

Triphorids of the Karubenthos Expedition to Guadeloupe Island

Emilio ROLÁN (1) & Raúl FERNÁNDEZ-GARCÉS (2)

(1) Museo de Historia Natural of the University, Parque Vista Alegre, Campus Norte,
15782 Santiago de Compostela, Spain

(2) Centro de Estudios Ambientales de Cienfuegos (CEAC), Grupo de Gestión Ambiental (GGA),
calle 17, esquina Ave. 46, Cienfuegos, Cuba

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Abstract: The triphorid species collected during the Karubenthos Expedition to Guadeloupe Island are discussed. Two species are introduced as new to science and compared with their closest congeners.

Introduction: *Triphoridae* J.E. Gray, 1847 is a very diverse family of marine gastropods that occurs worldwide. It represents about 600 names proposed for the Recent species (Marshall, 1983). The family has its largest diversity in the tropical Indo-Pacific, where there are more than 1000 species (according to Marshall, 1983). This is probably too low a number.

Triphorids live on rocky substrates from the intertidal fringe to a depth of more than 1000 metres. Complete general information on the family *Triphoridae* can be found in Marshall (1983) and Wells (1998), who noted that it is a highly species-rich group; most species are sinistral, with a high spire, numerous whorls, a short to long anterior canal and a posterior apertural notch or canal. The teleoconch sculpture of triphorids is notably variable, and can be beaded, spinose or reticulate, and the shells are small (usually smaller than 10 mm, although some can grow up to 40 mm or larger).

In his revision of the Indo-Pacific species, Marshall (1983), emphasised the importance of the shape and sculpture of the protoconch for taxonomy, and pointed out that “under absolutely no circumstances should further new species be proposed unless a complete, unworn protoconch can be illustrated”.

Together with *Eulimidae*, *Pyramidellidae*, “*Turridae*” and *Cerithiopsidae*, *Triphoridae* belong to the five most species-rich families of molluscs (Bouchet et al. (2002). Although notably less diverse than in the Indo-Pacific, this family contains many species in the

Atlantic Ocean, however poorly known in most areas. Bouchet & Guillemot (1978) and Bouchet (1985, 1997) revised the species of this family occurring in the Mediterranean and neighbouring Atlantic, where CLEMAM data base recognised 19 species in 10 genera. Some additional species from the Cape Verde Islands were described by Fernandes & Rolán (1988, 1993) and Van der Linden (1998), as well as some from the Canary Islands and the Mediterranean Sea by Rolán & Peñas (2001).

Information on triphorids from many Caribbean areas is contained in a number of works, such as those for Jamaica (C.B. Adams, 1850a, 1850b, most species represented in Clench & Turner, 1950), Virgin Islands (Nowell-Usticke, 1959 and 1971), Yucatán Peninsula, Mexico (Vokes & Vokes, 1983), Puerto Rico and nearby Caribbean areas (Warmke & Abbott, 1961), Curacao, Aruba and Bonaire (De Jong & Coomans, 1988), Oceanic Islands off Brazil (Leal, 1991), Colombian Caribbean (Diaz Merlano & Puyana Hegedus, 1994), the Atlantic and Gulf coasts and West Indies (Morris, 1973), Bahamas (Redfern, 2001 and 2013) and Brazil (Rios, 1994, 2009). Rolán & Fernández-Garcés (1993a, 1993b, 1994 and 1995) and Rolán & Espinosa (1994) showed the known species from Cuba and described some new species. Besides, other authors described new species from other Caribbean areas, such as De Jong & Coomans (1988), Moolenbeek & Faber (1989), Faber & Moolenbeek (1991), Rolán & Cruz-Abrego (1996) and Rolán & Luque (1999). More recently, Simone (2006) described a large number of new species from Brazil. Many other species were recorded from deep water and described by Watson (1880, 1886), Dall (1881, 1889, 1927) and other authors. Fossil species were mentioned in Olsson & Harbison (1953). Colour photographs of 33 species, including most of the known shallow water species and those described during the previous 20 years in the abovementioned papers, are provided in two recent papers (Rolán & Fernández-Garcés, 2007, 2008) with

the description of new species together with a list of names assigned to the Caribbean **Triphoridae**.

The present work has the objective to show the species of **Triphoridae** collected at Guadeloupe Island during the Karubenthos Expedition in 2012 and to describe two new species which were collected during this expedition.

Abbreviations museums:

MNHN: Museum national d'Histoire naturelle, Paris
 MNCN: Museo Nacional de Ciencias Naturales, Madrid
 MHNS: Museo de Historia Natural de Santiago de Compostela
 ZMA: Zoologisch Museum, Amsterdam

Systematics:

Family **TRIPHORIDAE**

Genus *Isotriphora* Cotton & Godfrey, 1931

Type species (by original description):

Triforis tasmanica T. Wood, 1875.

Recent, South Australia, Tasmania.

Diagnosis of the genus: The most important characteristic of this genus is the protoconch, which is paucispiral, wide, and with nodular spiral cords.

Isotriphora tricingulata sp. nov.

Plate 2: A-D

Type material: Holotype (Plate 2: A-B) in MNHN IM-2000-30472.

Type locality: Guadeloupe Island, Grand Cul-de-Sac Marin, Port-Louis, KARUBENTHOS Stn. GD31, 81 m, 16°25.0'N, 61°32.8'W.

Description: Shell conical, elongate. Protoconch (Plate 2: C-E) of about three white whorls; about 430 µm, solid, beginning with a very narrow nucleus and bearing two nodulose spiral cords. Teleoconch of about seven light brown whorls, all bearing three spiral nodulose cords of similar size, rendering an external profile straight in the line of the conical profile of the shell. Aperture rounded, siphonal canal short.

Dimensions: the holotype measures 4.0 mm.

Distribution: Only known from the type locality.

Etymology: The species' name alludes to the presence of three spiral cords on all teleoconch whorls.

Remarks: the genus *Isotriphora* has several species in the Caribbean waters: the most important characteristic that allows for identification of the new species is the uniform light brown colour and the three nodulose spiral cords of similar size in all teleoconch whorls.

The most similar species in the Caribbean are the following:

Isotriphora peetersae (Moolenbeek & Faber, 1989). Most of the shells are smaller and ovoid. Its colour is white in the apex and dark brown in two different shades in the lower whorls. The teleoconch whorls only bear 2 nodulose spiral cords per whorl.

Isotriphora taenialba Rolán & Espinosa, 1994. The shell is larger, with a white apex and the teleoconch has two spiral nodulose cords, the upper one brown except on the first whorls, and the lower one consistently white. Between them a third spiral cord appears, but it is very small and also white. It increases in size but always remains smaller.

Isotriphora guanahacabibes Rolán & Fernández-Garcés, 2008. It has the typical white protoconch, which, however, only consists of two whorls. Usually on the fourth teleoconch whorl, a very fine third, undulating spiral cord appears, but it never increases to the size of the other two. Moreover, it is not nodulose. The colour of the shell is white, cream or light brown.

“Triphora” monteiroi sp. nov.

Plate 3: A-F

Type material: Holotype (Plate 3: A-C) in MNHN IM-2000-30473.

Type locality: Guadeloupe Island, Basse-Terre, Baie de Baille-Argent, KARUBENTHOS, Stn. GD21, 40 m, 16°15.55'N, 61°48.8'W.

Description: Shell (Plate 3: A-C) light, solid, conically elongate. Protoconch (Plate 3: D-F) with about 2 whorls, beginning in a wide nucleus and with a diameter of 250 µm in the first whorl and about 370 µm in the second whorls; entire protoconch white. In the first whorl of the protoconch, there are about 12 opisthoclinely curved, narrow axial ribs. In the second whorl they grow more numerous and become S-shaped. In the middle of both whorls there is a fine spiral cord which crosses the axial ribs at the point where they change direction. The teleoconch has 8 whorls with two

nodulose spiral cords on the first three whorls, and three spirals of almost equal size on all further teleoconch whorls. On the base there are three more cords, which, however, are not nodulose.

The colour is light brown, but darker on the suture, the upper cord of the whorls and the base. Aperture ovoid with an open and short siphonal canal.

Dimensions: the holotype measures 4.18 mm.

Distribution: Only known from the type locality.

Etymology: This species is named after António A. Monteiro, malacologist of Lisbon, Portugal, for his continuous help and his research work on **Conidae**.

Remarks: This species was not placed in a definite genus because of the lack of material for radular or genetic studies. As in other many cases in the Caribbean literature, this species is tentatively placed in "*Triphora*" in a wide sense.

The most similar species in the Caribbean are the following:

"*Triphora calva* (Faber & Moolenbeek, 1991) has a similar protoconch, but it is smooth except for a fine cord in the middle of the second protoconch whorl, thus lacking any axial ribs.

"*Triphora guadaloupensis* Rolán & Fernández-Garcés, 2008 is a very short, ovoid shell, which has only got 4 teleoconch whorls with two cords on the first whorls and three on the last one; the protoconch is white, but it has two spiral cords on the first whorl and three on the second one; thus without axial sculpture on the protoconch.

"*Triphora amicorum* Rolán & Fernández-Garcés, 2008. This species from Palm Beach, Florida, has almost three whorls in the protoconch and it is very sculptured with numerous undulating axial ribs and two fine spiral cords per whorl. Besides, the upper cord in the teleoconch whorls is paler in colour.

"*Triphora turtebayensis* Rolán & Fernández-Garcés, 2008 has a uniformly pale brown coloured shell. The protoconch consists of two whorls, but there are two spiral cordlets per whorls instead of one.

"*Triphora grenadensis* Rolán & Fernández-Garcés, 2008 is the most similar species, but the protoconch is brownish, the axial ribs are wider and the spiral cord of the protoconch is also wider and placed below mid-whorl.

"*Triphora abacoensis* Rolán & Redfern, 2008. This species has two protoconch whorls, but with a very different sculpture of very prosocline ribs and without spiral sculpture.

"*Triphora portoricencis* Rolán & Fernández-Garcés, 2008 has a similar, yet uniform colour and its protoconch consists of almost 3 whorls with a very prominent keel below mid-whorl.

Other species Plate 4

On Plate 4 some other species of **Triphoridae** collected in the KARUBENTHOS Expedition are shown. Most of them are known to science and were widely shown in other aforementioned papers.

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References:

- Adams, C.B., 1850a. Description of supposed new species of marine shells which inhabit Jamaica. *Contributions to Conchology* 1(4): 56-68.
- Adams, C.B., 1850b. Description of supposed new species of marine shells which inhabit Jamaica. *Contributions to Conchology* 1(7): 109-123.
- Bouchet, P., 1985. Les Triphoridae de Méditerranée et du proche Atlantique (Mollusca, Gastropoda). *Lavori S.I.M.* 21: 5-58.
- Bouchet, P., 1997. Nouvelles observations sur la systématique des Triphoridae de Méditerranée et du proche Atlantique. *Bollettino Malacologico* 31(9-12): 205-220.

- Bouchet, P. & Guillemot, H.**, 1978. The *Triphora perversa*-complex in Western Europe. *Journal of Molluscan Studies* 44: 344-356.
- Bouchet, P., Lozouet, P., Maestrati, P. & Héros, V.**, 2002. Assessing the magnitude of species richness in tropical marine environments: exceptionally high numbers of mollusks at a New Caledonia site. *Biological Journal of the Linnean Society* 75: 421-436.
- Clench, W.J. & Turner, R.D.**, 1950. The Western Atlantic marine mollusks described by C. B. Adams. *Occasional Papers on Mollusks* 1(15): 233-403.
- Dall, W.H.**, 1881. Reports on the results of dredging, under the supervision of Alexander Agassiz, in the Gulf of Mexico, and in the Caribbean Sea, 1877-79, by the United States Coast Survey steamer "Blake", Lieutenant-Commander C. D. Sigsbee, U. S. N., and Commander J. R. Bartlett, U. S. N., commanding. XV. Preliminary report on the Mollusca. *Bulletin of the Museum of Comparative Zoology* 9(2): 33-144.
- 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 United States Coast Survey steamer "Blake", Lieutenant-Commander C. D. Sigsbee, U. S. N., and Commander J. R. Bartlett, U. S. N., commanding. XXIX. Report on the Mollusca. Part 2. Gastropoda and Scaphopoda. *Bulletin of the Museum of Comparative Zoology* 18: 1-492, pls. 10-40.
- Dall, W.H.**, 1927. Small shells from dredging off the southeast coast of the United States by the United States Fisheries Steamer "Albatross" in 1885 and 1886. *Proceedings of the United States National Museum* 70: 1-134.
- De Jong, K.M. & Coomans, H.E.**, 1988. *Marine gastropods from Curaçao, Aruba and Bonaire*. E. J. Brill, Leiden, 261 pp.
- Diaz Merlano, J.M. & Puyana Hegedus, M.**, 1994. *Moluscos del Caribe Colombiano, un catálogo ilustrado*. Fundacion Natura/ Cociencias/Invemar, Bogota. 291 pp, 74 pls.
- Espinosa, J., Ortea, J.A., Fernandez-Garcés, R. & Moro, L.**, 2007. Adiciones a la fauna de moluscos marinos de la península de Guanahacabibes (I), con la descripción de nuevas especies. *Avicennia* 19: 63-88.
- 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(3-4): 81-85.
- Fernandes, F. & Rolán, E.**, 1988. A familia Triphoridae (Mollusca: Gastropoda) no arquipélago de Cabo Verde. *Publicações Ocasionalis da Sociedade Portuguesa de Malacologia* 11: 17-32.
- Fernandes, F. & Rolán, E.**, 1993 "1991". Nuevas aportaciones a la familia Triphoridae (Mollusca, Gastropoda) para el Archipiélago de Cabo Verde. *Iberus* 10(1): 143-148.
- Henderson, J.B. & Bartsch, P.**, 1914. Littoral marine mollusks of Chincoteague Island, Virginia. *Proceedings of the United States National Museum* 47: 411-421, pls. 13-14.
- Laseron, C.F.**, 1958. The family Triphoridae (Mollusca) from Northern Australia; also Triphoridae from Christmas Islands (Indian Ocean). *Australia Journal of Marine and Freshwater Research* 9(4): 569-658.
- Leal, J.H.**, 1991. *Marine Prosobranch Gastropods from Oceanic Islands off Brazil*. Universal Book Services, Oegstgeest, 418 pp.
- Linden, J. Van Der**, 1998. The Metaxiinae dredged by the CANCAP Expeditions, with the new species *Metaxia carinaplex* and *M. haplax* from the Cape Verde Islands (Gastropoda, Heteropoda, Triphoridae). *Basteria* 61(4-6): 115-122.
- Marshall, B.A.**, 1983. A revision of the Recent Triphoridae of Southern Australia (Mollusca: Gastropoda). *Records of the Australian Museum, Supplement* 2: 1-119.
- Moolenbeek, R.G. & Faber, M.J.**, 1989. Two new *Triphora* species from the West Indies (Gastropoda; Triphoridae). *Basteria* 53(4-6): 77-80.
- Morris, P.A.**, 1973. *A field guide to shells of the Atlantic and Gulf coasts and the West Indies*. Houghton Mifflin Company, Boston. 330, 76 pls.
- Nowell-Usticke, G.W.**, 1959. *A check list of the marine shells of S. Croix U.S. Virgin Islands with random annotations*. Lane Press, Burlington, 90 pp.
- Nowell-Usticke, G.W.**, 1971. *A supplementary listing of new shells (illustrated)*. Nowell-Usticke, USA, 31 pp.
- Olsson, A.A. & Harbison, A.**, 1953. Pliocene Mollusca of Southern Florida, with special reference to those from North Saint Petersburg. *Monographs of the Academy of Natural Sciences of Philadelphia* 8: 1-457, 65 pls.
- Redfern, C.**, 2001. *Bahamian seashells, a thousand species from Abaco, Bahamas*. Bahamianseashells.com Inc., Boca Raton, 280 pp, 124 pls.
- Redfern, C.**, 2013. *Bahamian Seashells: 1161 Species from Abaco, Bahamas*. Bahamianseashells.com Inc., Boca Raton, 501 pp.
- Rios, E.**, 1994. *Seashells of Brazil*. Editora de Furg, Rio Grande, 368 pp, 113 pls.
- Rios, E.**, 2009. *Compendium of Brazilian sea shells*. Rio Grande, RS. Evangraf, 676 pp.
- Rolán, E. & Cruz-Abrego, F.M.**, 1996 "1995". A new triphorid species (Gastropoda, Triphoridae) from Nichupte lagoon, Yucatan peninsula, Mexico. *Iberus* 13(2): 87-92.
- Rolán, E. & Espinosa, J.**, 1994. The family Triphoridae (Mollusca, Gastropoda, Prosobranchia) in Cuba 3. The genus *Isotriphora*, with description of a new species. *Basteria* 58(1-2): 63-68.
- Rolán, E. & Fernandez-Garcés, R.**, 1993a "1992". La familia Triphoridae (Mollusca: Gastropoda) en la isla de Cuba, 1. El genero *Metaxia* Monterosato, 1884. *Bollettino Malacologico* 28(5-12): 169-176.
- Rolán, E. & Fernandez-Garcés, R.**, 1993b. The family Triphoridae (Mollusca, Gastropoda) in Cuba. 2. The genus *Iniforis* Jousseume, 1884. *Apex* 8(3): 95-106.
- Rolán, E. & Fernandez-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(1): 17-27.
- Rolán, E. & Fernandez-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(1): 9-24.
- Rolán, E. & Fernandez-Garcés, R.**, 2007. Caribbean Triphoridae (Gastropoda, Triphoroidea): list and colour illustrations. *Neptunea* 6(3): 13-24.
- Rolán, E. & Fernandez-Garcés, R.**, 2008. New data on the Caribbean Triphoridae (Caenogastropoda, Triphoroidea) with the description of 26 new species. *Iberus* 26(1): 81-170.
- Rolán, E. & Luque, A.A.**, 1999. Two new species of triphorids (Gastropoda, Triphoridae) from the Miskitos Archipelago, Nicaragua. *Iberus* 17(1): 107-113.
- Rolán, E. & Peñas, A.**, 2001. Two new species of the genus *Monophorus* (Gastropoda, Triphoridae) in the east Atlantic and Mediterranean Sea. *Iberus* 19(2): 31-40.

Rolán, E. & Redfern, C., 1996. Variabilidad de la protoconcha de *Metaxia rugulosa* (C.B. Adams, 1850) (Gastropoda; Triphoridae). *Noticiario SEM* 26: 27-29.

Rosenberg, G., 2005. Malacolog 4.1: A database of Western Atlantic marine Mollusca. [WWW database (version 4.1.0)] URL <http://www.malacolog.org>.

Simone, L.R.L., 2006. A new Triphoridae from Canopus Bank, N. E. Brazil (Caenogastropoda). *Strombus* 13(1): 6-8.

Verduin, A., 1976. On the systematics of recent *Rissoa* of the subgenus *Turboella* Gray, 1847, from the Mediterranean and European Atlantic coasts. *Basteria* 40: 21-73.

Vokes, H.E. & Vokes, E.H., 1983. Distribution of shallow-water marine Mollusca, Yucatan Peninsula, Mexico. *Mesoamerican Ecology Institute, Monograph 1. Middle American Research Institute*, publ. 54, 183 pp.

Warmke, G.L. & Abbott, R.T., 1961. *Caribbean seashells*. Livingston Publishing Co., Wynnewood, Pennsylvania, 348 pp., 43 pls.

Watson, R.B., 1980. Mollusca of H. M. S. Challenger Expedition. *Journal of the Linnean Society of London* 15: 87-126.

Watson, R.B., 1886. Report on the Scaphopoda and Gasteropoda collected by HMS Challenger during the years 1873-1876. *Reports of the scientific results of the voyage of H.M.S. "Challenger"*. *Zoology* 15(42): 1-756.

Wells, A., 1998. Superfamily Triphoroidea. Pp. 808-811 In Beesley, P.L., Ross, G.J.B. and Wells, A. (eds). *Mollusca: The Southern Synthesis. Fauna of Australia vol. 5*. CSIRO Publications, Melbourne, Part B viii: 565-1234.

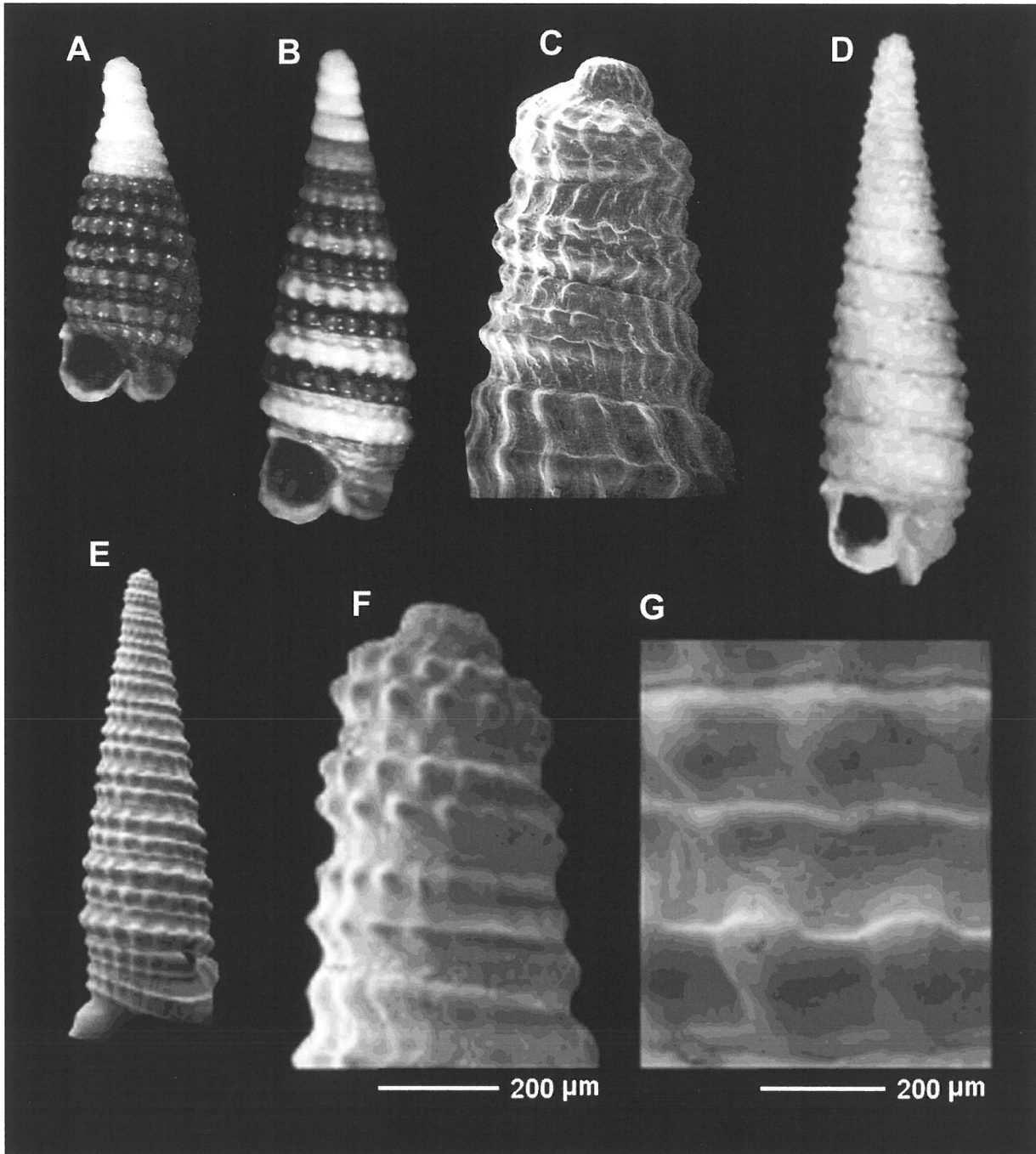


Plate 1. Caribbean species of *Isotriphora*: A: *Isotriphora peetersae* (Moolenbeek & Faber, 1989, holotype, 3.3 mm (ZMA)); B-C: *Isotriphora taenialba* Rolán & Espinosa, 1994; B: holotype, 4.7 mm (MNCN); C: protoconch of a paratype; D-G: *Isotriphora guanahacabibes* Rolán & Fernández-Garcés, 2008; D: holotype, 5.5 mm (MNCN); E: paratype, 4.7 mm (MHNS); F: protoconch; G: detail of the sculpture.

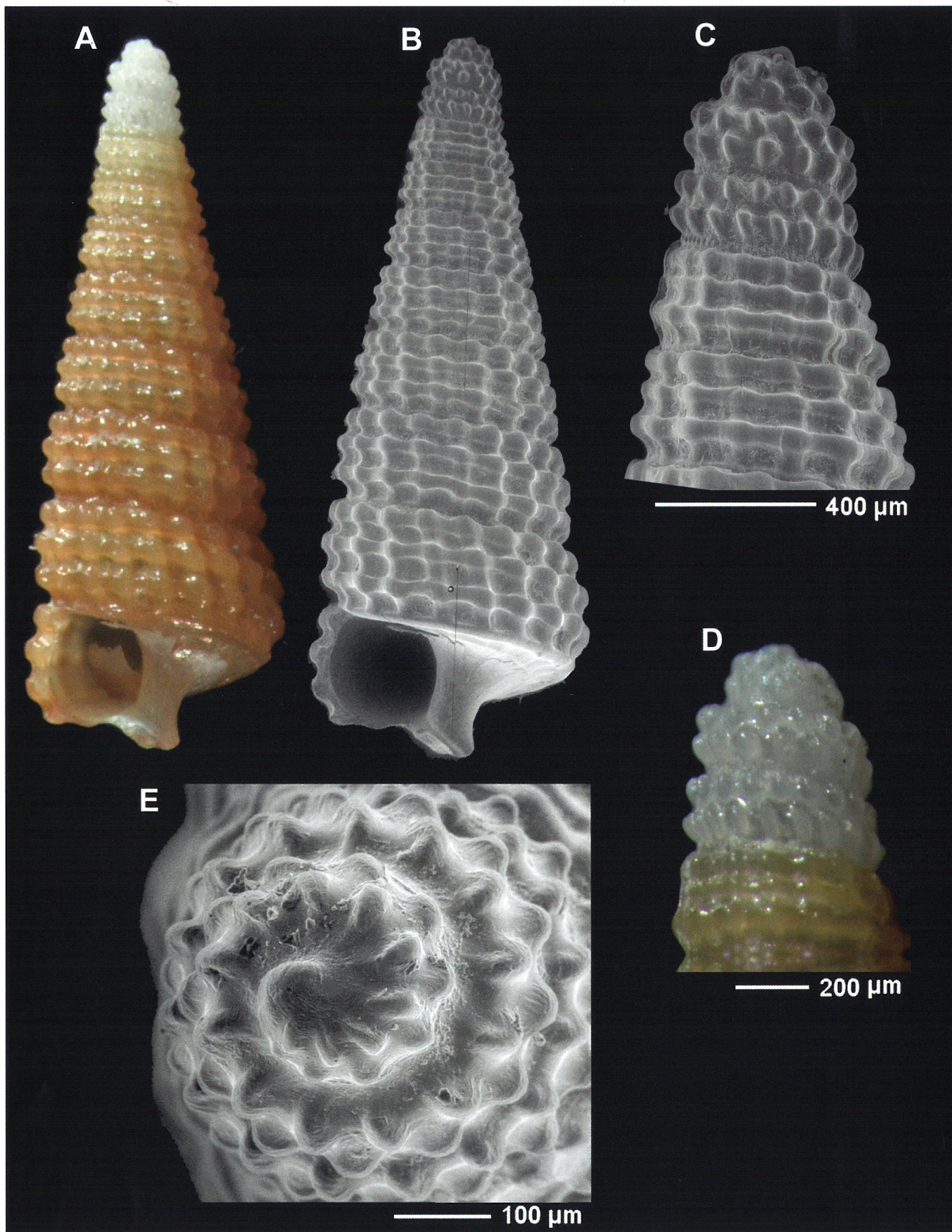


Plate 2. A-E: *Isotriphora tricingulata* sp. nov. A-B: holotype, 4.0 mm (MNHN im-2000-30472); C-E: protoconch.

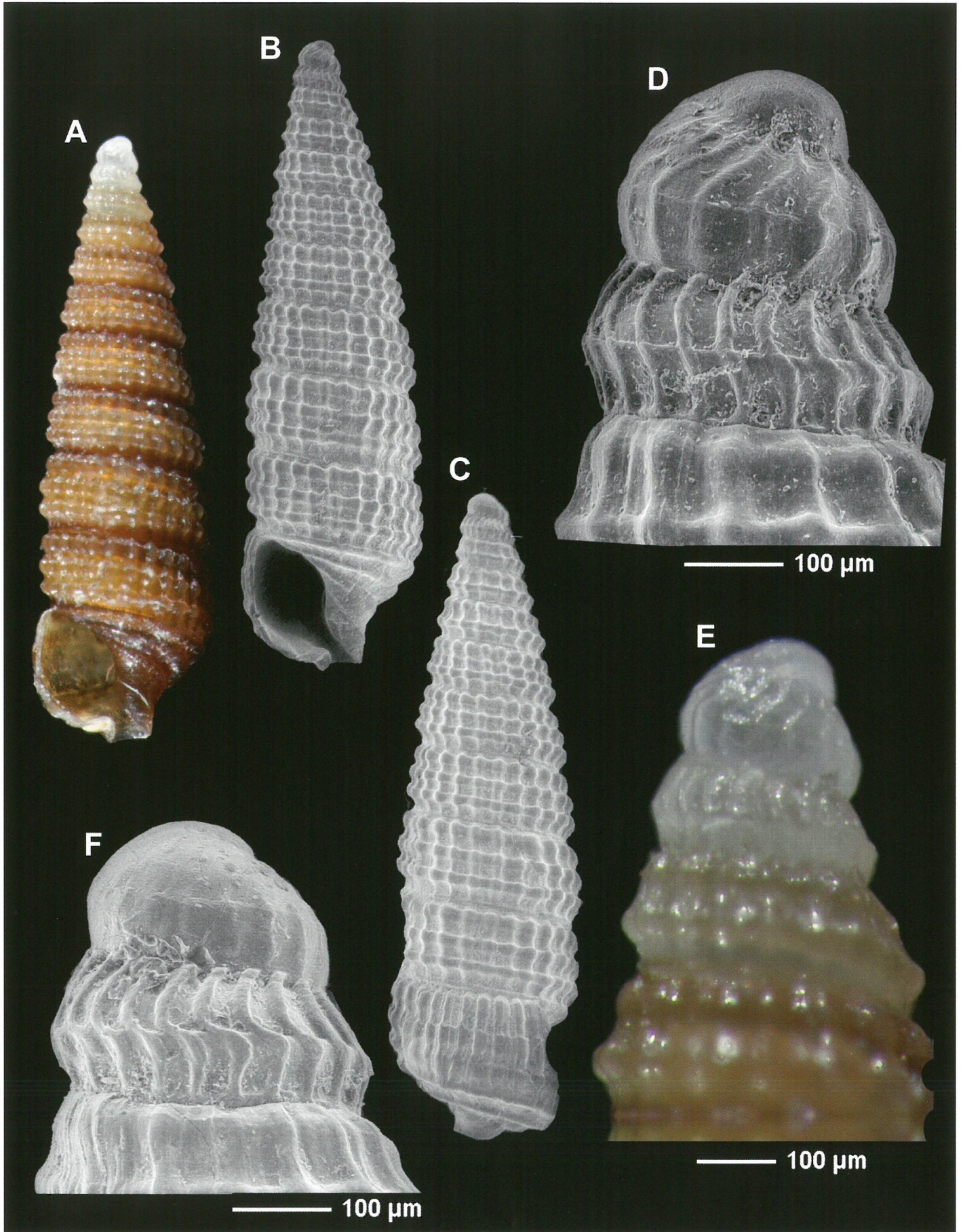


Plate 3. A-F: "*Triphora*" *monteiroi* sp. nov. A-C: holotype, 4.18 mm (MNHN IM-2000-30473); D-F: protoconch.

Plate 4: Other Triphoridae collected in the Karubenthos Expedition, 2012:

- A-B: *Iniforis turrithomae* (Holten, 1802), 4 and 5.5 mm.
 C: *Cosmotriphora melanura* (C.B. Adams, 1850), 7 mm.
 D: *Nototriphora decorata* (C.B. Adams, 1850), 9 mm.
 E: *Marshallora nigrocincta* (C.B. Adams, 1839), 3.5 mm.
 F: *Metaxia excelsa* Faber & Moolenbeek, 1991, 4 mm.
 G: *Metaxia rugulosa* (C.B. Adams, 1850), 5 mm.
 H: *Monophorus olivaceus* (Dall, 1889), 4 mm.
 I: *Coriophora novem* (Nowell-Usticke, 1969), 6 mm.
 J: *Iniforis* cf. *pseudothomae* Rolán & Fernández-Garcés, 1993, 3 mm.
 K: *Similiphora intermedia* (C.B. Adams, 1850), 3 mm.
 L: *Marshallora modesta* (C.B. Adams, 1850), 5 mm.
 M-N: *Similiphora intermedia* (C.B. Adams, 1850), 3 mm.
 O-P: *Iniforis gudeliae* Rolán & Fernández-Garcés, 2009, 6 and 5.5 mm.
 Q: *Aclophora sagei* Rolán & Fernández-Garcés, 1995, 3 mm.
 R: *Iniforis* sp., 4 mm.
 S: *Latitriphora albida* (A. Adams, 1854), 5 mm.
 T: *Eutriphora bermudensis* (Bartsch, 1911), 4 mm.
 U: “*Triphora*” sp., 4.5 mm.
 V: *Nanaphora decollata* (Rolán & Fernández-Garcés, 1994), 3 mm.
 W: *Nanaphora verbenei* (Moolenbeek & Faber, 1989), 5 mm.
 X: *Monophorus ateralbus* Rolán & Fernández-Garcés, 1994, 3.5 mm.

