

Taxonomic review of the genus *Opaliopsis* (Gastropoda: Nystiellidae) from Brazil, with description of a new species

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The genus Opaliopsis from Brazil is revised based on three deep-water species. Opaliopsis atlantis (Clench & Turner, 1952) is confirmed as occurring in north-eastern and south-eastern localities. Opaliopsis opalina (Dall, 1927) is reported for the first time in the south-western Atlantic. A new species, Opaliopsis cearense, is described from the north-eastern Brazilian coast, and is distinguished by its large number of fine spiral cords per teleoconch whorl.

Keywords: Epitonioida, Caenogastropoda, taxonomy, conchology, South America, Atlantic Ocean, biodiversity

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INTRODUCTION

The genus *Opaliopsis* Thiele, 1928 comprises a group of deep-water marine microgastropods belonging to the family Nystiellidae Clench & Turner, 1952. It was originally described as a section of the genus *Scala*, to include *Scala (Opaliopsis) elata* Thiele, 1925 and diagnosed as small turriculate shells with a brown, densely ribbed protoconch and with a teleoconch with strong ribs (Thiele, 1929).

The genus is represented in the western Atlantic by five species. All were originally described from northern localities, in the USA: Alabama: *Opaliopsis rabalaisi* Garcia, 2005; Georgia: *Opaliopsis opalina* (Dall, 1927) and *Opaliopsis canium* (Dall, 1927); Florida: *Opaliopsis concava* (Dall, 1927); and Cuba: *Opaliopsis atlantis* (Clench & Turner, 1952). From other regions of the world, Weil *et al.* (1999) listed *O. meiringnaudeae* Kilburn, 1985 from South Africa, *O. elata* from East Africa, and *O. hiranoi* (Shikama, 1962) from Japan. In addition, Bouchet & Warén (1986) stated that several undescribed species occur in the Indo-Pacific, while Kiel (2001) and Krüger (2002) reported fossil taxa from Mexico, Spain and Germany.

Clench & Turner (1952), based on the western Atlantic species created the genus *Nystiella*, diagnosed very similarly to *Opaliopsis*. In addition, they proposed the subfamily Nystiellinae for the family Epitoniidae, to include *Nystiella* and *Solustiscala*, based on the radula and on the presence of strong axial ribs in the protoconch.

Kilburn (1985), based on the similarity of general characters between the type species, proposed the synonymy of *Nystiella* and *Opaliopsis*. His proposal was followed by Bouchet & Warén (1986), who demonstrated the validity of the subfamily name Nystiellinae, also including *Eccliseogyra* (= *Solustiscala*), *Narrimania*, *Iphitus* and *Papuliscala*.

Finally, Nützel (1998) raised the Nystiellinae to family rank, and this proposal was followed by Bouchet & Rocroi (2005).

Recently, species of *Opaliopsis* were recorded from localities in Brazil, which considerably enlarged the known latitudinal range of the genus. However, these records are somewhat imprecise, since they were established in malacological lists or catalogues, without descriptions or illustrations, and based on doubtful determinations. Miyaji (2004) recorded *Opaliopsis* cf. *atlantis* and *Opaliopsis* sp. from the southern coast of Brazil. Benkendorfer & Soares-Gomes (2009) listed *Opaliopsis* aff. *nitida* (Verrill & Smith, 1885) from eastern Brazil. Rios (2009) recorded *Nystiella atlantis* from Pernambuco and Campos (state of Rio de Janeiro; [sic]), providing a photocopy of the holotype illustration by Clench & Turner (1952).

Therefore, knowledge of this genus in Brazil is still fragmentary. Recent collections in different localities on the Brazilian coast revealed three species of *Opaliopsis*, which are the subject of this revision.

MATERIALS AND METHODS

This study is based on empty shells collected at different localities on the north-east and south-east coasts of Brazil, in depths of 240–610 m. The identification of the taxa was based on Dall (1927), Clench & Turner (1952), Kilburn (1985) and Bouchet & Warén (1986). In the material lists, the number inside square brackets indicates the amount of shells in each lot.

Abbreviations used: IBUFRJ: Instituto de Biologia/ Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil; MCZ: Museum of Comparative Zoology, Cambridge, USA; MNRJ: Museu Nacional/Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil; MZSP: Museu de Zoologia/Universidade de São Paulo, São Paulo, Brazil; USNM: National Museum of Natural History, Washington, DC, USA.

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SYSTEMATICS

Superfamily EPITONIOIDEA Berry, 1910
 Family NYSTIELLIDAE Clench & Turner, 1952
 Genus *Opaliopsis* Thiele, 1928

Opaliopsis Thiele, 1928: 92. Type species by original designation: *Scala elata* Thiele, 1925.

Nystiella Clench & Turner, 1952: 337. Type species by original designation: *Epitonium opalinum* Dall, 1927. Synonymized by Kilburn (1985).

Opaliopsis atlantis (Clench & Turner, 1952)
 (Figures 1–3)

Nystiella atlantis Clench & Turner, 1952: 343, pl. 168; Rios (2009: 186, figure 454, holotype photograph reproduced).

Opaliopsis atlantis: Bouchet & Warén (1986: 489, figures 1133, 1151–1152); Weil *et al.* (1999: 26, figure 67); Ardovini & Cossignani (2004: 140); Segers *et al.* (2009: 107).

TYPE MATERIAL

Holotype: MCZ 187988, off Bahía de Cochinos, Cuba (22°09' N 081°10'W), 420–484 m.

Paratypes: T. McGuinty collection (Clench & Turner, 1952) and USNM 417386 (Weil *et al.*, 1999).

MATERIAL EXAMINED

Brazil: Ceará State: off Canopus Bank (02°14'25''S 38°22'50''W, 240–260 m), November 2005: MNRJ 13617, [1]; MZSP 67621, [1]. Pernambuco State: MNRJ 15499, [1]. Santa Catarina State: off Itajaí (26°38'44.9''S 46°51'54.2''W, 150 m), February 2004: MNRJ 13615, [2]; MNRJ 13616, [3].

CHARACTERIZATION

Shell turriculate; imperforate; opaque; spire angle about 28°; maximum length/width 8.15 mm/3 mm (8th teleoconch whorl). Protoconch conical; dark brown; partly broken, up to two remaining whorls (400 µm wide); with strong orthocone axial riblets (about 27 on last protoconch whorl), interspaces with about 18 microscopic spiral striae. Teleoconch with up to nine convex whorls; cream-coloured; suture

impressed and distinctly sinuous, subsutural spiral band with axial lines only. Sculpture consisting of strong non-lamellar axial ribs, some forming varices, 14–15 ribs per whorl (7th–9th whorls), crossed by 13 strong spiral cords somewhat darker than overall shell colour, forming nodules on intersections; interspaces about same width as ribs; entire teleoconch surface with microscopic axial lines. Periphery of last whorl with spiral basal ridge crossed by the axial ribs. Base pattern same as palatal area, with about five strong spiral cords forming nodules at the intersections with the axial ribs. Aperture subcircular, slightly pointed below, peristome thickened by the last axial rib, columella arcuate.

DISTRIBUTION

Eastern Atlantic Ocean: Azores, Strait of Gibraltar (Bouchet & Warén, 1986: 489); Canary Islands, Madeira (Segers *et al.*, 2009: 107); western Atlantic Ocean: USA: Florida; Cuba: Bahía de Cochinos (Clench & Turner, 1952: 344); Brazil: Rio de Janeiro (Rios, 2009); Ceará, Pernambuco and Santa Catarina (this study).

Opaliopsis opalina (Dall, 1927)
 (Figures 4–9)

Epitonium opalinum Dall, 1927: 61.

Epitonium lavaratum Dall, 1927: 62. Synonymized by Clench & Turner (1952).

Opalia ? dromio Dall, 1927: 63. Synonymized by Clench & Turner (1952).

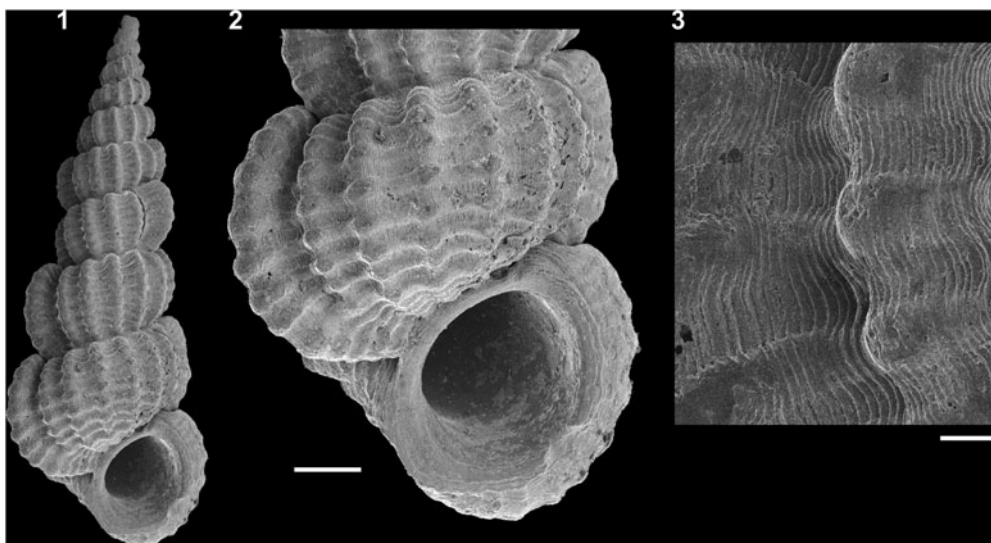
Nystiella opalina: Clench & Turner (1952: 337, pls 163–164).

TYPE MATERIAL

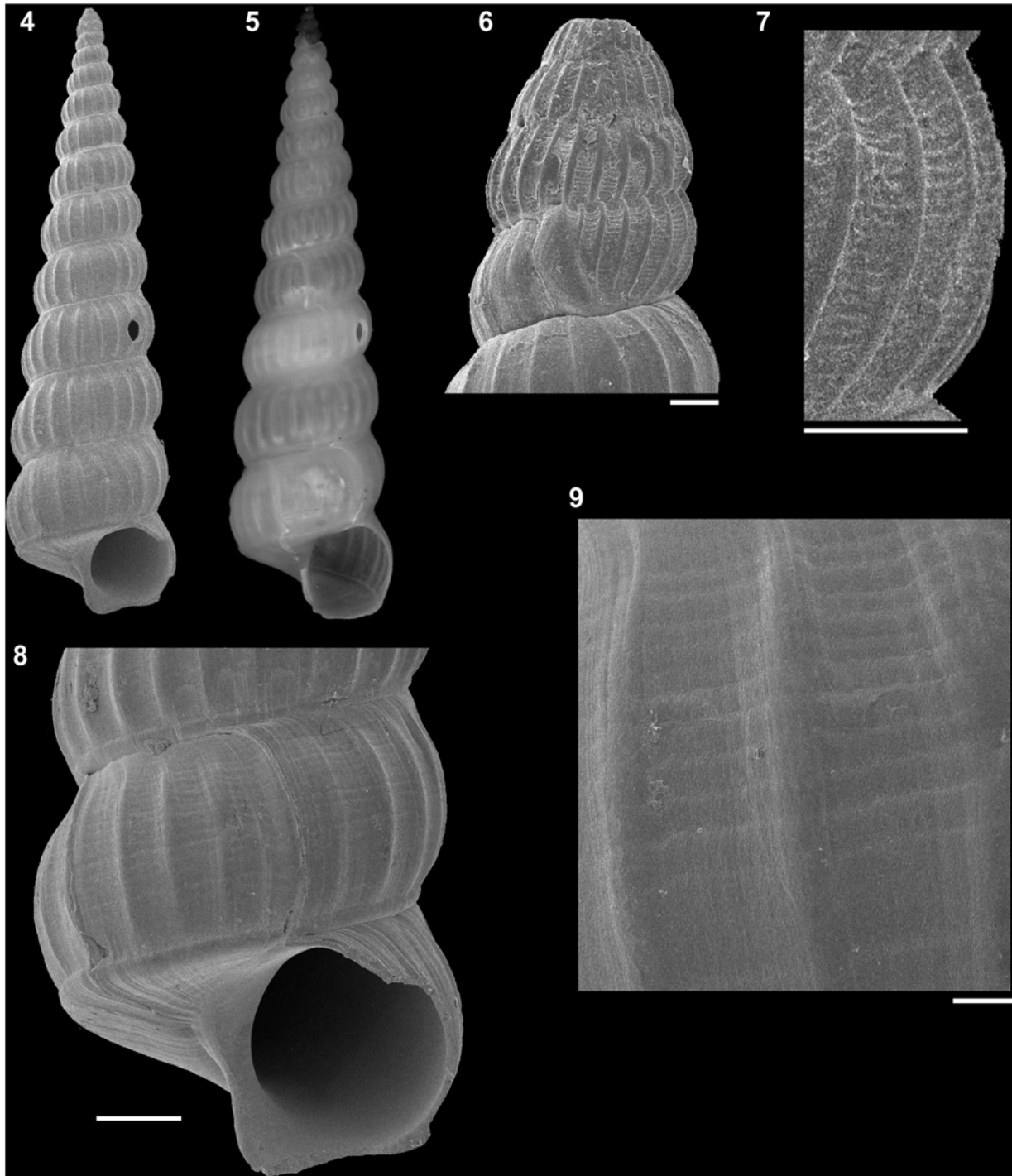
Holotype USNM 108368 (Clench & Turner, 1952), off Georgia, USA, Albatross Station 2415, 804 m.

MATERIAL EXAMINATED

Brazil: Ceará State: off Canopus Bank (02°14'25''S 38°22'50''W, 240–260 m), November 2005: MNRJ 13688, [1]; MZSP 70304, [2]. São Paulo State: off Santos: MNRJ 13694, [3].



Figs 1–3. *Opaliopsis atlantis*. MNRJ 13615. (1) Whole shell (8.15 mm); (2) last whorl; (3) detail of sculpture on last whorl. Scale bars: (2) 500 µm; (3) 100 µm.



Figs 4–9. *Opaliopsis opalina*. MNRJ 13964. (4–5) Whole shell (9.4 mm); (6) protoconch; (7) detail of sculpture in last protoconch whorl; (8) last whorl; (9) detail of sculpture on last whorl. Scale bars: (6–7 & 9) 100 μm ; (8) 500 μm .

CHARACTERIZATION

Shell turriculate; imperforate; translucent; spire angle about 23° ; maximum length/width 11.7 mm/3.5 mm (apex broken, with eight remaining teleoconch whorls, estimated 6th–13th by comparison with other specimens). Protoconch conical; dark brown; with 3.5 whorls (650 μm height, 400 μm width), nuclear one smooth, remaining with strong orthocline axial riblets (about 25 on last protoconch whorl); interspaces with about 20 microscopic spiral striae. Teleoconch with up to probably 13 convex whorls (largest specimen with apex broken); cream-coloured, with

a narrow subsutural light brown band; suture straight impressed, with a low suprasutural spiral cord more conspicuous from the sixth whorl on and a somewhat irregular subsutural band where growth lines are more contrasting. Sculpture consisting of tiny, low, rounded axial ribs (about 25 on the body whorl), some of them forming discrete varices; interspaces about twice the ribs width, crossed by numerous very tiny spiral striae, irregularly spaced, that surpass the axial ribs; spiral sculpture absent on initial six whorls. Periphery of the last teleoconch whorl with spiral base ridge. Base is somewhat flat and smooth except for

growth lines. Aperture subquadrate, inner lip reflected on parietal region, outer lip thin and somewhat rounded, columella arcuate.

DISTRIBUTION

USA: from Georgia to Florida; West Indies: off St Christopher Island (Clench & Turner, 1952); Brazil: Ceará and Rio de Janeiro (this study).

Opaliopsis cearense new species
(Figures 10–16)

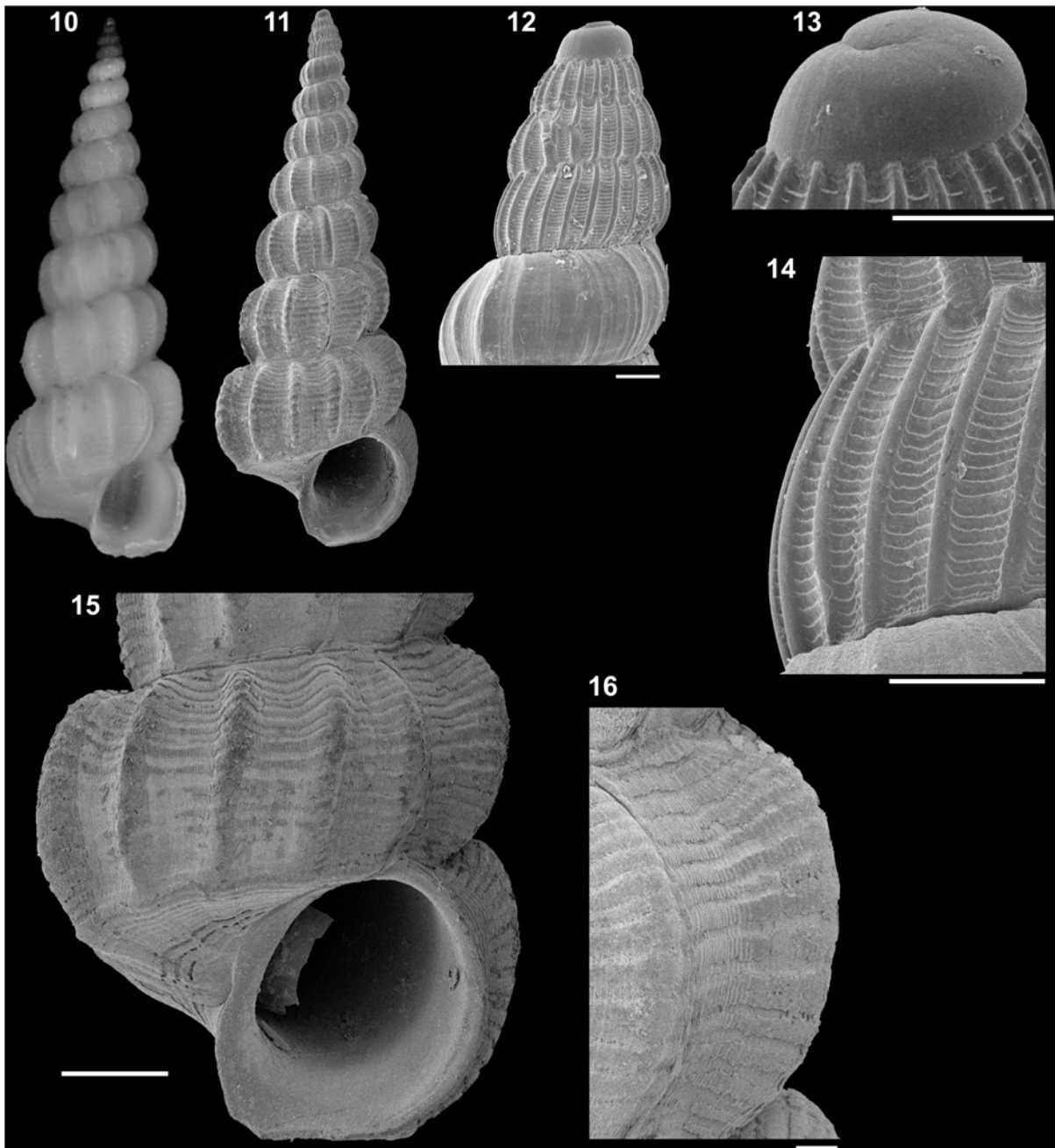
TYPE MATERIAL

Holotype: MNRJ 15500, Canopus Bank, 96 miles off Ceará State, Brazil ($02^{\circ}14'25''\text{S}$ $38^{\circ}22'50''\text{W}$, 240–260 m).

Paratypes (all from type locality): MNRJ 13347, [3]; MZSP 70329, [6]; IBUFRJ 18945, [1].

DIAGNOSIS

Shell with numerous regularly spaced spiral sculpture on teleoconch, surpassing the axial ribs, without nodule formation, and distinct axial growth striae covering entire surface of teleoconch whorls.



Figs 10–16. *Opaliopsis* new species. (10) Holotype (6.4 mm length); (11–16) paratypes (MNRJ 13347); (11) whole shell (5.7 mm); (12) protoconch; (13) first protoconch whorl; (14) detail of sculpture on last protoconch whorl; (15) last whorl; (16) detail of sculpture on last whorl. Scale bars: (12–14 & 16) 100 μm ; (15) 500 μm .

DESCRIPTION

Shell turriculate, spire angle about 27° , maximum length/width 6.4 mm/2.15 mm; imperforate. Protoconch conical, dark brown, with about five whorls, earliest two globose and smooth, the remainder subpyriform in profile, sculptured with strong orthocone axial riblets; about 22 riblets on last protoconch whorl; interspaces with about 23 microscopic spiral striae, not surpassing the axial riblets. Teleoconch somewhat translucent, colour light cream; with up to eight whorls of strongly convex profile; suture impressed, slightly sinuous, with a very thin spiral cord above. Sculpture consisting of strong non-lamellar axial ribs; holotype with 18, 16, 14, 13, 12, 11, 11 and 13 ribs on whorls 1–8 respectively; two to three varices per whorl, slightly developed and fairly distinct from axial sculpture; interspaces approximately twice the ribs width, crossed by 12–15 spiral cords of regular width and spacing surpassing the axial ribs, not forming nodules; entire teleoconch surface with very thin axial lines. Periphery of last teleoconch whorl with a spiral basal ridge. Base sharply angled, somewhat flattened, sculptured with about 10 undulating spiral cords and microscopic axial lines; teleoconch axial ribs do not continue over the base, except for evanescent varices. Aperture is circular, slightly projected below, columella slightly oblique, outer lip thin.

Dimensions: holotype with eight teleoconch whorls; total length: 6.4 mm; length up to 7th teleoconch whorl, 4.0 mm; length up to 6th teleoconch whorl, 3.2 mm; total width: 1.9 mm; width of 7th teleoconch whorl: 1.3 mm; width of 6th teleoconch whorl: 1.4 mm. Protoconch: 580 μm height, 360 μm width.

ETYMOLOGY

'*Cearense*' is the designation for people who were born in Ceará State.

TYPE LOCALITY

Found in Canopus Bank, 96 miles off Ceará State, Brazil ($02^\circ 14' 25''\text{S}$ $38^\circ 22' 50''\text{W}$, 240–260 m).

DISTRIBUTION

This species is known from type locality only (Figure 17).

DISCUSSION

Opaliopsis cearense (Figures 10–16) exhibits the distinguishing shell characters of *Opaliopsis*. The protoconch (Figures 12–14) is typical for the family Nystiellidae, as described by Clench & Turner (1952) and Bouchet & Warén (1986). The teleoconch whorls have strong axial ribs (Figures 10–11 & 15), in a similar pattern to *O. opalina* (Figures 4–5 & 8), *O. rabalaisi* (Garcia, 2005), and *O. cania*, this last one the most similar western Atlantic species, as also in the turriculate shell shape. In *O. opalina* (Figures 4–9) the spiral sculpture is very tiny (Figure 9), whereas in *O. cania* and to a lesser extent in *O. rabalaisi* the spirals are much stronger, forming small nodules when crossing the axials. In *O. cearense*, the spiral riblets cross the axial ribs but do not form nodules (Figure 16). Additionally, the spiral riblets are more numerous (about 16 per whorl) (Figures 15–16) than in *O. cania* (about six per whorl) and *O. rabalaisi* (about eight).

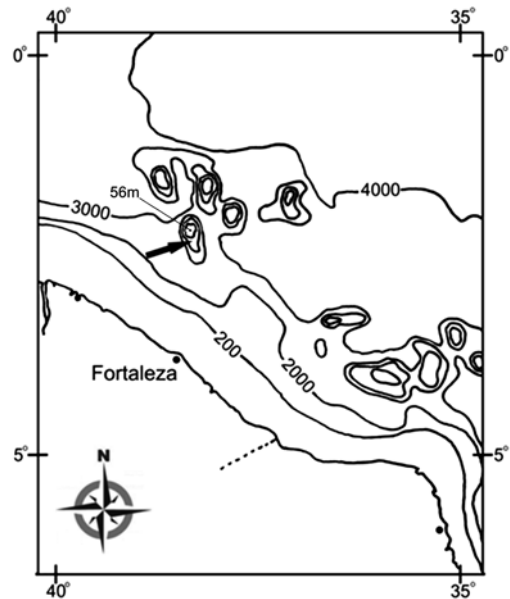


Fig 17. Map of South America, with detail of Canopus Bank (56 m depth), off Fortaleza City, type locality of *Opaliopsis cearense* (black arrow indicates site of collecting, in the isobath of ~250 m depth). Approximate sites of occurrence of the other species also shown (see Materials list for details): (1) off Pernambuco State; (2) off Santos, São Paulo State; (3) off Itajaí, Santa Catarina State.

There is some variation among species of *Opaliopsis* regarding the expression of the basal ridge and sculpture. *Opaliopsis opalina* (Figure 8), *O. cania*, *O. rabalaisi*, and *O. cearense* (Figure 15), as well as the type species *O. elata*, have a well-marked perypheric spiral ridge. *Opaliopsis atlantis* (Figure 2) and *O. meiringnaudeae*, in contrast, lack such a ridge. The type species *O. elata* has a smooth base (Weil *et al.*, 1999). In *O. opalina*, the base is almost smooth (Figure 8); in *O. cania*, *O. rabalaisi* and *O. cearense* (Figure 15) the base has better-defined spiral lines, while in *O. atlantis* (Figure 2) and *O. meiringnaudeae*, the base has the same sculpture pattern as the last whorl, with the axial ribs and spiral cords continuing over it as a strong sculpture.

Clench & Turner (1952) recognized thread-like axial ridges covering the surface of the shell of *O. cania*, particularly in the

intercostal spaces. The same sculpture is found in *O. atlantis* (Figure 3) and *O. cearense* (Figure 16).

Previous records of *Opaliopsis* from Brazil should be considered dubious. The first record of the genus was reported by Miyaji (2004) in a list of mollusc species collected in southern localities off Brazil. The author listed *Opaliopsis* cf. *atlantis* and *Opaliopsis* sp. The taxonomic list has no illustration or comment about the specimens that gave rise to the record, and the specimens could not be found in Brazilian collections. Benkendorfer & Soares-Gomes (2009) listed *Opaliopsis* aff. *nitida* (Verrill & Smith, 1885) from south-east Brazil; this taxon is currently allocated to a different genus, *Eccliseogyra*, according to Bouchet & Warén (1986). Rios (2009) listed *Opaliopsis atlantis* from Pernambuco and Rio de Janeiro. However, the figure presented was not of a specimen from Brazil, but a reproduction of the photograph in Bouchet & Warén (1986).

The results presented herein confirm the occurrence of *Opaliopsis atlantis* in Brazil. This is the only amphiatlantic species reported for this genus. Amphiatlantism seems to be rare in the Nystiellidae, with only an additional known record in *Eccliseogyra nitida* (Bouchet & Warén, 1985).

The depth-ranges of the three species studied herein, indicate the lowest depth (240 m) record of *Opaliopsis*, a deep-water taxon, whose bathymetry varies from 460 m (Shikama, 1962) to 804 m (Clench & Turner, 1952). Bouchet & Warén (1986) stated that although this is a small genus with few species, there are several undescribed species of *Opaliopsis* from Indo-Pacific deep waters. The records of the three species from the south-western Atlantic presented herein are additional evidence that the richness and range of occurrence of this genus may be greater than presently known, and that additional deep-water surveys may help to better understand its biogeography.

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