Journal of the Marine Biological Association of the United Kingdom, 2015, 95(4), 791–804.
doi:10.1017/S0025315414001933

New species and records of Newtoniellinae (Caenogastropoda, Newtoniellidae) from Brazil

MAURÍCIO R. FERNANDES, RAQUEL GAROFALO AND ALEXANDRE D. PIMENTA

Departamento de Invertebrados, Museu Nacional, Universidade Federal do Rio de Janeiro, Quinta da Boa Vista, São Cristóvão, 20940-040, Rio de Janeiro, Brazil

Newtoniellinae is a worldwide marine group of cold-water, deep-sea species, comprising the genera Cerithiella, Paramendax *and* Trituba. *Prior to this study, the subfamily was represented in Brazil by four species of* Cerithiella. *The present contribution adds new Brazilian records of two of these species,* Cerithiella amblytera *and* Cerithiella enode, *in addition to new records of two species previously known only from Cuba and the south-eastern USA, respectively:* Cerithiella sigsbeana *comb. nov. and* Cerithiella producta. *Two new species of* Cerithiella *from Brazil are described:* Cerithiella atali *sp. nov. has a pointed protoconch identical to the species described in the previously synonymized genus* Stilus; Cerithiella candela *sp. nov. has the teleoconch very similar to* Cerithiella pernambucoensis, *but is differentiated by the protoconch morphology. Also, a new species of* Trituba *is described,* Trituba anubis *sp. nov., which is the second species of this genus recorded for the western Atlantic.* Eumetula axicostulata *comb. nov. and* Eumetula vitrea *comb. nov., both from the western Atlantic but not recorded from Brazil, are transferred from the genus* Cerithiella. *This study increases from four to nine the number of known species of Newtoniellinae from Brazil.*

Keywords: *Cerithiella*, *Trituba*, *Triforis*, Triphoroidea, Canopus Bank, Campos Basin

Submitted 11 June 2014; accepted 19 November 2014; first published online 17 February 2015

INTRODUCTION

The family Newtoniellidae Korobkov, 1955 is part of Triphoroidea (Ponder & Bouchet, 2005), and is a group with uncertain limits of usually dextral and elongated shells, believed to contain clades of very old origins (Nützel, 1998; Gofas, 2003; although both authors do not classify these clades properly in Newtoniellidae). It is most commonly found in to deep (e.g. Bouchet & Warén, 1993) and/or cold (e.g. Engl, 2012) waters, in contrast to the usually shallow and tropical/temperate families Triphoridae and Cerithiopsidae, both also members of Triphoroidea (Ponder & Bouchet, 2005). As in these families, Newtoniellidae contains sponge feeders (Marshall, 1980; Gofas, 2003). Genera of this family were traditionally included in Cerithiopsidae (e.g. Bouchet & Warén, 1993) and were recently transferred to Newtoniellidae (Ponder & Bouchet, 2005), but still with divergences in its classification (e.g. Nützel, 1998; Engl, 2012). In molecular phylogenies, Newtoniellidae appeared in undefined positions among the Hypsogastropoda (Colgan *et al.*, 2007, who classified it as Cerithiopsidae *s.l.*). Five subfamilies are currently recognized in Newtoniellidae (Ponder & Bouchet, 2005), but the family still needs a thorough taxonomic revision (P. Bouchet, pers. comm.).

Newtoniellinae Korobkov, 1955 (=Cerithiellidae Golikov & Starobogatov, 1975) was diagnosed by Golikov & Starobogatov (1975) as having a paucispiral protoconch [but see below], a spirally nodular sculpture on the teleoconch, a basal keel, a developed and oblique anterior canal, and certain radular features. Newtoniellinae has three valid genera (Rosenberg, 2013): *Cerithiella* Verril, 1882, *Paramendax* Powell, 1937 and *Trituba* Jousseaume, 1884, the latter including the previously accepted genus *Granulotriforis* Kosuge, 1967, currently as a subgenus (Rosenberg & Gofas, 2014a). A *Cerithiella* species was proved to have a multispiral protoconch derived from intracapsular development (Bouchet & Warén, 1993), and *Trituba* species are believed to have the same development (Gofas, 2003), owing to the unclear limits between embryonic shell/larval shell and protoconch/teleoconch.

Cerithiella is the best-known genus of Newtoniellinae, with 36 Recent species worldwide (Bouchet *et al.*, 2014) and a large number of morphospecies in Antarctica (Engl, 2012). It is found in deep and cold waters, sometimes in temperatures below 0°C (Høisaeter, 2010). *Cerithiella* is the only genus of Newtoniellidae recorded for Brazil (although not yet included in Newtoniellidae in the Brazilian scientific literature, but in Cerithiopsidae; e.g. Lima & Barros, 2007), with four species: *Cerithiella amblytera* (Watson, 1880), *Cerithiella enode* (Watson, 1880), *Cerithiella cepene* Lima & Barros, 2007 and *Cerithiella pernambucoensis* Lima & Barros, 2007; besides *Cerithiella mamillana* (Watson, 1880), described from Pernambuco (north-eastern Brazil), but considered a synonym of *C. amblytera* by Bouchet & Warén (1993). *Cerithiella* is differentiated from other genera of Newtoniellinae by the teleoconch sculpture, with a less-developed and non-tubular anterior canal

Corresponding author:
M.R. Fernandes
Email: mauriciofernandes14@hotmail.com

and the absence of a strongly developed posterior canal, besides certain radular features (Marshall, 1980).

The name *Triforis* Deshayes, 1834 (not *Triphora* Blainville, 1828) was until recently applied to *Granulotriforis, Paramendax* and *Trituba*, all previously considered subgenera of *Triforis* (Kosuge, 1967; Marshall, 1977, 1980). In addition to the historical confusion relating to *Triforis* and *Triphora* (see Kosuge, 1967; Marshall, 1980), the name *Triforis* is currently considered invalid (Rosenberg & Gofas, 2014b), but it is usually informally applied to the three above-mentioned groups. Triforids have a great diversity of radulae (Bouchet & Fechter, 1981; Nützel, 1998) and share features such as the protoconch axially ribbed, the presence of two strongly nodular spiral cords on short spire whorls, the tubular anterior canal and aperture (Marshall, 1977), besides the development of a characteristic posterior canal. They are well known from fossil material (Marshall, 1977), and Recent species were recognized as part of this group only in the last few decades (e.g. Kosuge, 1967; Marshall, 1977).

The genus *Trituba*, including the current subgenus *Granulotriforis*, is composed by 18 species (Coomans & Faber, 1984; Rosenberg & Gofas, 2014a). The only species of *Trituba* known from the western Atlantic is *Trituba barbadensis* (Coomans & Faber, 1984), described from Barbados (West Indies), although several Recent species occur near the Mid-Atlantic Ridge (Gofas, 2003).

The main objective of the present work is to update the taxonomic knowledge of Newtoniellinae from Brazil, including new records and two new species of *Cerithiella*, besides the description of a *Trituba* species.

MATERIALS AND METHODS

The material examined was obtained by different expeditions along the continental slope of Brazil and it is deposited in the following institutions: Instituto de Biologia/Universidade Federal do Rio de Janeiro (IBUFRJ), Rio de Janeiro, Brazil; Muséum national d'Histoire naturelle (MNHN), Paris, France; Museu Nacional/Universidade Federal do Rio de Janeiro (MNRJ), Rio de Janeiro, Brazil; Museu de Zoologia da Universidade de São Paulo (MZUSP/MZSP), São Paulo, Brazil; National Museum of Natural History (NMNH/USNM), Washington, DC, USA. Other abbreviations: Academy of Natural Sciences of Philadelphia (ANSP), Philadelphia, PA, USA; Museum of Comparative Zoology (MCZ), Cambridge, MA, USA; Natural History Museum (NHM), London, UK. Most specimens were obtained from three major expeditions: Canopus Bank (off Ceará State, north-eastern Brazil), conducted in 2005 by dredgings from commercial fishing boats, including depths between 240–260 m, in biogenic substrate; Oceanprof (Campos Basin, off Rio de Janeiro State, south-eastern Brazil), conducted in 2002 (Oceanprof I) and 2003 (Oceanprof II), with benthic samples made by box-corer in depths of 750–1950 m (more details in Lavrado *et al.*, 2010); MD55 Expedition, conducted in 1987 by the Research Vessel Marion-Dufresne, sampling by dredging and trawling in several localities in the southern Bahia State and in the south-east region of Brazil, in a bathymetric range of 15–5100 m (Tavares, 1999).

The taxonomic identifications were based on conchiliological comparisons viewed under a stereomicroscope and on scanning electron microscope (SEM) images. When necessary, comparisons were made with type material, in addition to published descriptions and photographs (e.g. Bouchet & Warén, 1993; Gofas, 2003; Lima & Barros, 2007). Terminology and characters used for shell descriptions and parameters were based partly on Gofas (2003), although the distinction between the protoconch and teleoconch by a change in the sculpture (Gofas, 2003) was not always clear (Figure 1B). When a posterior or anterior canal was present, its maximum length and diameter were measured, as well as the diameter of the aperture and the maximum distance between the posterior canal and the border of the aperture (Figure 1C–E). In the lists of material examined, the number of shells in each lot is indicated between brackets.

RESULTS

SYSTEMATICS

Subclass CAENOGASTROPODA Cox, 1960
Superfamily TRIPHOROIDEA Gray, 1847
Family NEWTONIELLIDAE Korobkov, 1955
Subfamily NEWTONIELLINAE Korobkov, 1955
Genus *Cerithiella* Verrill, 1882

TYPE SPECIES

Cerithium metula Lovén, 1846, designation by Sars (1878) when creating the pre-occupied name *Lovenella* Sars, 1878 *non* Hincks, 1869. Recent, Europe.

DIAGNOSIS

Conical, elongated and dextral shell; protoconch with apex dome-shaped or pointed and twisted; teleoconch usually reticulated, with considerable variation on number and strength of spiral cords and axial ribs; anterior canal distinctly twisted; posterior canal as a small sinus or absent; base smooth below the single peripheral cord; central tooth with three cusps, lateral teeth broad and with two pointed cusps, marginal teeth short, arched and simply pointed (adapted from Thiele, 1929 and Bouchet & Warén, 1993).

SYNONYMS

Lovenella Sars, 1878 *non* Hincks, 1869; *Stilus* Jeffreys, 1885; *Newtonia* Cossmann, 1892 *non* Schlegel, 1867; *Newtoniella* Cossman, 1893; *Cerithiolinum* Locard, 1903; *Chasteria* Iredale, 1915; *Euseila* Cotton, 1951; *Binda* Laseron, 1951 (based on Bouchet & Warén, 1993).

Cerithiella amblytera (Watson, 1880)
(Figure 2A–B, E–G)

Cerithium (*Bittium*) *amblyterum* Watson, 1880: 108; 1886: 542, pl. 39, figure 6.

Cerithium (*Bittium*) *mamillanum* Watson, 1880: 109; 1886: 543, pl. 40, figure 6.

Cerithiopsis amblytera var. *attenuata* Locard, 1897: 382.

Finella mamillatum [*sic*]: Rios (1975: 50; 1985: 52, pl. 19, figure 232; 1994: 64, pl. 21, Figure 243; 2009: 110, text-fig.)

Cerithiella amblytera: Bouchet & Warén (1993: 597, figures 1316, 1319–1324).

https://doi.org/10.1017/S0025315414001933 Published online by Cambridge University Press

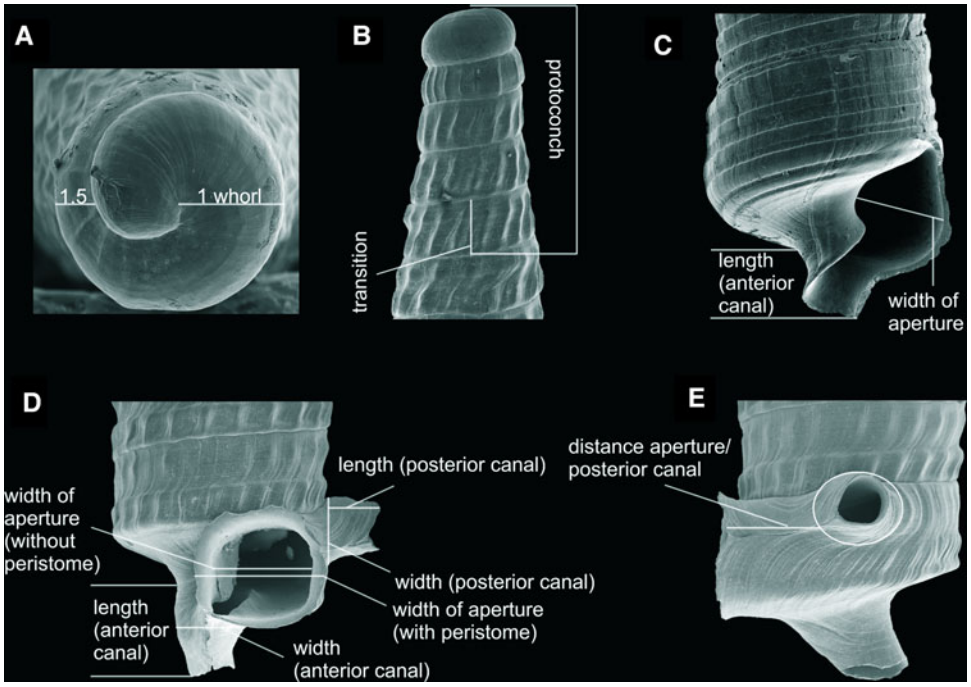

Fig. 1. Terminology and measurements of some shell characters. (A) Counting whorls procedure on the protoconch, adapical view; (B) Unclear transition between protoconch and teleoconch; in this case, the teleoconch is defined on the beginning of the spiral sculpture, as in Gofas (2003); (C) Abapical portion of shell in *Cerithiella*, frontal view; (D) Abapical portion of shell in *Trituba*, frontal view; (E) Abapical portion of shell in *Trituba*, lateral view.

TYPE MATERIAL
Holotype: NHM 1887.2.9.1696.

TYPE LOCALITY
38°38′N 28°29′W, 823 m, Azores.

MATERIAL EXAMINED
Brazil: off Amapá State: MNRJ 17240, 03°25′N 48°03′W, 700 m, Ship Paulo Moreira coll., 14/xii/2005 [1]. Campos Basin, off Rio de Janeiro State: MNRJ 32637, 21°54′00″S 39°49′50″W, 1170 m, 24/viii/2001 [2].

REMARKS
This is the third record of *Cerithiella amblytera* for Brazil, following those by Watson (1880; as *Cerithiella mamillana*) and Bouchet & Warén (1993). The present study establishes the shallowest record of *C. amblytera* (700 m), similar to that of the type locality (823 m), although shells of this species have been collected from depths up to 3910 m in the eastern Atlantic (Bouchet & Warén, 1993).

GEOGRAPHIC DISTRIBUTION
Azores (type locality); Madeira Is. (Bouchet & Warén, 1993); off Morocco (type locality of *C. amblytera* var. *attenuata*); off Nigeria (Bouchet & Warén, 1993); Brazil: off Amapá (this study); off Pernambuco (type locality of *C. mamillana*), off Espírito Santo (Bouchet & Warén, 1993), off Rio de Janeiro (this study).

BATHYMETRIC DISTRIBUTION
700 m (this study) to 3910 m (Bouchet & Warén, 1993).

Cerithiella enode (Watson, 1880)
(Figure 2C-D, H–J)

Cerithium (*Bittium*) *enode* Watson, 1880: 115; 1886: 541, pl. 39, figure 3.

Finella enode: Rios (1975: 50, pl. 13, figure 183; 1985: 52, pl. 19, figure 231; 1994: 63, pl. 21, figure 242; 2009: 110, text-fig.); Barros *et al.* (2001: 17, figure 5C).

Cerithiella enode: Bouchet & Warén (1993: 599, figures 1325–1327).

Cerithiella enodis [*sic*]: Absalão (2010: 91).

TYPE MATERIAL
Syntypes: NHM 1887.2.9.1694–5 [2].

TYPE LOCALITY
08°37′S 34°28′W, 1235 m, off Pernambuco State, Brazil.

MATERIAL EXAMINED
Brazil: Camamu-Almada Basin, off Bahia State: MNRJ 32869, 14°19′48″S 38°32′34″W, 2200 m, 2011 [2]; MNRJ 32870, 14°30′42″S 38°44′02″W, 1400 m, 2011 [1]. Campos Basin, off Espírito Santo State: MNRJ 17237, REVIZEE station C5-50F, 20°49′58″S 39°13′58″W, 1650 m, 20/vii/2001 [1]. Campos Basin, off Rio de Janeiro State: IBUFRJ 19644, Oceanprof II station 62, 21°52′41″S 39°46′17″W, 1688 m, 26/vi/2003 [1]; IBUFRJ 19650, Oceanprof II station 63, 21°52′43″S 39°40′41″W, 1941 m, 26/vi/2003 [1]; IBUFRJ 19645, Oceanprof I station 45, 22°10′54″S 39°52′19″W, 1040 m, 10/xii/2002 [1]; MNRJ 26619, Oceanprof I station 47, 22°11′04″S 39°47′04″W, 1654 m, 25/xi/2002 [1].

REMARKS
This is the fourth record of *Cerithiella enode* for Brazil, following those by Watson (1880), Barros *et al.* (2001) and Absalão (2010). As noted by Bouchet & Warén (1993), the abyssal fauna in Brazil reaches shallower waters than in the north-

https://doi.org/10.1017/S0025315414001933 Published online by Cambridge University Press

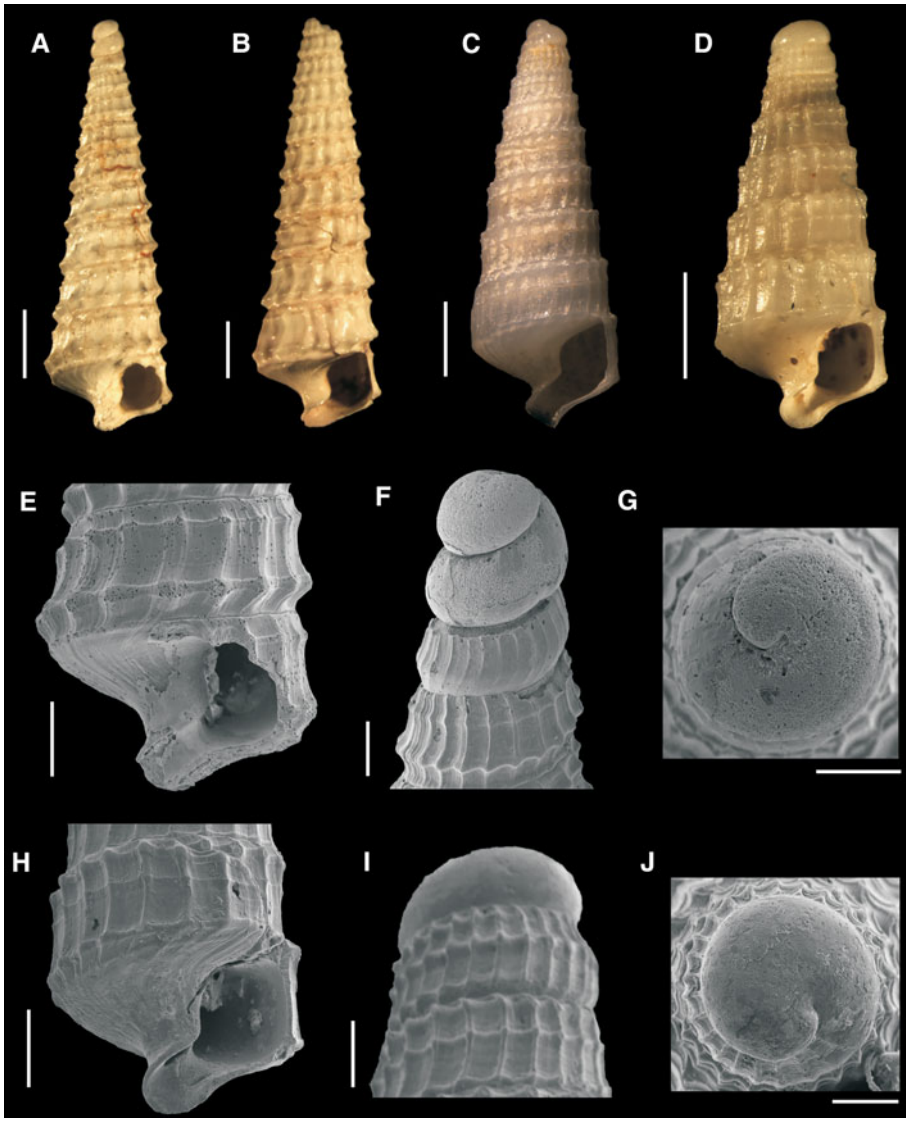

Fig. 2. A–B, E–G: *Cerithiella amblytera*: (A) Shell from off Rio de Janeiro, MNRJ 32637, 6.00 mm long; (B) Shell from off Amapá, MNRJ 17240, 7.06 mm long; (E–G: same shell as A): (E) Abapical portion of shell; (F) Protoconch; (G) Adapical view of protoconch. C–D, H–J: *Cerithiella enode*: (C) Shell from off Bahia, MNRJ 32869, 5.47 mm long; (D) Shell from off Espírito Santo, MNRJ 17237, 3.71 mm long; (H–J: same shell as D): (H) Abapical portion of shell; (I) Protoconch; (J) Adapical view of protoconch. Scale bars: A–D, 1 mm; E, H. 500 μm. F–G, I–J, 200 μm.

eastern Atlantic; in accordance with this pattern, the bathymetric records in this study (1040–2200 m) are much more similar to the type locality (1235 m) than to north-eastern Atlantic records (3460–4796 m). Precise coordinates and depths for *C. enode* were not provided by Barros *et al.* (2001) or by Absalão (2010).

GEOGRAPHIC DISTRIBUTION

North-eastern Atlantic Ocean (Bouchet & Warén, 1993); Brazil: off Pernambuco (type locality), off Bahia (this study), off Espírito Santo, off Rio de Janeiro (Absalão, 2010; this study).

BATHYMETRIC DISTRIBUTION

1040 m (this study) to 4796 m (Bouchet & Warén, 1993).

Cerithiella sigsbeana (Dall, 1881) comb. nov.
(Figure 3)

Cerithiopsis sigsbeana Dall, 1881: 87; 1889: 254, pl. 20, figure 1.

TYPE MATERIAL

Syntypes: USNM 87300 [1]; MCZ 7407 [1].

TYPE LOCALITY

23°02′39″N 83°10′59″W, 402 m, off Honda Bay, Cuba.

MATERIAL EXAMINED

Brazil: off Amapá State: MNRJ 26608, 04°27′54″N 49°58′05″W, 160 m, 13/x/2000 [1]. Canopus Bank, off Ceará State: MNRJ 31100 [6], MZSP 70358 [2], MZSP 90284 [3], all lots from 02°14′25″S 38°22′50″W, 240–260 m, P.M.S. Costa and J. Coltro coll., xi/2005.

https://doi.org/10.1017/S0025315414001933 Published online by Cambridge University Press

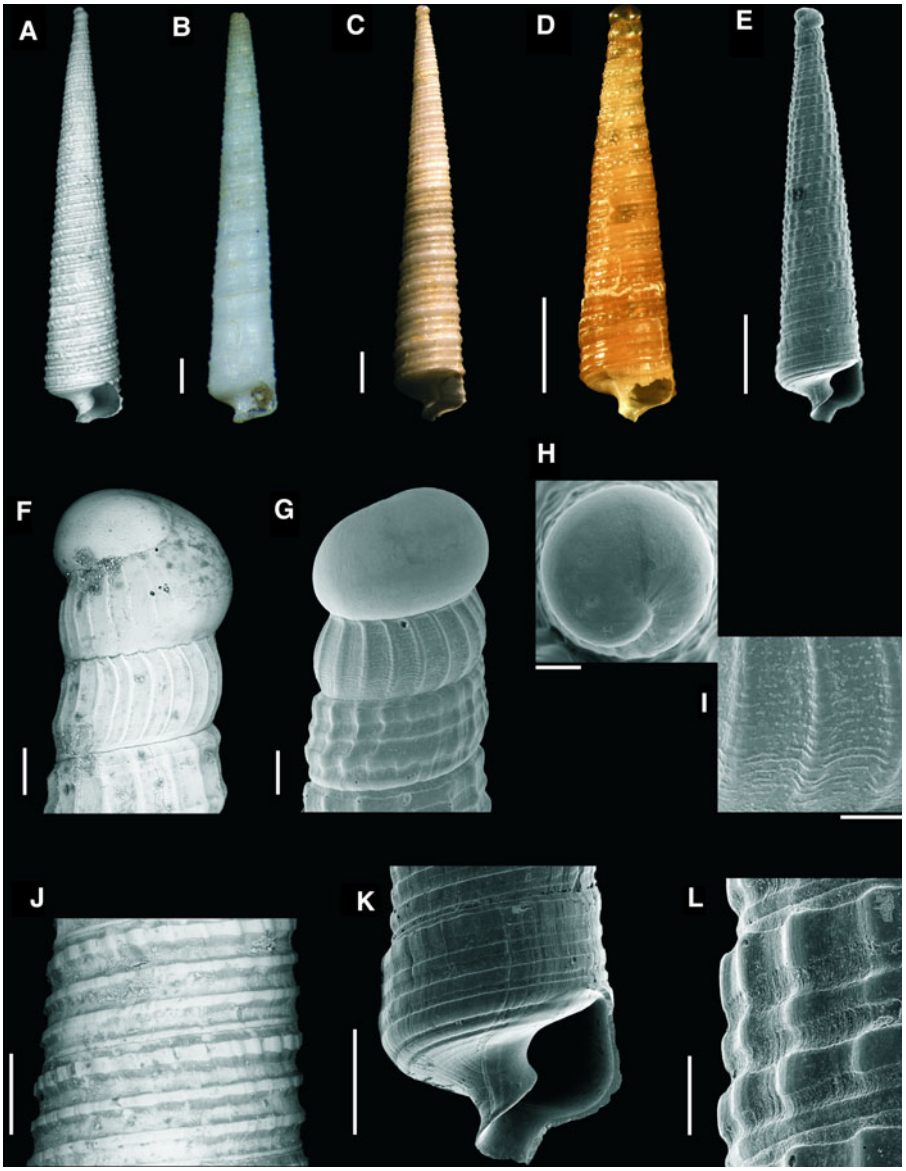

Fig. 3. *Cerithiella sigsbeana* comb. nov. (A) Syntype, USNM 87300; (B) Syntype, MCZ 7407; (C) Shell from off Amapá, MNRJ 26608, 10.13 mm long; (D–E) Shells from off Ceará, MNRJ 31100, 4.35 and 5.13 mm long, respectively; (F, J: same shell as A): (F) Protoconch; (J) Detail of teleoconch, late whorls; (G–I, K–L: same shell as E): (G) Protoconch; (H) Adapical view of protoconch; (I) Detail of protoconch; (K) Abapical portion of shell, frontal view; (L) Detail of teleoconch, early whorl. Scale bars: B–E, 1 mm; F–H, L, 100 μm; I, 50 μm; J–K, 500 μm.

CHARACTERIZATION

Shell up to 10.13 mm in length, 1.69 mm in width, dextral, conical-fusiform, elongated, rectilinear profile, white or light brown. Protoconch with 2.5–2.75 whorls, reaching 0.48–0.54 mm in length, 0.37–0.42 mm in width, but not easily distinct of teleoconch; apex dome-shaped, nucleus moderately protruded, first 1.75 whorl slightly inflated, smooth and convex, remaining whorl less convex and not inflated, but sculptured with straight to slightly sigmoid axial ribs and several microspiral threads. Teleoconch with up to 19 not convex whorls; two spiral cords on beginning, but a median spiral cord develops on the first or second whorl, reaching same size as the abapical cord after one to three whorls; the adapical spiral cord is slightly more prominent than the others, especially on late whorls; the three cords are equidistant and weakly nodulose, except on late whorls, being smooth; distance among spiral cords varies slightly, being quite close or more spaced; a smooth and sutural cord gradually strengthens and forms a fourth spiral cord on late whorls, but always thinner than other cords; weak, straight and nearly orthocline to slightly opisthocline axial ribs, numbering 21–25 ribs on eighth whorl of teleoconch, but disappearing on late whorls; short whorls, suture very shallow, almost indistinct; body whorl not constraining; smooth subperipheral cord, below which there are two to three small spiral threads; elliptical aperture, reaching 0.67 mm in width; anterior canal twisted and widely open, directed downward/sideward, reaching 0.47 mm in length; posterior sinus acute.

REMARKS

This is the only record of *Cerithiella sigsbeana* since its original description (Dall, 1881), and the two syntypes are illustrated (Figure 3A, B, F, J). Dall (1881) recognized colour variation in *C. sigsbeana*, usually reddish brown on the apex but changing

https://doi.org/10.1017/S0025315414001933 Published online by Cambridge University Press

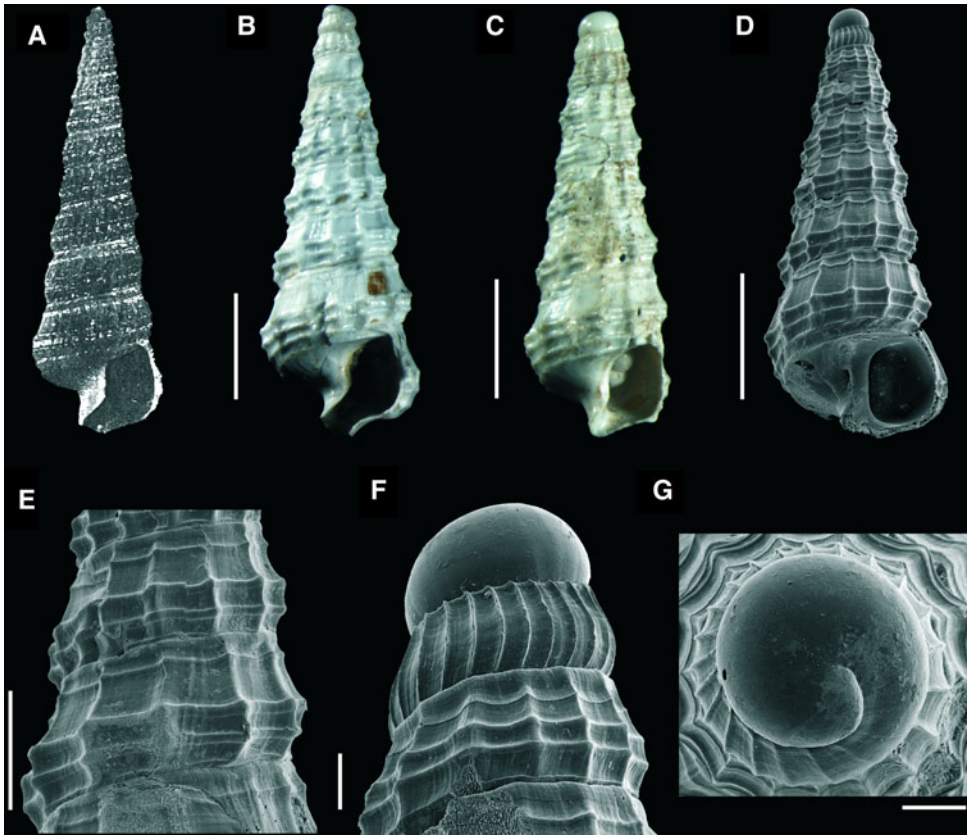

Fig. 4. *Cerithiella producta*: (A) Holotype, USNM 87305, courtesy Dr A. Wáren; (B) Shell from off Rio de Janeiro, MNRJ 26621, 4.02 mm long; (C) Shell from off Rio de Janeiro, USNM 1250194, 3.59 mm long; (D) Shell from off Rio de Janeiro, IBUFRJ 15945, 3.41 mm long; (E: same shell as B) Detail of teleoconch, late whorls; (F–G: same shell as D): (F) Protoconch; (G) Adapical view of protoconch. Scale bars: B–D, 1 mm; E, 500 μm; F–G, 100 μm.

to waxy white on late whorls, which also occurred with two worn shells from Brazil. The single shell from Amapá State is entirely white (Figure 3C), as is the syntype held by the MCZ (Figure 3B), however most shells from the Canopus Bank are light brown (Figure 3D). Some intraspecific variation is also observed on the strength of the axial sculpture of the teleoconch in shells from Brazil. In relation to the dimensions, the greatest length of shell in the type material of *C. sigsbeana* is 13.25 mm for 23 whorls of shell (Dall, 1881), in contrast to only 6.66 mm (15 whorls of teleoconch) in shells from the Canopus Bank, but similar to the single shell from Amapá (10.13 mm, 19 whorls of teleoconch).

Cerithiella sigsbeana is similar to *C. pernambucoensis*, especially relating to protoconch sculpture and size of the shell. After examining type material of *C. pernambucoensis* (MNRJ 10834, MNRJ 10835, MNRJ 10836), we noted that the main differences between them consist of the more developed and nodulose adapical spiral cord of *C. pernambucoensis*, much more prominent than the remaining spiral cords (but only slightly more prominent than other cords in *C. sigsbeana*), and the development of the median spiral cord (on third to fourth whorl in *C. pernambucoensis*; on first to beginning of second whorl in *C. sigsbeana*).

Marshall (1978) indicated that *C. sigsbeana* could be included in the genus *Euseila* Cotton, 1951, defined by him as having three to four well-defined spiral cords but very weak, almost obsolete, axial sculpture. *Cerithiella sigsbeana* shows this kind of sculpture, unique among its congeneric species from the western Atlantic. However, the absence of significant differences in radula and shell characters between *Cerithiella* and *Euseila* makes the latter a junior synonym of the former (Bouchet & Warén, 1993).

GEOGRAPHIC DISTRIBUTION

Cuba (type locality); Brazil: off Amapá, off Ceará (this study).

BATHYMETRIC DISTRIBUTION

160 m (this study) to 418 m (Dall, 1881).

Cerithiella producta Dall, 1927
(Figure 4)

Cerithiella producta Dall, 1927: 103.

TYPE MATERIAL

Holotype: USNM 87305 (not found; E. Strong, pers. comm.)

TYPE LOCALITY

30°58′N 79°38′W, 538 m [Dall (1927) wrongly cited 678 m], off Fernandina, Florida State, USA.

MATERIAL EXAMINED

Brazil: Camamu-Almada Basin, off Bahia State: MNRJ 32872, 14°21′56″S 38°39′47″W, 1800 m, 2011 [1]. Campos Basin, off Rio de Janeiro State: USNM 1250194, Oceanprof II station 61, 21°52′52″S 39°48′12″W, 1372 m, 26/vi/2003 [3]; IBUFRJ 19648, Oceanprof I station 57, 21°57′15″S 39°47′44″W, 1600 m, 14/xii/2002 [1]; IBUFRJ 19647, Oceanprof II station

https://doi.org/10.1017/S0025315414001933 Published online by Cambridge University Press

51, 22°04′43″S 39°49′09″W, 1308 m, 25/vi/2003 [1]; MNRJ 26621, Oceanprof I station 47, 22°11′04″S 39°47′05″W, 1654 m, 25/xi/2002 [1]; IBUFRJ 19646, Oceanprof I station 82, 22°28′49″S 39°53′24″W, 1650 m, 17/xi/2002 [1]; MNRJ 26622, Oceanprof II station 86, 22°31′37″S 39°55′14″W, 1636 m, 16/vi/2003 [1]; IBUFRJ 19649, Oceanprof II station 77, 22°36′12″S 39°58′23″W, 1666 m, 13/vi/2003 [1]; MNRJ 26620, Oceanprof II station 77, 22°36′12″S 39°58′23″W, 1666 m, 13/vi/2003 [1]; IBUFRJ 15945, Oceanprof II station 67, 22°46′58″S 40°07′49″W, 1596 m, 12/vi/2003 [1]; IBUFRJ 19652, Oceanprof I station 67, 22°46′59″S 40°07′49″W, 1650 m, 22/xi/2002 [3].

CHARACTERIZATION

Shell up to 4.30 mm in length, 1.39 mm in width, dextral, conical, elongated, rectilinear profile, white colour. Protoconch with 2.5–2.75 whorls, barely distinct of teleoconch; apex dome-shaped, nucleus moderately protruded, remaining whorls convex and slightly bulbous; sculpture initially smooth, with close, narrow, nearly straight to slightly sinuous axial ribs on last whorl; micro-spiral threads more evident in the adapical portion of the second whorl of protoconch. Teleoconch with up to seven moderately convex whorls; micro-spiral threads more evident in the adapical portion of the second whorl of protoconch; three spiral cords on the beginning, one (adapical) just below the suture, two (median abapical and abapical) very close to each other, on the abapical portion of whorl; during the first whorl or at the beginning of the second one, an additional spiral cord (median adapical) develops below the adapical cord, still distant from the two abapical cords; the spiral cords develop minute nodules (especially on the two abapical cords) or just slight elevations (especially on the median adapical cord) when crossed by axial ribs, with the adapical cord being mainly smooth/wavy; on late whorls, the median abapical is by far the most developed, with its profile resembling a keel, followed by the abapical one, and the adapical ones; straight, orthocline to slightly opisthocline, and pronounced axial ribs, numbering 13–16 ribs on fifth whorl of teleoconch; suture shallow, with a very small sutural cord more evident on late whorls; body whorl not constraining; smooth subperipheral cord, with a smooth basal cord developing just below the subperipheral one; elliptical aperture, reaching 0.58 mm in width; anterior canal twisted and widely open, directed downward/sideward, reaching 0.47 mm in length; posterior sinus little developed.

REMARKS

The most similar species to *Cerithiella producta* are *C. amblytera* and *C. cepene*, although they are easily differentiated by presenting only two main spiral cords on the teleoconch, versus four in *C. producta* (Figure 4E).

The holotype and only shell of *C. producta* examined by Dall (1927) was not found, and it is probably misplaced (E. Strong, pers. comm.). The single available image of this species (Figure 4A) was taken some decades ago by A. Warén, and it shows the same conchiliological features observed in the shells from Brazil, such as the unique spiral sculpture. The most discrepant feature is the dimension of the holotype, described by Dall (1927) as being 8.5 mm in length and 2.5 mm in width, for about nine whorls of teleoconch (Figure 4A), almost double the size of the largest shell examined here (4.30 mm in length, 1.39 mm in width, for seven whorls of teleoconch). In addition, the bathymetric record of the holotype (538 m) is considerably shallower than the Brazilian records (1308–1800 m). Notwithstanding, we consider these as minor differences, and more studies of material of the deep-water fauna from the Caribbean and South America will probably reveal more occurrences of this species.

Bouchet & Warén (1993: 606) proposed the new combination of *Krachia producta* (Dall, 1927) to this species, with the genus *Krachia Baluk*, 1975 being currently allocated in Cerithiopsidae owing to the absence of phylogenetic works in Triphoroidea. *Cerithiella producta* truly shares great similarities with other eastern Atlantic species also allocated in this genus by Bouchet & Warén (1993), especially with *Krachia guernei* (Dautzenberg & Fischer, 1896), only differentiated by the number of spiral cords of teleoconch. The type species of *Krachia*, *Cerithiopsis korytnicensis* Baluk, 1975, is a fossil one from the Miocene, with a similar protoconch to the Recent *Krachia* species but a very different teleoconch, possessing three spiral cords crossed by strong axial ribs. It is certainly preferable to maintain C. *producta* in the variable genus *Cerithiella*; the generic allocation of the eastern Atlantic species of Krachia does not concern us here, despite their similarity with *C. producta*.

GEOGRAPHIC DISTRIBUTION

USA: off Florida (type locality); Brazil: off Bahia, off Rio de Janeiro (this study).

BATHYMETRIC DISTRIBUTION

538 m (type locality) to 1800 m (this study).

Cerithiella atali sp. nov.
(Figure 5)

DIAGNOSIS

Protoconch mainly smooth and with apex very pointed; teleoconch initially with two spiral cords, abapical one assuming a more pronounced profile than adapical cord on later whorls, median spiral cord develops on seventh/eighth whorl.

TYPE MATERIAL

Holotype: MNHN IM-2000-27531, Expedition MD55 station 65-CB106, 02/vi/1987. Paratypes: off Espírito Santo State: MNHN IM-2000-27532, Expedition MD55 station 54-CB93, 19°36′S 38°53′W, 640 m, 30/v/1987 [1]. Campos Basin, off Rio de Janeiro State: MZSP 110599 [1]; IBUFRJ 19651, Oceanprof II station 49, 22°04′33″S 39°54′11″W, 722 m, 30/vi/2003 [1]; IBUFRJ 16989, Oceanprof II station 45, 22°10′53″S 39°52′18″W, 1039 m, 01/vii/2003 [2]; IBUFRJ 17263, Oceanprof II station 74, 22°27′31″S 40°09′23″W, 749 m, 18/vi/2003 [1]; MNRJ 26623, Oceanprof II station 75, 22°31′28″S 40°03′49″W, 1043 m, 18/vi/2003 [1]. Off Rio de Janeiro State: MNRJ 25900, type locality, Expedition MD55 station 65-CB106, 02/vi/1987 [1].

TYPE LOCALITY

23°54′S 42°10′W, 830 m, off Rio de Janeiro State, Brazil.

ETYMOLOGY

The specific name alludes to the god of ice in the Nordic culture, Atali, due to the snow-white colour of the shell. Epithet as a noun in apposition.

DESCRIPTION

Shell up to 8.47 mm in length, 1.97 mm in width, dextral, conical-fusiform, elongated, rectilinear profile, snow-white

https://doi.org/10.1017/S0025315414001933 Published online by Cambridge University Press

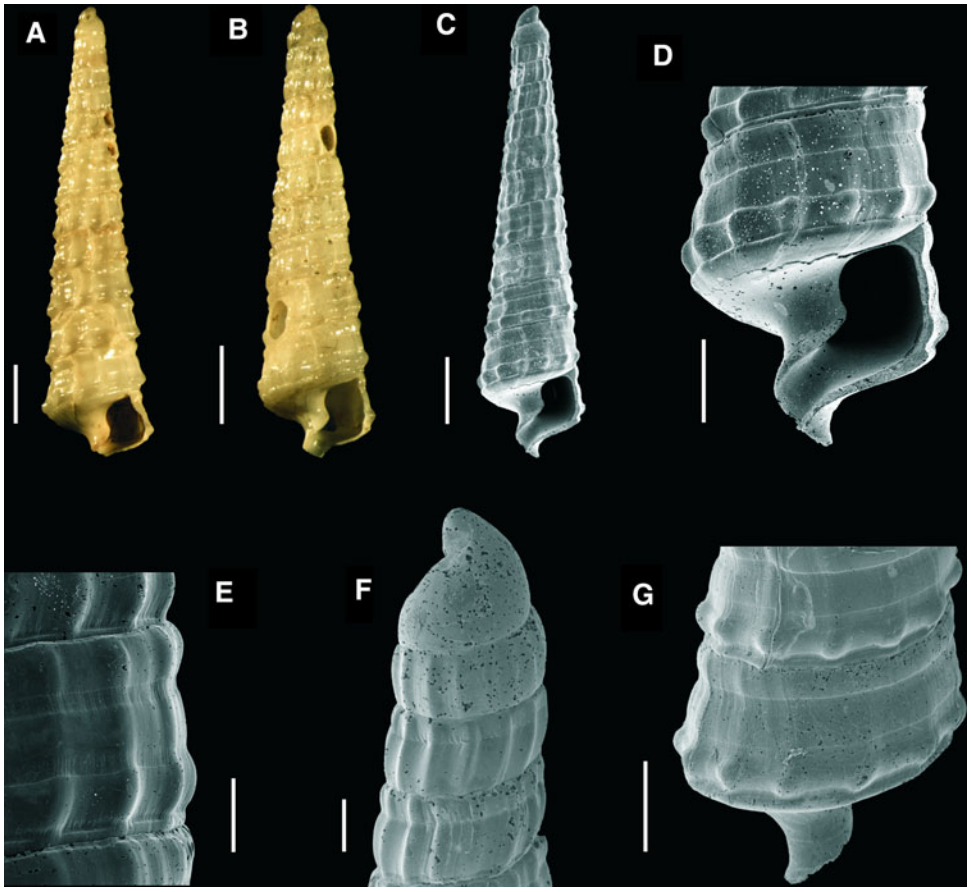

Fig. 5. *Cerithiella atali* sp. nov. (A) Paratype, MNHN IM-2000-27532, 7.68 mm long; (B) Paratype, MNRJ 25900, 5.80 mm long; (C) Holotype, MNHN IM-2000-27531, 6.76 mm long; (D–G: holotype): (D) Abapical portion of shell; (E) Detail of teleoconch, late whorl; (F) Protoconch; (G) Dorsal view of abapical portion of shell. Scale bars: A–C, 1 mm; D, G, 500 μm; E–F, 200 μm.

colour. Protoconch with 2.5–2.75 whorls, barely distinct of teleoconch; apex very pointed, nucleus totally protruded, remaining whorls convex and slightly bulbous; sculpture mainly smooth, except by spaced axial ribs on last whorl. Teleoconch with up to 11.5 whorls of very weak convex profile; two spiral cords on beginning, each situated on an extremity of the whorl, adapical one initially slightly larger, abapical one gradually strengthening and reaching same size as the adapical about the fifth whorl; on subsequent whorls, abapical cord assumes a more pronounced profile than adapical cord, resembling a keel; a small median spiral cord develops on seventh/eighth whorl in the wide zone between the other cords, equidistant from them; adapical and abapical spiral cords with nodules, median one nearly smooth; straight, orthocline and weak axial ribs, numbering 16–19 ribs on fifth whorl of teleoconch, almost disappearing on later whorls; short and broad whorls, suture shallow, with a small sutural cord; body whorl not constraining; thin and smooth subperipheral cord, base totally smooth; elliptical aperture, reaching 0.87 mm in width; anterior canal twisted and widely open, directed downward/sideward, reaching 0.70 mm in length; posterior sinus acute.

REMARKS

Cerithiella atali sp. nov. has the teleoconch somewhat similar to *C. amblytera* (Figure 2A–C), including the presence of two main spiral cords situated on each extremity of the whorl, although *C. atali* develops a median spiral cord on late whorls (Figure 5D). In addition, the very pointed protoconch of *C. atali* (Figure 5F) differs radically from *C. amblytera* (Figure 2F) and it is related to species previously referred to *Stilus*, a currently accepted synonym of *Cerithiella* (Bouchet & Warén, 1993). The type species of *Stilus, Cerithiella insignis* (Jeffreys, 1885), from the eastern Atlantic, has three well-developed spiral cords since the beginning of the teleoconch and the protoconch is axially sculptured earlier than in *C. atali*. The protoconch of *C. atali* is also similar to that of *Cerithiella genei* (Bellardi & Michelotti, 1840), a fossil European species, although the teleoconch of *C. genei* resembles that of *C. insignis*.

Two species previously allocated to the genus or subgenus *Stilus* are herein transferred to *Eumetula* Thiele 1912 (see Discussion): *Eumetula axicostulata* (Castellanos, Rolán & Bartolotta, 1987) comb. nov., described from Argentinian waters, and *Eumetula vitrea* (Dall, 1927) comb. nov. (Figure 8B, C), from the south-eastern USA. Although *E. axicostulata* and *E. vitrea* show a slightly pointed apex, which may have influenced respectively Castellanos *et al.* (1987) and Dall (1927) in their original allocations to *Stilus*, they differ radically from *C. atali* by the much stronger axial sculpture of the teleoconch, the strong convexity of the whorls, and the absence of the typical twisted anterior canal of *Cerithiella*.

https://doi.org/10.1017/S0025315414001933 Published online by Cambridge University Press

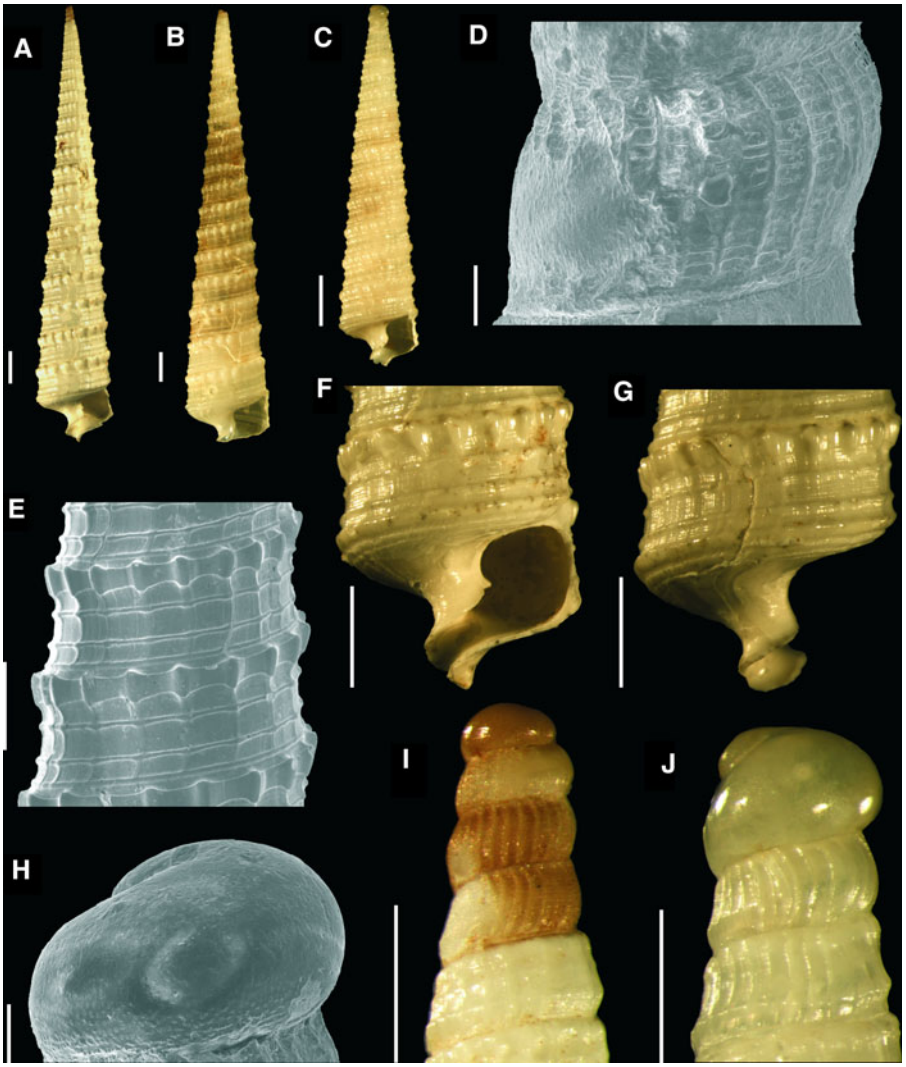

Fig. 6. A–B, D–I: *Cerithiella candela* sp. nov. (A) Holotype, MNRJ 32635, 13.49 mm long; (B) Paratype, MNHN IM-2012-2724, 15.05 mm long; (D–I: holotype): (D) Detail of larval shell; (E) Detail of teleoconch, mid whorls; (F) Abapical portion of shell; (G) Dorsal view of abapical portion of shell; (H) Embryonic shell; (I) Protoconch. (C, J) *Cerithiella pernambucoensis*: (C) Shell from north-eastern Brazil, MNRJ 17238, 7.35 mm long; (J) Protoconch, same shell as C. Scale bars: A–C, F–G, 1 mm; D, H, 50 μm; E, I–J, 500 μm.

GEOGRAPHIC DISTRIBUTION
Brazil: off Espírito Santo, off Rio de Janeiro.

BATHYMETRIC DISTRIBUTION
640–1043 m.

Cerithiella pernambucoensis Lima & Barros, 2007
(Figure 6C, J)

Cerithiella pernambucoensis Lima & Barros, 2007: 64, figures 1–9.

TYPE MATERIAL
Holotype: MNRJ 10834. Paratypes: MNRJ 10835 [3]; MNRJ 10836 [1]; MZSP 80484 [4]; MORG 50690 [3]; ANSP 413609 [3]. All lots from type locality.

TYPE LOCALITY
08°46′30″S 34°44′30″W, 690 m, off Pernambuco State, Brazil.

MATERIAL EXAMINED
Holotype and paratypes deposited in MNRJ; and MNRJ 17238, somewhere between 06°30′S (Paraíba State) and 10°30′ (Alagoas State), north-eastern Brazil [no precise data of coordinates and depth], 12/xi/2001 [2].

REMARKS
See comments on the following species.

GEOGRAPHIC DISTRIBUTION
Brazil: off Pernambuco (type locality).

BATHYMETRIC DISTRIBUTION
690 m (type locality).

Cerithiella candela sp. nov.
(Figure 6A-B, D–I)

https://doi.org/10.1017/S0025315414001933 Published online by Cambridge University Press

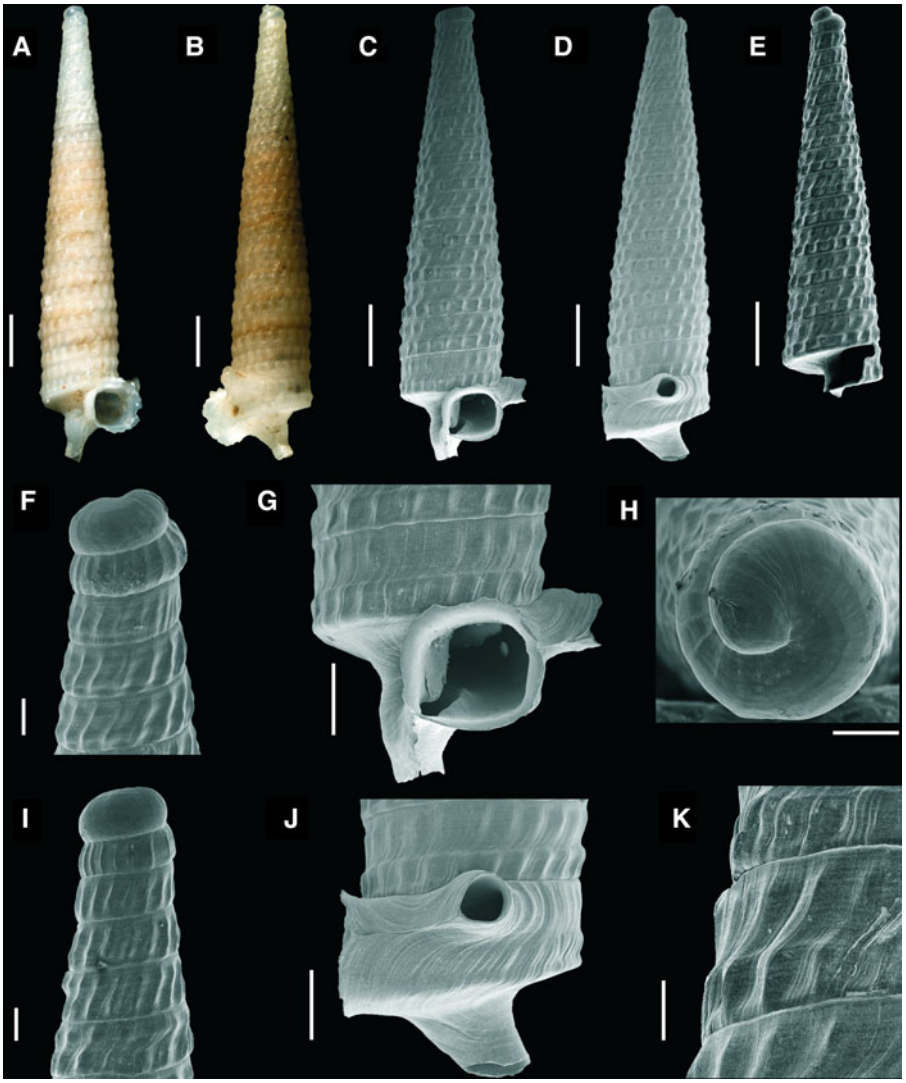

Fig. 7. *Trituba anubis* sp. nov. (A–B) Holotype, MNRJ 18000, 8.90 mm long; (C–D) Paratype, MNRJ 31097, 7.14 mm long; (E) Paratype, MNRJ 31097, 6.04 mm long; (F, H, K: MNRJ 31097, but entire shell not illustrated): (F) Apex; (H) Adapical view of protoconch; (K) Detail of teleoconch, mid whorls; (G, J: same shell as C–D): (G) Abapical portion of shell; (J) Lateral view of abapical portion of shell; (I: same shell as E) Protoconch. Scale bars: A–E, 1 mm; F, H–I, K, 200 μm; G, J, 500 μm.

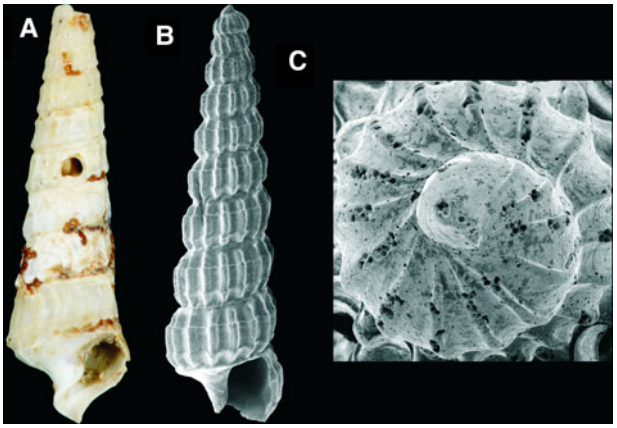

Fig. 8. A: *Cerithiella martensii*, syntype, USNM 93770. B–C: *Eumetula vitrea* comb. nov., holotype, USNM 108337.

DIAGNOSIS

Brown protoconch with four whorls; white teleoconch with three (initial whorls) to four (late whorls) main spiral cords, adapical one very nodulose and much larger than remaining cords.

TYPE MATERIAL

Holotype: MNRJ 32635, 24/viii/2001. Paratypes: Vitória-Trindade Seamount Chain: MNHN IM-2012-2724, Expedition MD55 station 43-CB77, 19°40′S 37°48′W, 790–940 m, Champlain Seamount, 27/v/1987 [1]. Campos Basin, off Rio de Janeiro State: MNRJ 26618, Oceanprof II station 45, 22°10′53″S 39°52′18″W, 1039 m, 01/vii/2003 [1].

TYPE LOCALITY

21°53′37″S 39°50′19″W, 1129 m, Campos Basin, off Rio de Janeiro State, Brazil.

ETYMOLOGY

Candela, L. =candle. The specific name alludes to the resemblance of its shell to a candle.

https://doi.org/10.1017/S0025315414001933 Published online by Cambridge University Press

DESCRIPTION

Shell up to 15.05 mm in length, 3.01 mm in width, dextral, conical-fusiform, very elongated, rectilinear profile. Protoconch brown with four whorls, with 0.58 mm in length, 0.35 mm in width; first 1.5 whorl dome-shaped, convex, nucleus moderately protruded, with very small granules only visible on its abapical portion; remaining whorls less convex, with close and nearly straight to slightly sigmoid axial ribs, besides several small spiral threads along the entire whorl. Teleoconch white to dirty-white, with up to 23 not convex whorls; it begins with two thin and faint spiral cords, each situated on an extremity of the whorl, with a median spiral cord appearing on the second/third whorl; after the third whorl, the adapical spiral cord gradually enlarges, becoming very nodulose and much larger than the smooth median and abapical spiral cords; a fourth, smooth and suprasutural cord is more evident on later whorls; several micro-spiral cords among the main spiral cords; nearly orthocline but slightly sigmoid axial ribs, numbering 20–22 ribs on tenth whorl of teleoconch, becoming very weak on later whorls; intense axial microsculpture between primary axial ribs; short and broad whorls, suture very shallow; body whorl not constraining; smooth subperipheral cord above two to three very small spiral basal threads, diminishing abapically and resulting in several micro-spiral threads; elliptical aperture, reaching 1.23 mm in width; anterior canal twisted and widely open, directed downward/sideward, reaching 1.02 mm in length; posterior sinus acute.

REMARKS

The teleoconch of *Cerithiella candela* sp. nov. (Figure 6A, B) is identical to that of *Cerithiella pernambucoensis* (Figure 6C), including the spiral sculpture, as well as similar dimensions of the shell (15.05 mm to 23 whorls of teleoconch in *C. candela*, protoconch partially broken; 16.1 mm to 23 whorls of teleoconch in *C. pernambucoensis*). The differences between them consist of the colour and shape of the protoconch: it is brown and typically multispiral, with four whorls, in *C. candela* (Figure 6I), and white and typically paucispiral (with 1.5 whorls) in *C. pernambucoensis* (Figure 6J). Several gastropod groups contain sibling species mainly differentiated by larval development, as observed in Vermetidae (Safriel & Hadfield, 1988), Rissoidae (Russo & Patti, 2005) or Raphitomidae (Fedosov & Puillandre, 2012), among many others. As poecilogony in Gastropoda has been proved to occur only in some taxa of Sacoglossa (Bouchet, 1989), we discard the hypothesis of *C. candela* being conspecific with *C. pernambucoensis*.

GEOGRAPHIC DISTRIBUTION

Brazil: Vitória-Trindade Seamount Chain, off Rio de Janeiro.

BATHYMETRIC DISTRIBUTION

790–1129 m.

Genus *Trituba* Jousseaume, 1884

TYPE SPECIES

Triforis bitubulatus Baudon, 1856, by original designation [Jousseaume (1884) wrongly cited '*Triforis bituberculatus*']. Eocene, France.

DIAGNOSIS

Cylindrical, elongated, dextral and white shell; protoconch axially ribbed, whorls more or less convex, with the apex sunken in the next whorl or protruding; teleoconch with opisthocline axial ribs and two spiral cords, usually producing nodular intersections; aperture usually circular, anterior and posterior canals tubular and well developed (adapted from Gofas, 2003).

SYNONYM

Tauroforis Sacco, 1895 (based on Cossmann & Peyrot, 1922 *apud* Marshall, 1977).

Trituba anubis sp. nov.
(Figure 7)

DIAGNOSIS

Protoconch with first 1.5–1.75 whorl dome-shaped, smooth and slightly inflated, more convex than remainder of protoconch.

TYPE MATERIAL

Holotype: MNRJ 18000. Paratypes: MNRJ 31097 [8]; MZSP 53716 [2]; MZSP 53922 [1]; MZSP 70275 [2]; MZSP 70306 [4]. All lots from: type locality, P.M.S. Costa and J. Coltro coll., xi/2005.

TYPE LOCALITY

02°14′25″S 38°22′50″W, 240–260 m, Canopus Bank, off Ceará State, Brazil.

ETYMOLOGY

The specific name alludes to the god of mummification in the Old Egyptian culture, Anubis, due to the presence of mummified soft parts in this species. Epithet as a noun in apposition.

DESCRIPTION

Shell up to 14.47 mm in length, 2.15 mm in width, dextral, conical-fusiform, elongated, rectilinear profile, white, with up to 26 whorls. Protoconch with 3–3.5 whorls, barely distinct of teleoconch; first 1.5–1.75 whorl dome-shaped, convex, nearly smooth (only with micro spiral threads) and slightly inflated, nucleus moderately protruded; in the next 1.5–1.75 whorl the convexity of the whorls diminishes and the axial sculpture predominates, initially with spaced and orthocline axial ribs that gradually become closer and opisthocline. Teleoconch whorls not convex; it begins with gradual development of two thin and faint spiral cords, abapical one usually slightly larger, resulting in small elevations in the intersections with the axial ribs; sigmoid and opisthocline axial ribs, numbering 19–20 ribs on tenth whorl of shell, but becoming very weak on later whorls; intense axial microsculpture between primary axial ribs; short and broad whorls, suture very shallow; body whorl weakly constraining in large shells; small subperipheral cord crossed by the weak axial sculpture; base with intense microsculpture of axial lines that converge to aperture and posterior canal; circular aperture, very projected, with a continuous peristome, reaching 0.95 (without peristome)/1.22 (with peristome) mm in width; elongated anterior canal, closed (except at its end), directed downward, reaching 1.07 mm in length, 0.75 mm in width; posterior canal dislocated up to 1.06 mm of the

https://doi.org/10.1017/S0025315414001933 Published online by Cambridge University Press

border of the aperture, directed sideward, forming an elongated and thick tube with up to 0.78 mm in length, 0.67 mm in width; columellar and labial edges coming very close, often with a small gap on the abapical extremity of the junction.

REMARKS

Trituba anubis sp. nov. is distinct from *Trituba barbadensis*, the only species of this genus previously recorded from the western Atlantic. *Trituba anubis* has two defined, although weak, spiral cords on the teleoconch, axial ribs closely spaced (Figure 7A–E, K), and the protoconch initially smooth and concave but thereafter axially ribbed and less convex (Figure 7F, I), in contrast to *T. barbadensis*, with only one visible spiral cord on the teleoconch, axial ribs widely spaced, and the protoconch strongly convex, with axial ribs present since its beginning (Coomans & Faber, 1984). *Trituba anubis* is also distinct from the species described from the north-eastern Atlantic (Gofas, 2003) in its smooth and inflated beginning of the protoconch. Similarly to *T. barbadensis* (90–100 m; Coomans & Faber, 1984) and *Trituba dexia* (73–201 m; Verco, 1909), *Trituba anubis* (240–260 m) occurs in shallower depths than species from the north-eastern Atlantic (270–1520 m; Gofas, 2003).

Species of the subgenus *Granulotriforis* have much more nodulose teleoconch than *T. anubis*, and species of the genus *Paramendax* have a different shell profile. The generic allocation of *T. anubis* is based on conchiliological similarities to its congeners, despite the unusual structure of its protoconch. We note the clearly multispiral protoconch in the type species of *Trituba* (illustrated by Marshall, 1980), although it is difficult to determine if the protoconch of *T. anubis* (Figure 7F, I) is multispiral but derived from intracapsular development, as proposed by Gofas (2003), or paucispiral.

GEOGRAPHIC DISTRIBUTION

Brazil: off Ceará.

BATHYMETRIC DISTRIBUTION

240–260 m.

DISCUSSION

Although absent from Brazil, some species previously referred to *Cerithiella* and *Stilus* are herein analysed to avoid future taxonomic problems: *Cerithiella martensii* (Dall, 1889), described from the Florida Strait and illustrated here for the first time (Figure 8A), is very similar to *C. amblytera*, including the presence of two spiral cords situated on each extremity of whorl; however, the only shell of *C. martensii* is very worn, without an apex, and it cannot be treated with certainty as a synonym of *C. amblytera*. *Eumetula axicostulata* (Castellanos *et al.*, 1987) comb. nov. was described in *Cerithiella*, but in the abstract of the same paper (Castellanos *et al.*, 1987) it was allocated to *Cerithiopsilla* Thiele, 1912, the same genus to which Dr P. Bouchet considered this species belonged (Martín & César, 2004); however, the narrow appearance of the shell, the prevalence of axial sculpture and the near-absence of an anterior canal in *E. axicostulata* mainly distinguishes it from the concept of *Cerithiopsilla*. *Eumetula vitrea* (Dall, 1927) comb. nov., also illustrated here for the first time (Figure 8B, C), was described as having a very short and not recurved anterior canal (Dall, 1927), which differentiates it from *Cerithiella*; *E. vitrea* resembles the variable eastern Atlantic species *Eumetula bouvieri* (Dautzenberg & Fischer, 1896), illustrated in Bouchet & Warén (1993: figures 1334, 1336–1340). Although the current concept of *Eumetula* comprises species with variable degrees of axial or spiral sculpture and convexity of whorls on the shell, *E. axicostulata* and *E. vitrea* share with the type species *Eumetula dilecta* Thiele, 1912 and other congeners some diagnostic features of the genus, such as the absence of a drawn-out anterior canal, but a base with a very narrow cord and the shell smaller than 10 mm (Bouchet & Warén, 1993). The junior homonym *Eumetula vitrea* Høisaeter, 2011 will receive a replacement name in an oncoming paper (T. Høisaeter, pers. comm.).

Recent Newtoniellinae species seldom present truly planktotrophic development, which appears to have been common in fossil species of this group (references and comments for triforids in Marshall, 1977, 1980; Gofas, 2003). *Cerithiella candela* sp. nov. possesses a multispiral protoconch with a clear delimitation from the teleoconch, which is rare among its Recent congeners and triforids, both considered to have multispiral protoconchs but derived from intracapsular metamorphosis (Bouchet & Warén, 1993; Gofas, 2003), with unclear delimitation from teleoconch. Another evidence for planktotrophy in *C. candela* is the brown colour of its protoconch, suggesting that larvae migrate to the photic zone to feed on phytoplankton (Bouchet, 1976), and complete its ontogenetic migration when metamorphosing at the deep-sea floor (Bouchet & Warén, 1994), when the adult begins to produce the white teleoconch. Bouchet & Warén (1994: 112) also considered 'occurrence of planktotrophy in deep-sea taxa to be a plesiomorphy that primarily reflects phylogeny'; in this way, *C. candela* could be related to an ancestral lineage in *Cerithiella*.

Previously to this study, four species of Newtoniellinae were recognized for Brazil, although still classified in Cerithiopsidae. Currently, nine species are recognized, in addition to a previously unknown genus to Brazil, *Trituba*. Of these species, five have a very restricted distribution (*Cerithiella cepene; Cerithiella pernambucoensis; Cerithiella atali; Cerithiella candela; Trituba anubis*), two have a wide range through the western Atlantic (*Cerithiella sigsbeana; Cerithiella producta*) and two are recognized as amphi-Atlantic species (*Cerithiella amblytera; Cerithiella enode*). Owing to the deep-sea habitat of Newtoniellinae species and its related difficulty in sampling, probably more species of this group exist in Brazilian waters.

ACKNOWLEDGEMENTS

We are very grateful to: Dr Ellen Strong (USNM), who photographed type material of *Cerithiella sigsbeana, Cerithiella martensii* and *Eumetula vitrea*, besides verifying the availability of the holotype of *Cerithiella producta*; Dr Anders Warén (Swedish Museum of Natural History), who furnished the photograph of the holotype of *C. producta*; Dr Adam Baldinger (MCZ), who photographed type material of *C. sigsbeana*; Dr Paulo Márcio Costa and José Coltro, who provided

the samples of *C. sigsbeana* and *T. anubis* from Canopus Bank, besides providing material from several lots (P. M. Costa); Dr Luiz Simone (MZUSP), who lent some lots of *Trituba anubis* deposited on MZUSP; Dr Philippe Bouchet and Dr Philippe Maestrati (MNHN), for loan of lots from the MD55 Expedition; Dr Franklin Santos (Universidade Federal do Espírito Santo), who donated a lot of *C. pernambucoensis*; Department of Entomology (MNRJ), that provided equipment for the colour photographs; Amanda Veiga and Beatriz Cordeiro, who operated the SEM at Department of Invertebrates (MNRJ); Janet Reid, for revising the English text; Dr Nick Pope, who edited the manuscript; two anonymous reviewers, for their criticisms and suggestions to improve the manuscript.

FINANCIAL SUPPORT

FAPERJ (Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro) provided financial support through project E-26/110.325/2014 and project E-26/110.068/2014 and CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico) provided fellowships to M. Fernandes and R. Garofalo.

REFERENCES

Absalão R.S. (2010) Mollusca. In Lavrado H.P. and Brasil A.C.S. (eds.) *Biodiversidade da região oceânica profunda da Bacia de Campos: Macrofauna*. Rio de Janeiro: SAG Serv, pp. 31–95.

Barros J.C.N., Santos F.N., Santos M.C.F., Cabral E. and Acioli F.D. (2001) Redescoberta de moluscos obtidos durante a "Challenger Expedition" (1873–1876): micromoluscos de águas profundas. *Boletim Técnico Científico CEPENE* 9, 9–24.

Bouchet P. (1976) Mise en évidence d'une migration de larves véligères entre l'étage abyssal et la surface. *Comptes rendus de l'Académie des sciences* 283, 821–824.

Bouchet P. (1989) A review of poecilogony in gastropods. *Journal of Molluscan Studies* 55, 67–78.

Bouchet P. and Fechter R. (1981) The Recent *Triforis* from the Eastern Atlantic (Gastropoda: Cerithiopsoidea). *Archiv für Molluskenkunde* 111, 165–172.

Bouchet P. and Warén A. (1993) Revision of the northeast Atlantic bathyal and abyssal Mesogastropoda. *Bolletino Malacologico* 3, 579–840.

Bouchet P. and Warén A. (1994) Ontogenetic migration and dispersal of deep-sea gastropod larvae. In Young C.M. and Eckelbarger K.J. (eds.) *Reproduction, larval biology, and recruitment of the deep-sea benthos*. New York, NY: Columbia University Press, pp. 98–117.

Bouchet P., Rosenberg G. and Gofas S. (2014) *Cerithiella* Verrill, 1882. Accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p=taxdetails&id=137763 on 2015-02-04.

Castellanos Z., Rolán E. and Bartolotta S. (1987) Nuevos micromoluscos de la plataforma inferior argentina y talud superior (Moll. Gastropoda). *Revista del Museo de La Plata* 14, 93–107.

Colgan D.J., Ponder W.F., Beacham E. and Macaranas J. (2007) Molecular phylogenetics of Caenogastropoda (Gastropoda: Mollusca). *Molecular Phylogenetics and Evolution* 42, 717–737.

Coomans H.E. and Faber M.J. (1984) Studies on West Indian marine molluscs, 2. *Triforis barbadensis*, a new species from deeper water off Barbados (Gastropoda: Triphoridae). *Bulletin Zoölogisch Museum Universiteit van Amsterdam* 10, 25–28.

Cossmann M.and Peyrot A. (1922) Conchologie Néogénique de l'Aquitane. Tome IV, Gastropodes. *Actes de la Société Linnéenne de Bordeaux* 73, 5–321.

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'. *Bulletin of the Museum of Comparative Zoology* 9, 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 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. 40 pls.

Dall W.H. (1927) Small shells from dredgings 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.

Engl W. (2012) *Shells of Antarctica*. 1st edition. Hackenheim: ConchBooks.

Fedosov A.E. and Puillandre N. (2012) Phylogeny and taxonomy of the *Kermia-Pseudodaphnella* (Mollusca: Gastropoda: Raphitomidae) genus complex: a remarkable radiation via diversification of larval development. *Systematics and Biodiversity* 10, 447–477.

Gofas S. (2003) An endemic radiation of *Trituba* (Mollusca, Gastropoda) on the North Atlantic seamounts. *American Malacological Bulletin* 17, 45–63.

Golikov A.N. and Starobogatov Y.I. (1975) Systematics of prosobranch gastropods. *Malacologia* 15, 185–232.

Høisaeter T. (2010) Reappraisal of *Cerithiella danielsseni* (Gastropoda: Caenogastropoda: Cerithiopsidae): a taxon confined to negative temperatures in the Norwegian Sea. *Journal of the Marine Biological Association of the United Kingdom* 90, 819–826.

Jousseaume F. (1884) Monographie des Triforidae. *Bulletins de la Société Malacologique de France* 1, 217–270.

Kosuge S. (1967) Description of a new dextral triforiid, *Triforis tanseiae* n. sp. with some considerations on its allied forms. *Bulletin of the National Science Museum* 10, 125–132.

Lavrado H.P., Brasil A.C.S., Fernandez M.P.C. and Campos L.S. (2010) Aspectos gerais da macrofauna bentônica da Bacia de Campos. In Lavrado H.P. and Brasil A.C.S. (eds.). *Biodiversidade da Região Oceânica Profunda da Bacia de Campos: Macrofauna*. Rio de Janeiro: SAG Serv., pp. 19–27.

Lima S.F.B. and Barros J.C.N. (2007) Two new species of *Cerithiella* (Apogastropoda: Cerithiopsidae) for the continental slope of Pernambuco (northeast Brazil). *Zootaxa* 1441, 63–68.

Locard A. (1897) *Expéditions scientifiques du travailleur et du talisman pendant les années 1880, 1881, 1882, 1883*. Paris: Milne-Edwards.

Marshall B.A. (1977) The recent New Zealand species of *Triforis* (Gastropoda: Triforidae). *New Zealand Journal of Zoology* 4, 101–110.

Marshall B.A. (1978) Cerithiopsidae (Mollusca: Gastropoda) of New Zealand, and a provisional classification of the family. *New Zealand Journal of Zoology* 5, 47–120.

Marshall B.A. (1980) The systematic position of *Triforis* Deshayes (Mollusca: Gastropoda). *New Zealand Journal of Zoology* 7, 85–88.

Martín S.M. and César I.I. (2004) *Catálogo de los tipos de moluscos Gastropoda-Bivalvia-Cephalopoda del Museo de La Plata*. 1st edition. La Plata: Fundación Museo de La Plata Francisco Pascasio Moreno.

Nützel A. (1998) Ueber die Stammesgeschichte der Ptenoglossa (Gastropoda). *Berliner Geowissenschaftliche Abhandlungen*, ser. E (Palaeobiologie) 26, 1–229.

Ponder W.F. and Bouchet P. (2005) Modern Caenogastropoda, modern lower Heterobranchia. In Bouchet P. and Rocroi J.P. (eds.) *Classification and nomenclator of gastropod families. Malacologia* 47, 247–258.

Rios E. (1975) *Brazilian marine mollusks iconography*. 1st edition. Rio Grande: Museu Oceanográfico da FURG.

Rios E. (1985) *Seashells of Brazil*. 1st edition. Rio Grande: Museu Oceanográfico da FURG.

Rios E. (1994) *Seashells of Brazil*. 2nd edition. Rio Grande: Museu Oceanográfico da FURG.

Rios E. (2009) *Compendium of Brazilian seashells*. 1st edition. Rio Grande: Evangraf.

Rosenberg G. (2013) Newtoniellinae. Acessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p=taxdetails&id=411734 on 2014-04-08.

Rosenberg G. and Gofas S. (2014a) *Trituba* Jousseaume, 1884. Accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p=taxdetails&id=180931 on 2015-02-04.

Rosenberg G. and Gofas S. (2014b) *Triforis* Deshayes, 1834. Accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p=taxdetails&id=137772 on 2015-02-04.

Russo G.F. and Patti F.P. (2005) Early life history of two closely related gastropods, *Rissoa auriscalpium* and *Rissoa italiensis* (Caenogastropoda: Rissoidae). *Marine Biology* 147, 429–437.

Safriel U.N. and Hadfield M.G. (1988) Sibling speciation by life-history divergence in *Dendropoma* (Gastropoda; Vermetidae). *Biological Journal of the Linnean Society* 35, 1–13.

Sars G.O. (1878) *Mollusca Regionis Arcticae Norvegiae*. 1st edition. Christiania: Christiania University.

Tavares M. (1999) The cruise of the Marion Dufresne off the Brazilian coast: account of the scientific results and list of stations. *Zoosystema* 21, 597–605.

Thiele J. (1929) *Handbook of systematic malacology. Part 1 (Loricata; Gastropoda: Prosobranchia)*. 1992 edition, translated to English. Washington, DC: Smithsonian Institution Libraries, The National Science Foundation.

Verco J.C. (1909) Notes on South Australian marine Mollusca, with descriptions of new species – part XI. *Transactions of the Royal Society of South Australia* 33, 277–292.

Watson R.B. (1880) Mollusca of H.M.S. "Challenger" Expedition. Part V. *Zoological Journal of the Linnean Society* 15, 87–126.

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

Correspondence should be addressed to:
M.R. Fernandes
Departamento de Invertebrados, Museu Nacional, Universidade Federal do Rio de Janeiro, Quinta da Boa Vista, São Cristóvão, 20940-040, Rio de Janeiro, Brazil
email: mauriciofernandes14@hotmail.com

https://doi.org/10.1017/S0025315414001933 Published online by Cambridge University Press