) predominates between 31-85 m.

KEY WORDS
Biodiversity,
Lesser Antilles,
larval development,
depth zones,
new combinations,
new species.

RÉSUMÉ
Les Triphoridae (Gastropoda) de Martinique échantillonnés lors de l'expédition MADIBENTHOS, avec des remarques sur les espèces des eaux peu profondes de Guadeloupe.
Cette étude vise à évaluer la composition taxonomique des triphoridés de la Martinique collectés pendant l'expédition MADIBENTHOS, qui comprenait plus de 500 événements de collectes. De plus, certaines identifications des triphoridés peu profonds de Guadeloupe (basées sur des travaux récents) sont corrigées. Après l'analyse de 1 615 spécimens, 33 espèces de triphoridés ont été dénombrées dans les eaux peu profondes de la Martinique, dont *Inella spinosa* n. sp., *Isotriphora pardus* n. sp. et *Metaxia discus* n. sp. décrits comme nouvelles espèces. De nouveaux signalements sont proposés pour les Petites Antilles, comme *Cheirodonta dupliniana* (Olsson, 1916), *Strobiligera inaudita* (Rolán & H.G.Lee, 2008) et *Triphora martii* Rolán & Fernández-Garcés, 1995. La taxonomie de certaines espèces est discutée (principalement pour *Nanaphora* Laseron, 1958), et de nouvelles allocations génériques sont proposées : *Marshallora abacoensis* (Rolán & Redfern, 2008) n. comb., *Marshallora armandoi* (Espinosa & Ortea, 2020) n. comb., *Marshallora grenadensis* (Rolán & Lee, 2008) n. comb., *Marshallora monteiroi* (Rolán & Fernández-Garcés, 2015) n. comb. La courbe de raréfaction individuelle des triphoridés de MADIBENTHOS est presque saturée mais n'a pas atteint l'asymptote. Sept espèces (toutes à développement planctotrophe) sont considérées comme abondantes ou très abondantes, tandis que huit espèces (à développement planctotrophe ou non-planctotrophe) sont représentées par des "singletons" ou des "doubletons". Le brossage et l'aspiration se sont révélés efficaces pour récolter des triphoridés, et certains dragages ont permis de récolter jusqu'à 13 espèces (principalement à des profondeurs inférieures à 50 m). Plus d'espèces ont été échantillonnées sur la façade atlantique de la Martinique, mais des stations hyper-diversifiées étaient répandues le long de l'île. L'abondance des triphoridés et la composition des espèces changent en Martinique le long du gradient de profondeur ; *Iniforis turristhomae* (Holten, 1802) est le triphoridé le plus abondant entre 0 et 30 m, alors que *Cosmotriphora melanura* (C.B. Adams, 1850) prédomine entre 31 et 85 m.

MOTS CLÉS
Biodiversité,
Petites Antilles,
développement larvaire,
zones de profondeur,
combinaisons nouvelles,
espèces nouvelles.

INTRODUCTION

Triphoridae Gray, 1847 is regarded as one of the "Big Five" families of marine gastropods in terms of species richness (Bouchet *et al.* 2002; Albano *et al.* 2011), which may be a consequence of their parasitic/micro-predatory feeding on sponges, i.e., the specialization on particular sponge hosts possibly triggered speciation and high diversity (Marshall 1983; Fernandes & Pimenta 2020; Nützel 2021). In fact, many taxonomic problems are derived from this great diversity, even more when only empty (and often worn) shells are available (Bouchet & Strong 2010). The discovery of Caribbean triphorids began in the early 19th century (Holten 1802), but reached a higher ground after the study of species from Jamaica (C. B. Adams 1850). Since then, several authors increased the knowledge about Caribbean triphorids after general catalogues of molluscs from particular localities (e.g. Dall & Simpson 1901; Warmke & Abbott 1962; Nowell-Usticke 1969; Vokes & Vokes 1983; De Jong & Coomans 1988; Merlano & Hegedus 1994; Hewitt & van Leeuwen 2017) or studies focused on the description of new species (e.g. Moolenbeek & Faber 1989; Faber & Moolenbeek 1991; Rolán & Luque 1999). Recent taxonomic revisions (with good illustrations) of Triphoridae from Caribbean sites include material from Cuba (e.g. Rolán & Fernández-Garcés 2007, 2008) and Bahamas (Redfern 2013).

Based on Rosenberg (2009), the triphorids of Guadeloupe and Martinique were untouched until the description of *Triphora guadaloupensis* Rolán & Fernández-Garcés, 2008, endemic from Guadeloupe. Further, Rolán & Fernández-Garcés (2015) studied the shallow-water triphorids from Guadeloupe, sampled by the KARUBENTHOS expedition (hereafter, KARUBENTHOS 1). Most of their identifications were followed by Lamy & Pointier (2018), which also included new material from Guadeloupe and Martinique; to the latter site, only *Inella triserialis* (Dall, 1881), *Iniforis turristhomae* (Holten, 1802), *Marshallora nigrocincta* (C. B. Adams, 1839), *Monophorus olivaceus* (Dall, 1889) and *Nototriphora decorata* (C. B. Adams, 1850) were recorded. These works greatly improved the knowledge about triphorids from the French Antilles, but there were mistakes on some of these taxonomic identifications, requiring corrections.

The MADIBENTHOS expedition was organized by the MNHN (Muséum national d'Histoire naturelle, France) team and conducted in Martinique between September-October 2016, comprising 503 sampling events in the shore and sea, such as dredging, trap lines, brushing of hard substrata and suction sampling (Bouchet *et al.* 2019). Sampling stations were performed down to 100 m, covering all portions of the island (Bouchet *et al.* 2019). Several new species of gastropods were recently described from material obtained by the expedition (e.g. Espinosa & Ortea 2017; Ortea & Buske 2018; Garrigues & Lamy 2019; Cecalupo & Perugia 2020), and others are still to come.

The objective of this study is to evaluate the taxonomic composition of triphorids obtained by the MADIBENTHOS. In addition, some identifications of shallow-water triphorids from Guadeloupe (Rolán & Fernández-Garcés 2015; Lamy & Pointier 2018) are corrected. The deep-sea species from Guadeloupe, obtained by the KARUBENTHOS 2 expedition, will be treated in another study.

MATERIAL AND METHODS

Sampling and taxonomic procedures

Stations in which triphorids were obtained are listed under each species, following the five main geographic zones within Martinique proposed by Bouchet *et al.* (2019); their coordinates, depths and sampling methods are listed in Appendix 1. All shallow-water species from Guadeloupe examined by the author are also listed, obtained by KARUBENTHOS 1 (Rolán & Fernández-Garcés 2015) and KARUBENTHOS 2 expeditions. A few shells from Guadeloupe were illustrated; in such cases asterisks (*) are given in the plates. Live triphorids from Guadeloupe were stored in ethanol during MNHN expeditions, and these will be studied in an ongoing molecular phylogeny of Triphoroidea (unpublished data); those from Martinique were mainly stored in dry capsules, with a few exceptions stored in ethanol. During expeditions, live specimens were photographed under a Canon EOS 50D (macro lens 65 mm or 90 mm) camera by the MNHN team. Live triphorids from Guadeloupe are also marked with asterisks (*) in the plates.

At the laboratory, shells were photographed under a Nikon D5000 camera coupled to a stereomicroscope Leica MZ16. Shells were not coated prior to SEM (Scanning Electron Microscope) images in order to preserve their color; the SEM equipment used was a JEOL 6490-LV. In legend captions, shell size refers to length. Descriptions are solely based on the material examined, following procedures and terminology on Fernandes & Pimenta (2015, 2019a). Empty shells and live specimens are respectively indicated in the material examined by 'sh' and 'spm'. Most species are treated in the taxonomic section briefly, with reduced data on synonymic lists and no descriptions or lists of geographic distribution; for those species, see previous studies (e.g. Fernandes & Pimenta 2020) for complete data.

Abbreviations

ANSP	The Academy of Natural Sciences of Drexel University, Philadelphia;
BMSM	Bailey-Matthews National Shell Museum, Sanibel;
FLMNH	Florida Museum of Natural History, Gainesville;
MNCN	Museo Nacional de Ciencias Naturales, Madrid;
MNHN	Muséum national d'Histoire naturelle, Paris;
MNRJ	Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro;
NHMUK	Natural History Museum, London;
USNM/NMNH	National Museum of Natural History, Washington D.C.;
ZMA.MOLL	Mollusca collection, Naturalis Biodiversity Center, Leiden.

Ecological analyses

The individual rarefaction curve and the abundance distribution of triphorids from MADIBENTHOS were obtained in the software PAST 4.02, regarding the total number of shells/specimens, as well as indices of dominance, Shannon's diversity, Pielou's equitability and Buzas & Gibson's evenness (all with 9999 bootstrap replications). The estimative of species richness (i.e., to evaluate the number of missing species) was calculated with a Chao1 estimator (100 randomization runs; bias-corrected) in the software EstimateS 9.1. The software Excel was used for simple graphs, such as the number and proportion of species sampled by each sampling method (AB, brushing; AD, dredging; AM, visual at intertidal; AR, visual at diving; AS, suction), following the codes in Bouchet *et al.* (2019); stations AN (trap lines) were excluded because they did not contain triphorids. Shells identified as *Nanaphora* cf. *verbernei* (Moolenbeek & Faber, 1989) were included within *N. verbernei* in all ecological analyses.

At the comparison between species found in Martinique vs other sites in the West Atlantic, only species from the continental shelf were considered, i.e., with at least one record shallower than 150 m; the records of *Inella triserialis* and "*Inella*" aff. *harryleei* Rolán & Fernández-Garcés, 2008 respectively from Martinique and Guadeloupe (Lamy & Pointier 2018) were regarded as from the deep-sea, even though the minimum depth was indicated as 55 m (see Discussion). In addition, some morphs without formal names were considered (e.g. three undescribed species of *Marshallora* Bouchet, 1985 in Brazil – Fernandes *et al.* 2021), but *nomina dubia* such as *Metaxia vicina* (C. B. Adams, 1850), recorded for the Aruba-Bonaire-Curaçao Is. (hereafter ABC Is.) (De Jong & Coomans 1988), were ignored. To evaluate whether triphorids from Martinique are endemic or have a wider range, a species is here considered to belong to the entire West Atlantic (and not restricted to the Lesser Antilles or the NW Atlantic) if crossing the Amazon filter. For example, *Isotriphora tricingulata* Rolán & Fernández-Garcés, 2015 occurs in part of the Caribbean and in Amapá state (North Brazil) (Fernandes & Pimenta 2020), but it is absent below the Amazon mouth, thus it is regarded as a NW Atlantic species.

For bathymetric comparisons, only shells not much worn were considered, to avoid bias of *post-mortem* dislodgement. Shells were assigned to each of five depth zones (0-10 m; 11-20 m; 21-30 m; 31-60 m; 61-85 m). When wide depth ranges are given in a station, the predominant range was considered (e.g. in a depth of 8-16 m, thus range 11-20 m was selected) or only the minimum depth, if distributed in equal parts (e.g. in a depth of 8-12 m, thus range 0-10 m was selected). Two ordinations of nMDS (non-metric multidimensional scaling) were calculated in PAST 4.02 for the depth and geographic zones within Martinique (as proposed by Bouchet *et al.* 2019: 217), one regarding the relative abundance (percentage) of each species per zone (using a Bray-Curtis index after an 'arcsin square root' transformation), the other regarding the presence/absence of each species per zone (using a Jaccard index); depth/geographic zones with less than 20 triphorid shells were excluded in order to reduce sampling bias.

RESULTS

After the analysis of 1615 shells/specimens, 33 triphorid species were sampled in the shallow waters of Martinique by the MADIBENTHOS expedition, of which three are described as new species. The taxonomic findings are treated individually in the next section (Figs 1-17), also comprising shallow-water

records from Guadeloupe (mostly KARUBENTHOS 1, with a few records from KARUBENTHOS 2), and live specimens are illustrated further (Figs 18-20). The ecological analyses (Figs 21-26) are treated in the Discussion.

Family Triphoridae Gray, 1847
Genus *Cheirodonta* Marshall, 1983

Cheirodonta dupliniana (Olsson, 1916)
(Fig. 1A)

Triphora dupliniana Olsson, 1916: 138, pl. 3 fig. 8.

Material examined. — **Guadeloupe**. **KARUBENTHOS 1** • 1 sh [identified by Rolán & Fernández-Garcés (2015): fig. 4L as *Marshallora modesta*]; sta. GS22; MNHN • 1 sh [previously identified as *Sagenotriphora osclausum*]; sta. GB25; MNHN • 1 sh [*idem*]; sta. GB34; MNHN.
Martinique. MADIBENTHOS • 1 sh; 'Nord Atlantique'; sta. AD244; MNHN • 1 sh; 'Nord Caraibe'; sta. AM040; MNHN • 2 sh; 'Nord Caraibe'; sta. AS570; MNHN • 1 sh; sta. AS576; MNHN.

Bathymetric distribution. — Recorded depth in Guadeloupe: 10-45 m. Recorded depth in Martinique: 0-59 m. Previous recorded depth in the West Atlantic: 6-183 m (Fernandes & Pimenta 2020).

Genus *Coriophora* Laseron, 1958

Coriophora novem (Nowell-Usticke, 1969)
(Figs 1B; 18A, B)

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

Material examined. — **Guadeloupe**. **KARUBENTHOS 1** • 1 sh; sta. GB06; MNHN • 1 sh; sta. GS07; MNHN • 2 sh; sta. GB08; MNHN • 1 spm; sta. GM08; MNHN • 1 sh; sta. GB09; MNHN • 1 sh; sta. GD10; MNHN • 2 sh; sta. GR13; MNHN • 5 sh; sta. GS13; MNHN • 1 sh; sta. GB20; MNHN • 1 sh; sta. GS24; MNHN • 1 sh; sta. GD25; MNHN • 1 sh [juvenile]; sta. GD31; MNHN • 2 sh; sta. GD58; MNHN • 1 sh; sta. GD59; MNHN. — **KARUBENTHOS 2** • 1 sh [worn]; sta. DW4545; MNHN.
Martinique. **MADIBENTHOS**. '**Nord Atlantique**' • 1 sh; sta. AB197; MNHN • 1 spm; sta. AD254; MNHN • 1 sh; sta. AB260; MNHN • 2 sh; sta. AD260; MNHN • 3 sh; sta. AD261; MNHN • 4 sh; sta. AD263; MNHN • 3 sh; sta. AD275; MNHN • 3 sh; sta. AB350; MNHN • 2 sh; sta. AB562; MNHN • 3 sh; sta. AS565; MNHN. — '**Sud Atlantique**' • 2 sh; sta. AS081; MNHN • 2 sh; sta. AB181; MNHN • 1 sh [juvenile]; sta. AB183; MNHN • 1 sh; sta. AS255; MNHN • 1 sh; sta. AB400; MNHN • 2 sh; sta. AB401; MNHN • 1 sh; sta. AB405; MNHN • 1 sh [worn]; sta. AB419; MNHN. —'**Nord Caraibe**' • 1 sh; sta. AB161; MNHN • 2 sh; sta. AD280; MNHN • 4 sh; sta. AD290; MNHN • 1 sh; sta. AB362; MNHN • 1 sh; sta. AB460; MNHN • 2 sh; sta. AS574; MNHN • 2 sh; sta. AS576; MNHN. 'Sud Caraibe' • 3 sh; sta. AB058; MNHN • 1 sh; sta. AB060; MNHN • 4 sh; sta. AS071; MNHN • 1 sh; sta. AB123; MNHN • 1 sh [juvenile]; sta. AB155; MNHN • 1 sh; sta. AB169; MNHN • 1 sh [juvenile]; sta. AD218; MNHN • 1 sh [juvenile]; sta. AB358; MNHN • 2 sh; sta. AB369; MNHN • 1 sh; sta. AD616; MNHN. — '**Baie de Fort-de-France**' • 1 sh; sta. AB398; MNHN.

Bathymetric distribution. — Recorded depth in Guadeloupe: 1-160 m (live specimen at 1 m). Recorded depth in Martinique: 4-80 m (live specimen at 62 m). Previous recorded depth in the West Atlantic: 2-110 m (Fernandes & Pimenta 2020).

Genus *Cosmotriphora* Olsson & Harbison, 1953

Cosmotriphora arnoldoi Faber & Moolenbeek, 1991
(Fig. 1C)

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

Material examined. — **Martinique**. **MADIBENTHOS**. '**Nord Atlantique**' • 1 sh; sta. AD260; MNHN.

Bathymetric distribution. — Recorded depth in Martinique: 78 m. Previous recorded depth in the West Atlantic: 20-155 m (Fernandes & Pimenta 2020).

Cosmotriphora melanura (C. B. Adams, 1850)
(Figs 1D; 18C-F)

Cerithium melanura C. B. Adams, 1850: 117.

Material examined. — **Guadeloupe**. **KARUBENTHOS 1** • 1 sh; sta. GB01; MNHN • 3 sh, 1 spm; sta. GB02; MNHN • 1 sh, 1 spm; sta. GB03; MNHN • 3 sh; sta. GS04; MNHN • 2 sh; sta. GS05; MNHN • 2 sh, 2 spm; sta. GB06; MNHN • 4 sh; sta. GS06; MNHN • 2 sh; sta. GS07; MNHN • 2 sh; sta. GB08; MNHN • 2 sh [juveniles]; sta. GM08; MNHN • 11 sh; sta. GS08; MNHN • 8 sh; sta. GB09; MNHN • 3 sh; sta. GS09; MNHN • 3 sh; sta. GD10; MNHN • 3 sh; sta. GR10; MNHN • 14 sh; sta. GB11; MNHN • 1 sh; sta. GS11; MNHN • 1 sh; sta. GB12; MNHN • 1 sh; sta. GS12; MNHN • 6; sta. GB13; MNHN • 25 sh; sta. GS13; MNHN • 1 sh; sta. GB14; MNHN • 1 sh; sta. GR14; MNHN • 2 sh; sta. GS14; MNHN • 1 sh; sta. GB15; MNHN • 1 sh; sta. GS15; MNHN • 13 sh; sta. GB16; MNHN • 1 sh; sta. GS16; MNHN • 3 spm; sta. GR17; MNHN • 3 sh, 1 spm; sta. GS17; MNHN • 2 sh; sta. GB18; MNHN • 3 sh; sta. GS18; MNHN • 1 sh; sta. GB19; MNHN • 3 sh; sta. GR19; MNHN • 6 sh, 1 spm; sta. GB20; MNHN • 1 sh; sta. GD20; MNHN • 5 sh; sta. GS20; MNHN • 1 sh; sta. GD21; MNHN • 1 sh; sta. GR21; MNHN • 4 sh; sta. GB22; MNHN • 2 sh; sta. GS22; MNHN • 1 sh; sta. GB23; MNHN • 2 sh; sta. GS23; MNHN • 1 sh; sta. GB24; MNHN • 1 sh; sta. GD24; MNHN • 2 sh; sta. GS24; MNHN • 2 sh; sta. GS25; MNHN • 1 sh; sta. GB26; MNHN • 5 sh; sta. GS29; MNHN • 2 sh; sta. GB30; MNHN • 10 sh; sta. GB31; MNHN • 1 sh; sta. GD31; MNHN • 1 sh; sta. GS32; MNHN • 1 sh; sta. GD33; MNHN • 3 sh; sta. GB34; MNHN • 4 sh; sta. GS34; MNHN • 1 sh; sta. GB36; MNHN • 3 sh; sta. GR36; MNHN • 4 sh; sta. GS36; MNHN • 1 sh; sta. GS37; MNHN • 1 sh; sta. GD52; MNHN • 1 sh; sta. GD55; MNHN • 2 sh; sta. GD58; MNHN • 1 sh; sta. GD59; MNHN • 1 sh; sta. GD69; MNHN. — **KARUBENTHOS 2** • 9 sh; sta. DW4545; MNHN • 1 sh; sta. DW4546; MNHN • 1 sh; sta. DW4550; MNHN • 1 sh; sta. DW4555; MNHN • 1 sh; sta. DW4586; MNHN • 1 sh [juvenile]; sta. DW4587; MNHN • 1 sh [juvenile]; sta. DW4599; MNHN.
Martinique. **MADIBENTHOS**. '**Nord Atlantique**' • 4 sh; sta. AB197; MNHN • 2 sh; sta. AD244; MNHN • 2 sh; sta. AD248; MNHN • 1 sh [juvenile]; sta. AD250; MNHN • 2 sh; sta. AD254; MNHN • 2 sh; sta. AD257; MNHN • 1 sh; sta. AB260; MNHN • 7 sh; sta. AD260; MNHN • 7 sh; sta. AD261; MNHN • 10 sh; sta. AD263; MNHN • 7 sh; sta. AD275; MNHN • 1 sh; sta. AB350; MNHN • 1 sh; sta. AS557; MNHN • 3 sh; sta. AB562; MNHN • 3 sh; sta. AS563; MNHN • 13 sh; sta. AS565; MNHN. — '**Sud Atlantique**' • 4 sh; sta. AS078; MNHN • 1 sh; sta. AS081; MNHN • 6 sh; sta. AB181; MNHN • 2 sh; sta. AB189; MNHN • 2 sh; sta. AB193; MNHN • 1 sh; sta. AD222; MNHN • 2 sh; sta. AD224; MNHN • 1 sh; sta. AD232; MNHN. — '**Nord Caraibe**'. 2 sh; sta. AS054; MNHN • 1 sh; sta. AB062; MNHN • 2 sh; sta. AB108; MNHN • 1 sh; sta. AD109; MNHN • 6 sh; sta. AB159; MNHN

FIG. 1. — Triphoridae Gray, 1847 from Martinique: **A**, *Cheirodonta dupliniana* (Olsson, 1916), MNHN, sta. AS576, 5.4 mm; **B**, *Coriophora novem* (Nowell-Usticke, 1969), MNHN, sta. AD280, 5.0 mm; **C**, *Cosmotriphora arnoldoi* Faber & Moolenbeek, 1991, MNHN, sta. AD260, 2.6 mm; **D**, *Cosmotriphora melanura* (C. B. Adams, 1850), MNHN, sta. AB123, 4.1 mm; **E**, *Eutriphora bermudensis* (Bartsch, 1911), MNHN, sta. AS257, 4.2 mm; **F**, *Iniforis gudeliae* Rolán & Fernández-Garcés, 2009, MNHN, sta. AS403, 4.7 mm; **G**, *Iniforis pseudothomae* Rolán & Fernández-Garcés, 1993, MNHN, sta. AB062, 7.0 mm; **H**, *Iniforis turristhomae* (Holten, 1802), MNHN, sta. AS075, 5.7 mm; **I**, *Isotriphora tricingulata* Rolán & Fernández-Garcés, 2015, MNHN, sta. AD263, 4.9 mm; **J**, *Isotriphora* sp., MNHN, sta. AS403, 2.6 mm. Scale bars: 1 mm.

• 3 sh; sta. AB183; MNHN • 2 sh; sta. AD276; MNHN • 3 sh; sta. AD280; MNHN • 2 sh; sta. AD289; MNHN • 12 sh; sta. AD290; MNHN • 3 sh; sta. AD298; MNHN • 1 sh; sta. AD299; MNHN • 2 sh; sta. AR308; MNHN • 3 sh; sta. AS363; MNHN • 2 sh; sta. AB372; MNHN • 1 sh; sta. AS373; MNHN • 7 sh; sta. AS375; MNHN • 1 sh; sta. AB377; MNHN • 1 sh; sta. AS378; MNHN • 3 sh; sta. AB386; MNHN • 1 sh; sta. AB460; MNHN • 5 sh; sta. AB463; MNHN • 2 sh; sta. AB567; MNHN • 3 sh; sta. AS570; MNHN • 2 sh; sta. AS572; MNHN • 3 sh; sta. AS574; MNHN • 2 sh; sta. AS576; MNHN • 3 sh; sta. AD612; MNHN. ‘Sud Caraibe’

• 2 sh; sta. AS057; MNHN • 1 sh; sta. AB058; MNHN • 1 sh; sta. AD067; MNHN • 3 sh; sta. AS068; MNHN • 4 sh; sta. AS071; MNHN • 2 sh; sta. AS075; MNHN • 3 sh; sta. AS092; MNHN • 1 spm; sta. AS096; MNHN • 1 sh, 1 spm; sta. AB123; MNHN • 6 sh; sta. AB126; MNHN • 2 sh; sta. AB150; MNHN • 5 sh; sta. AB152; MNHN • 1 sh; sta. AS154; MNHN • 1 sh; sta. AB163; MNHN • 4 sh; sta. AB169; MNHN • 1 sh; sta. AB173; MNHN • 1 sh; sta. AB177; MNHN • 1 sh, 1 spm; sta. AD214; MNHN • 3 sh; sta. AD216; MNHN • 5 sh; sta. AD218; MNHN • 1 sh; sta. AD220; MNHN • 1 sh; sta. AD271; MNHN • 3 sh; sta. AB354; MNHN • 1 sh [juvenile]; sta. AB358; MNHN • 1 sh; sta. AR359; MNHN • 1 sh; sta. AB360; MNHN • 2 sh; sta. AB369; MNHN • 1 sh; sta. AS370; MNHN • 1 sh; sta. AB578; MNHN • 2 sh; sta. AS579; MNHN • 2 sh; sta. AD615; MNHN • 1 sh; sta. AD616; MNHN. — **'Baie de Fort-de-France'** • 1 sh; sta. AB392; MNHN • 1 sh; sta. AB398; MNHN.

Bathymetric distribution. — Recorded depth in Guadeloupe: 0-150 m (live specimens at 3-23 m); some intact adult shells obtained by KARUBENTHOS 2 between 204-482 m, but they must be regarded with caution. Recorded depth in Martinique: 0-80 m (live specimens at 4-70 m). Previous recorded depth in the West Atlantic: 0-160 m, with discrepant records down to 480 m (Fernandes & Pimenta 2020).

Genus *Eutriphora* Cotton & Godfrey, 1931

Eutriphora bermudensis (Bartsch, 1911)
(Fig. 1E)

Triphoris bermudensis Bartsch, 1911: 305, pl. 28, figs 2, 4.

Material examined. — **Guadeloupe. KARUBENTHOS 1** • 1 sh [previously identified as *Iniforis turristhomae*]; sta. GS05; MNHN • 1 sh [*idem*]; sta. GS06; MNHN • 1 sh [*idem*]; sta. GB08; MNHN • 1 sh [*idem*]; sta. GS18; MNHN • 1 sh [*idem*]; sta. GB26; MNHN. **Martinique. MADIBENTHOS. 'Sud Atlantique'** • 1 sh; sta. AS253; MNHN • 1 sh; sta. AS257; MNHN. — **'Nord Caraibe'** • 1 sh; sta. AB161; MNHN. **'Sud Caraibe'**: • 1 sh; sta. AB169; MNHN. — **'Baie de Fort-de-France'** • 1 sh; sta. AB392; MNHN.

Bathymetric distribution. — Recorded depth in Guadeloupe: 17-49 m. Recorded depth in Martinique: 13-50 m. Previous recorded depth in the West Atlantic: 4-56 m (Rolán & Fernández-Garcés 1995).

Remark

The single shell identified by Rolán & Fernández-Garcés (2015: fig. 4T) as *E. bermudensis* from Guadeloupe, and followed by Lamy & Pointier (2018: pl. 91, fig. 6), actually refers to *Triphora martii* Rolán & Fernández-Garcés, 1995.

Genus *Inella* Bayle, 1879

Inella spinosa n. sp.
(Fig. 4)

urn:lsid:zoobank.org:act:42468F50-0E06-472E-8F1D-5738EF4F29B5

Type material. — **Holotype. Martinique. MADIBENTHOS** • sh; Macouba, region 'Nord Atlantique'; sta. AD275, 14°55'00"N, 61°08'54"W; depth 80 m; MNHN-IM-2000-38595.
Paratypes. Martinique. MADIBENTHOS. 'Nord Atlantique' • 2 sh; sta. AD263; MNHN-IM-2000-38596.

Type locality. — Martinique: Macouba, region 'Nord Atlantique'; MADIBENTHOS expedition sta. AD275, 14°55'00"N, 61°08'54"W; 80 m.

Other material examined. — **Guadeloupe. KARUBENTHOS 2** • 1 sh; sta. DW4545; MNHN.
Martinique. MADIBENTHOS. 'Nord Atlantique' • 1 sh [juvenile, worn]; sta. AD260; MNHN.

Etymology. — From Latin, *spinosus*. The species is named due to the spiny appearance of the spiral cords of teleoconch.

Diagnosis. — Spirally-elongated, pointed nodules in median and abapical cords, giving a spiny appearance to the teleoconch profile; adapical spiral cord initially very narrow, never reaching the same size of other cords; shell with a cream background.

Geographic distribution. — Guadeloupe and Martinique.

Bathymetric distribution. — Recorded depth in Guadeloupe: 60-82 m. Recorded depth in Martinique: 78-80 m.

Description

Shell sinistral, conical/fusiform, rectilinear profile, up to 4.4 mm long, 1.1 mm wide, length/width ratio 3.5-3.9; adult shells reach at least 2.7 mm in length. Protoconch paucispiral with truncated apex, without clear differentiation from the teleoconch, of 2.75-3.0 whorls, 0.57-0.61 mm long, 0.50-0.52 mm wide; the small nucleus rises in an adapical direction and further goes abapical in an oblique descent; two smooth, keeled spiral cords of equal size, situated at 26-34% and 66-71% of last whorl height, in addition to a narrow and smooth subsutural cord. Teleoconch with up to 8.5 whorls; two main spiral cords (median and abapical) at the beginning, continuous to those of protoconch, assuming a keeled-shape along the teleoconch, with median cord always more prominent, except on the body whorl where both cords have nearly the same size; adapical spiral cord initially very narrow, gradually strengthening along the teleoconch but never reaching the same size of other cords or forming distinct nodules; a smooth sutural cord is also evident, gradually strengthening and reaching the same size of adapical cord in larger shells; spirally-elongated, pointed nodules in median and abapical cords, giving a spiny appearance to the teleoconch profile; nine to ten orthocline axial ribs on seventh teleoconch whorl; suture distinct; smooth subperipheral cord, one narrow, smooth basal cord; supranumerical cords absent; elliptical aperture, 0.51-0.67 mm long, 0.37-0.44 mm wide, length/width ratio 1.4-1.5; open, very short anterior canal, 0.05-0.12 mm long, 0.18-0.27 mm wide, length/width ratio 0.3-0.5; posterior canal absent. Shell with a cream background, white nodules on teleoconch, internodular spaces light brown.

Remarks

The spiny appearance of the spiral cords of the teleoconch, combined with the color pattern and small shell size (reaching only 4.4 mm long), makes *I. spinosa* n. sp. unique among *Inella* and other West Atlantic triphorids. Because of its

FIG. 2. — Triphoridae Gray, 1847 from Martinique - cont.: **A**, *Latitriphora albida* (A. Adams, 1854), MNHN, sta. AB149, 4.0 mm; **B**, *Marshallora* cf. *modesta* (C. B. Adams, 1850), MNHN, sta. AB150, 4.3 mm; **C**, *Metaxia excelsa* Faber & Moolenbeek, 1991, MNHN, sta. AB123, 3.6 mm; **D**, *Metaxia rugulosa* (C. B. Adams, 1850), MNHN, sta. AD265, 6.3 mm; **E**, *Metaxia taeniolata* (Dall, 1889), MNHN, sta. AD261, 5.5 mm; **F**, *Monophorus olivaceus* (Dall, 1889), MNHN, sta. AS576, 9.5 mm; **G**, *Nototriphora decorata* (C. B. Adams, 1850), MNHN, sta. AB390, 6.8 mm; **H**, *Sagenotriphora osclausum* (Rolán & Fernández-Garcés, 1995), MNHN, sta. AS565, 3.4 mm; **I**, *Similiphora intermedia* (C. B. Adams, 1850), MNHN, sta. AD067, 5.6 mm; **J**, *Similiphora* sp., MNHN, sta. AS552, 5.1 mm. Scale bars: 1 mm.

probable lecithotrophic development and bathymetric range restricted to the upper 100 m (absent from deeper waters of Guadeloupe, based on samples from KARUBENTHOS 2), *I. spinosa* n. sp. probably has a narrow geographic range in the Lesser Antilles. The single shell obtained from Guadeloupe (Fig. 4D) has the axial sculpture much weaker than shells from Martinique (Fig. 4A-C), attenuating the spiny appearance of the spiral cords.

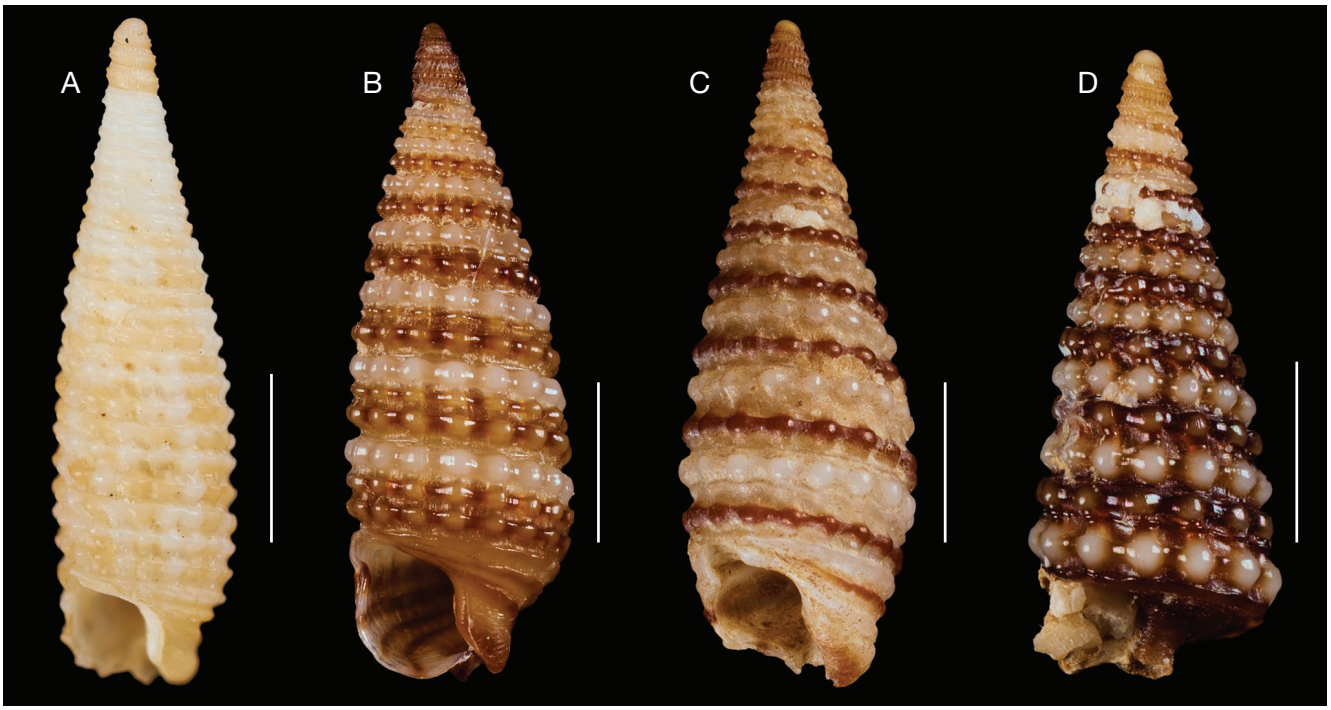

Fig. 3. — Triphoridae Gray, 1847 from Martinique – cont.: **A**, *Strobiligera inaudita* (Rolán & Fernández-Garcés, 2008), MNHN, sta. AD218, 4.0 mm; **B**, *Triphora ellyae* De Jong & Coomans, 1988, MNHN, sta. AB308, 4.1 mm; **C**, *Triphora martii* Rolán & Fernández-Garcés, 1995, MNHN, sta. AS252, 4.2 mm; **D**, *Triphora* cf. *scylla* Fernandes & Pimenta, 2015, MNHN, sta. AB562, 3.5 mm. Scale bars: 1 mm.

"***Inella***" sp.
(Fig. 5)

Material examined. — **Martinique**. **MADIBENTHOS. 'Sud Caraibe'** • 1 sh; sta. AD214; MNHN.

Geographic distribution. — Only known from Martinique.

Bathymetric distribution. — Only known from 70 m.

Remarks

This morph is allocated under the "pseudo *Inella*" group (Fernandes & Pimenta 2019a), because it shows a paucispiral protoconch similar to *Inella* s.s. and an elongated shell shape, but the late emergence of the median spiral cord of teleoconch makes its generic allocation uncertain. The median spiral cord emerges narrowly in the fourth/fifth teleoconch whorl, and after three whorls it starts to be more developed than the adapical spiral cord (Fig. 5B), but never reaching the same size than the abapical one. Owing to the color pattern, with narrow, brown axial patches (Fig. 5A), and the more developed abapical spiral cord, "*Inella*" sp. resembles "*Inella*" *harryleei* Rolán & Fernández-Garcés, 2008. However, the adult shell of "*Inella*" sp. is much smaller (5.8 mm vs up to 18.3 mm) and the median spiral cord becomes more prominent than the adapical one (contrary to "*I*". *harryleei*, whose median cord is always smaller than remaining cords).

Genus *Iniforis* Jousseaume, 1884

Iniforis gudeliae
Rolán & Fernández-Garcés, 2009
(Fig. 1F)

Iniforis gudeliae Rolán & Fernández-Garcés, 2009: 103, figs 2-5, 13-21, 29.

Material examined. — **Guadeloupe. KARUBENTHOS 1** • 2 sh; sta. GM06; MNHN • 1 sh; sta. GB30; MNHN • 3 sh; sta. GS32; MNHN • 1 sh; sta. GB36; MNHN.
Martinique. MADIBENTHOS. 'Nord Atlantique' • 2 sh; sta. AB350; MNHN • 1 sh; sta. AS563; MNHN. — **'Sud Atlantique'** • 3 sh; sta. AB130; MNHN • 5 sh; sta. AB187; MNHN • 5 sh; sta. AB191; MNHN • 2 sh; sta. AB193; MNHN • 3 sh; sta. AB195; MNHN • 1 sh; sta. AS252; MNHN • 4 sh; sta. AS255; MNHN • 3 sh; sta. AB400; MNHN • 2 sh; sta. AS403; MNHN • 1 sh; sta. AB405; MNHN • 1 sh [worn]; sta. AB419; MNHN. 'Sud Caraibe' • 11 sh; sta. AB360; MNHN.

Bathymetric distribution. — Recorded depth in Guadeloupe: 0-16 m. Recorded depth in Martinique: 1-23 m. Previous recorded depth in the West Atlantic: 7 m (Redfern 2013).

Remark

This species also includes the record from Guadeloupe of *Iniforis casta* (Hinds, 1843) made by Lamy & Pointier (2018: 286, pl. 91, fig. 10a-b).

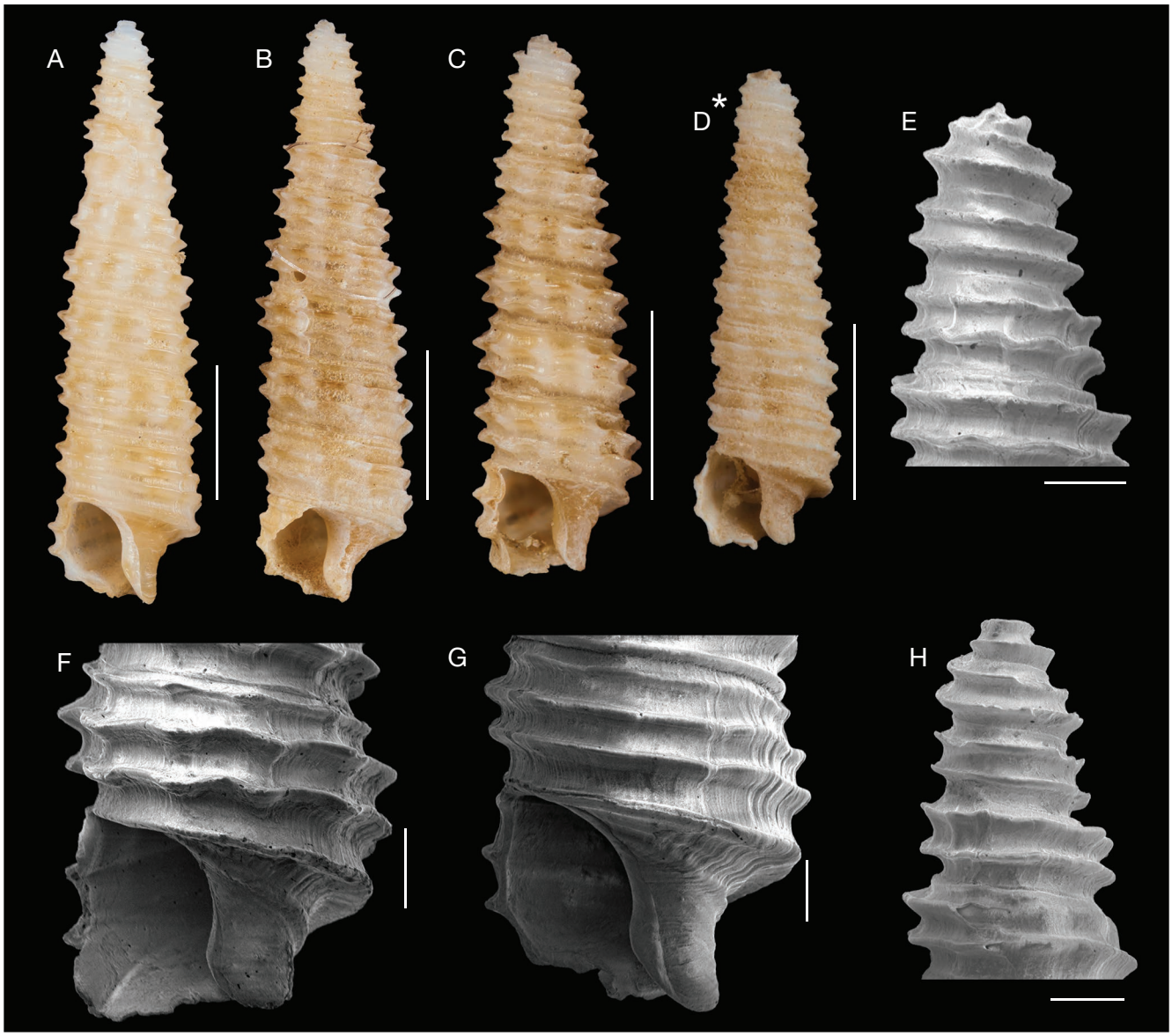

FIG. 4. — *Inella spinosa* n. sp.: **A**, **G-H**, MNHN-IM-2000-38595, holotype, 4.4 mm; **B**, **C**, **E**, **F**, MNHN-IM-2000-38596, paratypes, sta. AD263, 3.9 mm, 2.9 mm; **D**, MNHN, sta. DW4545 (KARUBENTHOS 2 expedition), 2.7 mm. Scale bars: A-D, 1 mm; E-H, 200 µm.

Iniforis pseudothomae
Rolán & Fernández-Garcés, 1993
(Fig. 1G)

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

MATERIAL EXAMINED. — **Guadeloupe**. **KARUBENTHOS 1** • 1 sh; sta. GB04; MNHN • 1 sh; sta. GS06; MNHN • 1 sh; sta. GB08; MNHN • 1 sh; sta. GD10; MNHN • 3 sh; sta. GR10; MNHN • 1 sh; sta. GB11; MNHN • 9 sh; sta. GS13; MNHN • 3 sh; sta. GS20; MNHN • 3 sh; sta. GS29; MNHN • 1 sh; sta. GD31; MNHN.
Martinique. **MADIBENTHOS**. '**Nord Atlantique**' • 6 sh; sta. AD260; MNHN. — '**Sud Atlantique**' • 1 sh; sta. AB405; MNHN. — '**Nord Caraibe**' • 1 sh; sta. AD299; MNHN • 1 sh; sta. AS574; MNHN. 'Sud Caraibe' • 1 sh; sta. AB060; MNHN • 4 sh; sta. AB062; MNHN • 18 sh; sta. AS075; MNHN • 3 sh; sta. AS092; MNHN • 1 sh; sta. AB165; MNHN • 2 sh; sta. AB173; MNHN.

BATHYMETRIC DISTRIBUTION. — Recorded depth in Guadeloupe: 10-85 m. Recorded depth in Martinique: 12-78 m. Previous recorded depth in the West Atlantic: 5-98 m (Fernandes & Pimenta 2020).

REMARK

I am uncertain whether a few shells from Guadeloupe belong to *I. pseudothomae* or *Iniforis turristhomae* (Holten, 1802), and these were not listed herein. Further investigations are required to test the validity of *I. pseudothomae*.

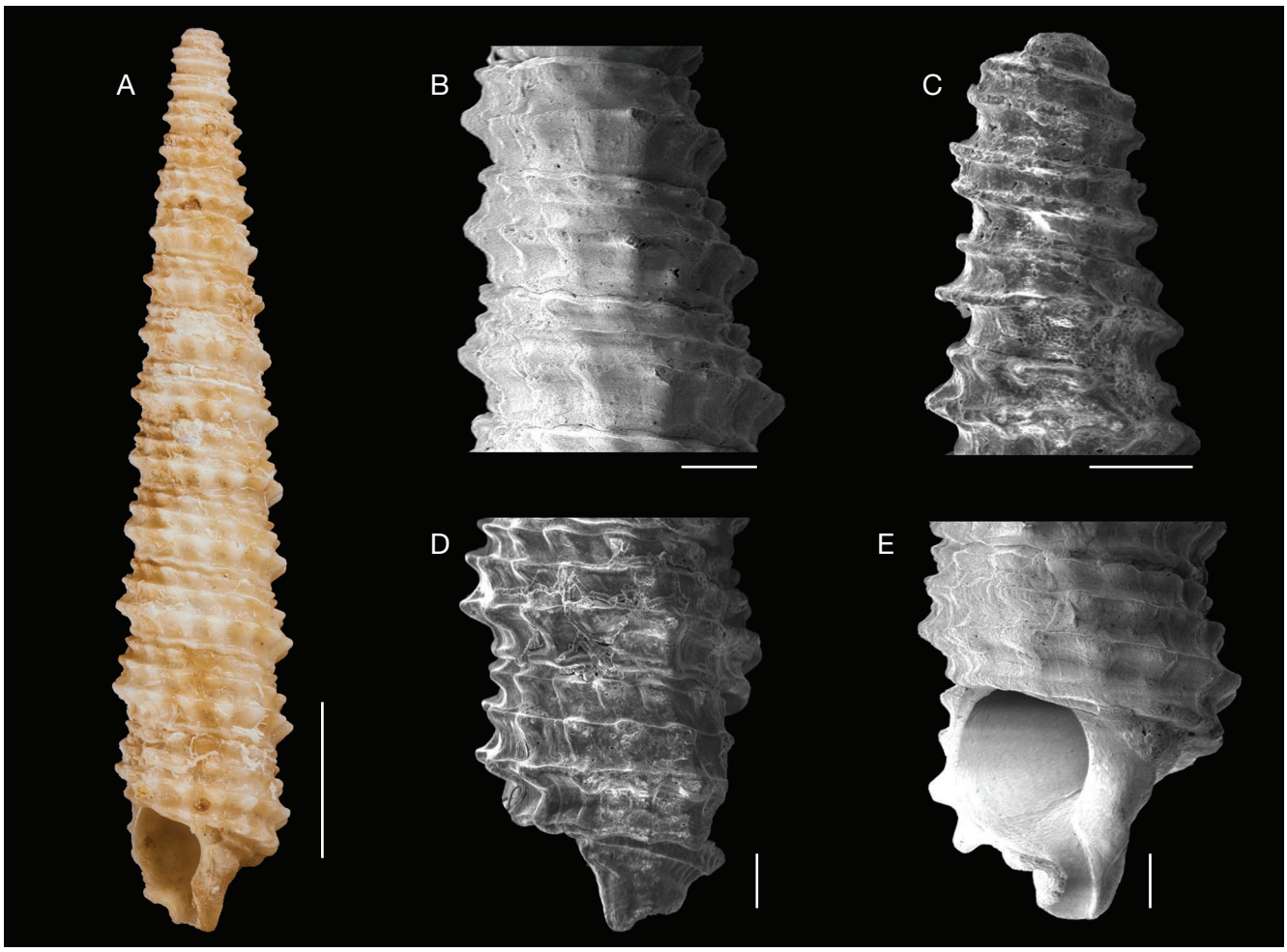

Fig. 5. — "*Inella*" sp., MNHN, sta. AD214, 5.8 mm. Scale bars: A, 1 mm, B-E, 200 µm.

Iniforis turristhomae (Holten, 1802) (Figs 1H; 18G-I, K)

Turbo turristhomae Holten, 1802: 71.

Material examined. — **Guadeloupe**. **KARUBENTHOS 1** • 3 sh, 3 spm; sta. GB02; MNHN • 3 sh; sta. GS04; MNHN • 5 sh; sta. GB05; MNHN • 6 sh; sta. GS05; MNHN • 2 sh; sta. GB06; MNHN • 2 sh; sta. GM06; MNHN • 7 sh; sta. GS06; MNHN • 4 sh, 1 spm; sta. GB07; MNHN • 5 sh; sta. GS07; MNHN • 11 sh; sta. GB08; MNHN • 1 spm; sta. GM08; MNHN • 1 sh; sta. GS08; MNHN • 3 sh; sta. GB09; MNHN • 9 sh; sta. GS09; MNHN • 1 sh; sta. GB10; MNHN • 6 sh; sta. GR10; MNHN • 14 sh; sta. GB11; MNHN • 13 sh; sta. GS11; MNHN • 1 sh; sta. GB12; MNHN • 4 sh; sta. GR12; MNHN • 2 sh; sta. GB13; MNHN • 1 sh; sta. GD13; MNHN • 36 sh; sta. GS13; MNHN • 4 sh; sta. GB14; MNHN • 3 sh; sta. GB15; MNHN • 4 sh; sta. GR15; MNHN • 9 sh; sta. GB16; MNHN • 1 sh; sta. GB17; MNHN • 4 sh; sta. GS18; MNHN • 1 sh; sta. GB19; MNHN • 2 sh; sta. GR19; MNHN • 1 sh; sta. GR20; MNHN • 13 sh; sta. GS20; MNHN • 9 sh; sta. GB21; MNHN • 3 sh; sta. GS21; MNHN • 4 sh; sta. GB22; MNHN • 2 sh; sta. GB23; MNHN • 1 sh; sta. GS23; MNHN • 3 sh; sta. GB24; MNHN • 1 sh; sta. GB25; MNHN • 5 sh; sta. GB26; MNHN • 1 sh; sta. GR28; MNHN • 23 sh; sta. GS29; MNHN • 6 sh; sta. GB30; MNHN • 12 sh; sta. GB31; MNHN • 1 sh; sta. GD31; MNHN • 9 sh; sta. GS32; MNHN • 1 sh; sta. GD33; MNHN • 2 sh; sta. GM33; MNHN • 5 sh; sta. GS34; MNHN • 5 spm; sta. GD36; MNHN • 5 sh; sta. GS36; MNHN • 1 sh; sta. GR37; MNHN • 2 sh; sta. GS39; MNHN • 1 sh; sta. GD65; MNHN. — **KARUBENTHOS 2** • 9 sh; sta. DW4545; MNHN • 1 sh, 1 spm; sta. DW4552; MNHN • 1 sh; sta. DW4574; MNHN • 1 sh [worn], sta. DW4583, MNHN. **Martinique**. **MADIBENTHOS**. **'Nord Atlantique'** • 2 sh; sta. AR143; MNHN • 9 sh; sta. AB197; MNHN • 4 sh; sta. AB199; MNHN • 1 sh; sta. AD244; MNHN • 1 sh; sta. AD252; MNHN • 2 sh [juveniles]; sta. AD254; MNHN • 2 sh; sta. AB260; MNHN • 1 sh [juvenile]; sta. AD260; MNHN • 3 sh; sta. AD261; MNHN • 2 sh; sta. AD263; MNHN • 5 sh; sta. AD267; MNHN • 1 sh; sta. AD273; MNHN • 6 sh; sta. AD275; MNHN • 2 sh; sta. AB301; MNHN • 11 sh; sta. AB350; MNHN • 3 sh; sta. AB562; MNHN • 1 sh; sta. AS563; MNHN • 9 sh; sta. AS565; MNHN. — **'Sud Atlantique'** • 1 sh; sta. AR133; MNHN • 1 sh; sta. AB134; MNHN • 1 sh; sta. AB181; MNHN • 3 sh; sta. AB185; MNHN • 5 sh; sta. AB187; MNHN • 3 sh; sta. AB189; MNHN • 7 sh; sta. AB191; MNHN • 15 sh; sta. AB193; MNHN • 8 sh; sta. AB195; MNHN • 2 sh; sta. AD222; MNHN • 1 sh; sta. AD232; MNHN • 1 sh; sta. AD235; MNHN • 1 sh; sta. AS252; MNHN • 1 sh; sta. AS253; MNHN • 5 sh; sta. AS255; MNHN • 7 sh; sta. AS257; MNHN • 11 sh; sta. AB400; MNHN • 4 sh; sta. AB401; MNHN • 10 sh; sta. AS403; MNHN • 23 sh; sta. AB405; MNHN • 4 sh; sta. AB452; MNHN. — **'Nord Caraibe'** • 4 sh; sta. AB108; MNHN • 23 sh; sta. AB159; MNHN • 3 sh; sta. AB161; MNHN • 1 sh; sta.

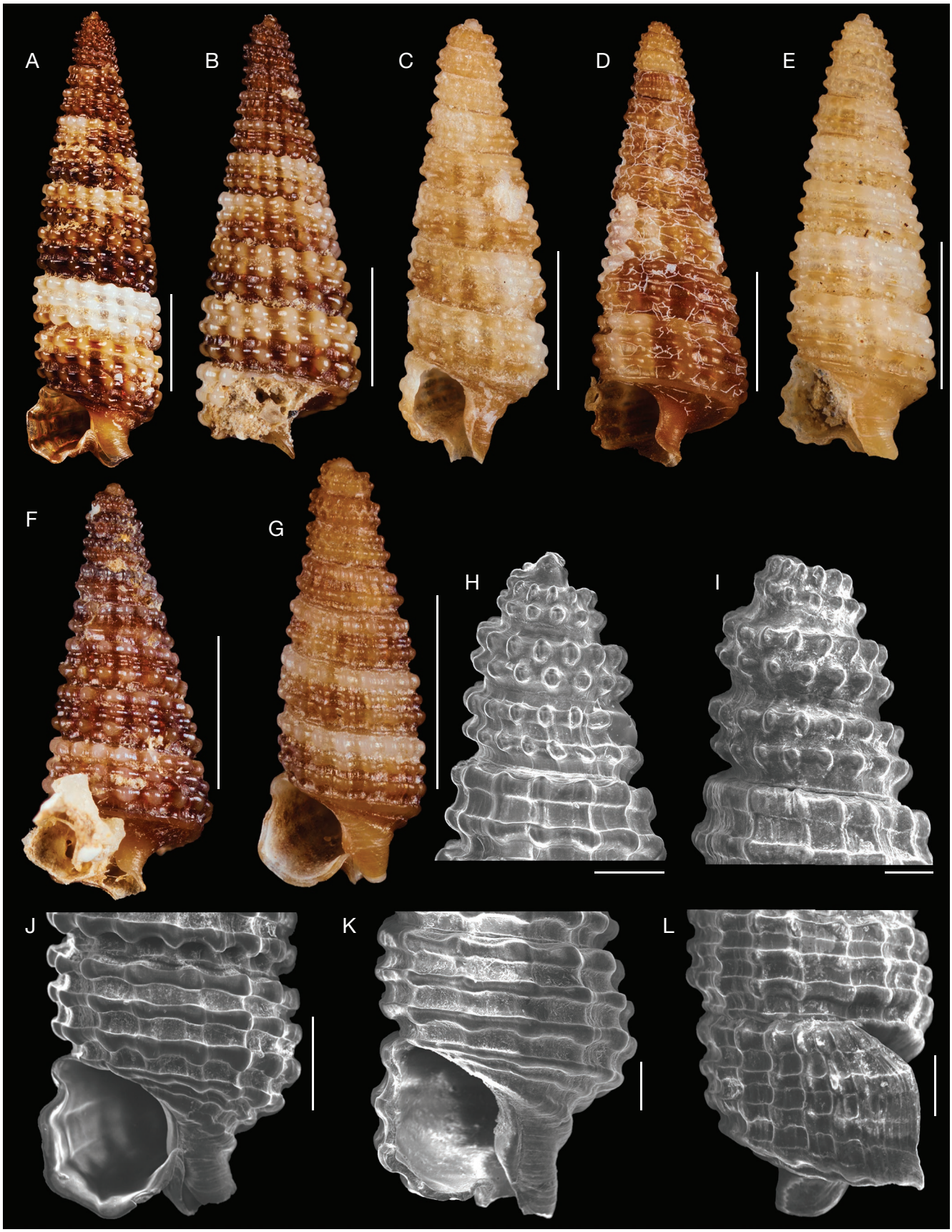

Fig. 6. — *Isotriphora pardus* n. sp.: **A**, **H**, **J**, MNHN-IM-2000-38597, holotype, 4.7 mm; **B**, MNHN-IM-2000-35481, paratype, sta. AB567, 3.8 mm; **C**, MNHN-IM-2000-38600, paratype, sta. AD280, 3.2 mm; **D**, MNHN-IM-2000-35480, paratype, sta. AD289, 3.8 mm; **E**, **K**, MNRJ 24517, paratype, sta. AD290, 3.0 mm; **F**, MNHN, sta. AS253, 2.7 mm; **G**, **I**, **L**, MNHN-IM-2000-38599, paratype, sta. AS409, 2.2 mm. Scale bars: A-G, 1 mm; H, K-L, 200 µm; I, 100 µm; J, 500 µm.

AD280; MNHN • 2 sh; sta. AD289; MNHN • 4 sh; sta. AD290; MNHN • 1 sh; sta. AD295; MNHN • 6 sh; sta. AR308; MNHN • 6 sh; sta. AB362; MNHN • 8 sh; sta. AS363; MNHN • 6 sh; sta. AS365; MNHN • 4 sh; sta. AB372; MNHN • 1 sh; sta. AS373; MNHN • 12 sh; sta. AS375; MNHN • 3 sh; sta. AS378; MNHN • 1 sh; sta. AR383; MNHN • 9 sh; sta. AB386; MNHN • 2 sh; sta. AB460; MNHN • 4 sh; sta. AB463; MNHN • 16 sh; sta. AB567; MNHN • 1 sh; sta. AS568; MNHN • 1 sh; sta. AS572; MNHN • 6 sh; sta. AS576; MNHN • 1 sh; sta. AD612; MNHN. 'Sud Caraibe' • 1 sh; sta. AM038; MNHN • 11 sh; sta. AB058; MNHN • 25 sh; sta. AB062; MNHN • 9 sh; sta. AS066; MNHN • 3 sh; sta. AD067; MNHN • 5 sh; sta. AS068; MNHN • 4 sh; sta. AS071; MNHN • 4 sh; sta. AS073; MNHN • 1 spm; sta. AS075; MNHN • 9 sh; sta. AS092; MNHN • 10 sh; sta. AS096; MNHN • 3 sh; sta. AS112; MNHN • 5 sh; sta. AD115; MNHN • 1 sh [juvenile]; sta. AB123; MNHN • 7 sh; sta. AB126; MNHN • 2 sh; sta. AB150; MNHN • 13 sh; sta. AB152; MNHN • 11 sh; sta. AB155; MNHN • 24 sh; sta. AB157; MNHN • 33 sh; sta. AB163; MNHN • 9 sh; sta. AB169; MNHN • 4 sh; sta. AB173; MNHN • 15 sh; sta. AB175; MNHN • 19 sh; sta. AB177; MNHN • 3 sh; sta. AB354; MNHN • 6 sh; sta. AB356; MNHN • 22 sh; sta. AB358; MNHN • 8 sh; sta. AB360; MNHN • 6 sh; sta. AB369; MNHN • 16 sh; sta. AS370; MNHN • 1 sh; sta. AS579; MNHN • 2 sh; sta. AB583; MNHN • 1 sh; sta. AD614; MNHN • 2 sh; sta. AD615; MNHN • 11 sh; sta. AD616; MNHN • 10 sh; sta. AD617; MNHN. 'Baie de Fort-de-France' • 10 sh, 2 spm; sta. AM005; MNHN • 1 sh; sta. AD105; MNHN • 17 sh; sta. AM326; MNHN • 6 sh; sta. AB392; MNHN • 11 sh; sta. AB398; MNHN.

Bathymetric distribution. — Recorded depth in Guadeloupe: 0-140 m (live specimens at 1-65 m). Recorded depth in Martinique: 0-84 m (live specimens at 0-26 m). Previous recorded depth in the West Atlantic: 0-101 m (Rosenberg 2009).

Genus *Isotriphora* Cotton & Godfrey, 1931

Isotriphora pardus n. sp.
(Fig. 6)

urn:lsid:zoobank.org:act:3DD03945-A798-4A99-8AE4-F8DDB7AB51D5

Type material. — **Holotype. Martinique** • sh; Presqu'Île de la Caravelle, region 'Nord Atlantique'; MADIBENTHOS expedition sta. AB562, 14°47'30"N, 60°57'24"W; depth 14 m; MNHN-IM-2000-38597.
Paratypes. Martinique. MADIBENTHOS. 'Nord Atlantique' • 1 sh; type locality; MNHN-IM-2000-38598. — **'Sud Atlantique'** • 2 sh; sta. AS409; MNHN-IM-2000-38599. — **'Nord Caraibe'** • 1 sh; sta. AD280; MNHN-IM-2000-38600 • 1 sh; sta. AD289; MNHN-IM-2000-35480 • 1 sh; sta. AD290; MNRJ 24517 • 1 sh; sta. AB567; MNHN-IM-2000-35481.

Type locality. — Martinique: Presqu'Île de la Caravelle, region 'Nord Atlantique'; MADIBENTHOS expedition sta. AB562, 14°47'30"N, 60°57'24"W; 14 m.

Other material examined. — **Martinique**. 'Sud Atlantique' • 1 sh; sta. AD233; MNHN • 1 sh; sta. AS253; MNHN.

Etymology. — As a noun in apposition (not an adjective), the specific name alludes to the leopard [*Panthera pardus* (Linnaeus, 1758)], owing to the habit of the author to name species of *Isotriphora* after big felines.

Diagnosis. — Shell mottled, with irregular patches varying from white, cream or brown; median spiral cord emerges at fifth whorl of shell, reaching the same size of abapical cord after two whorls.

Geographic distribution. — Only known from Martinique.

Bathymetric distribution. — Recorded depth in Martinique: 10-74 m.

Description
Shell sinistral, conical, nearly rectilinear profile, up to 4.7 mm long, 1.3 mm wide, length/width ratio 2.6-3.5; adult shells reach at least 2.2 mm in length. Protoconch paucispiral with truncated apex, without clear differentiation from the teleoconch, of 3.0-3.5 whorls, 0.52-0.68 mm long, 0.48-0.58 mm wide; two nodulose spiral cords, situated at 26-29% and 65% of last whorl height; faint axial threads only visible at the end of last protoconch whorl. Teleoconch with up to 8.5 whorls; two spiral cords (adapical and abapical) at the beginning, continuous to those of protoconch; median spiral cord emerges at fifth whorl of shell, reaching the same size of abapical cord (adapical one is slightly more prominent) after two whorls; rounded nodules of medium size; 14-17 nearly orthocline axial ribs on eighth whorl of shell; shallow suture, with small sutural cord; subperipheral cord slightly nodulose to wavy, two narrow basal cords, wavy to nearly smooth; supranumerical cords absent; nearly circular aperture, 0.48-0.68 mm long, 0.41-0.68 mm wide, length/width ratio 1.0-1.2; open or partly closed anterior canal, crossed in its base by projection of outer lip, 0.18-0.38 mm long, 0.14-0.22 mm wide, length/width ratio 1.3-1.7; posterior canal as a small sinus, not detached from aperture. Shell mottled, with irregular patches varying from white, cream or brown; some shells with adapical spiral cord whitish and lighter than other cords on late whorls.

Remarks
Isotriphora pardus n. sp. shows considerable variation in the adult shell size (2.2-4.7 mm long), in the color pattern (with the adapical spiral cord whitish and lighter than other cords on late whorls of some, but not all, shells) and in the closure of the anterior canal. *Isotriphora* sp. 1 from Fernando de Noronha Archipelago, Northeast Brazil (Fernandes & Pimenta 2020), is a much similar species, but having narrower axial patches on the teleoconch; the unknown base of *Isotriphora* sp. 1, due to the juvenile condition of all sampled shells, precludes further comparisons.

Isotriphora tricingulata
Rolán & Fernández-Garcés, 2015
(Fig. 1I)

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

Material examined. — **Guadeloupe. KARUBENTHOS 1** • holotype; sta. GD31; MNHN-IM-2000-30472.
Martinique. MADIBENTHOS. 'Nord Atlantique' • 1 sh; sta. AD263; MNHN • 1 sh; sta. AD266; MNHN • 1 sh; sta. AD275; MNHN.

Bathymetric distribution. — Recorded depth in Guadeloupe: 85 m (not 81 m, as recorded in the original description). Recorded depth in Martinique: 78-80 m. Previous recorded depth in the West Atlantic: 72-81 m (Fernandes & Pimenta 2020).

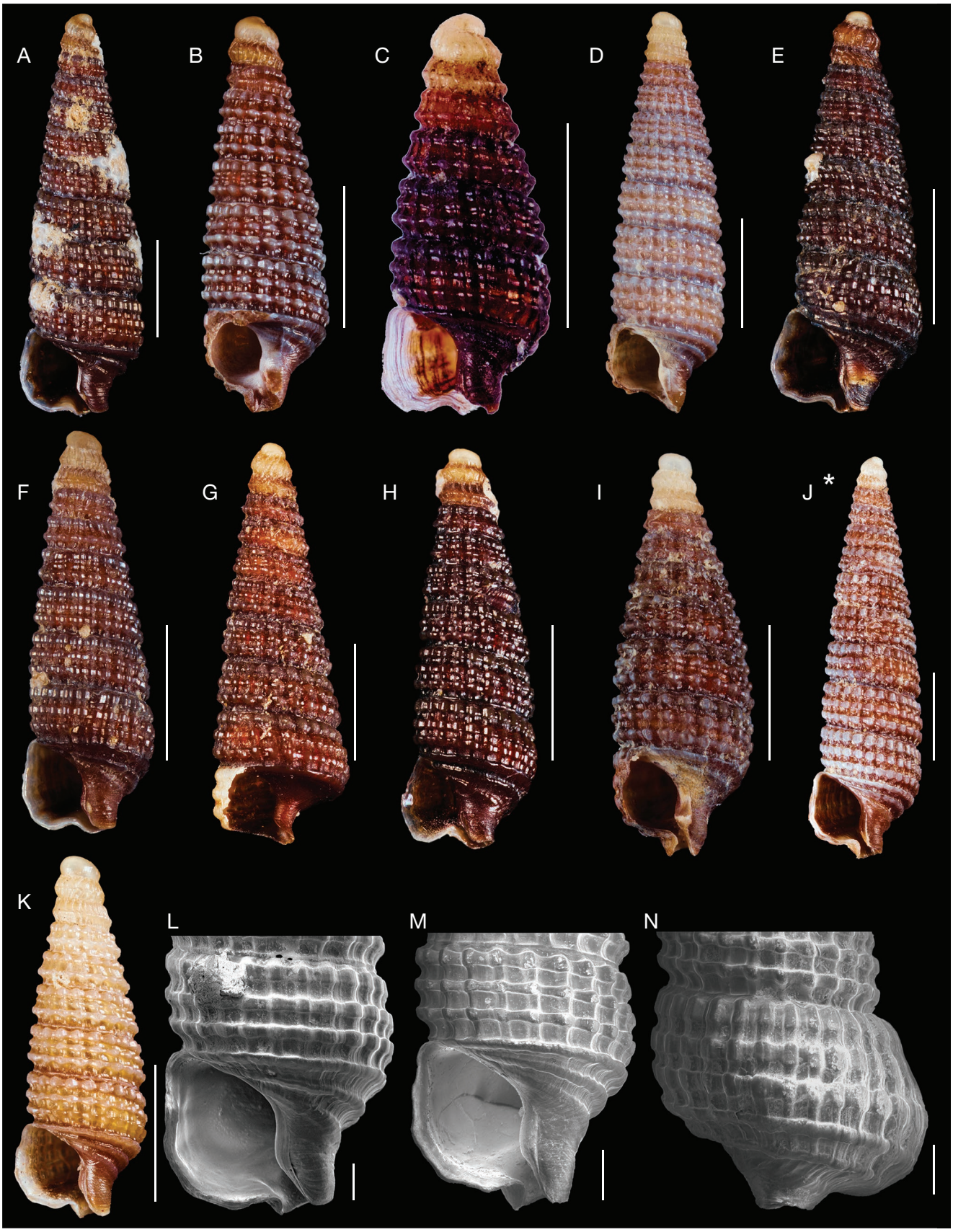

FIG. 7. — *Marshallora monteiroi* (Rolán & Fernández-Garcés, 2015) n. comb.: **A**, **L**, MNHN, sta. AD283, 4.2 mm; **B**, MNHN, sta. AS482, 2.8 mm; **C**, MNHN, sta. AB350, 2.0 mm; **D**, MNHN, sta. AD275, 3.7 mm; **E**-**H**, **N**, MNHN, sta. AD283, 3.0 mm, 3.0 mm, 3.5 mm, 3.0 mm; **I**, MNHN, sta. AS252, 3.0 mm; **J**, MNHN, sta. GD21 (KARUBENTHOS 1), 4.6 mm; **K**, **M**, MNHN, sta. AD263, 2.7 mm. Scale bars: A-K, 1 mm; L-N, 200 µm.

Remarks

Lamy & Pointier (2018: pl. 92, fig. 16) illustrated the holotype of *I. tricingulata* under the name *Triphora* sp. 5, providing a depth record of 50 m, contrary to the true depth record of the type locality (i.e., 85 m in station GD31 of KARUBENTHOS 1, not 81 m, as recorded in the original description). I disregard the depth record of 50 m provided by Lamy & Pointier (2018), due to the uncertainty of which shells were studied.

Isotriphora sp.
(Fig. 1J)

Material examined. — **Martinique**. **MADIBENTHOS.** 'Sud Atlantique' • 1 sh; sta. AS403; MNHN.

Bathymetric distribution. — Only known from 11 m.

Genus *Latitriphora* Marshall, 1983

Latitriphora albida (A. Adams, 1854)
(Fig. 2A)

Triphoris albidus A. Adams, 1854: 278.

Material examined. — **Guadeloupe**. **KARUBENTHOS 1** • 1 sh; sta. GS17; MNHN • 1 sh; sta. GB36; MNHN.
Martinique. **MADIBENTHOS.** '**Nord Atlantique**' • 2 sh; sta. AB562; MNHN. — '**Sud Atlantique**' • 1 sh; sta. AB117; MNHN • 2 sh; sta. AB149; MNHN. — '**Nord Caraibe**' • 1 sh, 1 spm; sta. AB386; MNHN. 'Sud Caraibe' • 1 sh [worn]; sta. AM033; MNHN • 1 sh; sta. AS075; MNHN • 1 sh [juvenile]; sta. AB126; MNHN • 1 sh; sta. AD216; MNHN. 'Baie de Fort-de-France' • 1 sh; sta. AB390; MNHN.

Bathymetric distribution. — Recorded depth in Guadeloupe: 3-16 m. Recorded depth in Martinique: 2-26 m (live specimen at 17 m). Previous recorded depth in the West Atlantic: 0-107 m (Fernandes & Pimenta 2020).

Remark

Rolán & Fernández-Garcés (2015: fig. 4S) illustrated a shell of *Nototriphora decorata* (C. B. Adams, 1850) under the name *L. albida*, which was followed by Lamy & Pointier (2018: pl. 91, fig. 15), and there were other 14 MNHN lots of *N. decorata* from Guadeloupe previously identified as *L. albida*; only two shells of *L. albida* were correctly identified.

Genus *Marshallora* Bouchet, 1985

Marshallora cf. *modesta* (C. B. Adams, 1850)
(Fig. 2B)

Cerithium modestum C. B. Adams, 1850: 117.

Material examined. — **Guadeloupe**. **KARUBENTHOS 1** • 2 spm; sta. GM01; MNHN • 1 sh, 3 spm; sta. GM02; MNHN • 2 spm; sta. GM03; MNHN • 2 sh; sta. GM11; MNHN • 1 sh; sta. GM29; MNHN • 1 sh; sta. GS30; MNHN • 3 sh; sta. GD39; MNHN • 1 sh; sta. GD49; MNHN • 1 sh; sta. GD51; MNHN. — **Martinique**. **MADIBENTHOS.** '**Sud Atlantique**' • 1 sh; sta. AM042; MNHN • 2 sh [one with hermit crab]; sta. AM043; MNHN • 1 sh; sta. AM325; MNHN. 'Sud Caraibe' • 1 sh; sta. AB150; MNHN. 'Baie de Fort-de-France' • 1 sh; sta. AM034; MNHN • 8 sh; sta. AB390; MNHN • 1 sh; sta. AB392; MNHN • 3 sh; sta. AB394; MNHN • 1 sh; sta. AD603; MNHN • 1 sh; sta. AD607; MNHN • 1 sh; sta. AD623; MNHN.

Bathymetric distribution. — Recorded depth in Guadeloupe: 0-15 m (live specimens at 1 m). Recorded depth in Martinique: 0-13 m. Previous recorded depth in the West Atlantic: 0-20 m (Rosenberg 2009).

Remarks

As abovementioned, the illustration of *M. modesta* from Guadeloupe by Rolán & Fernández-Garcés (2015: fig. 4L) actually refers to *C. dupliniana*, whereas their record of *Marshallora nigrocincta* (C. B. Adams, 1839) must be refused, because this species is known with certainty only from Canada and USA, based on DNA evidences and some shell features (Fernandes *et al.* 2021). Accordingly, the record of *M. nigrocincta* from Guadeloupe and Martinique by Lamy & Pointier (2018) is rejected. The material from the French Antilles will be studied under an integrative taxonomic basis, together with new samples from the West Atlantic (unpublished data). Meanwhile, shells are herein identified as *M.* cf. *modesta*, regarding the existence of at least two Caribbean species in this complex (Fernandes *et al.* 2021).

Marshallora monteiroi (Rolán & Fernández-Garcés, 2015) n. comb.
(Figs 7; 8; 20I-J)

"*Triphora*" *monteiroi* Rolán & Fernández-Garcés, 2015: 47, pl. 3.

Triphora portoricensis non Rolán & Redfern, 2008 – Lamy & Pointier 2018: 289, pl. 92, fig. 11.

Type material. — **Holotype. Guadeloupe** • sh; Basse-Terre, Baie de Baille-Argent; KARUBENTHOS 1 sta. GD21, 16°15'33"N, 61°48'48"W; depth 40 m; MNHN-IM-2000-30473.

Type locality. — Guadeloupe: Basse-Terre, Baie de Baille-Argent; KARUBENTHOS 1 sta. GD21, 16°15'33"N, 61°48'48"W; 40 m.

Material examined. — **Guadeloupe**. **KARUBENTHOS 1** • 1 sh [previously identified as *Marshallora modesta* – this shell is from the type locality]; sta. GD21; MNHN.
Martinique. **MADIBENTHOS.** '**Nord Atlantique**' • 1 sh; sta. AD263; MNHN • 1 sh; sta. AD275; MNHN • 1 sh; sta. AB350; MNHN. — '**Sud Atlantique**' • 1 sh; sta. AS252; MNHN. — '**Nord Caraibe**' • 10 sh, 1 spm; sta. AD283; MNHN • 1 sh; sta. AD290; MNHN • 1 sh; sta. AS482; MNHN.

Bathymetric distribution. — Recorded depth in Guadeloupe: 40 m (including a live specimen). Recorded depth in Martinique: 10-80 m (live specimen at 37-40 m).

Geographic distribution. — Guadeloupe and Martinique.

Emended description

Shell sinistral, conical to slightly pupoid, rectilinear to slightly convex profile, up to 4.6 mm long, 1.2 mm wide, length/width

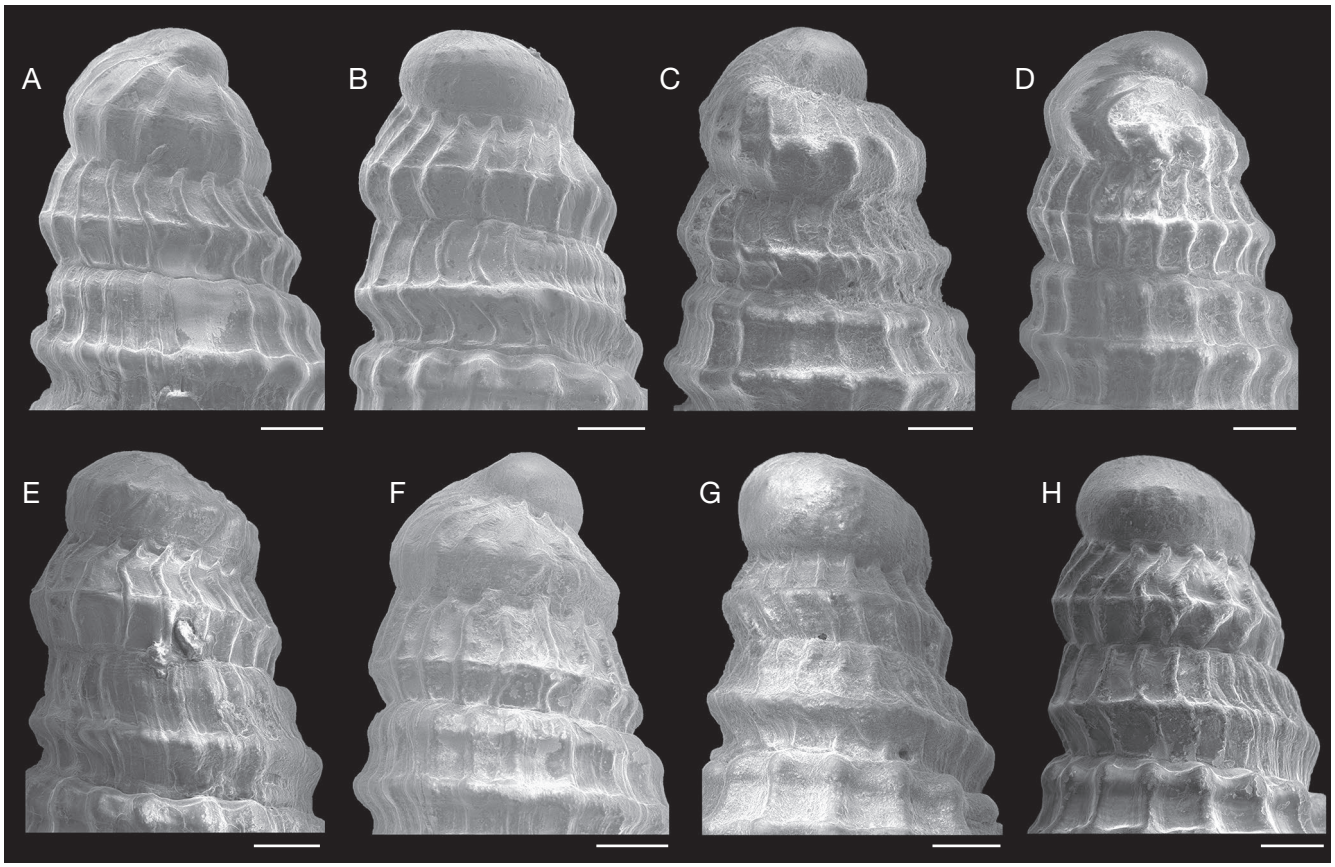

Fig. 8. — *Marshallora monteiroi* (Rolán & Fernández-Garcés, 2015) n. comb.: **A**, MNHN, sta. AD283 (Fig. 7A); **B**, MNHN, sta. AS482 (Fig. 7B); **C**, MNHN, sta. B350 (Fig. 7C); **D**, MNHN, sta. AD275 (Fig. 7D); **E**, MNHN, sta. AD283 (Fig. 7E); **F**, MNHN, sta. AD283 (Fig. 7F); **H**, MNHN, sta. AS252 (Fig. 7I); **H**, MNHN, sta. AD263 (Fig. 7K). Scale bars: 100 µm.

ratio 2.4-3.9; adult shells reach at least 2.0 mm in length. Protoconch sub-columnar, slightly inflated, of 2.75-3.0 whorls, 0.44-0.51 mm long, 0.41-0.48 mm wide, weak distinction between protoconch and teleoconch; first smooth, globose, but on subsequent whorls axial ribs soon appearing, with their adapical part emerging on the abapical part of the smooth whorl above, assuming an irregular shape, often considerably sigmoid on second whorl, but usually slightly sigmoid or nearly orthocline (sometimes opisthocline) towards the end of protoconch, where it numbers 20-22 ribs; one main spiral cord emerging soon after the axial ribs, keel-shaped and often smooth (but wrinkled in some shells), situated at 47-60% of last whorl height. Teleoconch with up to nine whorls; two spiral cords (adapical and abapical) at the beginning, the abapical one continuous to that of protoconch; median spiral cord emerging at the beginning of second to the end of third whorl, reaching the same size than other cords after one to two whorls; at the body whorl, the three cords are equidistant and have nearly the same size; 22-24 nearly orthocline axial ribs on the sixth whorl; rounded nodules of medium size; distinct suture, with a sutural cord; slightly nodulose to smooth subperipheral cord, two smooth, well-developed basal cords; no supranumerical cords; aperture ovate (with a minute notch in the posterior end), 0.50-0.81 mm long, 0.40-0.61 mm wide, length/width ratio 1.3-1.5; anterior canal short, open, 0.13-0.25 mm long, 0.14-0.28 mm wide, length/width ratio 0.8-0.9. Protoconch brownish, cream, golden or white; teleoconch dark to light brown, rarely beige; head-foot white, translucent.

Remarks

This species was previously known only from the holotype, which has a light brown teleoconch and white protoconch (Rolán & Fernández-Garcés 2015). An additional shell from the type locality in Guadeloupe is illustrated (Fig. 7J), with a darker teleoconch, which is the common pattern in shells of *Marshallora monteiroi* n. comb. from Martinique (Fig. 7). An exception is a shell with a gradual (not abrupt) color transition between the lighter protoconch and the cream/beige teleoconch (Fig. 7K), which is more similar to the planktotrophic species *Marshallora ostenta* Rolán & Fernández-Garcés, 2008, and it perhaps does not belong to *M. monteiroi* n. comb. The color of the protoconch is variable among shells of *M. monteiroi* n. comb., from white to brownish (Fig. 7). There are also slight variations in the protoconch sculpture, with a spiral cord usually smooth and situated at the mid portion of the whorl, but sometimes wrinkled or situated at a lower portion, in addition to the variable axial ribs (Fig. 8). Remarkably, the adult shell length ranges from 2.0 to 4.6 mm.

This species is placed under the Atlantic genus *Marshallora* owing to the brown teleoconch, smooth basal cords (Fig. 7L-M), absence of supranumerical cords (Fig. 7N) and white head-foot (Fig. 20I-J), among other features. There are other Caribbean species with paucispiral protoconchs currently allocated under the catch-all taxon "*Triphora*" that, otherwise, fit into the concept of *Marshallora*, following the above-mentioned features [including the white head-foot of one species – Redfern (2013: fig. 356B)]. These species are herein transferred to *Marshallora*, pending future anatomical and genetic studies to test these allocations: *Marshallora abacoensis* (Rolán & Lee, 2008) n. comb., *Marshallora armandoi* (Espinosa & Ortea, 2020) n. comb., *Marshallora calva* (Faber & Moolenbeek, 1991) [already cited in this genus by Fernandes & Pimenta 2020] and *Marshallora grenadensis* (Rolán & Lee, 2008) n. comb. The latter, only known from the holotype, is the most similar species to *M. monteiroi* n. comb., regarding slight differences in the color and sculpture of the protoconch (Rolán & Fernández-Garcés 2015), and possibly having a less inflated protoconch and slightly later emergence of the median spiral cord (emerging narrowly at the end of fourth teleoconch whorl – Rolán & Fernández-Garcés 2008: fig. 30D), requiring additional material for further comparisons.

Genus *Metaxia* Monterosato, 1884

Metaxia discus n. sp.
(Fig. 9A-F)

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TYPE MATERIAL. — **Holotype. Martinique.** • sh; North of Presqu'Île de la Caravelle, region 'Nord Atlantique'; MADIBENTHOS expedition; sta. AD245; 14°53'06"N, 60°3'24"W; depth 60 m; MNHN-IM-2000-38601.
Paratype. Martinique. MADIBENTHOS • 1 sh; type locality; MNHN-IM-2000-38602.

TYPE LOCALITY. — Martinique: North of Presqu'Île de la Caravelle, region 'Nord Atlantique'; MADIBENTHOS expedition sta. AD245, 14°53'06"N, 60°3'24"W; 60 m.

ETYMOLOGY. — From Latin, *discus*. The species is named due to the discoid shape of the protoconch.

DIAGNOSIS. — Protoconch with 2.5 much convex whorls, first whorl discoid, broad, with same width than second one, and with two spiral cords of varying expression; shell white.

GEOGRAPHIC DISTRIBUTION. — Martinique (this study).

BATHYMETRIC DISTRIBUTION. — Only known from 60 m.

DESCRIPTION
Shell dextral, conical/fusiform, rectilinear profile, up to 3.2 mm long, 0.8 mm wide, length/width ratio 3.5-4.1. Protoconch paucispiral, of 2.5 much convex whorls, 0.41-0.44 mm long, 0.34-0.37 mm wide; first whorl discoid, broad, with same width than second one, with two spiral cords on the adapical half of the whorl, having varying expression, the abapical cord more prominent and initially undulating (zigzag) to further nearly straight, and the adapical cord undulating (zigzag); on the second whorl, the two spiral cords having nearly the same width and being no longer restricted to the adapical portion of the whorl, situated respectively at *c.* 39% and *c.* 71% of whorl height, with small nodules, with incomplete, orthocline to slightly prosocline axial riblets located above adapical cord. Teleoconch with up to seven whorls; four equidistant spiral cords, with the first (adapical) cord being much smaller and the third cord the most prominent, in addition to a much reduced, smooth sutural cord; elliptical nodules of small size; *c.* 15 weak, orthocline axial ribs on the sixth teleoconch whorl; smooth and narrow subperipheral cord, no distinct basal cord; aperture rounded (but partially broken), with small anterior notch. Shell white.

REMARKS
Metaxia discus n. sp. superficially resembles the morph named *Metaxia* sp. 1 (Fig. 9G-H), from Barbados (Rolán & Fernández-Garcés 2008). The teleoconch of *Metaxia* sp. 1 has three main spiral cords, similarly to *Metaxia excelsa* (Faber & Molenbeek, 1991) or *Metaxia taeniolata* (Dall, 1889), whereas *M. discus* n. sp. has four main spirals in late whorls (i.e., the upper cord is stronger than that of *Metaxia* sp. 1, which seems a weak subsutural cord), similarly to *Metaxia rugulosa* (C. B. Adams, 1850). The protoconch of *Metaxia* sp. 1 is illustrated here (Fig. 9H), and, despite slightly worn, is more similar to *M. rugulosa* than to *M. discus* n. sp. (see comparisons below).

Despite having a nearly identical teleoconch, *M. discus* n. sp. is differentiated from the widespread West Atlantic species *M. rugulosa* by the discoid and truncated shape of the protoconch, often with undulating spiral cords (Fig. 9D), whereas the protoconch of *M. rugulosa* is always convex, with a dome-shaped first whorl and straight spiral cords in the second whorl (Rolán & Redfern 1996; Fernandes & Pimenta 2011).

Metaxia discus n. sp. has a protoconch similar to *Metaxia quadrata* Faber, 2010, which is known only by the holotype, from Aruba. However, the protoconch of *M. quadrata* seems to have three spiral cords on the first whorl (vs two cords in *M. discus* n. sp.), with a more accentuated zigzag pattern than in *M. discus* n. sp., although the second whorl of protoconch has a nearly rectilinear adapical spiral cord (but more undulating in *M. discus* n. sp.). In addition, the shell of *M. quadrata* is yellowish brown and it has a weaker axial sculpture (Faber 2010) vs entirely white in *M. discus* n. sp.

Metaxia excelsa Faber & Moolenbeek, 1991
(Figs 2C; 18J, L-O)

Metaxia excelsa Faber & Moolenbeek, 1991: 83.

MATERIAL EXAMINED. — **Guadeloupe. KARUBENTHOS 1** • 2 sh; sta. GB02; MNHN • 1 spm; sta. GB03; MNHN • 3 sh; sta. GB06; MNHN • 1 sh, 1 spm; sta. GS06; MNHN • 2 sh, 1 spm; sta. GB08; MNHN • 1 sh; sta. GB11; MNHN • 1 sh; sta. GS11; MNHN • 1 spm; sta. GB12; MNHN • 1 sh; sta. GB13; MNHN • 15 sh, 3 spm; sta. GS13; MNHN • 1 sh; sta. GB14; MNHN • 1 spm; sta. GS15; MNHN • 4 sh; sta. GB16; MNHN • 1 sh; sta. GS17; MNHN • 4 sh; sta. GS18; MNHN • 1 sh; sta. GS19; MNHN • 1 sh; sta. GS22; MNHN • 1 sh; sta. GB23; MNHN •

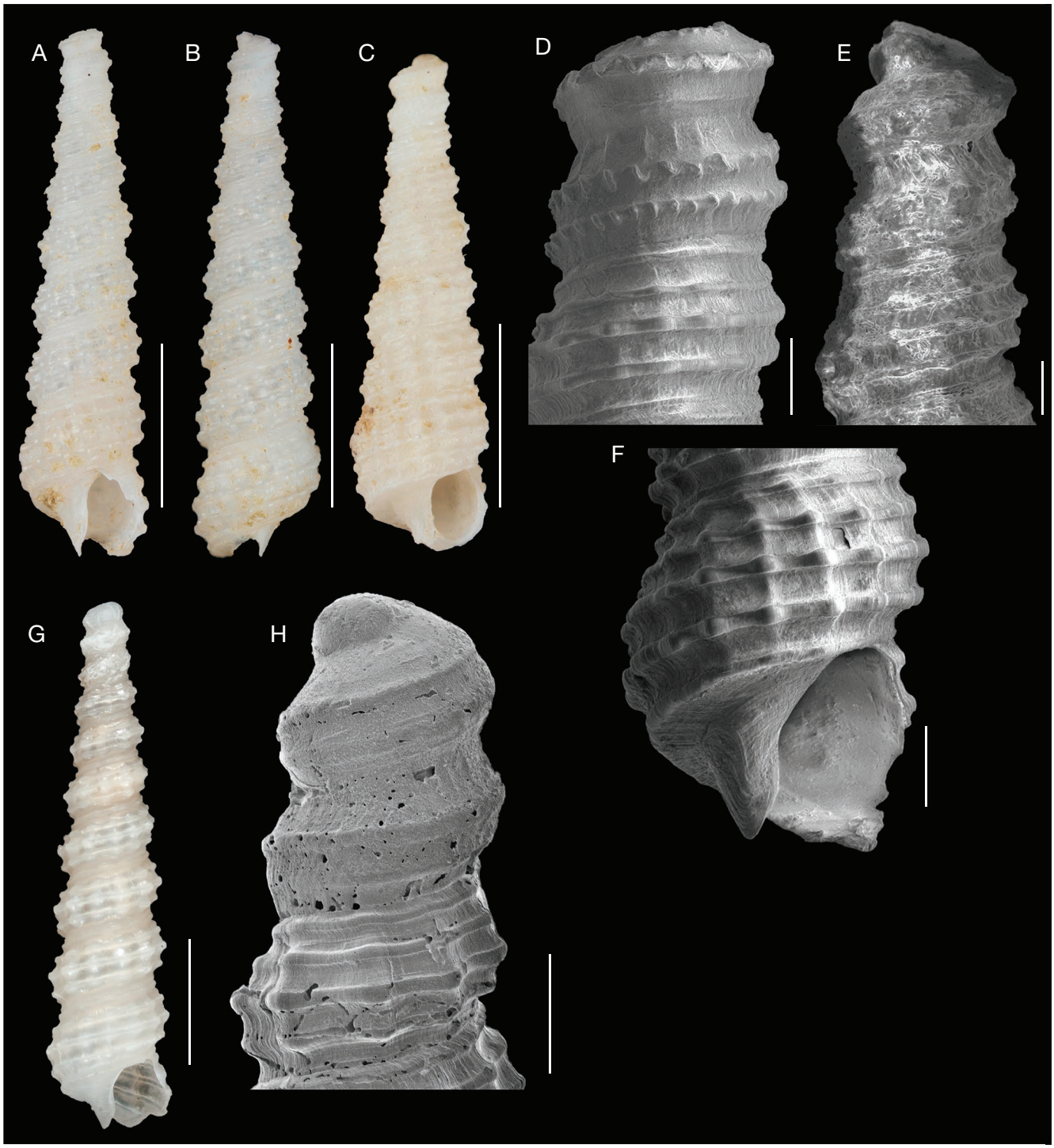

FIG. 9. — **A-F**, *Metaxia discus* n. sp. **A**, **B**, **D**, **F**, MNHN-IM-2000-38601, holotype, 3.2 mm; **C**, **E**, MNHN-IM-2000-38602, paratype, sta. AD245, 2.7 mm; **G**, **H**, *Metaxia* sp. 1 (morph named by Rolán & Fernández-Garcés [2008]), USNM 87301, 4.2 mm (vs 5.0 mm, according to Rolán & Fernández-Garcés [2008]); credits: Yolanda Villacampa (NMNH). Scale bars: A-C, G, 1 mm; D, E, 100 µm; F, H, 200 µm.

1 sh; sta. GS23; MNHN • 1 sh; sta. GB25; MNHN • 1 sh; sta. GB36; MNHN • 1 sh; sta. GD68; MNHN. — **KARUBENTHOS 2** • 1 sh; sta. DW4545; MNHN.

Martinique. **MADIBENTHOS. 'Nord Atlantique'** • 1 spm; sta. AB197; MNHN • 1 sh [worn]; sta. AD255; MNHN • 2 sh; sta. AD260; MNHN • 2 sh; sta. AD263; MNHN • 3 sh; sta. AD267; MNHN • 5 sh; sta. AD275; MNHN • 2 sh; sta. AS565; MNHN. — '**Sud Atlantique**' • 1 sh; sta. AD222; MNHN • 1 sh; sta. AB401; MNHN. — '**Nord Caraibe**' • 1 sh; sta. AB159; MNHN • 3 sh, 1 spm; sta. AB161; MNHN • 2 sh; sta. AD280; MNHN • 1 sh; sta. AD289; MNHN • 3 sh; sta. AD290; MNHN • 1 spm; sta. AB362; MNHN • 1 sh; sta. AS363; MNHN • 3 sh; sta. AB372; MNHN • 1 sh; sta. AS375; MNHN • 1 sh; sta. AB382; MNHN • 4 sh; sta. AB386; MNHN • 1 sh; sta. AB463; MNHN • 1 sh; sta. AB567; MNHN • 1 sh; sta. AS572; MNHN • 3 sh; sta. AS576; MNHN. 'Sud Caraibe' • 1 sh; sta. AB058; MNHN • 1 spm; sta. AB123; MNHN

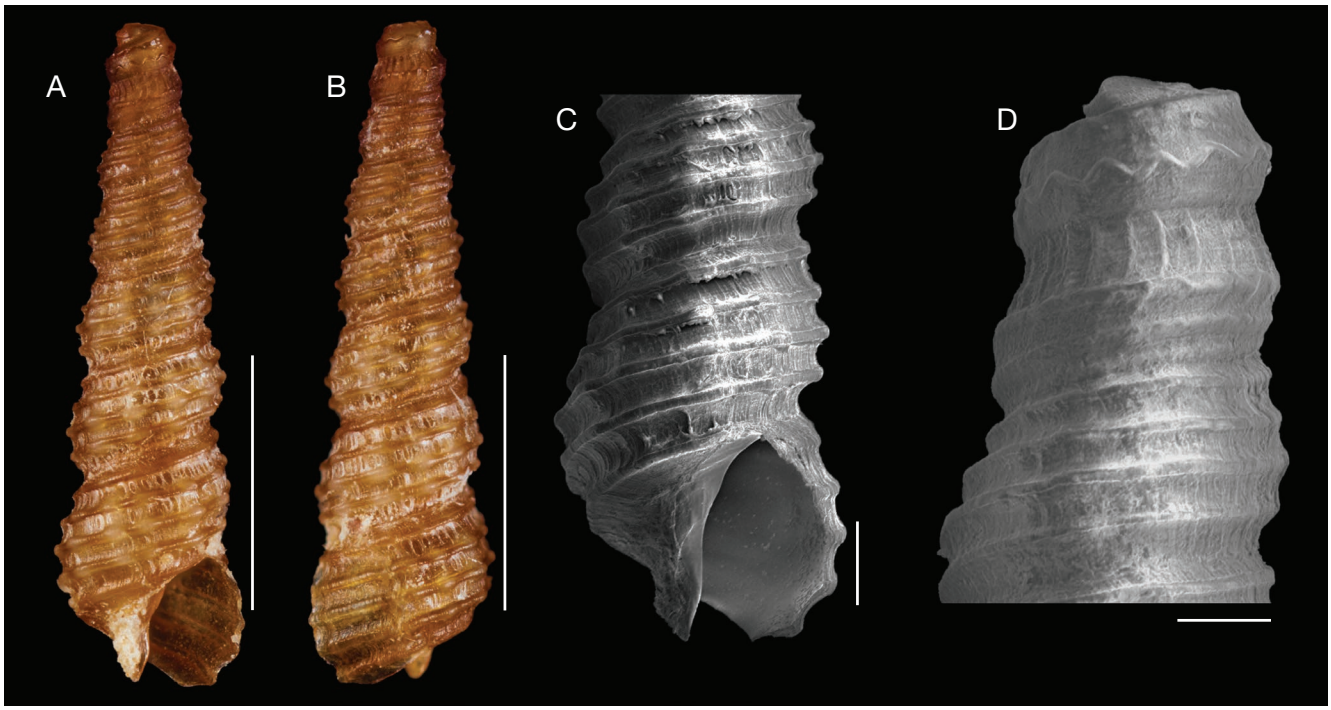

Fig. 10. — *Metaxia* sp. MNHN, sta. AB181, 2.6 mm. Scale bars: A, B, 1 mm; C, 200 µm; D, 100 µm.

• 2 sh; sta. AB150; MNHN • 2 sh; sta. AB152; MNHN • 2 sh; sta. AB169; MNHN • 1 sh; sta. AB173; MNHN • 2 sh; sta. AB177; MNHN • 1 sh; sta. AD203; MNHN • 2 sh; sta. AD216; MNHN • 1 sh [juvenile]; sta. AD271; MNHN • 1 sh; sta. AB354; MNHN • 1 sh; sta. AS370; MNHN • 1 sh; sta. AD617; MNHN. 'Baie de Fort-de-France' • 1 sh; sta. AB392; MNHN • 1 sh; sta. AB394; MNHN.

Bathymetric distribution. — Recorded depth in Guadeloupe: 3-60 m (live specimens at 14-50 m). Recorded depth in Martinique: 2-80 m (live specimens at 4-25 m). Previous recorded depth in the West Atlantic: 1-147 m (Fernandes & Pimenta 2020).

Metaxia rugulosa (C. B. Adams, 1850)
(Fig. 2D)

Cerithium rugulosum C. B. Adams, 1850: 121-122.

Material examined. — **Guadeloupe**. **KARUBENTHOS 1** • 1 sh; sta. GS13; MNHN • 1 sh; sta. GB14; MNHN • 1 sh; sta. GB30; MNHN. — **KARUBENTHOS 2** • 1 sh; sta. DW4586; MNHN. **Martinique**. **MADIBENTHOS**. **'Nord Atlantique'** • 1 sh; sta. AD244; MNHN • 1 sh; sta. AD260; MNHN • 2 sh; sta. AD261; MNHN • 2 sh; sta. AD263; MNHN • 1 sh; sta. AD265; MNHN • 4 sh; sta. AD275; MNHN. — **'Sud Atlantique'** • 1 sh; sta. AB120; MNHN • 1 sh; sta. AB185; MNHN. — **'Nord Caraibe'** • 1 sh; sta. AD277; MNHN • 1 sh; sta. AD280; MNHN • 1 sh; sta. AS363; MNHN • 1 sh; sta. AS576; MNHN. 'Sud Caraibe' • 1 sh; sta. AD067; MNHN • 1 sh; sta. AB150; MNHN • 1 sh; sta. AD218; MNHN. 'Baie de Fort-de-France' • 1 sh; sta. AB398; MNHN.

Bathymetric distribution. — Recorded depth in Guadeloupe: 16-50 m; one intact adult shell obtained by KARUBENTHOS 2 between 204-251 m, but it must be regarded with caution. Recorded depth in Martinique: 2-80 m. Previous recorded depth in the West Atlantic: 0-198 m (Fernandes & Pimenta 2020).

Remarks
The shell from Guadeloupe illustrated by Rolán & Fernández-Garcés (2015: fig. 4G) and Lamy & Pointier (2018: pl. 92, fig. 3) as *M. rugulosa* actually refers to *M. taeniolata* (Dall, 1889).

Metaxia taeniolata (Dall, 1889)
(Figs 2E; 19A, B)

Cerithiopsis metaxae var. *taeniolata* Dall, 1889: 256.

Material examined. — **Guadeloupe**. **KARUBENTHOS 1** • 1 sh [previously identified as *M. rugulosa*]; sta. GB08; MNHN • 1 sh [*idem*]; sta. GD10; MNHN • 1 sh [*idem*]; sta. GD31; MNHN. **Martinique**. **MADIBENTHOS**. **'Nord Atlantique'** • 1 spm; sta. AD261; MNHN • 1 sh; sta. AD275; MNHN • 1 sh; sta. AS552; MNHN. — **'Nord Caraibe'** • 1 sh; sta. AS572; MNHN.

Bathymetric distribution. — Recorded depth in Guadeloupe: 17-85 m. Recorded depth in Martinique: 18-80 m (live specimen at 80 m). Previous recorded depth in the West Atlantic: 4-101 m (Fernandes & Pimenta 2020).

Metaxia sp.
(Fig. 10)

Material examined. — **Martinique**. **MADIBENTHOS**. 'Sud Atlantique' • 1 sh; sta. AB181; MNHN.

Geographic distribution. — Only known from Martinique.

Bathymetric distribution. — Only known from 22 m.

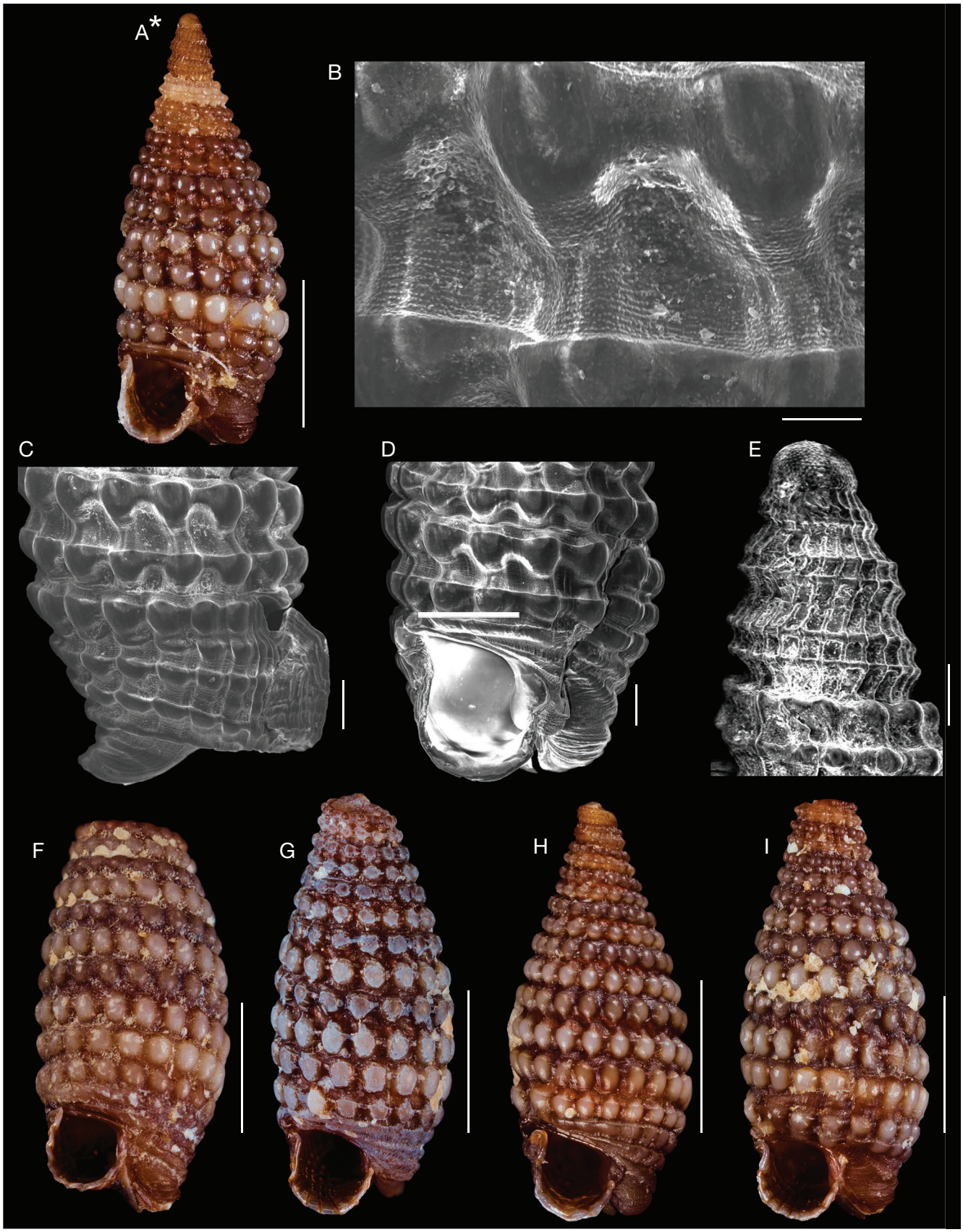

FIG. 11. — **A**-**E**, *Nanaphora decollata* (Rolán & Fernández-Garcés, 1994), MNHN, sta. GB09 (KARUBENTHOS 1), 2.9 mm; a weak micro-sculpture on the teleoconch is shown in **B**; **F**-**I**, *Nanaphora* cf. *verbernei* (Moolenbeek & Faber, 1989); **F**, **G**, MNHN, sta. AB130, both 3.0 mm; **H**, **I**, MNHN, sta. AB149, 2.8 mm, 3.1 mm. Scale bars: A, F-I, 1 mm; B, E, 100 µm; C, D, 200 µm.

Remarks

The single available shell of *Metaxia* sp. has a faint axial sculpture and a protoconch with 2.5 whorls (measuring 0.32 mm long, 0.31 mm wide), and its embryonic shell has a distinct, abapical zigzag spiral cord and a smaller, adapical spiral cord bordering the adapical portion of the whorl (Fig. 10D). It could be an atypical shell of *M. rugulosa*, regarding the wide variation in the embryonic shell of this species (Rolán & Redfern 1996), although Caribbean shells of *M. rugulosa* are usually white and have a coarse axial sculpture (Rolán & Fernández-Garcés 2007, 2008; Lee 2009). Most Brazilian shells of *M. rugulosa* are brown (Fernandes & Pimenta 2011, 2020), similarly to *Metaxia* sp. (Fig. 10A, B), which demands further studies – desirably with genetic evidence. *Metaxia propinqua* Rolán & Fernández-Garcés, 2008, from southern USA, has shells entirely white or with a white protoconch and light brown teleoconch. The white paratype of *M. propinqua* illustrated by Rolán & Fernández-Garcés (2008: fig. 1E-G) seems a typical shell of *M. rugulosa*, contrary to the bicolor holotype.

Another remarkably similar species to *Metaxia* sp. is *Metaxia quadrata* Faber, 2010, described from Aruba, based on a single (juvenile) shell. This species was described as yellowish brown, and the axial sculpture of the teleoconch is much faint, as observed in *Metaxia* sp. (Faber 2010). The apparent single difference between them is that *M. quadrata* has three spiral cords (vs two in *Metaxia* sp.) on the first protoconch whorl. Because *Metaxia* species are mainly differentiated by subtle differences in protoconch morphology, more material from the Lesser Antilles is required to properly evaluate the taxonomy of this morph from Martinique.

Genus *Monophorus* Grillo, 1877

Monophorus olivaceus (Dall, 1889)
(Figs 2F; 19C-F)

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

Material examined. — **Guadeloupe**. **KARUBENTHOS 1** • 1 sh, 1 spm; sta. GB03; MNHN • 1 sh; sta. GS06; MNHN • 1 sh; sta. GS07; MNHN • 3 sh; sta. GS08; MNHN • 3 sh; sta. GD10; MNHN • 2 sh; sta. GB11; MNHN • 1 sh; sta. GB12; MNHN • 15 sh, 1 spm; sta. GS13; MNHN • 5 sh; sta. GB14; MNHN • 2 sh; sta. GD15; MNHN • 1 sh; sta. GS16; MNHN • 2 sh; sta. GS18; MNHN • 2 sh [juveniles]; sta. GB19; MNHN • 1 spm; sta. GD21; MNHN • 1 sh; sta. GS21; MNHN • 3 sh; sta. GB22; MNHN • 1 sh; sta. GS22; MNHN • 1 sh; sta. GB24; MNHN • 1 sh; sta. GB25; MNHN • 2 sh; sta. GS26; MNHN • 1 sh; sta. GS29; MNHN • 2 sh [juveniles]; sta. GR34; MNHN • 1 sh; sta. GB36; MNHN • 1 sh; sta. GD61; MNHN.
Martinique. **MADIBENTHOS**. '**Nord Atlantique**' • 1 sh; sta. AR143; MNHN • 1 sh; sta. AB197; MNHN • 1 sh; sta. AB199; MNHN • 1 sh; sta. AD254; MNHN • 1 sh [juvenile]; sta. AD260; MNHN • 1 sh; sta. AD263; MNHN • 6 sh; sta. AB556; MNHN • 8 sh; sta. AS557; MNHN • 3 sh; sta. AB559; MNHN • 1 sh; sta. AB562; MNHN • 7 sh; sta. AS565; MNHN. — '**Sud Atlantique**' • 1 sh; sta. AD084; MNHN • 1 spm; sta. AB185; MNHN • 1 sh; sta. AS255; MNHN • 3 sh [juveniles]; sta. AB405; MNHN. — '**Nord Caraibe**' • 5 sh; sta. AB108; MNHN • 8 sh; sta. AB159; MNHN • 2 sh; sta. AB161; MNHN • 1 sh, 1 spm; sta. AD283; MNHN • 1 sh; sta. AD294; MNHN • 4 sh; sta. AR308; MNHN • 1 sh; sta. AB362; MNHN • 1 sh; sta. AS365; MNHN • 1 sh; sta. AB372; MNHN • 2 sh; sta. AS373; MNHN • 10 sh; sta. AS375; MNHN • 7 sh; sta. AB377; MNHN • 2 sh; sta. AS378; MNHN • 2 sh; sta. AB386; MNHN • 1 sh; sta. AB388; MNHN • 1 spm; sta. AR461; MNHN • 1 sh [juvenile]; sta. AB510; MNHN • 5 sh; sta. AS570; MNHN • 2 sh; sta. AS572; MNHN • 1 sh; sta. AS574; MNHN • 5 sh; sta. AS576; MNHN. 'Sud Caraibe' • 1 sh; sta. AS066; MNHN • 1 sh; sta. AS071; MNHN • 1 sh; AR100; MNHN • 1 sh; sta. AR122; MNHN • 1 sh; sta. AB126; MNHN • 6 sh; sta. AB150; MNHN • 1 spm; sta. AB152; MNHN • 1 sh; sta. AB155; MNHN • 3 sh; sta. AB177; MNHN • 1 sh; sta. AD271; MNHN. 'Baie de Fort-de-France' • 1 sh; sta. AB394; MNHN • 2 sh; sta. AS581; MNHN.

Bathymetric distribution. — Recorded depth in Guadeloupe: 9-80 m (live specimens at 22-50 m). Recorded depth in Martinique: 2-80 m (live specimens at 4-40 m). Previous recorded depth in the West Atlantic: 0-120 m, with discrepant records down to 260 m (Fernandes & Pimenta 2020).

Genus *Nanaphora* Laseron, 1958

Nanaphora decollata
(Rolán & Fernández-Garcés, 1994)
(Fig. 11A-E)

Cheirodonta decollata Rolán & Fernández-Garcés, 1994: 20, figs 19-21, 23-24, 30CD; 2007: 20, pl. 1, figs 6-11. — Zhang 2011: 99, fig. 289. — Redfern 2013: 127, fig. 361. — Lamy & Pointier 2018: 284, pl. 91, fig. 2.

Nanaphora decollata – Fernandes & Pimenta 2015: 502. — Rolán & Fernández-Garcés 2015: 53, fig. 4V.

Type material. — **Holotype. Cuba** • sh; MNCN 15.05/11142. **Paratypes.** See the original description.

Type locality. — Cuba: Marianao beach, La Habana.

Material examined. — **Guadeloupe**. **KARUBENTHOS 1** • 1 sh; sta. GB09; MNHN.

Geographic distribution. — Bahamas (Redfern 2013); Cuba (Rolán & Fernández-Garcés 1994); Cayman (this study); Antigua (Zhang 2011); Guadeloupe (Rolán & Fernández-Garcés 2015; Lamy & Pointier 2018; this study).

Bathymetric distribution. — Recorded depth in Guadeloupe: 6 m. Previous recorded depth in the West Atlantic: 2 m (Rolán & Fernández-Garcés 1994) to 14 m (Redfern 2013).

Remarks

Nanaphora decollata was originally described in *Cheirodonta* Marshall, 1983, a genus with only two confirmed species, i.e., the type species *Cheirodonta pallescens* (Jeffreys, 1867) from the East Atlantic and *Cheirodonta dupliniana* (Olsson, 1916) from the West Atlantic, plus a third species [*Cheirodonta labiata* (A. Adams, 1854), from Australia] with a tentative allocation (Marshall 1983; Fernandes & Pimenta 2015). The Atlantic species of *Cheirodonta* have radula with multicuspid teeth, of which the marginal are much elongated (Bouchet & Guillemot 1978; Bouchet 1985; Fernandes & Pimenta 2019b). In fact, there are significant

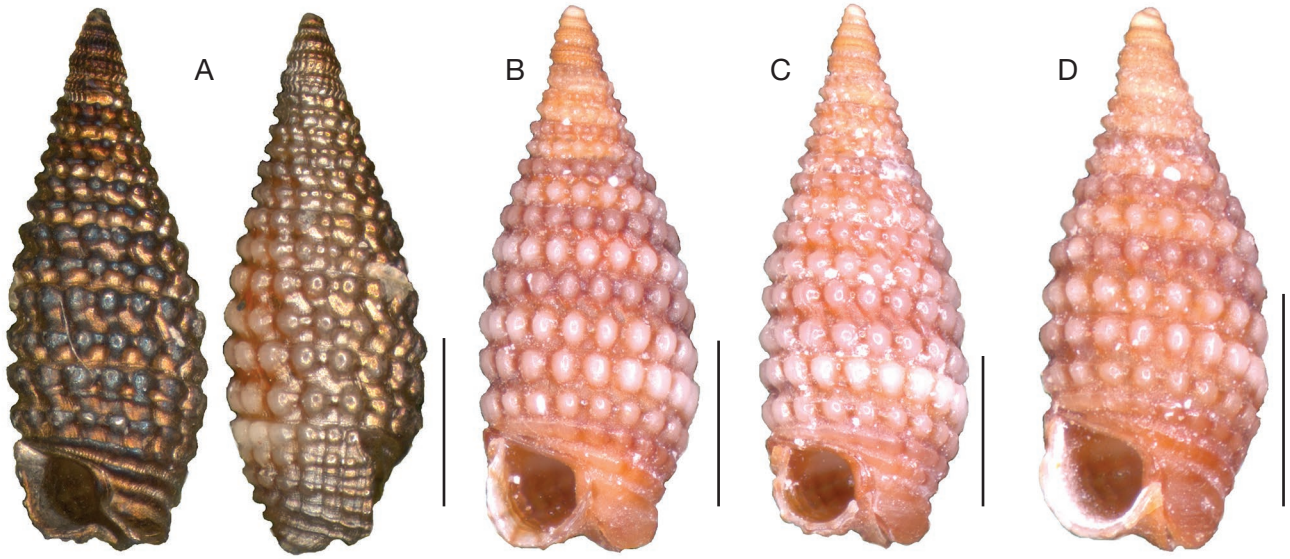

Fig. 12. — Types of *Nanaphora verbernei* (Moolenbeek & Faber, 1989); credits to MSc. Hannco Bakker; **A**, ZMA.MOLL.136613, holotype; **B**-**D**, ZMA.MOLL.136655, paratypes. Scale bars: 1 mm.

similarities between the radula of *N. decollata* (Rolán & Fernández-Garcés 1994) and those of *Cheirodonta*, mainly in the morphology of the lateral teeth, with the central and marginal teeth of *N. decollata* being also similar to those of *C. dupliniana*, but slightly different from those of *C. pallescens*, which shows central tooth with a diastema and marginal teeth with cusps restricted to the distal part of the basal plate. The protoconch of *N. decollata* is also slightly similar to that of *Cheirodonta*, bearing granules on the embryonic shell and two spiral cords on the larval shell (Fig. 11E), although the former protoconch is shorter and its whorls are more convex. The most discrepant differences between *N. decollata* and *Cheirodonta* rely on teleoconch features, with the former showing a small and ovoid shell shape, nodules much larger (including the subperipheral and basal cords) and a much reduced suture (Fig. 11A). These conditions are also observed in other West Atlantic species, which, perhaps prematurely, led Fernandes & Pimenta (2015) to include them in *Nanaphora*, a probably non-monophyletic genus which shows species with different patterns of embryonic and larval shell sculptures, and whose type species has a paucispiral protoconch (hindering comparisons) and unknown radula (Marshall 1983; Fernandes & Pimenta 2015). Citing Fernandes & Pimenta (2015: 502), "the affinity among the genera *Nanaphora*, *Opimaphora* Laseron, 1958 and *Cheirodonta* makes necessary a taxonomic revision of them to achieve a precise delimitation of each genus", including a further molecular phylogeny.

Two unusual teleoconch features of *N. decollata* were indicated by Rolán & Fernández-Garcés (1994) and Redfern (2013), and are confirmed here. The presence of micro-sculpture (Fig. 11B) is not widespread in Triphoridae (Marshall 1983; Fernandes & Pimenta 2020), but some species currently allocated in *Nanaphora* may show it (Marshall 1983; see also the next species). Another remarkable feature of *N. decollata* is the emergence of the median spiral cord not between the adapical and abapical cords, as observed in most triphorids, but derived from a split of the adapical cord on the body whorl (Fig. 11C), after the adapical cord had become axially elongated – it does not seem a supranumerical cord (Bouchet 1985; Fernandes & Pimenta 2015). The splitting of one spiral cord into two cords is observed in some species of Cerithiopsidae H. Adams & A. Adams, 1853, and it was reported in a Triphoridae species from Ascension Island (Bakker & Swinnen 2021), although with a different formation and major divergences in the shell.

Rosenberg (2009) cited two new localities for the Caribbean range of *Nanaphora verbernei* (Moolenbeek & Faber, 1989), i.e., Cayman and Grenada, based on material from the ANSP collection. After checking images of the single lots for such localities (ANSP 200078, Grand Cayman Is., 2 m - 2.8 mm long, with protoconch; ANSP 296542, Prickly Bay, Grenada, 0-1 m - 3.5 mm long, without protoconch), the material from Cayman actually refers to *N. decollata*, whereas that from Grenada is worn and precludes further identification (although it seems *N. decollata*). The main difference between both species is the spiral sculpture of the protoconch, since *N. decollata* has always two spiral cords (Fig. 11E). Shells without apex may be much similar owing to the ovoid shape and bifurcating adapical spiral cord of teleoconch (for *N. verbernei*, see Fig. 13B and Moolenbeek & Faber 1989: fig. 8). Rolán & Fernández-Garcés (1994) argued that the white band is only seen in the adapical cord of *N. decollata*, but it can be also present in the abapical cord in the penultimate whorl of *N. verbernei*, which is seen in most shells from Martinique without apex (Fig. 11F-I); even though, it is preferred to name these decollate shells as *N.* cf. *verbernei*, and so far *N. decollata* is absent from Martinique.

Nanaphora verbernei (Moolenbeek & Faber, 1989)
(Figs 12; 13)

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

Triphora exiguum non C. B. Adams, 1850 – De Jong & Coomans 1988: 49.

Cheirodonta verbernei – Rolán & Fernández-Garcés 1994: 20, figs 17-18, 22, 30 CV.

Cosmotriphora verbernei – Rolán & Fernández-Garcés 2007: 20, pl. 1, figs 17-18.

Nanaphora verbernei – Fernandes & Pimenta 2015: 500 (new generic allocation, but the species was misidentified – see below).

Type material. — **Holotype. Curaçao** • sh; ZMA.MOLL.136613. **Paratypes. Curaçao** • 19 sh; type locality; ZMA.MOLL.136655.

Type locality. — Curaçao: Boca Labadera, Santa Catarina, beach.

Material examined. — **Guadeloupe**. **KARUBENTHOS 1** • 1 sh [worn – previously identified as *Nanaphora decollata*]; sta. GM06; MNHN • 1 sh [*idem*]; sta. GM11; MNHN • 1 sh [juvenile – previously identified as *Coriophora novem*]; sta. GS13; MNHN. — **KARUBENTHOS 2** • 1 sh; sta. DW4545; MNHN • 1 sh [juvenile]; sta. DW4551; MNHN.
Martinique. **MADIBENTHOS. 'Nord Atlantique'** • 1 sh; sta. AD261; MNHN • 1 sh; sta. AD275; MNHN. — '**Nord Caraibe**' • 1 sh; sta. AD280; MNHN. 'Sud Caraibe' • 1 sh; sta. AD115; MNHN.

Material examined of *Nanaphora* cf. *verbernei* (Figs 1 F-I; 1 I). — **Martinique**. 'Sud Atlantique' • 4 sh; sta. AB130; MNHN • 2 sh, 1 spm; sta. AB149; MNHN.

Geographic distribution. — Cuba (Rolán & Fernández-Garcés 1994); Puerto Rico (Moolenbeek & Faber 1989); Guadeloupe and Martinique (this study); Bonaire and Curaçao (Moolenbeek & Faber 1989).

Bathymetric distribution. — Recorded depth in Guadeloupe: 0-82 m. Recorded depth in Martinique: 11-80 m. Recorded depth of *N.* cf. *verbernei* in Martinique: 1-2 m (live specimen at 2 m). Previous recorded depth in the West Atlantic: 0-90 m (Moolenbeek & Faber 1989).

Emended description

Shell sinistral, cyrtoconoid, convex profile, up to 3.9 mm long, 1.4 mm wide, length/width ratio 2.8-3.0. Protoconch multispiral, conical/columnar, of 5.0-5.5 slightly convex whorls, 0.54-0.57 mm long, 0.42-0.44 mm wide; embryonic shell dome-shaped, covered by rounded granules; larval shell initially with two spiral threads but adapical one soon disappearing, with one spiral cord (abapical) remaining until the emergence of adapical cord in the penultimate whorl, the two cords situated at 32-36% and 61-68% of last whorl height; *c.* 27 nearly rectilinear to slightly sigmoid axial ribs. Teleoconch with up to nine whorls; two spiral cords (adapical and abapical) at the beginning, abapical one continuous to that of protoconch; median spiral cord emerging narrowly at sixth or seventh whorl, bordering close the adapical cord, reaching the same size of abapical cord (adapical one is slightly more prominent on body whorl) after 1.5-2.0 whorls; rounded nodules of large size; 17-19 opisthocline axial ribs on seventh whorl; shallow suture, with small sutural cord; spiral micro-sculpture present in all teleoconch; subperipheral cord nodulose, adapical basal cord slightly nodulose to wavy, nearly smooth abapical basal cord; supranumerical cords not discernible (but peristome never intact); nearly circular aperture, 0.55-0.57 mm long, 0.50-0.58 mm wide, length/width ratio 0.9-1.1; anterior canal almost closed, crossed in its base by projection of outer lip, slightly curved backward, 0.34-0.50 mm long, 0.22-0.26 mm wide, length/width ratio 1.3-2.2; posterior canal as a small hole, detached from aperture. Light brown to orange protoconch; teleoconch light brown to nearly orange, with adapical spiral cord often whitish on body whorl, and some shells also show abapical cord lighter than adapical cord on mid whorls.

Remarks

The author initially allocated this species in *Coriophora* due to the spiral sculpture of the protoconch (Fig. 13H, K), combined with a micro-sculpture on teleoconch (Fig. 13G, J), shell shape, opisthocline axial ribs, shallow suture and late emergence of median spiral cord of teleoconch (Fig. 13A-E) – regarding there are substantial divergences between the single species from the West Atlantic (*C. novem*) and the type species of *Coriophora* (Fernandes & Pimenta 2020). However, after reviewing details on the protoconch sculpture of *Nanaphora verbernei* in the literature from the Caribbean (Moolenbeek & Faber 1989; Rolán & Fernández-Garcés 1994), an error was detected. Fernandes & Pimenta (2015) interpreted the embryonic shell of the Caribbean species as reticulated (following shells from Brazil), owing to the inadequate SEM images previously available, despite being described with hemispheric tubercles in the material from Cuba (Rolán & Fernández-Garcés 1994). Fernandes & Pimenta (2015) also considered that *N. verbernei* had always two spiral cords in the larval shell, following shells from Brazil and the dubious image of a shell from Cuba (Rolán & Fernández-Garcés 1994: fig. 22, which is bright in part of the protoconch, hampering a proper visualization), but they equivocally contested the description of the larval shell as having initially one but further two spiral cords (Moolenbeek & Faber 1989: fig. 7). In fact, the Caribbean *N. verbernei* has rounded granules on the embryonic shell and the pattern 2-1-2-(1) spiral cords on the larval shell (Fig. 13H, K). The Brazilian morph, despite showing a much similar teleoconch morphology, is not *N. verbernei*, as indicated by discrepant features on the radula and on the color of living specimens (Fernandes & Pimenta 2019b), and it will be discussed under the following species. Accordingly, the record of *N. verbernei* from Antigua (Zhang 2011) is related to the next species, and the records from Cayman and Grenada (Rosenberg 2009) are invalid (see remarks of *N. decollata*).

The identification of *N. verbernei* from Guadeloupe by Rolán & Fernández-Garcés (2015), and followed by Lamy & Pointier (2018), is also incorrect (see next species); the real *N. verbernei* was hidden under the names of two other species (see material examined). Because E. Rolán was one reviewer of the manuscript that resulted in Fernandes & Pimenta (2015), nearly at the same time of the publication of Rolán & Fernández-Garcés (2015), it may have influenced the wrong identification of shells from Guadeloupe. Comparing the material from Gua-

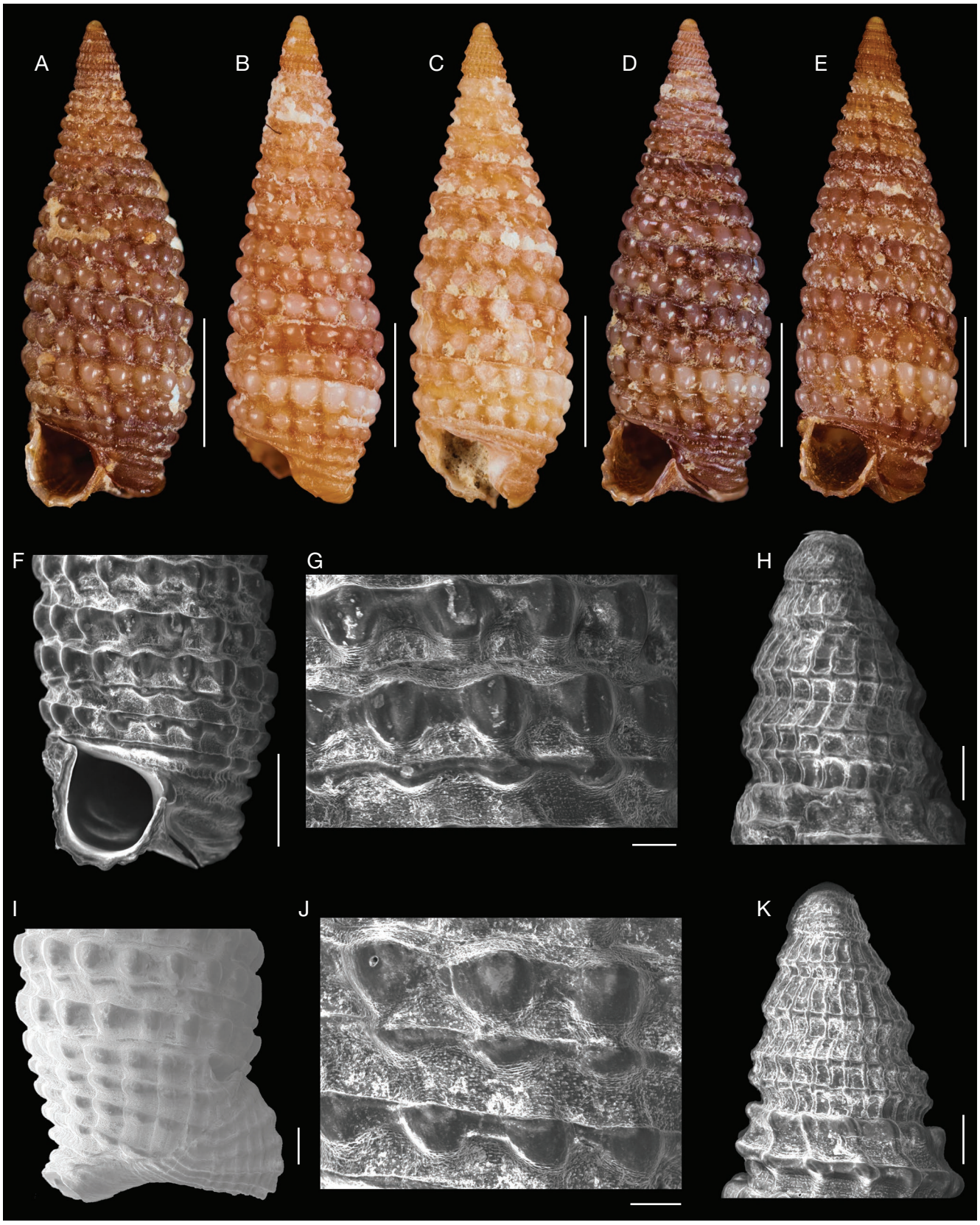

FIG. 13. — *Nanaphora verbernei* (Moolenbeek & Faber, 1989): **A**, MNHN, sta. GM11 (KARUBENTHOS 1), 3.8 mm; **B**, MNHN, sta. AD115, 3.9 mm; **C**, MNHN, sta. AD261, 3.7 mm; **D**, **F-I**, MNHN, sta. AD280, 3.9 mm; **E**, **J**, **K**, MNHN, sta. DW4545 (KARUBENTHOS 2 expedition), 3.8 mm. A weak micro-sculpture on the teleoconch is shown in **G**, **J**. Scale bars: A-E, 1 mm; F, 500 µm; G-H, J-K, 100 µm; I, 200 µm.

deloupe and Martinique with previous records from Caribbean (Moolenbeek & Faber 1989; Rolán & Fernández-Garcés 1994, 2007), shells from the French Antilles seem to be slightly darker and may reach up to 3.9 mm vs 3.5 mm (in Cuba, but with a broken apex) and 3.2 mm (holotype); as consequence, they are less ovoid than small shells. Moolenbeek & Faber (1989) already noticed a micro-sculpture on the teleoconch of *N. verbernei* (Fig. 13G, J), in addition to supranumerical cords, which were not evident in the present material owing to the broken or repaired condition of the peristome in all shells (Fig. 13I), but are evident in the holotype (Fig. 12A). The definitive generic placement of this species may require a molecular phylogeny; despite similarities with the shell of *C. novem* (as abovementioned), the radula of *N. verbernei* is strikingly different (Rolán & Fernández-Garcés 1994, 1995).

The head-foot of a specimen with a decollate shell, herein determined as *N.* cf. *verbernei*, is whitish (Fig. 19I), agreeing with the description of the external morphology of this species by Rolán & Fernández-Garcés (1994).

Nanaphora leei Fernandes & Pimenta, 2015
(Figs 14; 15; 19G-H)

Nanaphora leei Fernandes & Pimenta, 2015: 503, fig. 5.

Cheirodonta verbernei non Moolenbeek & Faber, 1989 – Zhang 2011: 99, fig. 288. — Lamy & Pointier 2018: 284, pl. 91, fig. 3.

Nanaphora verbernei non Moolenbeek & Faber, 1989 – Fernandes & Pimenta 2015: 500, fig. 4. — Fernandes & Pimenta 2019b: 30, figs 2G, 19-20. — Fernandes & Pimenta 2020: 152, figs 23R, 84A. — Rolán & Fernández-Garcés 2015: 53, fig. 4W. — Bandeira 2019: 24, 56. — Cesar 2020: 40, fig. 8D.

Nanaphora leei – Fernandes & Pimenta 2020: 55, fig. 23Q.

Type material. — **Holotype. Brazil** • sh; Espírito Santo state, Guarapari, Praia de Meaípe; depth 20-25 m; MNRJ 34086.
Paratypes. Brazil • 2 sh; Rio de Janeiro state, Campos Basin; 22°42' S, 40°40' W; 2007; MNRJ 29765.

Type locality. — Brazil: Espírito Santo state, Guarapari, Praia de Meaípe; 20-25 m.

Material examined. — **Guadeloupe**. **KARUBENTHOS 1** • 1 sh; sta. GS14; MNHN • 1 sh; sta. GS34; MNHN.
Martinique. **MADIBENTHOS**. '**Nord Atlantique**' • 1 sh; sta. AB197; MNHN • 2 sh; sta. AB260; MNHN • 1 sh; sta. AS557; MNHN. — '**Sud Atlantique**' • 1 sh; sta. AB191; MNHN • 1 sh; sta. AB195; MNHN • 1 sh; sta. AS252; MNHN • 1 sh, 1 spm; sta. AB400; MNHN • 1 spm; sta. AB419; MNHN • 6 sh; sta. AB452; MNHN. — '**Nord Caraibe**' • 1 sh; sta. AB567; MNHN. 'Sud Caraibe' • 1 sh; sta. AM038; MNHN • 1 sh; sta. AS075; MNHN • 1 sh; sta. AB360; MNHN.

Geographic distribution. — Antigua (Zhang 2011); Guadeloupe (Rolán & Fernández-Garcés 2015; Lamy & Pointier 2018; this study); Martinique (this study); Brazil: Ceará (Bandeira 2019) to Santa Catarina (Fernandes & Pimenta 2020).

Bathymetric distribution. — Recorded depth in Guadeloupe: 8-15 m. Recorded depth in Martinique: 0-26 m (live specimens at 2-17 m). Previous recorded depth in the West Atlantic: 0-45 m (Fernandes & Pimenta 2015, 2020).

Emended description
Shell sinistral, elongated, cyrtoconoid to nearly ovoid, slightly convex profile, up to 5.0 mm long, 1.9 mm wide, length/width ratio 2.4-2.9; adult shells reach at least 3.0 mm in length. Protoconch multispiral, conical/columnar, of 3.75-4.25 convex whorls, 0.37-0.44 mm long, 0.32-0.33 mm wide; embryonic shell dome-shaped, reticulated, covered by axial threads and *c.* 10-14 micro-spiral threads; larval shell with two spiral cords, situated at 31-41% and 54-71% of last whorl height, but adapical cord may disappear before transition to the teleoconch; *c.* 30-35 nearly rectilinear to slightly sigmoid axial ribs. Teleoconch with up to ten whorls; two spiral cords (adapical and abapical) at the beginning, abapical one continuous to that of protoconch, and being slightly more prominent than adapical one in early whorls; median spiral cord often emerging at eighth or ninth whorl, rarely at seventh whorl, bordering the adapical cord, and reaching the same size of abapical cord (adapical one is slightly more prominent on body whorl) after nearly one whorl; rounded nodules of large size; 15-18 nearly orthocline to slightly opisthocline axial ribs on seventh whorl; shallow suture, with small sutural cord; subperipheral and adapical basal cords thick and nodulose, wavy abapical basal cord; two minute supranumerical cords may emerge near peristome, one between median and abapical spiral cords, the other between abapical and subperipheral cords; nearly circular to slightly rhomboid aperture, 0.56-0.74 mm long, 0.48-0.73 mm wide, length/width ratio 1.0-1.4; partly closed anterior canal, crossed in its base by projection of outer lip, 0.22-0.42 mm long, 0.12-0.26 mm wide, length/width ratio 1.0-2.5; deep posterior canal, almost detached from aperture. Golden to light brown protoconch; teleoconch light brown or cream, resembling wax or varnished, with adapical spiral cord considerably or faintly darker than abapical cord, which has whitish nodules; head-foot with whitish background, but red patches distributed along the entire extension (including the foot sole), except at the cephalic tentacles and the very anterior (11% of sole length) and very posterior (10% of sole length) extremities of the foot sole, which are translucent with small white dots.

Remarks
Nanaphora leei was described from Southeast Brazil, supposedly with minor divergences when compared to the Brazilian records of the so-called *N. verbernei*, such as shell and protoconch size, shell shape and emergence of the median spiral cord of teleoconch (Fernandes & Pimenta 2015). Because the Brazilian record of *N. verbernei* was misidentified (see above), the remaining doubt is whether it constitutes a new species or whether, after the evaluation of additional material, it also refers to *N. leei*. Some typical shells of *N. leei* (following the type material) were obtained from Martinique and Guadeloupe (Fig. 14A, B), as well as typical shells of the so-called *N. verbernei* from Brazil (Fig. 14L), comprising adult shell sizes from 3.0 to 5.0 mm (the holotype reaches 5.8 mm), shell shape more elongated to more ovoid depending on shell size (Fig. 14), and emergence of the median spiral cord between seventh and ninth whorls (also depending on shell size, i.e., smaller shells have an earlier

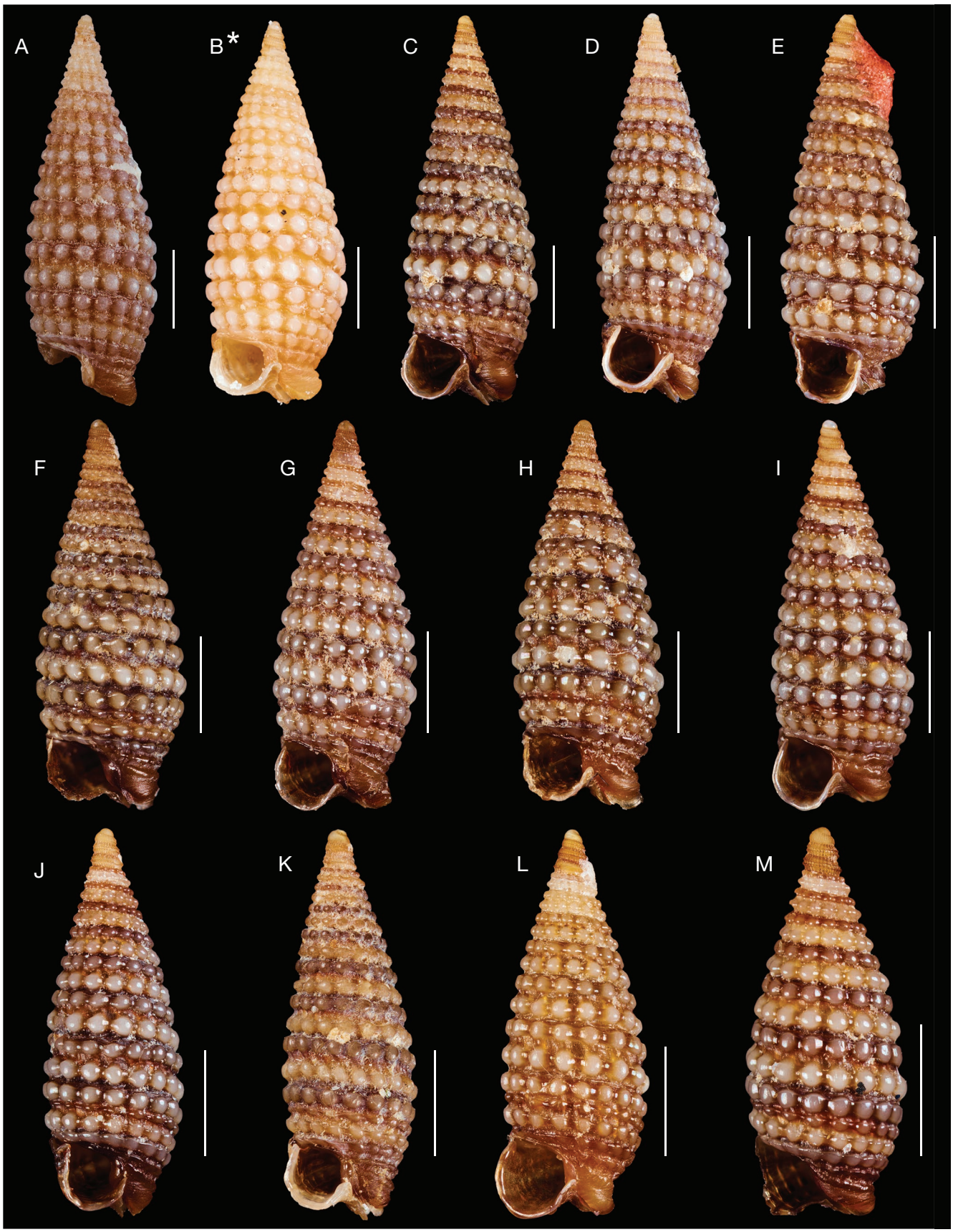

FIG. 14. — *Nanaphora leei* Fernandes & Pimenta, 2015: **A**, MNHN, sta. AS075, 5.0 mm; **B**, MNHN, sta. GS34 (KARUBENTHOS 1), 4.9 mm; **C**, MNHN, sta. AB191, 4.8 mm; **D**, **E**, MNHN, sta. AB260, 4.3 mm, 4.2 mm; **F**, MNHN, sta. AS252, 4.1 mm; **G**, MNHN, sta. AB197, 3.9 mm; **H**, MNHN, sta. AB567, 3.9 mm; **I**, MNHN, sta. AB195, 3.9 mm; **J**, MNHN, sta. AB360, 3.7 mm; **K**, MNHN, sta. AB400, 3.7 mm; **L**, MNHN, sta. AS557, 3.6 mm; **M**, MNHN, sta. AB419, 3.0 mm. Scale bars: 1 mm.

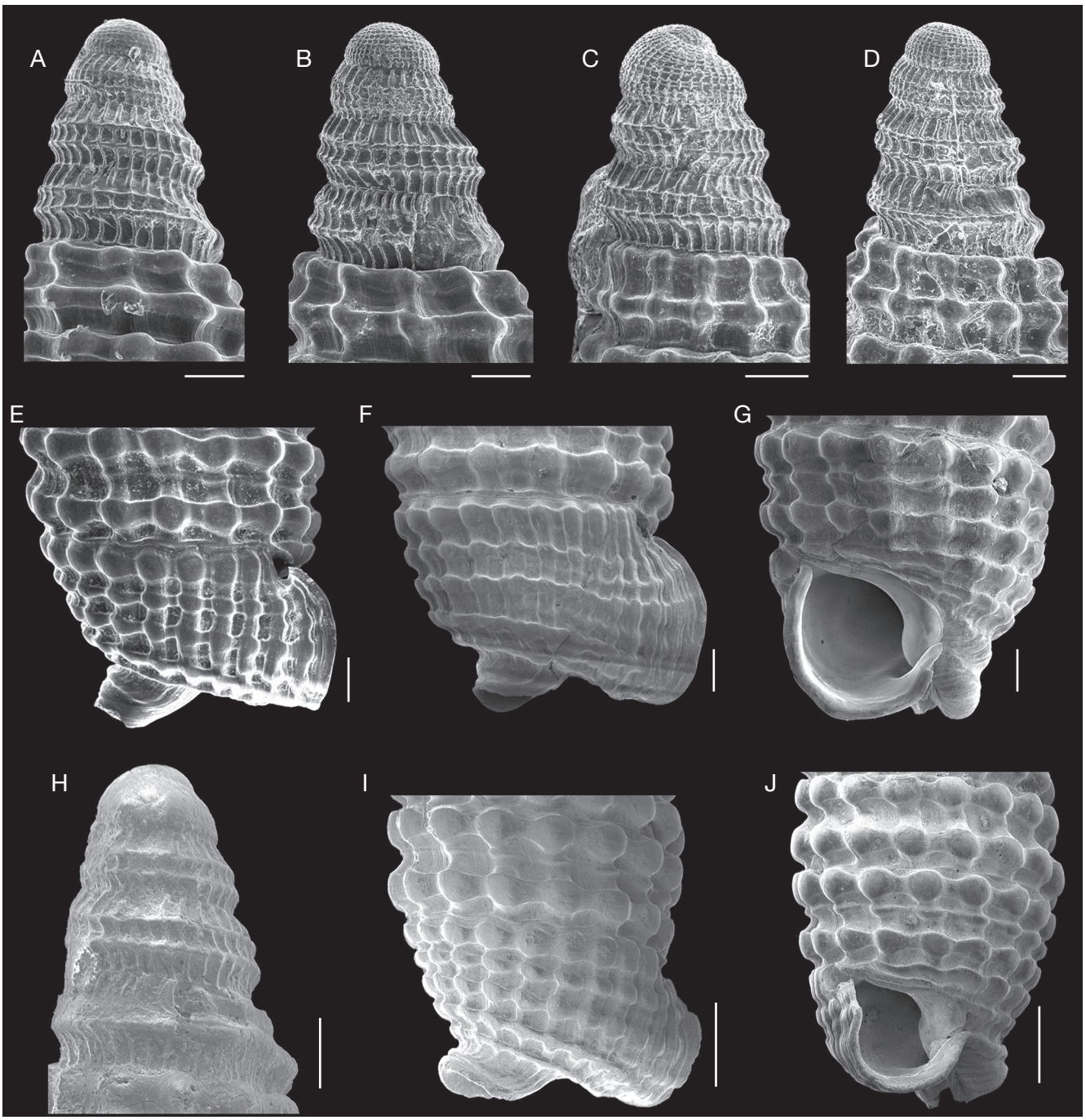

Fig. 15. — *Nanaphora leei* Fernandes & Pimenta, 2015: **A**, MNHN, sta. AB197; **B**, MNHN, sta. AB567; **C**, **E**, MNHN, sta. AB360; **D**, MNHN, sta. AB419; **F**, **G**, MNHN, sta. AS557; **H**-**J**, MNHN, sta. GS34 (Karubenthos 1) (Fig. 14B). Scale bars: A-D, H, 100 µm; E-G, 200 µm; I-J, 500 µm.

emergence of the median cord). Another evident variation is related to the color of the adapical spiral cord, which can be considerably light brown (Fig. 14C, K) or similar to the background (Fig. 14L), but never whitish as in most shells of true *N. verbernei* from Caribbean. With the current knowledge mainly limited to shell features, this high variation is conservatively considered as intraspecific of *N. leei*, which now has a known geographic distribution extended deeply into the Caribbean, including Antigua (Zhang 2011). One shell from Bahamas (Redfern 2013: fig. 368B), identified as *Monophorus ateralbus* Rolán & Fernández-Garcés, 1994, is also possibly related to *N. leei*, but its broken apex precludes further comparisons.

Fernandes & Pimenta (2015) cited divergences between *N. leei* and *M. ateralbus* related to shell color and emergence of the median spiral cord. With the additional material of *N. leei* from the Caribbean, the adapical and median spiral cords of *M. ateralbus* are again considered darker than *N. leei* (Fig. 14). The protoconch of *M. ateralbus* from Cuba has *c.* 0.6 mm long and five whorls (Rolán & Fernández-Garcés

1994: fig. 7), although described as having four whorls (but using different counting of protoconch whorls), whereas typical shells of *N. leei* from Brazil and the material from Guadeloupe and Martinique often have four whorls (but up to 4.5 whorls) and reach 0.45 mm long. Small and ovoid shells of *N. leei* from Brazil (i.e., the so-called *N. verbernei*), however, reach five whorls of protoconch (up to 0.55 mm long). The latter morph has obvious similarities but species-level divergences on radular features (Fernandes & Pimenta 2019b) when compared to *M. ateralbus* from Cuba (Rolán & Fernández-Garcés 1994), and the mitochondrial DNA also separates them (unpublished data – based on specimens of *M. ateralbus* from Florida, USA), although no typical specimens of *N. leei* are available yet to genetic studies. The single shell identified by Rolán & Fernández-Garcés (2015) as *M. ateralbus* from Guadeloupe, and followed by Lamy & Pointier (2018), actually refers to *Triphora ellyae* De Jong & Coomans, 1988. Owing to the slight divergences indicated above (especially regarding the type of *N. leei*), it is preferable to consider *M. ateralbus* absent from the Lesser Antilles, with a known range comprising Florida (USA), Cuba and Bahamas (Rolán & Fernández-Garcés 1994, 2007; Krisberg 2009; Redfern 2013), but further Caribbean material should be obtained to test this hypothesis.

The two live specimens of *N. leei* obtained from Martinique (Fig. 19G-H) have a reddish head-foot, bearing shells with a slightly dark adapical spiral cord of teleoconch (Fig. 14K, M); unfortunately, both specimens were stored dry during the expedition, avoiding DNA comparisons. The color of their soft parts is similar to that of the so-called *N. verbernei* from Brazil (Fernandes & Pimenta 2019b: fig. 19A, B) and to the description of *M. ateralbus* (Rolán & Fernández-Garcés 1994), highlighting affinities between *N. leei* and the variable genus *Monophorus*, which has most (but not all) species described with a reddish head-foot (Fernandes & Pimenta 2019b).

Genus *Nototriphora* Marshall, 1983

Nototriphora decorata (C. B. Adams, 1850)
(Figs 2G; 20A-D)

Cerithium decoratum C. B. Adams, 1850: 117.

MATERIAL EXAMINED. — **Guadeloupe**. **KARUBENTHOS 1** • 1 sh; sta. GS04; MNHN • 2 sh; sta. GB05; MNHN • 1 spm; sta. GS05; MNHN • 1 sh; sta. GB06; MNHN • 1 sh; sta. GS06; MNHN • 2 sh; sta. GB07; MNHN • 1 sh; sta. GS07; MNHN • 8 sh; sta. GB08; MNHN • 2 sh; sta. GB09; MNHN • 2 sh; sta. GS09; MNHN • 1 spm; sta. GR10; MNHN • 2 sh; sta. GB11; MNHN • 1 sh; sta. GS11; MNHN • 2 sh; sta. GR12; MNHN • 1 sh; sta. GS12; MNHN • 1 sh; sta. GB13; MNHN • 1 sh; sta. GS13; MNHN • 3 sh; sta. GB15; MNHN • 1 sh; sta. GS15; MNHN • 1 sh; sta. GB16; MNHN • 1 sh; sta. GD16; MNHN • 3 sh; sta. GB19; MNHN • 1 sh; sta. GS19; MNHN • 1 sh; sta. GB21; MNHN • 1 sh; sta. GB23; MNHN • 4 sh; sta. GB27; MNHN • 1 sh; sta. GS29; MNHN • 1 sh; sta. GB30; MNHN • 1 sh; sta. GB31; MNHN • 1 sh [juvenile]; sta. GD31; MNHN • 1 sh; sta. GS32; MNHN • 2 sh; sta. GS34; MNHN • 1 sh; sta. GD36; MNHN • 1 sh; sta. GD42; MNHN • 1 sh; sta. GD50; MNHN • 1 sh; sta. GD52; MNHN • 1 sh; sta. GD54; MNHN.
Martinique. **MADIBENTHOS. 'Nord Atlantique'** • 1 sh; sta. AD260; MNHN • 1 sh; sta. AD261; MNHN • 2 sh; sta. AD263; MNHN • 1 sh; sta. AD265; MNHN • 1 sh; sta. AD267; MNHN • 1 sh; sta. AB301; MNHN • 2 sh, 1 spm; sta. AB350; MNHN • 2 sh; sta. AB556; MNHN • 1 sh; sta. AB559; MNHN • 2 sh; sta. AB562; MNHN • 2 sh; sta. AS565; MNHN. — **'Sud Atlantique'** • 1 sh; sta. AS078; MNHN • 1 sh; sta. AS081; MNHN • 2 sh; sta. AB117; MNHN • 2 sh; sta. AB120; MNHN • 1 sh; sta. AB189; MNHN • 2 sh; sta. AB193; MNHN • 1 sh; sta. AD232; MNHN • 1 sh, 1 spm; sta. AS253; MNHN • 1 sh; sta. AD241; MNHN • 1 sh; sta. AB400; MNHN. — **'Nord Caraibe'** • 1 sh; sta. AB108; MNHN • 4 sh, 1 spm; sta. AB161; MNHN • 1 sh; sta. AD276; MNHN • 1 sh; sta. AD280; MNHN • 2 sh; sta. AD289; MNHN • 3 sh; sta. AD290; MNHN • 1 sh; sta. AR308; MNHN • 1 sh; sta. AS363; MNHN • 1 sh; sta. AB372; MNHN • 2 sh; sta. AS373; MNHN • 1 sh; sta. AB377; MNHN • 1 spm; sta. AB382; MNHN • 2 sh; sta. AB386; MNHN • 1 sh; sta. AB460; MNHN • 1 spm; sta. AR461; MNHN • 1 sh; sta. AB567; MNHN • 1 sh; sta. AS570; MNHN. 'Sud Caraibe' • 1 sh; sta. AB060; MNHN • 2 sh; sta. AS066; MNHN • 3 sh; sta. AD067; MNHN • 2 sh; sta. AS075; MNHN • 1 sh; sta. AB102; MNHN • 2 sh [juveniles]; sta. AB123; MNHN • 2 sh; sta. AB126; MNHN • 1 sh; sta. AS112; MNHN • 1 spm; sta. AR114; MNHN • 1 sh; sta. AB150; MNHN • 1 sh; sta. AB175; MNHN • 4 sh; sta. AB177; MNHN • 2 sh; sta. AB179; MNHN • 1 sh; sta. AD216; MNHN • 1 sh; sta. AD218; MNHN • 1 sh, 1 spm; sta. AB356; MNHN • 1 sh [juvenile]; sta. AB358; MNHN • 1 sh; sta. AB369; MNHN • 2 sh; sta. AS579; MNHN. 'Baie de Fort-de-France' • 2 sh; sta. AM005; MNHN • 11 sh; sta. AB390; MNHN • 4 sh; sta. AB392; MNHN • 1 sh; sta. AB394; MNHN • 1 sh; sta. AD607; MNHN.

BATHYMETRIC DISTRIBUTION. — Recorded depth in Guadeloupe: 2-85 m (live specimens at 22-29 m). Recorded depth in Martinique: 0-80 m (live specimens at 2-29 m). Previous recorded depth in the West Atlantic: 0-110 m, with discrepant records down to 450 m (Fernandes & Pimenta 2020).

Genus *Sagenotriphora* Marshall, 1983

Sagenotriphora osclausum
(Rolán & Fernández-Garcés, 1995)
(Figs 2H; 20E-F)

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

MATERIAL EXAMINED. — **Guadeloupe**. **KARUBENTHOS 1** • 2 sh; sta. GB01; MNHN • 1 sh; sta. GS05; MNHN • 1 sh; sta. GB06; MNHN • 1 sh; sta. GS13; MNHN • 1 sh; sta. GB14; MNHN • 1 sh; sta. GD15; MNHN • 1 sh; sta. GS24; MNHN • 1 sh; sta. GS25; MNHN • 4 sh; sta. GB31; MNHN • 1 sh; sta. GD32; MNHN • 1 sh; sta. GS33; MNHN • 1 sh; sta. GR34; MNHN. — **KARUBENTHOS 2** • 1 sh; sta. DW4586; MNHN.
Martinique. **MADIBENTHOS. 'Nord Atlantique'** • 1 sh; sta. AB197; MNHN • 1 sh; sta. AD247; MNHN • 1 sh; sta. AD256; MNHN • 1 sh; sta. AD261; MNHN • 1 sh; sta. AD263; MNHN • 3 sh; sta. AD275; MNHN • 2 sh; sta. AB350; MNHN • 2 sh; sta. AS557; MNHN • 1 sh; sta. AB559; MNHN • 3 sh; sta. AS550; MNHN • 4 sh; sta. AB556; MNHN • 2 sh; sta. AB562; MNHN • 5 sh; sta. AS565; MNHN. — **'Sud Atlantique'** • 1 sh; sta. AS081; MNHN • 1 sh; sta. AB181; MNHN • 3 sh; sta. AB183; MNHN • 3 sh; sta. AB185; MNHN • 3 sh; sta. AB189; MNHN • 1 spm; sta. AB191; MNHN • 1 sh; sta. AD223; MNHN • 1 sh; sta. AD224; MNHN • 1 sh; sta. AS252; MNHN • 1 sh; sta. AS255; MNHN • 2 sh; sta. AB400; MNHN • 3 sh; sta. AB401; MNHN • 6 sh; sta. AB405; MNHN. — **'Nord Caraibe'** • 1 sh; sta. AD276; MNHN • 1 sh; sta. AD283; MNHN • 1 sh; sta. AS482; MNHN • 1 sh; sta. AB483; MNHN • 2 sh; sta. AS570; MNHN • 1 sh [juvenile]; sta. AS574; MNHN •

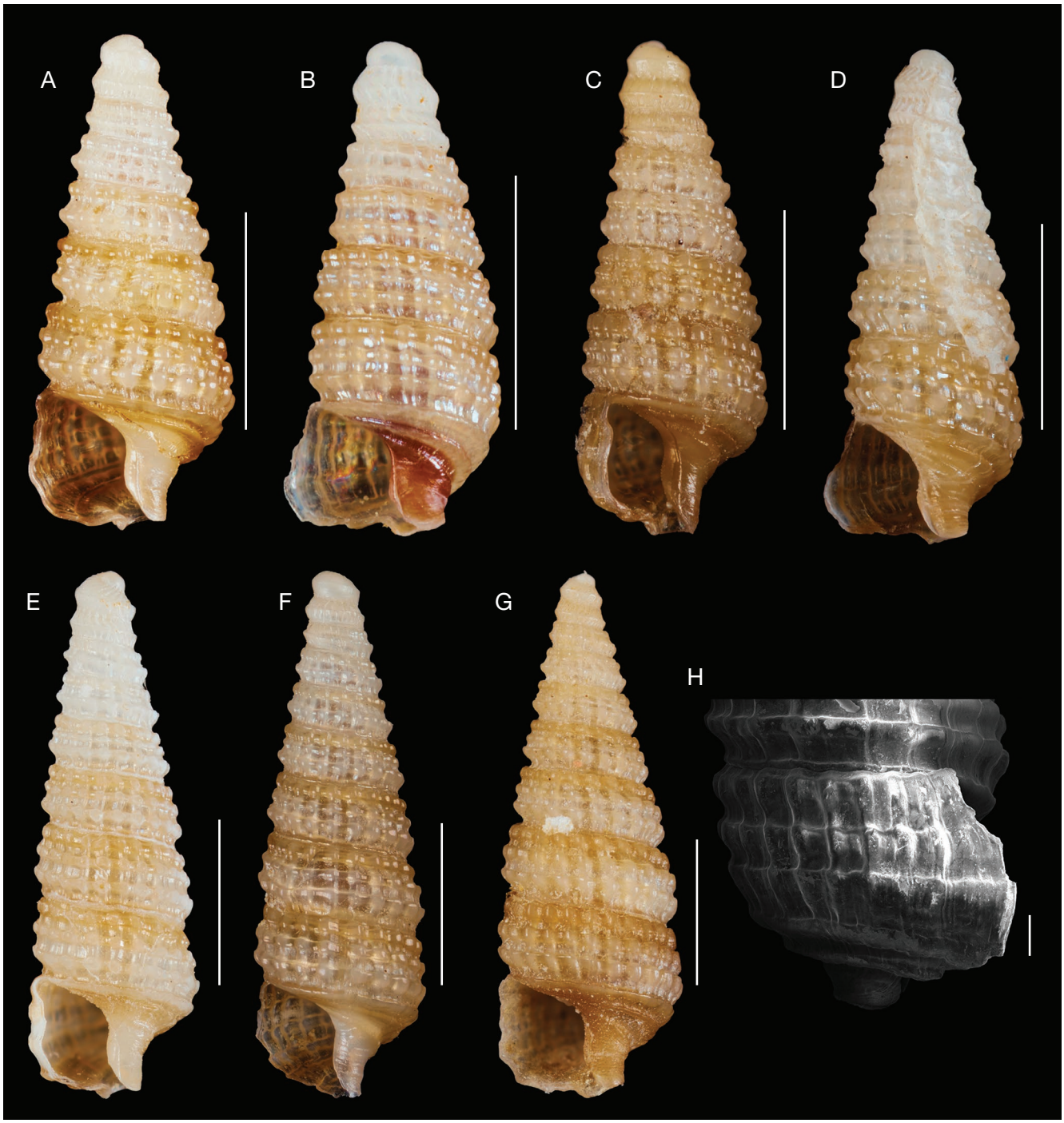

Fig. 16. — *Triphora portoricensis* Rolán & Redfern, 2008: **A**, MNHN, sta. AB183, 2.3 mm; **B**, **H**, MNHN, sta. AB193, 1.9 mm; **C**, MNHN, sta. AB350, 2.3 mm; **D**-**F**, MNHN, sta. AB405, 2.4 mm, 3.2 mm, 3.3 mm; **G**, MNHN, sta. AS255, 3.6 mm. Scale bars: A-G, 1 mm; H, 100 µm.

1 sh; sta. AS576; MNHN. 'Sud Caraibe' • 5 sh; sta. AB123; MNHN • 2 sh; sta. AB150; MNHN • 1 sh; sta. AB360; MNHN • 1 sh; sta. AB369; MNHN. 'Baie de Fort-de-France' • 1 sh; sta. AD605; MNHN.

Bathymetric distribution. — Recorded depth in Guadeloupe: 6-80 m; one intact adult shell obtained by KARUBENTHOS 2 between 204-251 m, but it must be regarded with caution. Recorded depth in Martinique: 4-80 m (live specimen at 14 m). Previous recorded depth in the West Atlantic: 2-183 m (Fernandes & Pimenta 2020).

Remarks

Although the illustrated shell of *S. osclausum* had a wrong identification as *Similiphora intermedia* (C. B. Adams, 1850) in Rolán & Fernández-Garcés (2015: fig. 4K), this was a *lapsus calami*, because most shells identified as *S. osclausum* from Guadeloupe were correct. The shell identified by Lamy & Pointier (2018: pl. 92, fig. 9) as *Triphora guadaloupensis* Rolán & Fernández-Garcés, 2008 refers to *S. osclausum*.

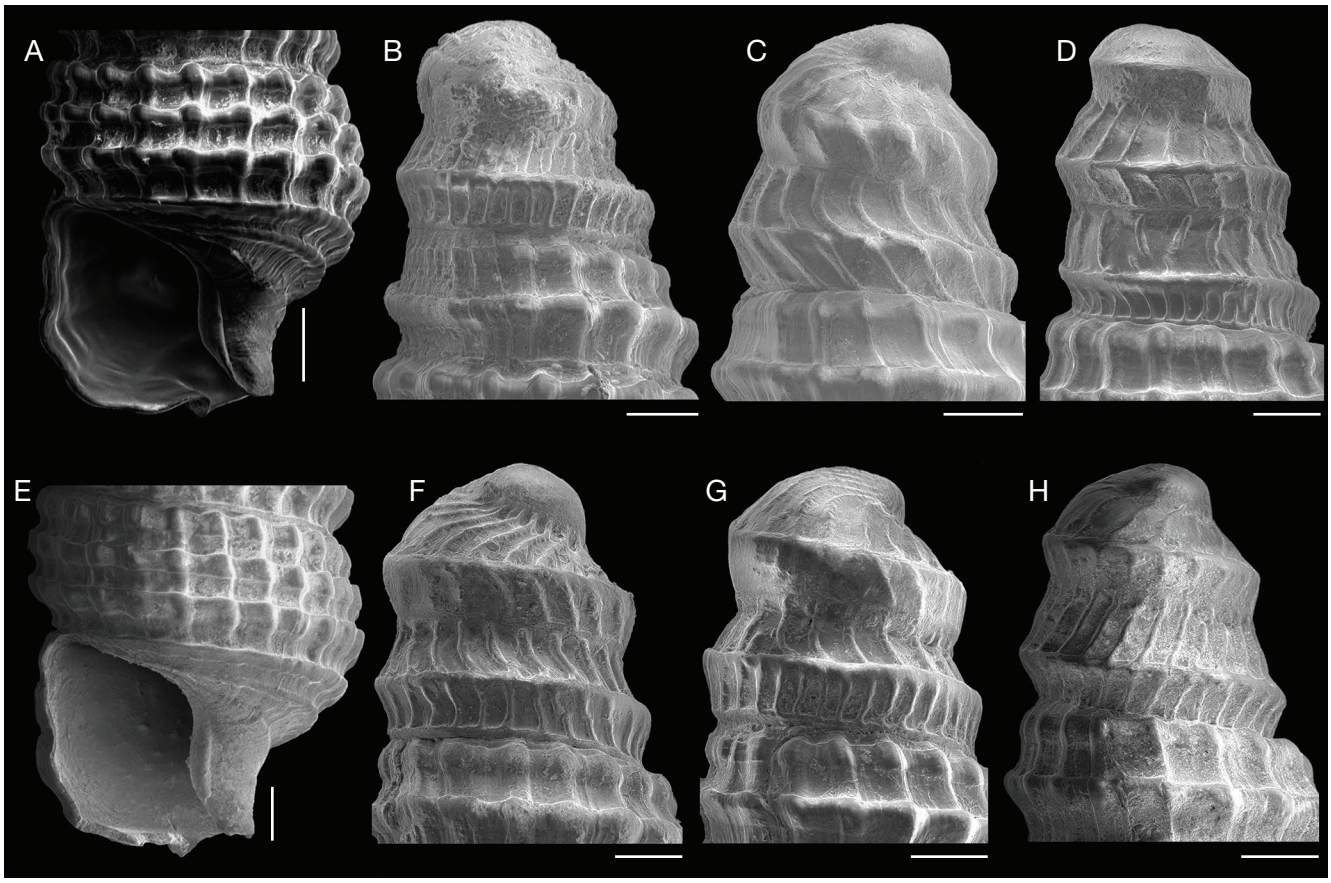

Fig. 17. — *Triphora portoricensis* Rolán & Redfern, 2008: **A**, **B**, MNHN, sta. AB183 (Fig. 16A); **C**, MNHN, sta. AB193 (Fig. 16B); **D**, MNHN, sta. AB350 (Fig. 16C); **E**, **H**, MNHN, sta. AS255 (Fig. 16G); **F**, MNHN, sta. AB405 (Fig. 16E); **G**, MNHN, sta. AB405 (Fig. 16F). Scale bars: A, E, 200 µm; B-D, F-H, 100 µm.

Genus *Similiphora* Bouchet, 1985

Similiphora intermedia (C. B. Adams, 1850) (Fig. 2I)

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

Material examined. — **Guadeloupe**. **KARUBENTHOS 1** • 1 sh; sta. GB06; MNHN • 1 sh; sta. GB07; MNHN • 1 sh; sta. GS08; MNHN • 1 sh [worn]; sta. GD10; MNHN • 2 sh; sta. GS13; MNHN • 1 sh; sta. GR20; MNHN • 1 sh; sta. GB25; MNHN • 1 sh; sta. GD31; MNHN • 1 sh; sta. GR50; MNHN. — **KARUBENTHOS 2** • 1 sh [juvenile]; sta. DW4586; MNHN. **Martinique**. **MADIBENTHOS**. '**Nord Atlantique**' • 1 sh; sta. AD244; MNHN • 1 sh; sta. AD258; MNHN • 1 sh; sta. AD275; MNHN • 3 sh; sta. AS550; MNHN • 1 sh; sta. AB556; MNHN • 2 sh; sta. AS557; MNHN • 1 sh; sta. AS565; MNHN. — '**Sud Atlantique**' • 1 sh; sta. AS253; MNHN. — '**Nord Caraibe**' • 1 sh; sta. AD279; MNHN • 2 sh; sta. AR308; MNHN • 1 sh; sta. AS375; MNHN • 4 sh; sta. AS570; MNHN. 'Sud Caraibe' • 1 sh; sta. AD067; MNHN • 1 sh; sta. AB150; MNHN • 1 sh; sta. AB152; MNHN • 1 sh; sta. AB369; MNHN • 1 sh; sta. AB578; MNHN.

Bathymetric distribution. — Recorded depth in Guadeloupe: 4-85 m; one juvenile shell obtained by KARUBENTHOS 2 between 204-251 m, but it must be regarded with caution. Recorded depth in Martinique: 5-80 m. Previous recorded depth in the West Atlantic: 0-150 m (Fernandes & Pimenta 2020).

Similiphora sp. (Fig. 2J)

Material examined. — **Guadeloupe**. **KARUBENTHOS 1** • 1 sh [identified by Rolán & Fernández-Garcés (2015: fig. 4Q) as *Aclophora sagei* Rolán & Fernández-Garcés, 1995]; sta. GN27; MNHN. **Martinique**. **MADIBENTHOS**. '**Nord Atlantique**' • 1 sh; sta. AD261; MNHN • 1 sh; sta. AS552; MNHN. — '**Nord Caraibe**' • 1 sh; sta. AD290; MNHN.

Bathymetric distribution. — Recorded depth in Guadeloupe: 120 m. Recorded depth in Martinique: 18-80 m.

Remark

Fernandes & Pimenta (2020) already discussed on the existence of shells possibly belonging to *S. intermedia*, but with a much lighter adapical spiral cord of teleoconch, which requires further investigation comprising soft parts in order to evaluate whether this is a mere ecophenotypic plasticity or if it represents a different species.

Genus *Strobiligera* Dall, 1924

Strobiligera inaudita (Rolán & Lee, 2008) (Fig. 3A)

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

MATERIAL EXAMINED. — **Guadeloupe**. **KARUBENTHOS 1** • 1 sh; sta. GD35; MNHN.
Martinique. **MADIBENTHOS. 'Sud Caraibe'** • 1 sh; sta. AD218; MNHN.

BATHYMETRIC DISTRIBUTION. — Recorded depth in Guadeloupe: 66 m. Recorded depth in Martinique: 60 m. Previous recorded depth in the West Atlantic: 58-163 m (Fernandes & Pimenta 2020).

REMARK
This species was identified as "*Triphora*" sp. by Rolán & Fernández-Garcés (2015: fig. 4U) and as *Isotriphora* sp. 1 by Lamy & Pointier (2018: pl. 91, fig. 14).

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

Triphora ellyae De Jong & Coomans, 1988 (Figs 3B; 20G-H)

Triphora ellyae De Jong & Coomans, 1988: 50, pl. 34, fig. 242.

MATERIAL EXAMINED. — **Guadeloupe**. **KARUBENTHOS 1** • 2 sh [previously identified as *Similiphora intermedia*]; sta. GB05; MNHN • 1 sh, 1 spm [*idem*]; sta. GB06; MNHN • 1 sh [*idem*]; sta. GB11; MNHN • 1 sh [identified as *Monophorus ateralbus* by Rolán & Fernández-Garcés (2015: fig. 4X)]; sta. GD13; MNHN • 1 sh [previously identified as *Similiphora intermedia*]; sta. GS13; MNHN.
Martinique. **MADIBENTHOS. 'Nord Atlantique'** • 1 sh; sta. AD260; MNHN • 1 sh; sta. AD263; MNHN • 1 sh; sta. AB350; MNHN • 1 sh; sta. AB556; MNHN • 2 sh; sta. AS557; MNHN. — **'Nord Caraibe'** • 2 sh; sta. AB159; MNHN • 1 sh; sta. AD283; MNHN • 1 sh; sta. AD290; MNHN • 1 sh; sta. AD299; MNHN • 1 spm; sta. AB308; MNHN • 1 sh; sta. AS375; MNHN • 3 sh; sta. AB463; MNHN • 1 sh; sta. AS570; MNHN • 2 sh; sta. AS572; MNHN. 'Sud Caraibe' • 1 sh; sta. AB062; MNHN • 1 sh; sta. AB169; MNHN.

BATHYMETRIC DISTRIBUTION. — Recorded depth in Guadeloupe: 5-50 m (live specimen at 23 m). Recorded depth in Martinique: 5-80 m. Previous recorded depth in the West Atlantic: 3-110 m (Fernandes & Pimenta 2020).

Triphora martii Rolán & Fernández-Garcés, 1995 (Fig. 3C)

"*Triphora*" *martii* Rolán & Fernández-Garcés, 1995: 16, figs 39-42.

MATERIAL EXAMINED. — **Guadeloupe**. **KARUBENTHOS 1** • 1 sh [identified as *Eutriphora bermudensis* by Rolán & Fernández-Garcés (2015: fig. 4T)]; sta. GS18; MNHN • 1 sh [previously identified as *Iniforis turristhomae*]; sta. GD59; MNHN.
Martinique. MADIBENTHOS. 'Sud Atlantique' • 1 sh; sta. AS252; MNHN.

BATHYMETRIC DISTRIBUTION. — Recorded depth in Guadeloupe: 49-88 m. Recorded depth in Martinique: 10-12 m. Previous recorded depth in the West Atlantic: 20-40 m (Rolán & Fernández-Garcés 1995).

Triphora portoricensis Rolán & Redfern, 2008 (Figs 16; 17)

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

Iniforis sp. – Redfern 2001: 66, pl. 33, fig. 278A, B.

"*Triphora*" *portoricensis* – Redfern 2013: 127, fig. 358A, B. — Fernandes & Pimenta 2015: 505, fig. 6. — Fernandes & Pimenta 2020: 168.

TYPE MATERIAL. — **Holotype. Puerto Rico** • sh; FLMNH 363895.
Paratype. Bahamas • 1 sh; Abaco; 26°44'00"N, 77°09'00"W; 9.IX.1987; C. Redfern leg.; depth 52 m; BMSM 55395.

TYPE LOCALITY. — Puerto Rico.

MATERIAL EXAMINED. — **Martinique**. **MADIBENTHOS.** 'Nord Atlantique' • 3 sh; sta. AB350; MNHN. 'Sud Atlantique' • 1 sh; sta. AB183; MNHN • 1 sh; sta. AB191; MNHN • 1 sh; sta. AB193; MNHN • 1 sh; sta. AS255; MNHN • 5 sh; sta. AB405; MNHN.

GEOGRAPHIC DISTRIBUTION. — Bahamas (Rolán & Fernández-Garcés 2008; Redfern 2013); Puerto Rico (Rolán & Fernández-Garcés 2008); Martinique (this study); Brazil. Rio Grande do Norte to Rio de Janeiro (Fernandes & Pimenta 2015).

BATHYMETRIC DISTRIBUTION. — Recorded depth in Martinique: 14-23 m. Previous recorded depth in the West Atlantic: 23-100 m (Fernandes & Pimenta 2015, 2020).

EMENDED DESCRIPTION
Shell sinistral, conical to slightly pupoid, rectilinear to slightly convex profile, reaching 3.6 mm long, 1.3 mm wide, length/width ratio 2.6-3.1; adult shells reach at least 1.9 mm in length. Protoconch sub-columnar, slightly inflated, of 2.75-3.25 whorls, 0.40-0.58 mm long, 0.41-0.51 mm wide, weak distinction between protoconch and teleoconch; initial 0.5 whorl smooth, but axial ribs soon appear, with their adapical part emerging on the abapical part of the smooth whorl above, assuming an irregular shape, often arrow-shaped initially but varying from sigmoid, nearly orthocline, strongly opisthocline or strongly prosocline on the last whorl, where it numbers 20-34 ribs; one main spiral cord often occupying the mid portion of the whorl (sometimes the abapical portion), situated at 44-61% of last whorl height, keel-shaped, in addition to a small sutural cord. Teleoconch with up to seven whorls; two spiral cords (adapical and abapical) at the beginning, the abapical one continuous to that of protoconch; median spiral cord emerging at the end of second whorl or at the third whorl, reaching the same size than other cords after *c.* 1.5 whorl; at the body whorl, the three cords being equidistant and nearly the same size; 20-21 nearly orthocline axial ribs on the fifth whorl; rounded nodules of medium size, with square interspaces among nodules; distinct suture, with a sutural cord; slightly nodulose to wavy subperipheral cord, one to two smooth basal cords, often narrow, but sometimes well-developed; no distinct supranumerical cords, but a minute spiral thread sometimes appearing between abapical and subperipheral cords prior to the peristome; aperture rounded to slightly rhomboid (with a discrete notch in the posterior end), 0.47-0.83 mm long, 0.43-0.59 mm wide, length/width ratio 1.1-1.4; anterior canal very short, open, 0.07-0.15 mm long, 0.13-0.20 mm wide, length/width ratio 0.4-0.7. White to light cream shell, with adapical spiral cord and base slightly darker.

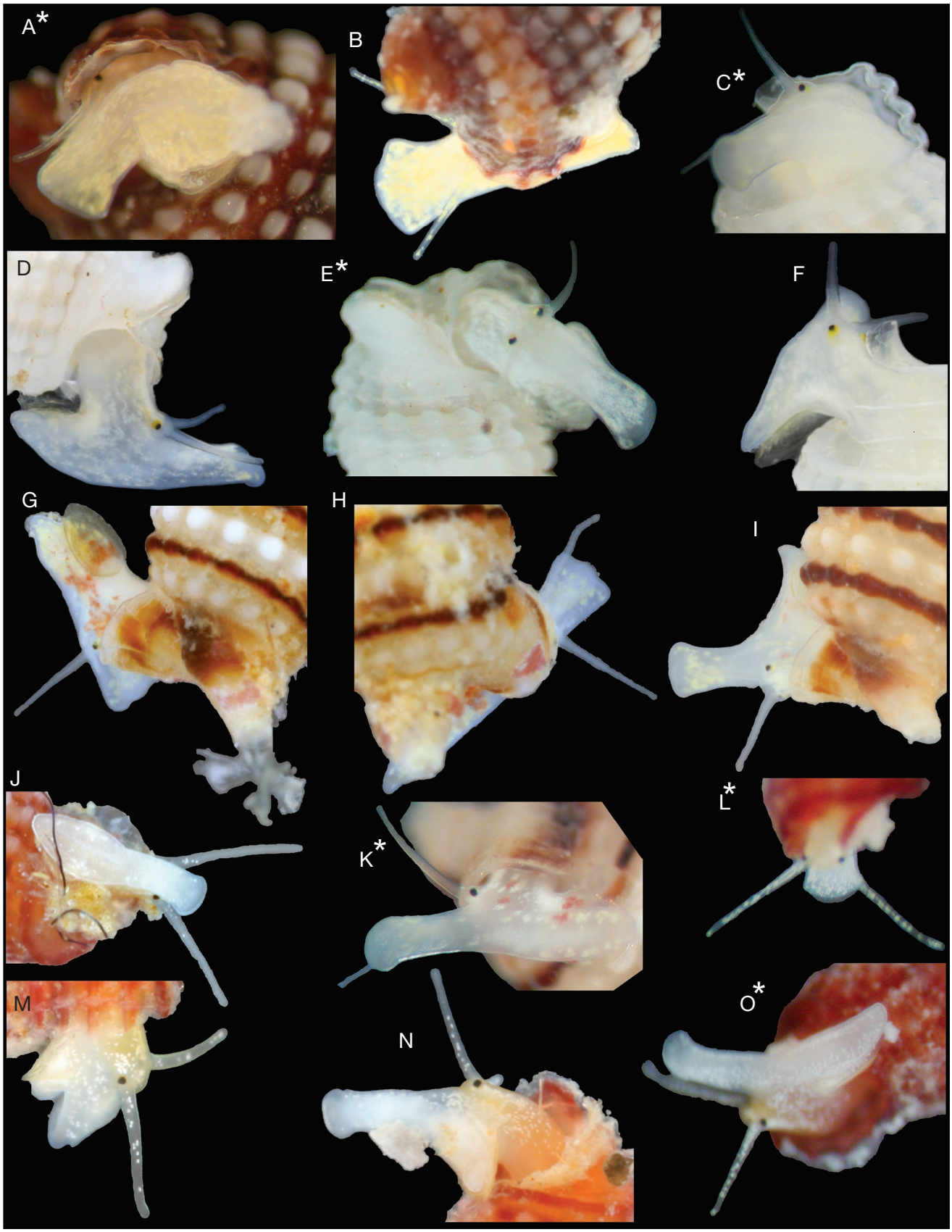

Fig. 18. — Live triphorids from Martinique and Guadeloupe (marked with **asterisk**): **A**, **B**, *Coriophora novem* (Nowell-Usticke, 1969), MNHN, sta. GM08 (**A**), AD254 (**B**); **C**-**F**, *Cosmotriphora melanura* (C.B.Adams, 1850), MNHN, sta. GB03 (**C**), AS096 (**D**), GS17 (**E**), AD214 (**F**); **G**-**I**, **K**, *Iniforis turristhomae* (Holten, 1802), MNHN, sta. AS075 (**G**-**H**), AM005 (**I**), GB07 (**K**); **J**, **L**-**O**, *Metaxia excelsa* Faber & Moolenbeek, 1991, MNHN, sta. AB123 (**J**), GB12 (**L**, **O**), AB362 (**M**), AB197 (**N**). Credits: MNHN team.

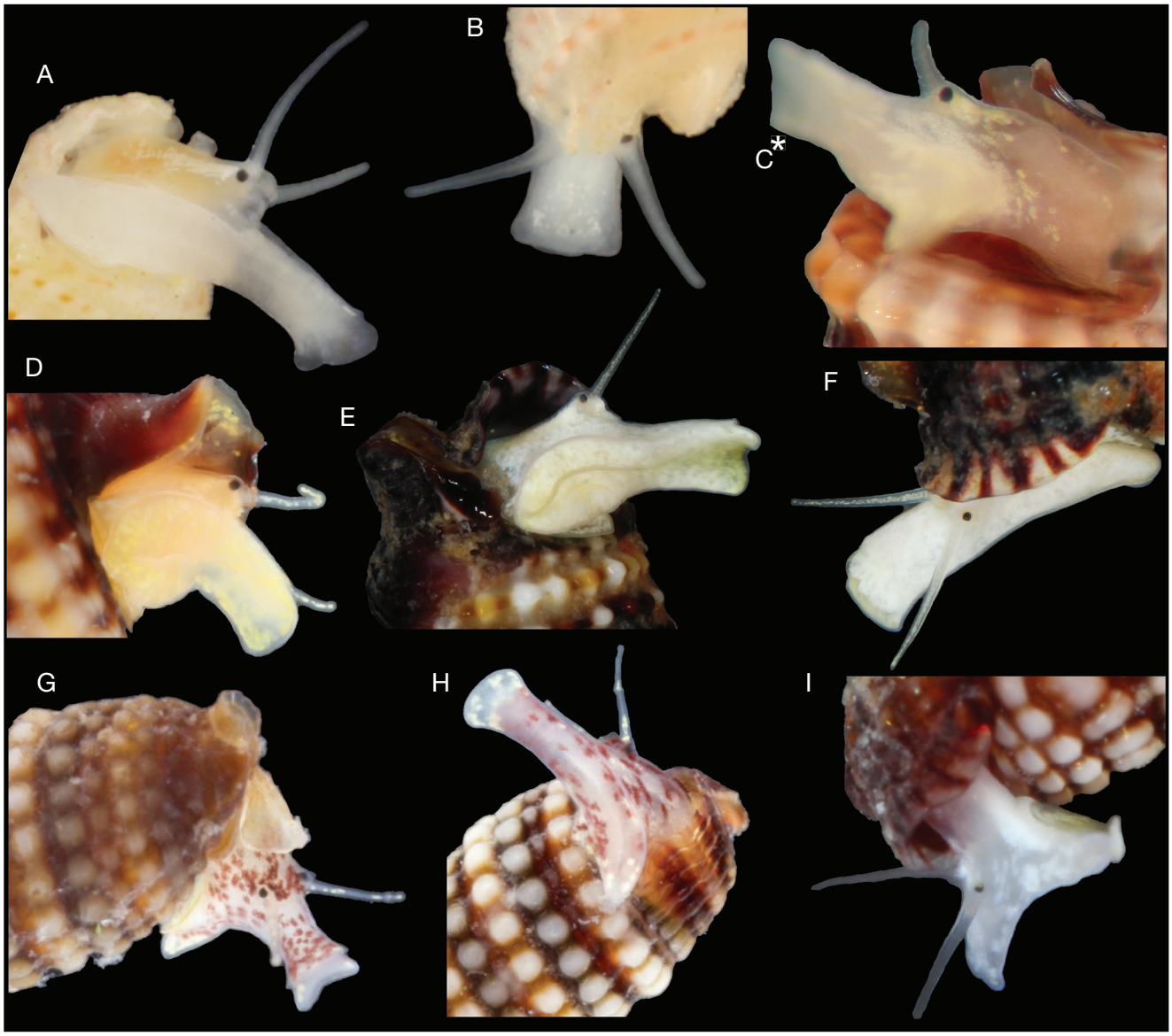

Fig. 19. — Live triphorids from Martinique and Guadeloupe (marked with **asterisk**): **A**, **B**, *Metaxia taeniolata* (Dall, 1889), MNHN, sta. AD261; **C**-**F**, *Monophorus olivaceus* (Dall, 1889), MNHN, sta. GD21 (**C**), AB185 (**D**), AR461 (**E**, **F**); **G**, **H**, *Nanaphora leei* Fernandes & Pimenta, 2015, MNHN, sta. AB400 (**G**), AB419 (**H**); **I**, *Nanaphora* cf. *verbernei* (Moolenbeek & Faber, 1989), MNHN, sta. AB149. Credits: MNHN team.

Remarks

The shell from Guadeloupe identified by Lamy & Pointier (2018: pl. 92, fig. 11) as *Triphora portoricensis* is actually the holotype of *Marshallora monteiroi* n. comb. Some shells of *T. portoricensis* from Martinique (Fig. 16) resemble one shell tentatively identified as *M. monteiroi* n. comb. (Fig. 7K), but the former morph has a slightly darker adapical spiral cord of teleoconch (vs spiral cords with a more homogeneous color in *M. monteiroi* n. comb.) and basal cords (Fig. 17A, E) often considerably thinner than *M. monteiroi* n. comb. (Fig. 7L-M).

Shells of *T. portoricensis* from Martinique vary in the adult shell length (1.9-3.6 mm) and in the axial sculpture of the protoconch, but the largest shells are similar to the holotype from Puerto Rico (4.4 mm to eight teleoconch whorls vs up to seven whorls in shells from Martinique). In contrast, shells from Bahamas and Brazil are entirely white (Redfern 2013; Fernandes & Pimenta 2015); those from Brazil have a different teleoconch sculpture in late whorls, with a more distant adapical spiral cord (not discernible in Bahamian shells, only known by juveniles), and reach up to 10 mm to 13 teleoconch whorls (Fernandes & Pimenta 2015). This suggests that the current concept of *T. portoricensis* is actually a species complex masked by the similar protoconch morphology, which could be derived from convergence or parallelism.

Triphora cf. ***scylla*** Fernandes & Pimenta, 2015 (Fig. 3D)

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

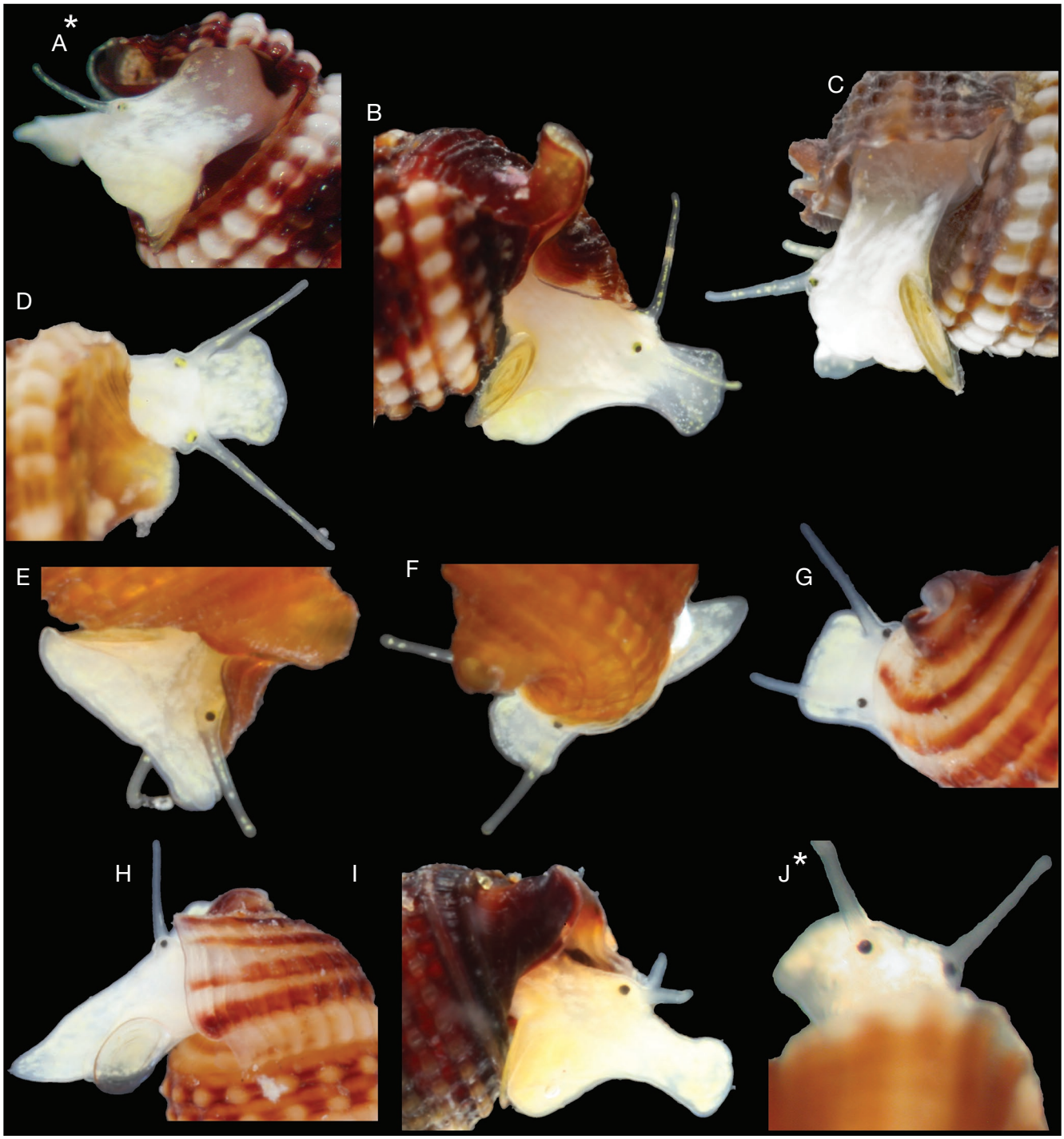

FIG. 20. — Live triphorids from Martinique and Guadeloupe (marked with **asterisk**): **A**-**D**, *Nototriphora decorata* (C.B. Adams, 1850), MNHN, sta. GR10 (**A**), AS253 (**B**), AB382 (**C**), AB161 (**D**); **E**, **F**, *Sagenotriphora osclausum* (Rolán & Fernández-Garcés, 1995), MNHN, sta. AB191; **G**, **H**, *Triphora ellyae* De Jong & Coomans, 1988, MNHN, sta. AB308; **I**, **J**, *Marshallora monteiroi* (Rolán & Fernández-Garcés, 2015) n. comb., MNHN, sta. AD283 (**I**), GD21 (**J**). Credits: MNHN team.

MATERIAL EXAMINED. — **Martinique. MADIBENTHOS. 'Nord Atlantique'** • 1 sh [juvenile]; sta. AD275; MNHN • 1 sh [juvenile]; sta. AB562; MNHN.

BATHYMETRIC DISTRIBUTION. — Recorded depth in Martinique: 14-80 m. Previous recorded depth in the West Atlantic: 20-150 m (Fernandes & Pimenta 2020).

DISCUSSION

After more than 500 collection events and 33 triphorid species sampled from the shallow waters of Martinique, the MADIBENTHOS expedition significantly improved our knowledge about the diversity of Triphoridae from the Caribbean. Besides the description of three new species

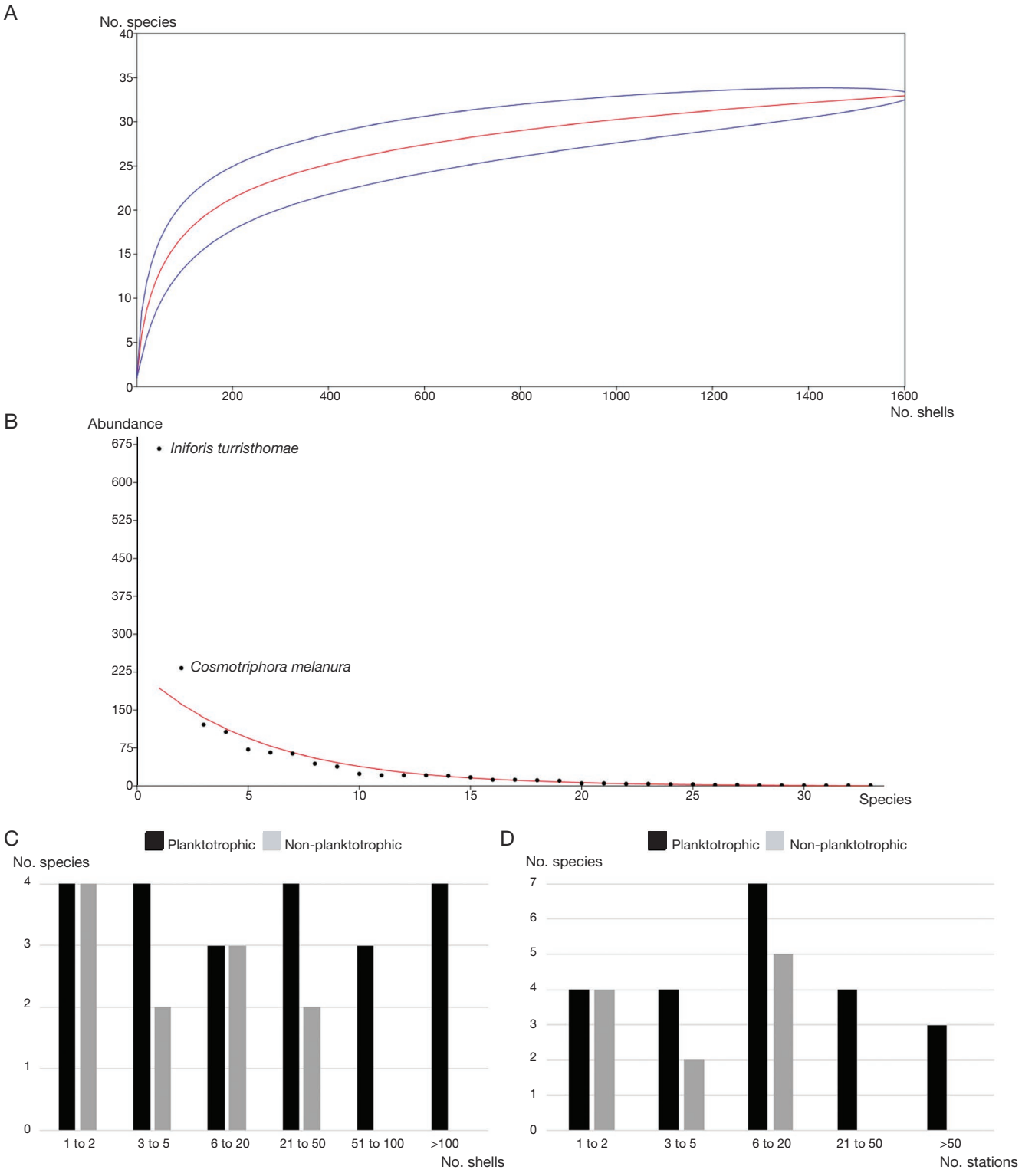

FIG. 21. — **A**, Individual rarefaction curve of triphorids from MADIBENTHOS; blue curves indicate the 95% confidence interval; **B**, abundance distribution of triphorids from MADIBENTHOS; **C**, **D**, number of species vs number of shells (**C**) or number of stations (**D**), regarding planktotrophic (**black bars**) and non-planktotrophic (grey bars) species.

(all non-planktotrophic), there were some new records of planktotrophic species to the Lesser Antilles. *Cheirodonta dupliniana* and *Strobiligera inaudita* were reported along the North and South portions of the West Atlantic, but neither were previously recorded from any Caribbean island (Fernandes & Pimenta 2020). Despite the abovementioned

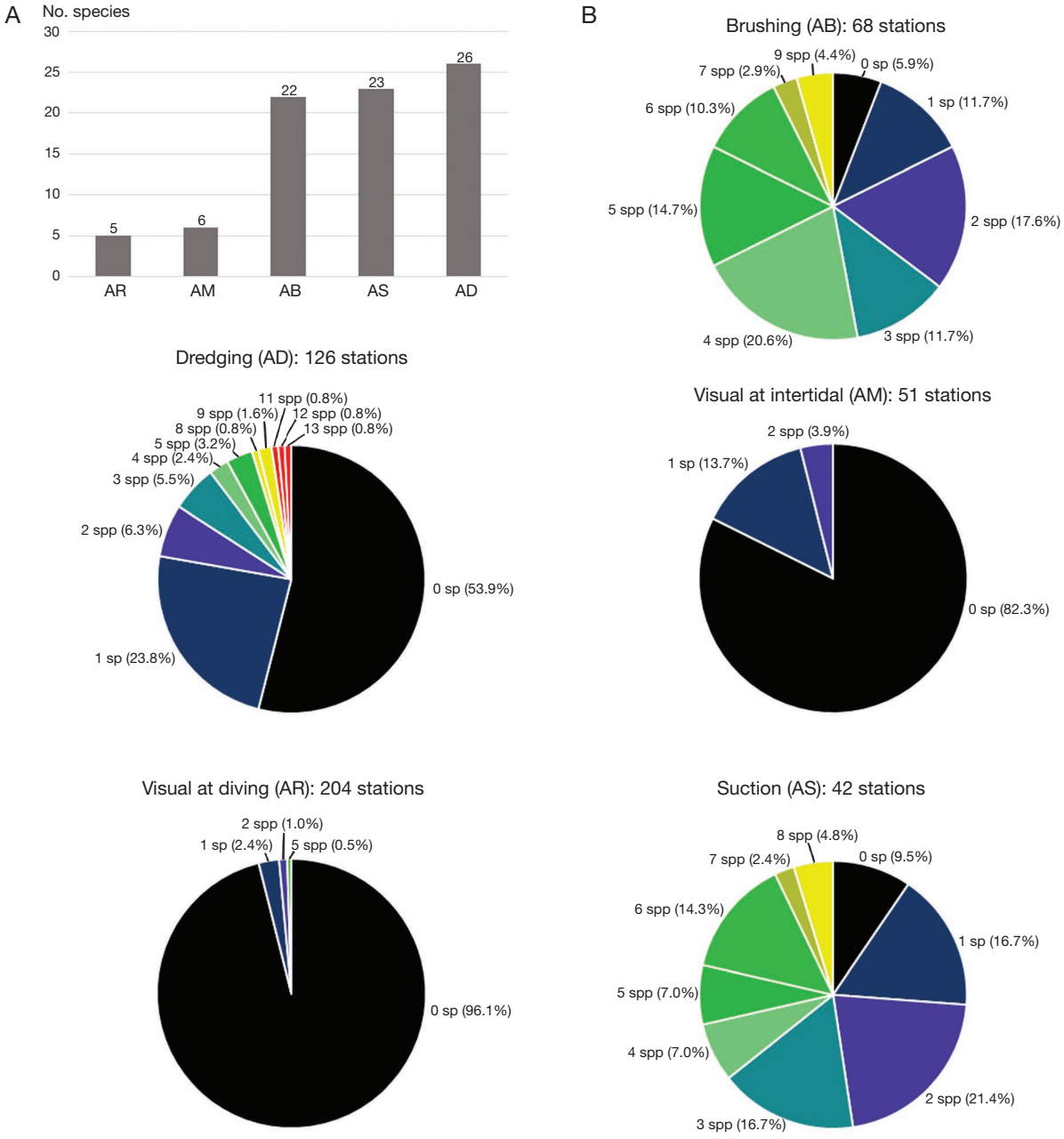

FIG. 22. — **A**, number of triphorid species obtained in MADIBENTHOS by each sampling method (**AB**, brushing; **AD**, dredging; **AM**, visual at intertidal; **AR**, visual at diving; **AS**, suction); **B**, number of species sampled vs proportion of stations according to each sampling method in MADIBENTHOS.

issues of identification, *Nanaphora leei* is now confirmed to the Caribbean, and not restricted to Brazil; the same may apply for *Triphora* cf. *scylla*, pending additional material. *Triphora martii* was previously known from Cuba (Rolán & Fernández-Garcés 1995; Espinosa *et al.* 2007; García & Capote 2013). On the other hand, no shell of *Inella triserialis* was sampled by MADIBENTHOS, confirming this is a deep-sea species; the identification from Martinique is uncertain (Lamy & Pointier 2018), regarding the poor condition of types, from the deep sea of the Yucatán Strait (Rolán & Fernández-Garcés 2008; Fernandes & Pimenta 2019a).

The individual rarefaction curve of triphorids from MADIBENTHOS (Fig. 21A) is nearly saturated but did not reach the asymptote, suggesting more than 33 species exist in Martinique. Accordingly, Chao1 estimator suggested the occurrence of 38 species, i.e., five species from Martinique were possibly missed (not sampled) by MADIBENTHOS. This number is considerably inferior than the total triphorid species found in similar efforts by the MNHN team in the Indo-Pacific, such as New Caledonia (174 species, 42 stations – Bouchet *et al.* 2002) and Vanuatu (259 species, 566 stations – Albano *et al.* 2011). Similarly, Marshall (1983) indicated the existence of at least 80 triphorid species in a single sand sample

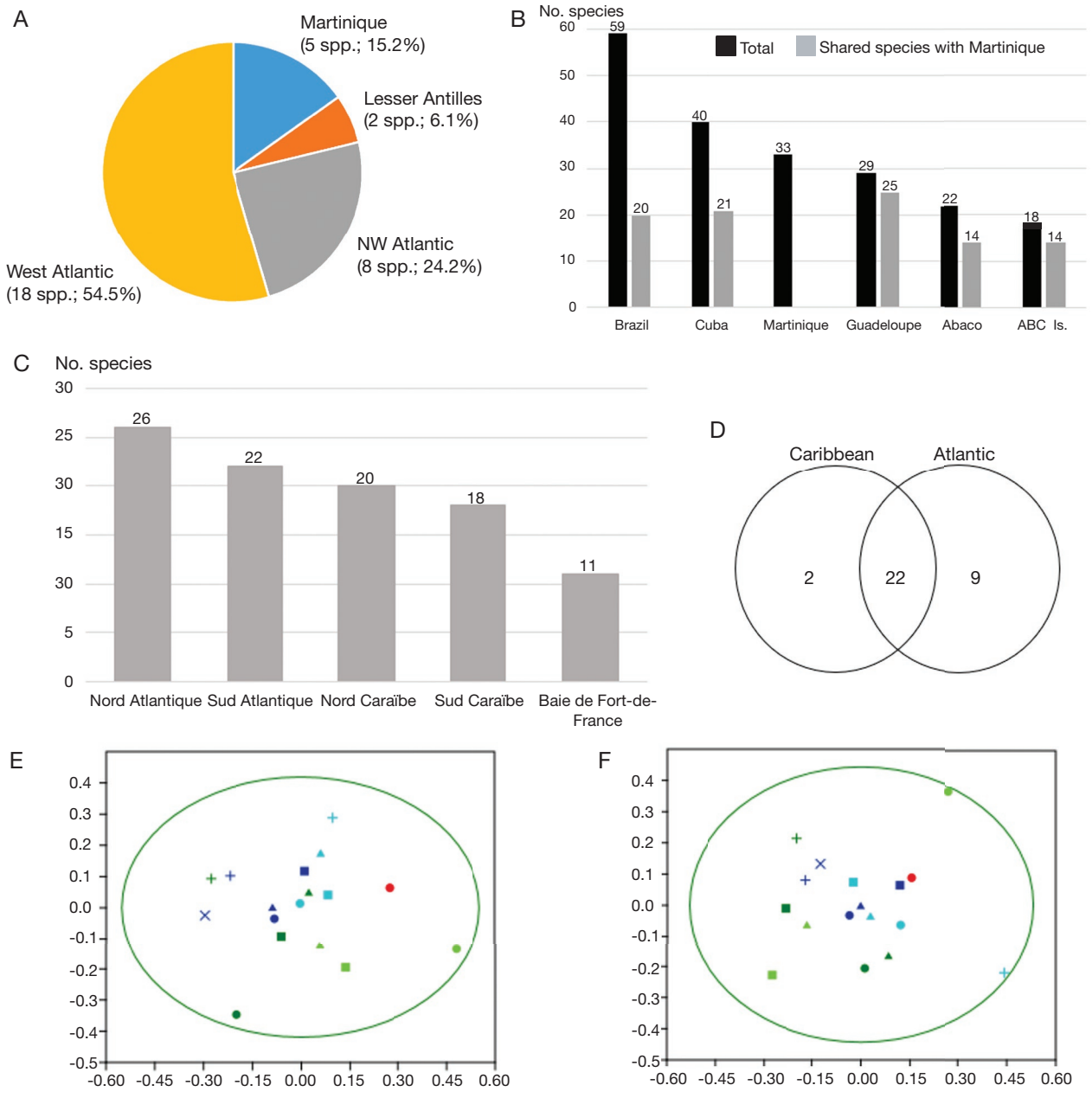

FIG. 23. — **A**, Geographic range of triphorids from Martinique, whether endemic vs present in other sites in Lesser Antilles or beyond in the Northwest or West Atlantic; **B**, total shallow-water triphorids recorded in each well-sampled locality, including the number of shared species with Martinique; references from Brazil are those of M. Fernandes and colleagues, from Cuba those of E. Rolán (or J. Espinosa) and colleagues, from Aruba, Bonaire and Curaçao (ABC Is.) are De Jong & Coomans (1988), Moolenbeek & Faber (1989), Faber & Moolenbeek (1991) and Faber (2010), and Redfern (2013) from Abaco, Bahamas; **C**, number of triphorid species per geographic zone; **D**, number of triphorid species per Caribbean or Atlantic side in Martinique; **E**, **F**, nMDS of geographic and bathymetric zones regarding triphorid species, based on Bray-Curtis (**E**) and Jaccard (**F**) indexes: **dark green**, Nord Atlantique; **light green**, Sud Atlantique; **dark blue**, Nord Caraïbe; **light blue**, Sud Caraïbe; **red**, Baie de Fort-de-France; **dots**, 0-10 m; **squares**, 11-20 m; **triangles**, 21-30 m; **X**, 31-60 m; **+ -** 61-85 m.

from NE Australia. These contrasting numbers reflect the known higher diversity of Triphoridae in the Indo-Pacific (Albano *et al.* 2011).

The abundance distribution of triphorids (Fig. 21B) shows two species with skewed distributions, i.e., *Iniforis turristhomae* and *Cosmotriphora melanura*. This is reflected in the low evenness (0.276; 0.258-0.294), although the dominance was also low (D: 0.209; 0.192-0.226), whereas Shannon's diversity (H: 2.208; 2.141-2.274) and Pielou's equitability (J: 0.631; 0.612-0.650) were moderately high. Seven species (all with planktotrophic development) were considered abundant (51-100 shells) or much abundant (>100 shells) and were sampled in more than 20 stations, whereas eight species (with planktotrophic or non-planktotrophic modes) were much rarer (i.e., represented by singletons or doubletons) and sampled in one or two stations (Fig. 21C, D). Not all planktotrophic species

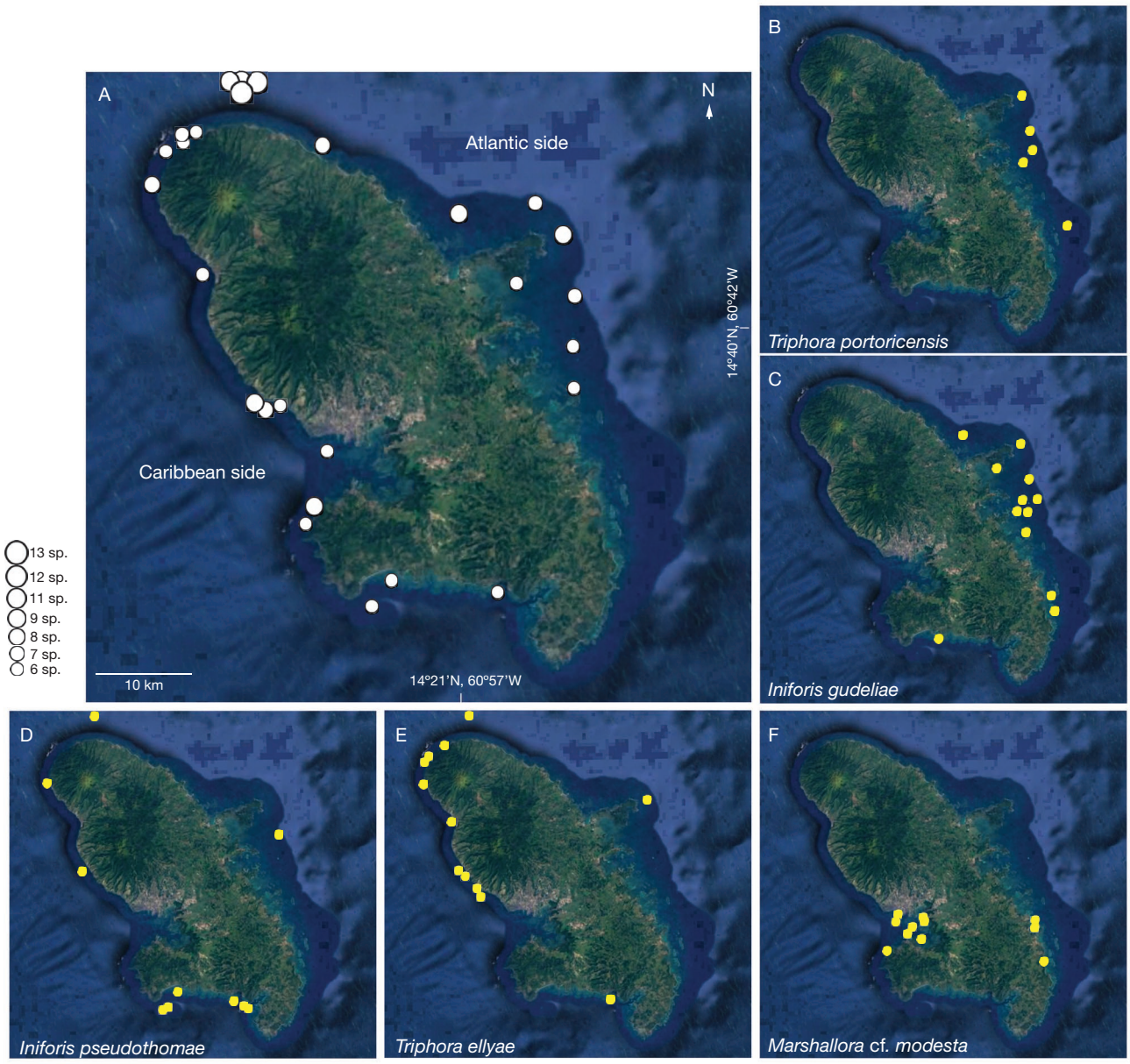

Fig. 24. — **A**, hyper-diverse stations of Triphoridae from MADIBENTHOS, containing more than six species; **B**-**F**, maps of geographic distribution of selected species. All maps obtained from Google Earth.

were abundant or present in many stations, because there might be biotic and abiotic restrictions for larval settlement and adult survivorship (such as the presence of particular sponge hosts). Similar higher abundances of planktotrophic triphorids were also observed in a survey from Vanuatu, SW Pacific (Albano *et al.* 2011), suggesting that non-planktotrophic triphorids are demographically rarer owing to certain biological (e.g. short or even null larval dispersion) or ecological restrictions. Two thirds (22 of 33) of the triphorid species from MADIBENTHOS are planktotrophic, a proportion higher than the nearly 50% found for triphorids from Brazil (Fernandes & Pimenta 2020) and southern Australia (Marshall 1983). However, the study of deep-sea material from Martinique will certainly alter this scenario by adding more non-planktotrophic species.

There was a bias in the sampling methods on MADIBENTHOS, with 42 suction (AS) events, 51 visual efforts at intertidal (AM), 68 of brushing (AB), 126 of dredging (AD) and 204 visual efforts at diving (AR). No method could sample all 33 triphorid species due to the rarity of many of them, but the visual methods (AM and AR) were clearly poor at the total number of sampled species and on the required attempts to obtain a single specimen (Fig. 22), due to the small size of triphorids (Albano *et al.* 2011). On the other hand, brushing and suction were once again regarded as efficient methods to obtain triphorids (Albano *et al.* 2011), sampling similar numbers of species (22 vs 23) and proportions of species (up to nine or eight) per station (Fig. 22). Despite that *c.* 54% of dredging stations did not recover any triphorid, some

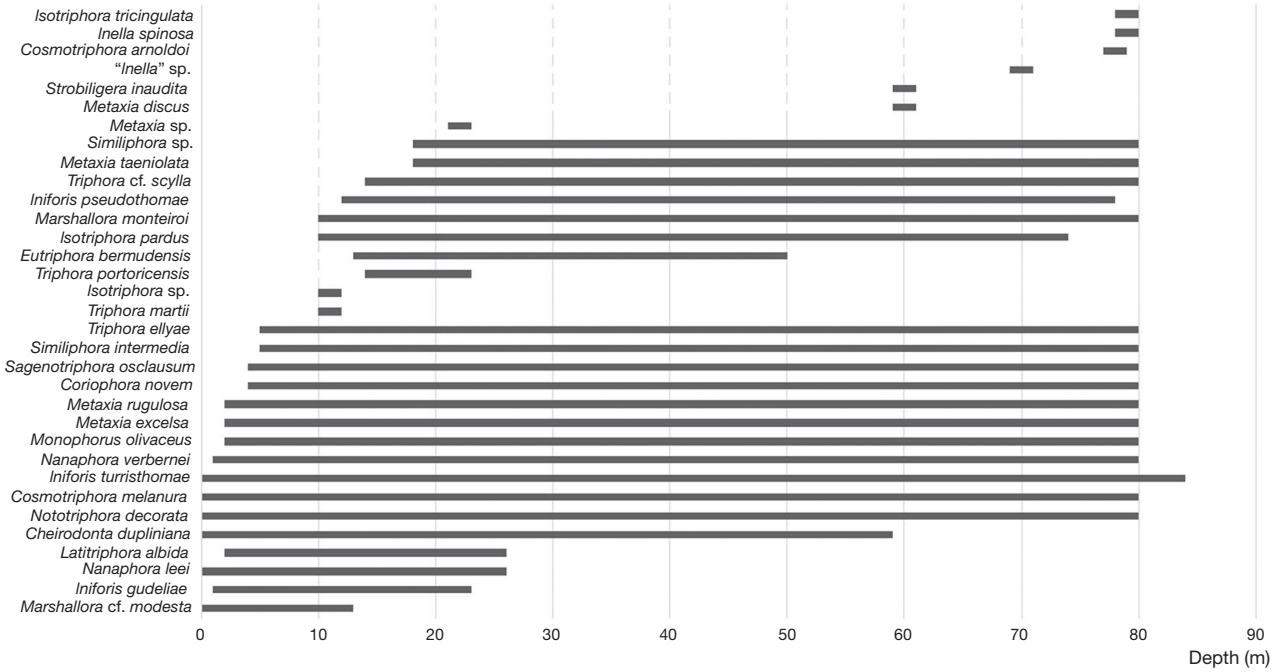

Fig. 25. — Depth range of triphorid species in Martinique, sampled by MADIBENTHOS.

hyper-diverse dredging stations recovered up to 13 species, mainly at depths below 50 m, in which brushing and suction did not occur. In addition to the restriction of depth, there were more dredging stations than the sum of brushing and suction stations, and the area covered by a dredging is often larger than of a AB or AS station, which explain the higher number of sampled species (Fig. 22A). However, dredging usually samples empty shells, contrary to brushing and suction, which in most cases obtain live triphorids (rarely shells with hermit crabs; pers. obs. for brushing). Unfortunately, the MADIBENTHOS expedition did not aim for the storage of live triphorids in ethanol, and the amount of photographed live specimens probably does not reflect the actual number, avoiding further comparisons.

The five species currently endemic from Martinique ("*Inella*" sp., *Isotriphora pardus* n. sp., *Isotriphora* sp., *Metaxia discus* n. sp., *Metaxia* sp.) have non-planktotrophic development (Fig. 23A), but their extreme rarity (sampled as singletons or doubletons, with the exception of *I. pardus* n. sp.) and the lack of intensive sampling in other parts of the Lesser Antilles avoid such certainty. Other species sampled from Martinique but absent from Guadeloupe are *Cosmotriphora arnoldoi*, *Triphora* cf. *scylla* and *Triphora portoricensis*, although the two former are singleton or doubleton. In contrast, 25 out of 29 species from Guadeloupe (86.2%) are shared with Martinique (Fig. 23B); *Nanaphora decollata*, *Isotriphora peetersae* Moolenbeek & Faber, 1989 (KARUBENTHOS stations: GS05 [2], GB11 [1], GS29 [1]) and *Triphora elvirae* (KARUBENTHOS station: GR10 [1]) were absent from Martinique, whereas the non-planktotrophic *Triphora guadaloupensis* was absent from MADIBENTHOS and KARUBENTHOS 1. The triphorid fauna from ABC Is. has 14 of the 18 recorded species (77.8%) shared with Martinique, whereas Abaco (Bahamas) shares with Martinique 14 of 22 species (63.6%) (Fig. 23B). The similarity drops when comparing shallow-water triphorids from Martinique with those from Cuba (21 of 40 species shared, i.e., 52.5%), which has more species than Martinique due to a much larger coastline and with researchers actively describing species since 1992; many triphorids from Cuba are non-planktotrophic, which influences their endemism. The (bio)geographic distance between Martinique and Brazil partly explains the low number of shared species (20 of the 59 species from Brazil, i.e., 33.9%); Brazil has more known triphorids owing to a much larger coastline, comprising different marine provinces (Spalding *et al.* 2007), in addition to several species known from the end of the continental shelf (Fernandes & Pimenta 2019a, 2020), a depth zone poorly explored in Martinique. An expected but intriguing absence from Martinique is the planktotrophic *Triphora atlantica* Smith, 1890, which is widely distributed in the southern USA and in Brazil, but with a single Caribbean record from Puerto Rico (Rolán & Fernández-Garcés 2008; Fernandes & Pimenta 2020).

Another sampling bias in MADIBENTHOS was related to the geographic zones within Martinique, with the increasing order (excluding AN stations): Baie de Fort-de-France (49 stations), Nord Atlantique (69), Nord Caraibe (95), Sud Atlantique (131), Sud Caraibe (147); i.e., the Atlantic side had less stations (200) than the Caribbean side (291). Even though, the zones with most triphorid species are, in a decreasing order: Nord Atlantique (26 species / Chao1 estimator: 26.1 species), Sud Atlantique (22 / 25.7), Nord Caraibe (20

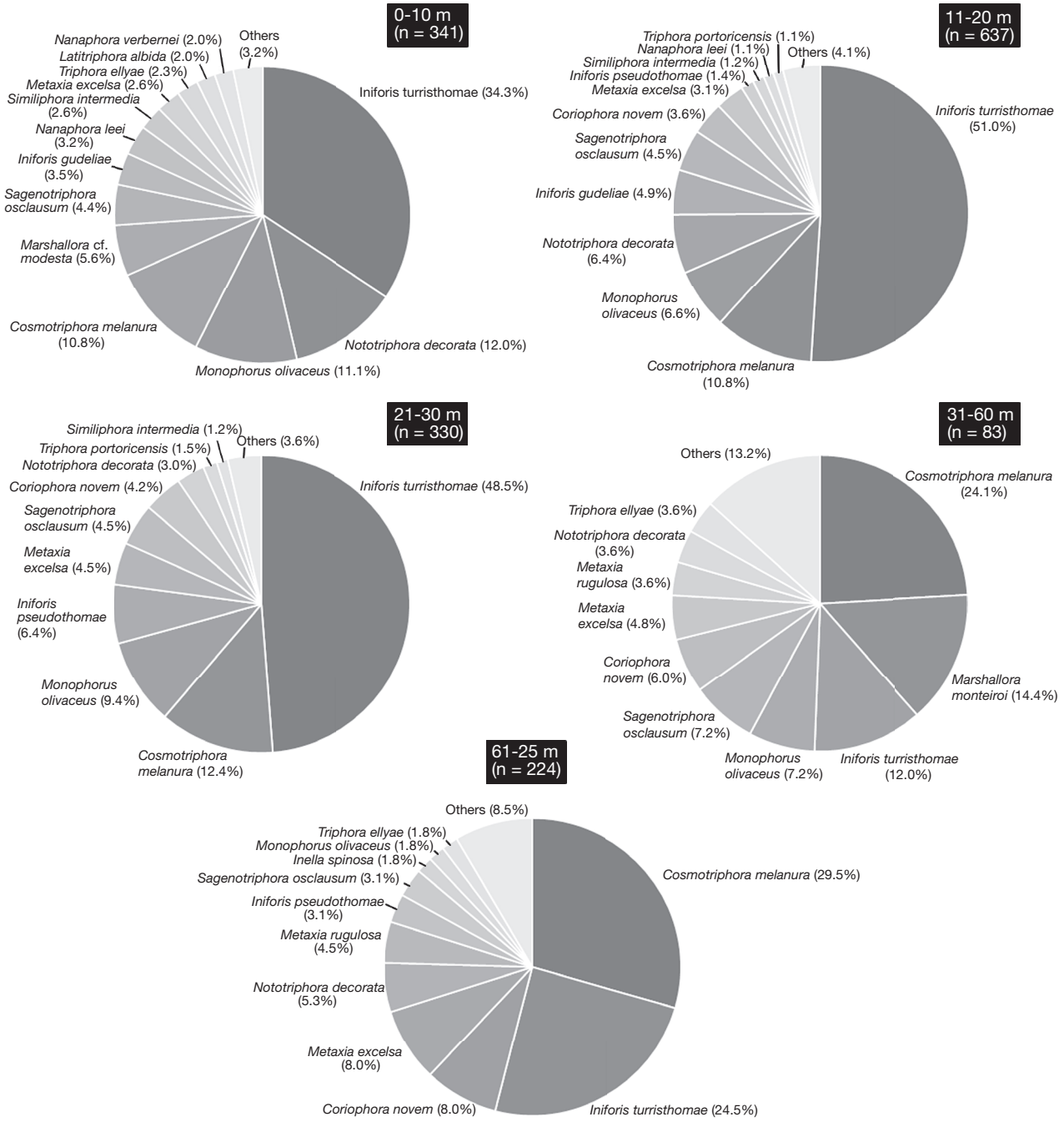

Fig. 26. — Proportion of triphorid species sampled by MADIBENTHOS, according to depth zones and total number of shells/specimens (**n**).

/ 22.0), Sud Caraibe (18 / 27.0) and Baie de Fort-de-France (11 / 12.0) (Fig. 23C, D). In the nMDS groupings (Fig. 23E-F), the shallower (0-30 m) stations from the Caribbean side (including Baie de Fort-de-France) mainly grouped together, just like shallower stations from the Atlantic side, despite the skewed category 'Sud Atlantique 0-10 m' in the presence/absence matrix (Fig. 23F). Deeper (31-85 m) stations also grouped close (Fig. 23E-F), except the category 'Sud Caraibe 61-85 m', which had a highly discrepant relative abundance of *Iniforis turristhomae* (72.7%).

Some hyper-diverse stations at Nord Atlantique derived from deeper dredging (Fig. 24A) lye close to the arbitrary limit with Nord Caraibe (Bouchet *et al.* 2019: 217), and influenced the higher number of triphorids in the Atlantic side of Martinique (Fig. 23C, D) despite the reduced number of stations, regarding other portions of the island lacked dredging in deeper levels. The wider 'shelf' of the Atlantic side might have also contributed to the increased number of triphorids owing to a supposed higher availability of microhabitats (e.g. perhaps more sponge hosts). As expected

due to the smaller area, reduced sampling (comprising stations down to 15 m only, except by AN stations) and certain anthropic impact, Baie de Fort-de-France housed less triphorids (Fig. 23C).

The hyper-diverse stations of triphorids were widespread along Martinique (Fig. 24A), except by the SE corner of the island. This is probably explained by the lower numbers of AB, AD and AS stations at this part (Bouchet *et al.* 2019: 24-25), although other factors (such as hydrodynamics) may also play a role. Some species, independently of having non-planktotrophic (Fig. 24B, C) or planktotrophic (Fig. 24D-F) development, have patchy ranges in Martinique, concentrated in the Atlantic (Fig. 24B, C) or Caribbean (Fig. 24D, E) side. This suggests niche differentiation due to the presence of particular sponge hosts or preference (by larvae or adults) for specific oceanic conditions, such as low or moderate wave exposure (which affects predation levels). The non-planktotrophic *Triphora portoricensis* and *Iniforis gudeliae* are mainly restricted to the Atlantic side (Fig. 24B, C), suggesting this type of development might be useful for stronger currents. However, the non-planktotrophic *Marshallora monteiroi* n. comb. and several planktotrophic triphorids are widespread in Martinique, suggesting they feed on many sponge hosts or even few hosts (but with widespread ranges), and might be tolerant to other biotic/abiotic factors. An intriguing patchy distribution in Martinique is that of *Marshallora* cf. *modesta* (Fig. 24F): this taxon occurs only in the littoral (Fig. 25) and seems abundant in the Caribbean, but in Martinique it is restricted to two hotspots, with eight stations at Baie de Fort-de-France and three stations in a narrow area at Sud Atlantique. DNA sequences should be provided in order to test the existence of one or more species under *M*. cf. *modesta* from Martinique, regarding this is a species complex (Fernandes *et al.* 2021).

Besides *M*. cf. *modesta*, only two species (*Iniforis gudeliae* and *Nanaphora leei*) sampled shallower than 30 m in Martinique are consistently found shallower than 45 m in the West Atlantic (Fig. 25). One third of the triphorid species (11 of 33) sampled by MADIBENTHOS have their shallowest records between 10-25 m; Albano *et al.* (2011) indicated a turnover of the triphorid fauna from Vanuatu below the 10 m limit, possibly due to reduced hydrodynamics. Worthy to mention, of these 11 species, *Eutriphora bermudensis*, *Iniforis pseudothomae* and *Metaxia taeniolata* are occasionally found at 4-5 m in particular sites on the West Atlantic (Rolán & Fernández-Garcés 1995; Fernandes & Pimenta 2020), but never in the intertidal. Six species were only sampled deeper or near the 60 m limit in Martinique (Fig. 25), although *Cosmotriphora arnoldoi* occurs up to 20 m in the West Atlantic; this is another turnover of triphorid fauna found by Albano *et al.* (2011) and observed for some species in Brazil (Fernandes & Pimenta 2020), with the twilight zone initiated near 60 m (and the consequent temperature decrease) possibly affecting the distribution of sponges and snails. With the exception of *Strobiligera inaudita* (and disregarding *C. arnoldoi*), the other four species are non-planktotrophic, a condition common in triphorids from deeper waters.

The abundance of triphorids changes in Martinique along the depth gradient (Fig. 26). The first 30 m shows a clear predominance of *Iniforis turristhomae*, usually followed by *Cosmotriphora melanura*, *Monophorus olivaceus* and *Nototriphora decorata*, which is however the eighth most abundant species in the 21-30 m layer. Despite a reduced sampling effort below 30 m, *C. melanura* is the most abundant triphorid between 31-85 m, with *I. turristhomae* as the second (61-85 m) or third (31-60 m) most abundant triphorid, whereas *M. olivaceus* is only the tenth in the 61-85 m layer. Fernandes & Pimenta (2020) also noticed a dominance of *C. melanura* in the Vitória-Trindade seamount chain, SE Brazil, regarding *I. turristhomae* is absent from Brazil.

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REFERENCES

Adams A. 1854. — Descriptions of new species of *Eulima*, *Triphoris*, etc., from the collection of Hugh Cuming, esq. *Proceedings of the Zoological Society of London* 19: 276-279. https://doi.org/10.1111/j.1096-3642.1851.tb01178.x

Adams C. B. 1850. — Descriptions of supposed new species of marine shells which inhabit Jamaica. *Contributions to Conchology* 7: 109-123.

Albano P. G., Sabelli B. & Bouchet P. 2011. — The challenge of small and rare species in marine biodiversity surveys: microgastropod diversity in a complex tropical coastal environ-

ment. *Biodiversity and Conservation* 20: 3223-3237. https://doi.org/10.1007/s10531-011-0117-x

BAKKER P. A. J. & SWINNEN F. 2021. — Triphoridae (Gastropoda) from the island of Saint Helena and Ascension Island, with the description of three new species. *Basteria* 85 (2): 130-144.

BANDEIRA E. V. P. 2019. — *Malacofauna associada a rodolitos da plataforma continental na Costa Oeste do Estado do Ceará, Brasil*. MSc thesis. Universidade Federal do Ceará, Fortaleza, 57 p.

BARTSCH P. 1911. — New marine mollusks from Bermuda. *Proceedings of the United States National Museum* 41 (1861): 303-306, pl. 28. https://doi.org/10.5479/si.00963801.41-1861.303

BOUCHET P. 1985. — Les Triphoridae de Méditerranée et du proche Atlantique (Mollusca, Gastropoda). *Lavori de la Società Italiana di Malacologia* 21: 5-58.

BOUCHET P. & GUILLEMOT H. 1978. — The *Triphora perversa*-complex in Western Europe. *Journal of Molluscan Studies* 44: 344-356. https://doi.org/10.1093/oxfordjournals.mollus.a065441

BOUCHET P. & STRONG E. 2010. — Historical name-bearing types in marine molluscs: an impediment to biodiversity studies?, *in* POLASZEK A. (ed). *Systema Naturae* 250: 63-74.

BOUCHET P., LOZOUET P., MAESTRATI P. & HÉROS V. 2002. — Assessing the magnitude of species richness in tropical marine environments: exceptionally high numbers of molluscs at a New Caledonia site. *Biological Journal of the Linnean Society* 75: 421-436. https://doi.org/10.1046/j.1095-8312.2002.00052.x

BOUCHET P., DIRBERG G., CORBARI L. & LEBLOND A. 2019. — *Rapport final de l'expédition Madibenthos 2016*. Muséum national d'Histoire naturelle, Paris, 233 p. https://hal.science/hal-02473023

CECALUPO A. & PERUGIA I. 2020. — Report on the Cerithiopsidae from Guadeloupe, Martinique and French Guiana (Caenogastropoda: Triphoroidea). *Visaya*, suppl. 14: 1-103.

CESAR A. R. M. 2020. — Diversidade malacológica associada aos bancos de rodolitos de ilhas da costa brasileira (Fernando de Noronha, Abrolhos e Queimada Grande). MSc thesis. Universidade Estadual de Campinas, Campinas, 90 p.

DALL W. H. 1889. — Reports on the results of dredging, under the supervision of Alexander Agassiz, in the Gulf of Mexico (1877-78) and in the Caribbean Sea (1879-80), by the U.S. Coast Survey steamer "Blake", Lieut.-Commander C. D. Sigsbee, U. S. N., and Commander J. R. Bartlett, U.S.N., Commanding. XXIX - Report on the Mollusca. Part II - Gastropoda and Scaphopoda. *Bulletin of the Museum of Comparative Zoology* 18: 1-492.

DALL W. H. & SIMPSON C. T. 1901. — The Mollusca of Porto Rico. *Bulletin of the United States Fish Comission* 1: 351-524.

DE JONG K. M. & COOMANS H. E. 1988. — *Marine gastropods from Curaçao, Aruba and Bonaire*. E. J. Brill, Leiden, 261 p.

ESPINOSA J. & ORTEA J. 2017. — Tras las huellas de Alcide D'Orbigny: el género *Eratoidea* Weinkauff, 1879 (Mollusca: Neogastropoda: Marginellidae) en la isla de Martinica, Antillas Menores, con la descripción de dos nuevas especies. *Revista de la Academia Canaria de Ciencias* 29: 207-220.

ESPINOSA J., ORTEA J., FERNÁNDEZ-GARCÉS R. & MORO L. 2007. — Adiciones a la fauna de moluscos marinos de la península de Guanahacabibes (I), con la descripción de nuevas espécies. *Avicennia* 19: 63-88.

FABER M. J. 2010. — Marine gastropods from the ABC islands and other localities. 35. A new species of *Metaxia* (Gastropoda: Triphoridae). *Miscellanea Malacologica* 4 (3): 30.

FABER M. J. & MOOLENBEEK R. G. 1991. — Two new shallow water triphorids and a new name in *Metaxia* from Florida and the West Indies. *Apex* 6: 81-85.

FERNANDES M. R. & PIMENTA A. D. 2011. — Taxonomic review of *Metaxia* (Gastropoda: Triphoridae) from Brazil, with description of a new species. *Zoologia* 28: 819-830. https://doi.org/10.1590/S1984-46702011000600016

FERNANDES M. R. & PIMENTA A. D. 2015. — Five new species and two records of Triphorinae (Caenogastropoda, Triphoridae) from Brazil. *Zootaxa* 4012: 493-513. https://doi.org/10.11646/zootaxa.4012.3.5

FERNANDES M. R. & PIMENTA A. D. 2019a. — Taxonomic review of *Inella* and *Strobiligera* (Gastropoda: Triphoridae) from Brazil. *Zootaxa* 4613: 1-52. https://doi.org/10.11646/zootaxa.4613.1.1

FERNANDES M. R. & PIMENTA A. D. 2019b. — Basic anatomy of species of Triphoridae (Gastropoda, Triphoroidea) from Brazil. *European Journal of Taxonomy* 517: 1-60. https://doi.org/10.5852/ejt.2019.517

FERNANDES M. R. & PIMENTA A. D. 2020. — Unraveling one of the 'Big Five': update of the taxonomy of Triphoridae (Gastropoda, Triphoroidea) from Brazil. *European Journal of Taxonomy* 665: 1-170. https://doi.org/10.5852/ejt.2020.665

FERNANDES M. R., SALGUEIRO F., DE PAULA T. S., LÔBO-HAJDU G. & PIMENTA A. D. 2021. — Cryptic speciation in the "*Marshallora nigrocincta*" species complex (Gastropoda, Triphoridae) from the Western Atlantic. *Journal of Zoological Systematics and Evolutionary Research* 59: 819-838. https://doi.org/10.1111/jzs.12461

GARCÍA Y. L. D. & CAPOTE A. J. 2013. — Lista y distribución de los moluscos marinos de Santiago de Cuba, costa suroriental de Cuba. *Amici Molluscarum* 21: 23-38.

GARRIGUES B. & LAMY D. 2019. — Inventaire des Muricidae récoltés au cours de la campagne MADIBENTHOS du MNHN en Martinique (Antilles Françaises) et description de 12 nouvelles espèces des genres *Dermomurex*, *Attilosa*, *Acanthotrophon*, *Favartia*, *Muricopsis* et *Pygmaepterys* (Mollusca, Gastropoda). *Xenophora Taxonomy* 23: 3-39.

HEWITT S. J. & VAN LEEUWEN S. 2017. — Marine molluscs of St. Eustatius, eastern Caribbean: results of the Statia Marine Biodiversity Expedition 2015. *Vita Malacologica* 16: 44-80.

HOLTEN H. S. 1802. — Enumeratio systematica conchyliorum beat J. H. Chemnitzii quondam ecclesiae Zebaothi Havniae pastoris, plurim societum sodialis p. p. quae publica auctione venduntur die 7me Decembris ano pres. K. H. Scidelini, Copenhagen, vi + 88 p.

KRISBERG M. 2009. — Let's talk seashells. Available from: https://olram9.wixsite.com/letstalkseashells/copy-of-template-284

LAMY D. & POINTIER J. P. 2018. — *Marine and freshwater molluscs of the French Caribbean*. Volume I. PLB Editions, Guadeloupe, 388 p.

LEE H. G. 2009. — *Marine shells of Northeast Florida*. Shell Club, Jacksonville, 204 p.

MARSHALL B. A. 1983. — A revision of the recent Triphoridae of Southern Australia (Mollusca: Gastropoda). *Records of the Australian Museum*, suppl. 2: 1-119. https://doi.org/10.3853/j.0812-7387.2.1983.102

MERLANO J. M. D. & HEGEDUS M. P. 1994. — *Moluscos del Caribe colombiano*. Colciencias, Fundación Natura, Invemar, Santa Fé de Bogotá, 291 p., 74 pls.

MOOLENBEEK R. G. & FABER M. J. 1989. — Two new *Triphora* species from the West Indies (Gastropoda; Triphoridae). *Basteria* 53: 77-80.

NOWELL-USTICKE G. W. 1969. — *A supplementary listing of new shells (illustrated). To be added to the check list of the marine shells of St. Croix*. Lane Press, Burlington, 32 p., 6 pls.

NÜTZEL A. 2021. — Gastropods as parasites and carnivorous grazers: a major guild in marine ecosystems, *in* DE BAETS K. & HUNTLEY J. W. (eds), *The evolution and fossil record of parasitism*. Springer, Cham, 565 p. https://doi.org/10.1007/978-3-030-42484-8

OLSSON A. A. 1916. — New Miocene fossils. *Bulletins of American Paleontology* 5: 1-32.

ORTEA J. & BUSKE Y. 2018. — Lista inicial ilustrada de las babosas marinas (Heterobranquios) de la expedición Madibenthos, realizada en 2016 en Martinica (Antillas Menores, mar Caribe). *Revista de la Academia Canaria de Ciencias* 30: 67-102.

REDFERN C. 2001. — *Bahamian seashells – a thousand species from Abaco, Bahamas*. Bahamian Seashells Inc., Boca Raton, 280 p.

REDFERN C. 2013. — *Bahamian seashells: 1161 species from Abaco,*

Bahamas. Bahamian Seashells Inc., Boca Raton, 501 p.
Rolán E. & Fernández-Garcés R. 1993. — The family Triphoridae (Mollusca, Gastropoda) in Cuba. 2. The genus *Iniforis* Jousseaume, 1884. *Apex* 8: 95-105.
Rolán E. & Fernández-Garcés R. 1994. — The family Triphoridae (Mollusca, Gastropoda) in Cuba. 4. The genera *Monophorus*, *Nototriphora*, *Cosmotriphora* and *Cheirodonta*, with the description of three new species. *Apex* 9: 17-27.
Rolán E. & Fernández-Garcés R. 1995. — The family Triphoridae (Mollusca, Gastropoda) in Cuba. 5. The genera *Marshallora*, *Mesophora*, *Similiphora*, *Eutriphora*, *Latitriphora*, *Aclophora* and other species without generic affiliation. *Apex* 10: 9-24.
Rolán E. & Fernández-Garcés R. 2007. — Caribbean Triphoridae (Gastropoda: Triphoroidea): list and colour ilustrations. *Neptunea* 6: 13-24.
Rolán E. & Fernández-Garcés R. 2008. — New data on the Caribbean Triphoridae (Caenogastropoda, Triphoroidea) with the description of 26 new species. *Iberus* 26: 81-170.
Rolán E. & Fernández-Garcés R. 2009. — Two new species of *Iniforis* (Gastropoda: Triphoridae) from the Caribbean. *Novapex* 10: 103-108.
Rolán E. & Fernández-Garcés R. 2015. — Triphorids of the KARUBENTHOS Expedition to Guadeloupe Island. *Gloria Maris* 54: 46-54.
Rolán E. & Luque A. A. 1999. — Two new species of triphorids (Gastropoda, Triphoridae) from the Miskitos Archipelago, Nicaragua. *Iberus* 17: 107-113.
Rolán E. & Redfern C. 1996. — Variabilidad de la protoconcha de *Metaxia rugulosa* (C.B. Adams, 1850) (Gastropoda; Triphoridae). *Noticiario de la Sociedad Española de Malacologia* 26: 27-29.
Rosenberg G. 2009. — Malacolog 4.1.1: a database of Western Atlantic marine Mollusca. http://www.malacolog.org/
Spalding M. D., Fox H. E., Allen G. R., Davidson N., Ferdaña Z. A., Finlayson M., Halpern B. S., Jorge M. A., Lombana A., Lourie S. A., Martin K. D., McManus E., Molnar J., Recchia C. A. & Robertson J. 2007. — Marine ecoregions of the world: a bioregionalization of coastal and shelf areas. *BioScience* 57: 573-583. https://doi.org/10.1641/B570707
Vokes H. E. & Vokes E. H. 1983. — *Distribution of shallow water marine Mollusca, Yucatan Peninsula, Mexico*. Mesoamerican Ecology Institute, Middle American Research Institute, New Orleans, viii + 182 p.
Warmke G. L. & Abbott R. T. 1962. — *Caribbean seashells*. Dover Publications, New York, 348 p.
Zhang D. Y. 2011. — *Antiguan shallow-water seashells - a collection with 18 years study and research of shoreline shells from Antigua, West Indies*. MdM Publishing, Wellington, xi + 211 p.

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APPENDIX

Appendix 1. — Coordinates, depths and sampling methods of stations in which shallow-water triphorids were sampled in Martinique (MADIBENTHOS expedition) and Guadeloupe (KARUBENTHOS 1 and KARUBENTHOS 2 expeditions). Initial depths are indicated only when there are differences with final depths.

Station	Locality	Latitude (N)	Longitude (W)	Initial depth (m)	Final depth (m)	Sampling method
			MADIBENTHOS – Baie de Fort-de-France			
AM005	Baie de Fort-de-France	14°32.6’	61°04.7’	0	1	Visual at intertidal
AM034	Baie de Fort-de-France	14°36.1’	61°04’	0	1	Visual at intertidal
AD105	Baie de Fort-de-France	14°33’	61°03.7’	–	2	Dredging
AM326	Baie de Fort-de-France	14°32.6’	61°04.7’	–	0	Visual at intertidal
AB390	Baie de Fort-de-France	14°33.2’	61°01.6’	–	6	Brushing
AB392	Baie de Fort-de-France	14°35’	61°04.6’	–	13	Brushing
AB394	Baie de Fort-de-France	14°34.3’	61°02.7’	–	7	Brushing
AB398	Baie de Fort-de-France	14°34.6’	61°03.3’	–	6	Brushing
AS581	Baie de Fort-de-France	14°33.4’	61°04.3’	–	11	Brushing
AD603	Baie de Fort-de-France	14°35.3’	61°01.5’	–	9	Dredging
AD605	Baie de Fort-de-France	14°35’	61°01.4’	–	10	Dredging
AD607	Baie de Fort-de-France	14°35.2’	61°01.4’	–	2	Dredging
AD623	Baie de Fort-de-France	14°33.7’	61°03.1’	–	2	Dredging
			MADIBENTHOS – Nord Caraibe			
AM040	Baie de St-Pierre	14°43.9’	61°10.8’	0	1	Visual at intertidal
AS054	Vétiver	14°37.9’	61°07.7’	–	10	Suction
AB062	Ste-Luce	14°27.3’	60°55.5’	–	15	Brushing
AB108	Case-Pilote	14°38.6’	61°08.5’	–	8	Brushing
AD109	Case-Pilote	14°38.6’	61°08.5’	–	8	Dredging
AB159	Case-Pilote	14°38.3’	61°08.4’	–	12	Brushing
AB161	Vétiver	14°37.8’	61°07.7’	–	25	Brushing
AB183	Passe du Brigot	14°33.8’	60°47.6’	–	17	Brushing
AD276	Baie de Fort-de-France	14°35.7’	61°06’	–	60	Dredging
AD277	Schoelcher	14°36.7’	61°06’	–	3	Dredging
AD279	Schoelcher	14°36.9’	61°06.7’	–	80	Dredging
AD280	SW Vétiver	14°37.6’	61°08.3’	–	60	Dredging
AD283	Fond Boucher	14°39.3’	61°09.6’	40	37	Dredging
AD289	Bellefontaine	14°40.2’	61°10.5’	–	70	Dredging
AD290	SW Vétiver	14°37.5’	61°08.3’	–	74	Dredging
AD294	Le Carbet	14°42.3’	61°11.6’	–	76	Dredging
AD295	Le Carbet	14°42.3’	61°11.6’	–	77	Dredging
AD298	Bellefontaine	14°40.4’	61°10.6’	–	70	Dredging
AD299	Bellefontaine	14°40.1’	61°10.5’	–	77	Dredging
AR308	Le Prêcheur	14°48.4’	61°13.6’	1	22	Visual at diving
AB362	Fond Boucher	14°39.3’	61°09.4’	–	14	Brushing
AS363	Fond Boucher	14°39.3’	61°09.4’	–	14	Suction
AS365	Case-Pilote	14°38.9’	61°09.1’	–	14	Suction
AB372	Bellefontaine	14°39.7’	61°09.6’	–	12	Brushing
AS373	Bellefontaine	14°39.7’	61°09.6’	–	9	Suction
AS375	Îlet La Perle	14°50.5’	61°13.7’	–	23	Suction
AB377	Le Prêcheur	14°48.4’	61°13.6’	–	21	Brushing
AS378	Le Prêcheur	14°48.4’	61°13.6’	–	15	Suction
AB382	Le Prêcheur	14°47.2’	61°13.1’	–	2	Brushing
AR383	Le Prêcheur	14°47.2’	61°13.1’	10	17	Visual at diving
AB386	Le Prêcheur	14°46.8’	61°12.7’	–	17	Brushing
AB388	Baie de St-Pierre	14°45.1’	61°11’	–	17	Brushing
AB460	Schoelcher	14°37.7’	61°07.2’	–	4	Brushing
AR461	Schoelcher	14°37.7’	61°07.2’	4	9	Visual at diving
AB463	Anse Couleuvre	14°50.4’	61°13.4’	–	7	Brushing
AS482	Case-Pilote	14°38.5’	61°08.8’	–	56	Suction
AB483	Vétiver	14°38’	61°08.2’	–	7	Brushing
AB510	Baie de St-Pierre	14°44.7’	61°10.7’	–	45	Brushing
AB567	Anse des Galets	14°51.4’	61°12.8’	0	10	Brushing
AS568	Anse des Galets	14°51.4’	61°12.8’	14	26	Suction
AS570	Anse à Voile	14°51’	61°12.9’	5	7	Suction
AS572	Baie de St-Pierre	14°44.5’	61°10.8’	44	47	Suction
AS574	Le Prêcheur	14°48.5’	61°13.8’	–	56	Suction
AS576	Le Prêcheur	14°49.1’	61°13.8’	20	25	Suction
AD612	SW Vétiver	14°37.6’	61°08.6’	–	66	Dredging

Appendix 1. — Continuation.

Station	Locality	Latitude (N)	Longitude (W)	Initial depth (m)	Final depth (m)	Sampling method
			MADIBENTHOS – Nord Atlantique			
AR143	Presqu'Île de la Caravelle	14°46.8'	60°56.3'	4	10	Visual at diving
AB197	Presqu'Île de la Caravelle	14°48.4'	60°52.8'	23	25	Brushing
AB199	E Pointe Ténos	14°48.4'	60°59'	–	14	Brushing
AD244	N Presqu'Île de la Caravelle	14°52.1'	60°53.7'	–	59	Dredging
AD245	N Presqu'Île de la Caravelle	14°53.1'	60°53.4'	–	60	Dredging
AD247	N Presqu'Île de la Caravelle	14°51.9'	60°50.7'	–	57	Dredging
AD248	N Presqu'Île de la Caravelle	14°52.5'	60°51.1'	–	58	Dredging
AD250	N Presqu'Île de la Caravelle	14°52'	60°51.4'	–	57	Dredging
AD252	NE Le Lorrain	14°53.8'	60°59.2'	–	62	Dredging
AD254	NE Le Lorrain	14°53.7'	61°00.3'	–	62	Dredging
AD255	NE Le Lorrain	14°51.3'	61°01.7'	–	48	Dredging
AD256	NE Le Lorrain	14°51.3'	61°01.7'	–	49	Dredging
AD257	N Le Lorrain	14°55.1'	61°02.4'	–	63	Dredging
AD258	Macouba	14°53.1'	61°09.1'	–	22	Dredging
AB260	Ste-Marie	14°46.3'	60°57.5'	–	20	Brushing
AD260	Macouba	14°55.1'	61°08.9'	–	78	Dredging
AD261	Macouba	14°55.1'	61°09'	–	80	Dredging
AD263	Macouba	14°55'	61°08.9'	78	80	Dredging
AD265	Macouba	14°55.1'	61°08.9'	–	80	Dredging
AD266	Macouba	14°55.1'	61°08.9'	–	80	Dredging
AD267	Macouba	14°54.9'	61°08.9'	–	77	Dredging
AD273	Macouba	14°53.2'	61°09'	–	22	Dredging
AD275	Macouba	14°55'	61°08.9'	–	80	Dredging
AB301	Presqu'Île de la Caravelle	14°47.3'	60°57.4'	–	19	Dredging
AB350	Presqu'Île de la Caravelle	14°46.5'	60°51.5'	–	15	Brushing
AS550	Grand'Rivière	14°52.7'	61°11'	–	16	Suction
AS552	Macouba	14°52.9'	61°08.7'	18	19	Suction
AB556	Grand'Rivière	14°52'	61°11.7'	–	6	Brushing
AS557	Grand'Rivière	14°52'	61°11.7'	–	6	Suction
AB559	Presqu'Île de la Caravelle	14°48.2'	60°55.8'	–	14	Brushing
AB562	Presqu'Île de la Caravelle	14°47.5'	60°57.4'	–	14	Brushing
AS563	Presqu'Île de la Caravelle	14°47.5'	60°57.4'	–	14	Suction
AS565	Le Lorrain	14°50.7'	61°03.8'	11	14	Suction
			MADIBENTHOS – Sud Atlantique			
AM042	Le Vauclin	14°30.9'	60°49.8'	–	0	Visual at intertidal
AM043	La Baie des Mulets	14°34.3'	60°50.6'	0	2	Visual at intertidal
AS078	E Le Vauclin	14°34.7'	60°45.9'	–	20	Suction
AS081	E Le Vauclin	14°34.7'	60°45.9'	–	18	Suction
AD084	Le François	14°38'	60°51.2'	5	14	Dredging
AB117	Pointe Baham	14°24.7'	60°50.1'	–	2	Brushing
AB120	Pointe Michel	14°26.4'	60°49.3'	–	2	Brushing
AB130	Le Vauclin	14°32'	60°49'	–	1	Brushing
AR133	Le Vauclin	14°32.3'	60°48.5'	3	5	Visual at diving
AB134	Le François	14°37'	60°49.5'	–	1	Brushing
AB149	Presqu'Île de la Caravelle	14°45.5'	60°52.8'	–	2	Brushing
AB181	E Le Vauclin	14°34.7'	60°45.9'	–	22	Brushing
AB183	Passe du Brigot	14°33.8'	60°47.6'	–	17	Brushing
AB185	NE Pointe Jacob	14°36.1'	60°49'	–	23	Brushing
AB187	Le François	14°38'	60°51.2'	–	5	Brushing
AB189	Presqu'Île de la Caravelle	14°44.1'	60°50.8'	–	16	Brushing
AB191	E Le Robert	14°40.1'	60°51.1'	–	14	Brushing
AB193	Le Robert	14°41.3'	60°50.2'	–	18	Brushing
AB195	Le Robert	14°41.1'	60°51.4'	–	10	Brushing
AD222	Canal de Ste Lucie	14°22.7'	60°51.6'	–	65	Dredging
AD223	Canal de Ste Lucie	14°22.7'	60°51.3'	–	65	Dredging
AD224	Canal de Ste Lucie	14°23.1'	60°50.2'	–	65	Dredging
AD232	E Le Vauclin	14°34.6'	60°45.2'	–	70	Dredging
AD233	E Le Vauclin	14°34.1'	60°47.1'	–	40	Dredging
AD235	SE Pointe Cerisier	14°35.6'	60°50.8'	2	3	Dredging
AD241	Presqu'Île de la Caravelle	14°44.5'	60°53.5'	5	12	Dredging
AS252	Le François	14°38'	60°51.2'	10	12	Suction
AS253	Presqu'Île de la Caravelle	14°44.1'	60°50.8'	–	29	Suction
AS255	E Le Robert	14°40.1'	60°51.1'	–	16	Suction
AS257	Le Robert	14°41.5'	60°49.6'	–	50	Suction
AM325	Baie de Sans-Souci	14°34.7'	60°50.7'	–	0	Visual at intertidal
AB400	Baie du Galion	14°43.9'	60°54.1'	–	17	Brushing
AB401	Le Robert	14°41'	60°49.4'	–	23	Brushing

Appendix 1. — Continuation.

Station	Locality	Latitude (N)	Longitude (W)	Initial depth (m)	Final depth (m)	Sampling method
AS403	Baie du Robert	14°40.2’	60°52.5’	–	11	Suction
AB405	Le Robert	14°43.2’	60°50.6’	–	23	Brushing
AS409	NE Pointe du Vauclin	14°34.9’	60°48.4’	18	20	Suction
AB419	Le Vauclin	14°30.5’	60°48.5’	–	2	Brushing
AB452	Baie du Robert	14°42’	60°53.8’	–	2	Brushing
			MADIBENTHOS – Sud Caraibe			
AM033	Grande anse du Diamant	14°28’	61°02.8’	0	1	Visual at intertidal
AM038	Anse Dufour	14°31.5’	61°05.4’	0	1	Visual at intertidal
AS057	Rocher du Diamant	14°26.7’	61°02.3’	19	21	Suction
AB058	Passe du Marin	14°26.6’	60°54.3’	–	15	Brushing
AB060	Passe du Marin	14°26.7’	60°54’	19	15	Brushing
AB062	Ste-Luce	14°27.3’	60°55.5’	–	15	Brushing
AS066	Passe du Marin	14°26.9’	60°54’	–	15	Suction
AD067	Passe du Marin	14°26.9’	60°54’	–	15	Dredging
AS068	Rocher du Diamant	14°26.5’	61°02.4’	–	26	Suction
AS071	Rocher du Diamant	14°26.5’	61°02.4’	26	32	Suction
AS073	Banc du Diamant	14°26.4’	61°01.8’	–	23	Suction
AS075	Grande anse du Diamant	14°27.9’	61°01.2’	–	26	Suction
AS092	Rocher du Diamant	14°26.7’	61°02.2’	–	12	Suction
AS096	Rocher du Diamant	14°26.7’	61°02.2’	–	22	Suction
AR100	Anse Noire	14°32’	61°05.3’	2	8	Visual at diving
AB102	Anse Noire	14°31.7’	61°05.3’	–	6	Brushing
AS112	Passe du Marin	14°27’	60°53.8’	4	8	Suction
AR114	Passe du Marin	14°26.8’	60°53.5’	2	11	Visual at diving
AD115	Passe du Marin	14°26.8’	60°53.5’	–	11	Dredging
AR122	Ste-Luce	14°27.5’	60°55.2’	4	6	Visual at diving
AB123	Rocher du Diamant	14°26.7’	61°02.3’	4	10	Brushing
AB126	Pointe du Diamant	14°27.5’	61°02.9’	–	3	Brushing
AB150	Anse Noire	14°32’	61°05.3’	–	13	Brushing
AB152	Grande Anse d’Arlets	14°30.5’	61°06.1’	20	23	Brushing
AS154	Anse Noire	14°32’	61°05.3’	–	10	Suction
AB155	Les Anses-d’Arlet	14°29.7’	61°05.4’	–	19	Brushing
AB157	Grande Anse d’Arlets	14°29.9’	61°05.4’	–	28	Brushing
AB163	Rocher du Diamant	14°26.6’	61°02.4’	–	22	Brushing
AB165	Passe du Marin	14°26.8’	60°54.3’	–	15	Brushing
AB169	Ste-Luce	14°27.3’	60°55.5’	–	22	Brushing
AB173	Rocher du Diamant	14°26.5’	61°02.4’	–	24	Brushing
AB175	Rocher du Diamant	14°26.7’	61°02.4’	–	14	Brushing
AB177	Banc du Diamant	14°26.4’	61°01.7’	–	18	Brushing
AB179	Grande anse du Diamant	14°27.9’	61°01.2’	–	15	Brushing
AD203	Anse d’Arlet	14°29.4’	61°05’	–	12	Dredging
AD214	Pointe du Diamant	14°27’	61°04.1’	–	70	Dredging
AD216	Grande Anse du Diamant	14°28.5’	61°01.1’	–	7	Dredging
AD218	Passe du Marin	14°26.1’	60°54.5’	–	60	Dredging
AD220	Canal de Ste Lucie	14°24.5’	60°54’	–	65	Dredging
AD271	Les Anses-d’Arlet	14°28.5’	61°05.1’	0	29	Dredging
AB354	Trois Rivières	14°27.7’	60°57.8’	4	5	Brushing
AB356	Trois Rivières	14°27.8’	60°57.9’	3	4	Brushing
AB358	Grande anse du Diamant	14°27.9’	61°01.4’	–	17	Brushing
AR359	Grande anse du Diamant	14°27.9’	61°01.4’	12	32	Visual at diving
AB360	Grande anse du Diamant	14°28’	61°00.1’	–	12	Brushing
AB369	Pointe de la Baleine	14°31.1’	61°05.9’	17	19	Brushing
AS370	Pointe de la Baleine	14°31.1’	61°05.9’	–	20	Suction
AB578	Trois Rivières	14°27.5’	60°58.2’	–	17	Brushing
AS579	Trois Rivières	14°27.5’	60°58.2’	17	19	Suction
AB583	W Grande anse du Diamant	14°28’	61°02.1’	–	19	Brushing
AD614	Pointe du Diamant	14°26.9’	61°04’	–	84	Dredging
AD615	Pointe du Diamant	14°27.1’	61°04.2’	–	66	Dredging
AD616	Les Anses-d’Arlet	14°28.1’	61°05.3’	–	72	Dredging
AD617	Grande Anse d’Arlets	14°30.1’	61°06.3’	–	71	Dredging
			KARUBENTHOS 1			
GB01	Îlet du Gosier	16°11.8’	61°29.66’	–	6	Brushing
GM01	Petit Cul-de-sac marin	16°13.41’	61°31.83’	–	1	Visual at intertidal
GB02	Grand Cul-de-sac marin	16°21.97’	61°37.98’	–	11	Brushing
GM02	Anse Babin	16°20.45’	61°31.55’	–	1	Visual at intertidal
GB03	Grand Cul-de-sac marin	16°21.72’	61°36.35’	–	22	Brushing
GM03	Baie-Mahault	16°16.17’	61°35.1’	–	1	Visual at intertidal
GB04	Grand Cul-de-sac marin	16°21.75’	61°36.07’	–	23	Brushing

Appendix 1. — Continuation.

Station	Locality	Latitude (N)	Longitude (W)	Initial depth (m)	Final depth (m)	Sampling method
GS04	Grand Cul-de-sac marin	16°21.97’	61°37.98’	–	11	Suction
GB05	Pointe à Lézard	16°08.43’	61°46.92’	–	12	Brushing
GS05	Grand Cul-de-sac marin	16°21.72’	61°36.35’	–	22	Suction
GB06	Tête à l’Anglais	16°22.9’	61°45.94’	–	23	Brushing
GM06	Îlet Fortune	16°09’	61°33.67’	–	1	Visual at intertidal
GS06	Grand Cul-de-sac marin	16°21.75’	61°36.07’	–	23	Suction
GB07	Pointe du Quesy	16°06.07’	61°46.37’	–	6	Brushing
GS07	Pointe à Lézard	16°08.43’	61°46.92’	–	12	Suction
GB08	Pointe à Lézard	16°08.43’	61°46.92’	–	12	Brushing
GM08	Pointe de l’Ermitage	16°07.57’	61°46.45’	–	1	Visual at intertidal
GS08	Tête à l’Anglais	16°22.9’	61°45.94’	–	23	Suction
GB09	Baie de Bouillante	16°08.07’	61°46.71’	–	6	Brushing
GS09	Pointe de l’Ermitage	16°07.61’	61°46.53’	–	11	Suction
GB10	Pointe de Malendure	16°05.95’	61°47.5’	–	8	Brushing
GD10	N Baie de Bouillante	16°08.48’	61°47.03’	–	54	Dredging
GR10	Pointe à Lézard	16°08.43’	61°46.92’	–	29	Visual at diving
GB11	Côte Ferry	16°17.69’	61°48.23’	–	10	Brushing
GM11	Cabrit	16°11.97’	61°34.28’	–	1	Visual at intertidal
GS11	S Rocroy	16°02.38’	61°45.71’	–	17	Suction
GB12	Port-Louis	16°25.61’	61°32.57’	–	14	Brushing
GR12	Tête à l’Anglais	16°22.9’	61°45.94’	–	21	Visual at diving
GS12	Baie de Bouillante	16°08.07’	61°46.71’	–	6	Suction
GB13	Port-Louis	16°23.26’	61°31.79’	–	10	Brushing
GD13	Petite Anse	16°05.72’	61°46.26’	–	5	Dredging
GR13	Pointe de l’Ermitage	16°07.61’	61°46.53’	–	11	Visual at diving
GS13	Îlet Pigeon	16°02.4’	61°45.6’	–	50	Suction
GB14	Near Port-Louis	16°23.74’	61°32.07’	–	49	Brushing
GR14	Vieux Habitan	16°03.25’	61°46.17’	–	27	Visual at diving
GS14	Pointe de Malendure	16°05.95’	61°47.5’	–	8	Suction
GB15	S Port-Louis, W Petit Canal	16°22.57’	61°31.74’	–	8	Brushing
GD15	Anse à la Barque	16°05.39’	61°46.48’	–	50	Dredging
GR15	Pointe du Quesy	16°06.07’	61°46.37’	–	11	Visual at diving
GS15	Sec Ferry	16°17.51’	61°48.96’	–	27	Suction
GB16	Port-Louis	16°27.34’	61°32.07’	–	19	Brushing
GD16	Anse Caraïbe	16°12.37’	61°47.2’	–	10	Dredging
GS16	Port-Louis	16°25.61’	61°32.57’	–	25	Suction
GB17	Pointe Grigri	16°23.26’	61°31.79’	–	13	Brushing
GR17	Baie de Bouillante	16°08.07’	61°46.71’	–	13	Visual at diving
GS17	Port-Louis	16°23.26’	61°31.79’	–	3	Suction
GB18	Port-Louis	16°25.99’	61°32.92’	–	45	Brushing
GS18	Near Port-Louis	16°23.74’	61°32.07’	–	49	Suction
GB19	Port-Louis	16°23.26’	61°31.79’	–	11	Brushing
GR19	Îlet Pigeon	16°02.4’	61°45.6’	–	15	Visual at diving
GS19	S Port-Louis	16°22.57’	61°31.74’	–	8	Suction
GB20	Port-Louis	16°26.78’	61°32.41’	–	16	Brushing
GD20	Near Baie de Baille-Argent	16°15.54’	61°48.71’	–	35	Dredging
GR20	Pointe de Malendure	16°05.95’	61°47.5’	–	8	Visual at diving
GS20	Port-Louis	16°27.34’	61°32.07’	–	19	Suction
GB21	Trou à l’orage	16°22.88’	61°31.43’	–	8	Brushing
GD21	Near Baie de Baille-Argent	16°15.55’	61°48.8’	–	40	Dredging
GR21	Sec Ferry	16°17.51’	61°48.96’	–	27	Visual at diving
GS21	Pointe Grigri	16°23.26’	61°31.79’	–	14	Suction
GB22	Pointe Montagnier	16°30.57’	61°28.45’	–	12	Brushing
GS22	Pointe d’Antigues	16°25.99’	61°32.92’	–	45	Suction
GB23	Grotte Amédier	16°30.04’	61°28.79’	–	16	Brushing
GS23	Port-Louis	16°23.26’	61°31.79’	–	7	Suction
GB24	Sec Pâté	15°54’	61°39.3’	–	25	Brushing
GD24	Port-Louis	16°25’	61°33’	–	150	Dredging
GS24	Port-Louis	16°26.78’	61°32.41’	–	16	Suction
GB25	Marina de Rivière Sens	15°59’	61°43.08’	–	25	Brushing
GD25	Port-Louis	16°25’	61°33’	–	160	Dredging
GS25	Pointe Montagnier	16°30.57’	61°28.45’	–	12	Suction
GB26	Near Caret	16°22.28’	61°38.14’	–	29	Brushing
GS26	Grotte Amédier	16°30.04’	61°28.79’	–	16	Suction
GB27	Îlot Caret	16°21.26’	61°37.79’	–	2	Brushing
GN27	Port-Louis	16°23’	61°33’	–	120	Trap lines
GR28	Port-Louis	16°27.34’	61°32.07’	–	19	Visual at diving
GM29	Grand Cul-de-sac marin	16°17.42’	61°33.19’	–	1	Visual at intertidal
GS29	Near Caret	16°22.28’	61°38.14’	–	29	Suction
GB30	Caye Plate	16°10.97’	61°32.41’	–	16	Brushing

Appendix 1. — Continuation.

Station	Locality	Latitude (N)	Longitude (W)	Initial depth (m)	Final depth (m)	Sampling method
GS30	Îlot Caret	16°21.26’	61°37.79’	–	2	Suction
GB31	Petite Terre	16°09.71’	61°07.73’	–	15	Brushing
GD31	Port-Louis	16°24.97’	61°32.8’	–	85	Dredging
GD32	Port-Louis	16°23.88’	61°32.47’	–	80	Dredging
GS32	W Fajou	16°21.35’	61°35.79’	–	2	Suction
GD33	Port-Louis	16°24’	61°33’	–	130	Dredging
GM33	Anse Tarare	16°15.37’	61°11.92’	–	6	Visual at diving
GS33	Caye Plate	16°10.97’	61°32.41’	–	14	Suction
GB34	Petite Terre	16°10.45’	61°08.16’	–	10	Brushing
GR34	Pointe de la Fontaine	16°27.74’	61°31.84’	–	9	Visual at diving
GS34	Petite Terre	16°09.71’	61°07.73’	–	15	Suction
GD35	Port-Louis	16°22.77’	61°34.19’	–	66	Dredging
GB36	W Petite Terre	16°09.45’	61°10.5’	–	16	Brushing
GD36	Vieux-Bourg	16°22.87’	61°33.05’	–	65	Dredging
GR36	Pointe Montagnier	16°30.57’	61°28.45’	–	12	Visual at diving
GS36	Petite Terre	16°07.87’	61°12.52’	–	50	Suction
GR37	Grotte Amédier	16°30.04’	61°28.79’	–	16	Visual at diving
GS37	Petite Terre	16°10.45’	61°08.16’	–	10	Suction
GD39	Grand Cul-de-sac marin	16°17.34’	61°33.32’	–	1	Dredging
GS39	W Petite Terre	16°09.45’	61°10.5’	–	16	Suction
GD42	Grand Cul-de-sac marin	16°21.12’	61°32.33’	–	3	Dredging
GD49	Petit Cul-de-sac marin	16°13.62’	61°32.38’	–	3	Dredging
GD50	Îlet Gosier	16°11.31’	61°29.59’	–	22	Dredging
GR50	Lagon de Petite Terre	16°10.55’	61°06.67’	–	4	Visual at diving
GD51	Îlet Gosier	16°11.44’	61°29.34’	–	15	Dredging
GD52	Îlet Gosier	16°12.09’	61°29.71’	–	6	Dredging
GD54	Near Îlet Fajou	16°22.2’	61°35.01’	–	60	Dredging
GD55	Near Îlet Fajou	16°22.48’	61°35.46’	–	85	Dredging
GD58	Near Îlet Fajou	16°22.68’	61°34.95’	–	95	Dredging
GD59	Near Îlet Fajou	16°22.55’	61°35.38’	–	88	Dredging
GD61	E Petite Terre	16°11.97’	61°03.96’	–	80	Dredging
GD65	Banc des Vaisseaux	16°08.14’	61°16.96’	–	20	Dredging
GD68	Banc des Vaisseaux	16°09.03’	61°17.31’	–	33	Dredging
GD69	Anse Tarare	16°15.97’	61°10.18’	–	60	Dredging
			KARUBENTHOS 2			
DW4545	N Grande-Terre	16°29.7’	61°31.4’	60	82	Dredging
DW4546	N Grande-Terre	16°31’	61°32’	268	306	Dredging
DW4550	N Grande-Terre	16°37’	61°31’	432	482	Dredging
DW4551	N Grande-Terre	16°31.3’	61°24.5’	59	74	Dredging
DW4552	E La Désirade	16°23.9’	60°56.2’	48	60	Dredging
DW4555	E La Désirade	16°24’	60°51’	100	258	Dredging
DW4574	E La Désirade	16°22’	60°54’	140	340	Dredging
DW4583	N Marie-Galante	16°09’	61°19’	233	396	Dredging
DW4586	W Marie-Galante	16°00’	61°23’	204	251	Dredging
DW4587	W Marie-Galante	16°01’	61°24’	281	406	Dredging
DW4599	W Marie-Galante	15°53’	61°25’	262	266	Dredging