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ARTICLE

Two new species of deep water south Brazilian turriforms (Neogastropoda, Conoidea, Turridae and Cochlespiridae)

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Abstract. Two deep water new species of turriforms are described from south Brazilian coast. One of them is the turrid *Polystira tupan* **sp. nov.**, one of the largest species of the genus (~80 mm), with proper sculpture, shallow anal notch, collected off Santa Catarina, 350 m. The other is a cochlespirid that has been confused with *Cochlespira elegans,* a north Atlantic species; as it has different sculpture, shape, peripheric spines, etc., a new species, *Cochlespira notomaris* **sp. nov.**, is introduced, occurring so far from off Santa Catarina to Rio Grande do Sul, 200-1,000 m. For comparative purposes, the holotype of *C. elegans* is also illustrated.

Keywords. Taxonomy; New species; Faunistic survey, Morphology.

INTRODUCTION

The Brazilian deep waters have been targeted for economic exploration because of the pre-salt level of petroleum extraction (Moreira *et al.,* 2007; Abelha & Petersohn, 2018). High potentially polluting activities have been developed in that fragile environment without a complete comprehension of the local fauna. A more detailed survey of the continental shelf and slope is fundamental, understanding the richness and possible endemicity areas. The malacofauna has been a source of several new recent discoveries (*e.g.,* Simone & Cunha, 2012, 2014; Simone, 2014, 2017; Cavallari *et al.,* 2014 2019) showing a high diversity and a certain endemicity degree, which undoubtedly can be threatened in case of any petroleum accident.

The present paper presents the description of two new deep-water turriform species found in the south Brazilian coast by the Cenemar (https://www.cenemar.org.br). One of them is a total novelty, a giant form belonging to the Turridae genus *Polystira* Woodring, 1928 (type species *Pleurotoma albida* Perry, 1811, OD). The *Polystira* clade has been considered hyper-diverse, endemic to the Americas, and was recently revised (Todd & Rawlings, 2014). The other belongs to the Cochlespiridae genus *Cochlespira* Conrad, 1865 (type species *Pleurotoma cristata* Conrad, 1848, M), which so far had been erroneously identified as *C. elegans* (Dall, 1881), a species with type locality in Florida reefs (Blake sta. 2: 805 fms, four miles from Havana – Dall, 1881). *C. elegans* had a supposed wide range, from Florida to South Brazil. However, there was a wide gap from Colombia to Rio de Janeiro, in which the species was never collected. This wide geographic distance, associated with conchological differences, indicate that the south populations belong to another, new species, which is introduced herein. A similar taxonomic history happened with another Floridian congener – *C. radiata* (Dall, 1889) – in which the supposedly southernmost populations were described as a different species – *C. elongata* Simone, 1999 – from the SE-S Brazilian coast.

MATERIAL AND METHODS

Material examined are the types listed in each species' description. For comparison purposes, images of the syntype of *Cochlespira elegans* are also presented (Figs. 3A-C), from the sample USNM 87397 (Cuba, Havana, Bed of Gulf Stream, Yucatan Strait, Morro Light, 23°14'N, 82°25'W, 1,472 m). All images were obtained by digital cameras; as the holotype of *Polystira tupan* has parts of peristome and canal broken, they were digitally reconstructed (Fig. 4) based on easily detected growth lines. The notation of the spiral cords in the *Polystira* sculpture (A to G) follows Todd & Rawlings (2014).

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Abbreviations: Cenemar = Centro de Estudos Marinhos do Atlântico Sul; **MZSP** = Museu de Zoologia da Universidade de São Paulo; **o.t.** = otter trawl; **USNM** = National Museum of Natural History, Smithsonian Institution. Washington DC.

RESULTS

Systematics

Genus *Polystira* Woodring, 1928

Polystira tupan sp. nov.
(Figs. 1A-E)
http://zoobank.org/F2E42EF6-DB9F-447C-AF1F-3D0789B29EDC

Types: Holotype MZSP 156575.

Type locality: BRAZIL. **Santa Catarina;** off Itajaí, 26°53′S, 46°32′W, 350 m (otter trawl, iv.2005).

Etymology: The specific epithet is in apposition, and refers to the native Tupi-Guarani godhead Tupã, the Thunder-God, creator of the earth, heaven and seas. This is an allusion to the large size of the shell.

Diagnosis: Shell over 80 mm; spire angle ~30°. Sculpture 4 narrow subsutural spiral lines in superior ⅓, and 4 strong spiral cords in penultimate whorl in inferior ⅔, being superior cord larger, equally spaced; interspaces of spiral cords and lines filled by uniform distributed axial lines, with additional spiral line interposed in spiral cords in inferior ⅔. Canal relatively short, anal notch very shallow.

Description: Shell (Fig. 1) over 80 mm; 3.5 times longer than wide; spire angle ~30°. Walls thick. Growth uniformly increasing. Spire ~49% of total length; suture shallow, well-marked. Protoconch unknown (eroded). Sculpture as delicate, relatively uniform reticulate, with predominance of spiral sculpture; successive scars of anal notch located between middle and superior thirds, forming larger spiral cord (spiral cord B); superior third weakly convex, possessing 4 spiral cords (spiral cords A) relatively uniform and equidistant from each other, interspaces fulfilled by axial secondary narrow cords, uniformly and slightly prosocline distributed. Penultimate whorl with middle and inferior thirds with 4 similar-size strong spiral cords (Figs. 1B, E), interspaces ~1.5 times wider than each cord, fulfilled by ~60 uniform axial narrow cords (spiral cords C to F). Body whorl slightly larger than expected by uniform spire growth; sculpture similar to penultimate whorl, ~11 subcarinate spiral cords uniformly fulfilled by axial narrow cords (Figs. 1C, D). Aperture elliptical, ~1.5 times longer than wide; superior region with terminal narrow notch; inferior region simply opened to canal, lacking folds. Outer lip (Fig. 1D) with shallow anal notch located preceding superior quarter; smoothly bearing small expansion as end of each spiral cords. Inner lip weakly concave, callus narrow, relatively thin. About 10 spiral internal cords detectable, ending ~⅛ whorl posterior to outer lip (Fig. 1A); each cord narrow, low, smooth interspaces ~3-times wider than cords. Canal simple, straight, with ~60% of spire length, prolonging shell length ~20% forwards.

Habitat: Depth ~350 m.

Measurements (in mm): 76.1 by 25.8.

Material examined: Type.

Genus *Cochlespira* Conrad, 1865

Cochlespira notomaris sp. nov.
(Figs. 2A-J)
http://zoobank.org/F9D908E5-2455-44EB-92D2-8F8456DB2E29

Types: Holotype MZSP 154215 (Figs. 2A-D). **Paratypes:** MZSP 36676, 1 shell from type locality (Fig. 2F). BRAZIL. **Santa Catarina;** off Itajai, 350 m, CENEMAR, 1 shell (o.t., iii.2005), ~27°06′S, 46°52′W, 200-300 m, MZSP 56941, 1 shell (CM Cunha col, x/2004).

Type locality: BRAZIL. **Rio Grande do Sul;** off Chui, ~34°30′S, 51°43′W, 800-1,000 m [o.t., boat Kinpo Maw 58 col, 01.iv.2003].

Etymology: The specific epithet is a junction of Greek name *notos,* meaning south, with Latin word *mare,* meaning sea. An allusion to the South Atlantic occurrence of the species.

Diagnosis: Shell ~40 mm. Spire angle of ~40-45°. Sculpture of relatively uniform, spiral aligned pins. Carinate whorls region with inferior side concave. First spire whorls with wide carina turned superiorly. Carina periphery with aligned series of crowded small spines strongly turned superiorly, relatively uneven in size. Spiral central cord in superior area of carina large; larger spiral cord in middle of last whorl weakly developed.

Description: Shell (Fig. 2) about 40 mm; ~3 times longer than wide; spire angle ~40-45°. Walls thick. Growth uniformly increasing. Spire ~48% of total length; suture deep marked. Protoconch unknown (eroded). Whorls strongly carinate, forming profile angulation of 35-40°. Carina periphery with single series of aligned small spines, strongly turned upwards since first whorls, ~60 in penultimate whorl; each spine closely located with its neighbor spines; spines size slightly irregular, sometimes even fused with each other (Figs. 2E, H). Sculpture of outer half of area superior to carina and entire area inferior to carina as delicate, relatively uniform pins organized in spiral lines, with also certain axial alignment; 3-4 spiral lines flanking carina in its superior area (Figs. 2A, I), ~15 spiral lines in inferior area, being gradually narrower towards inferior (Figs. 2B, F, H). Middle larger middle spiral cord both in su-

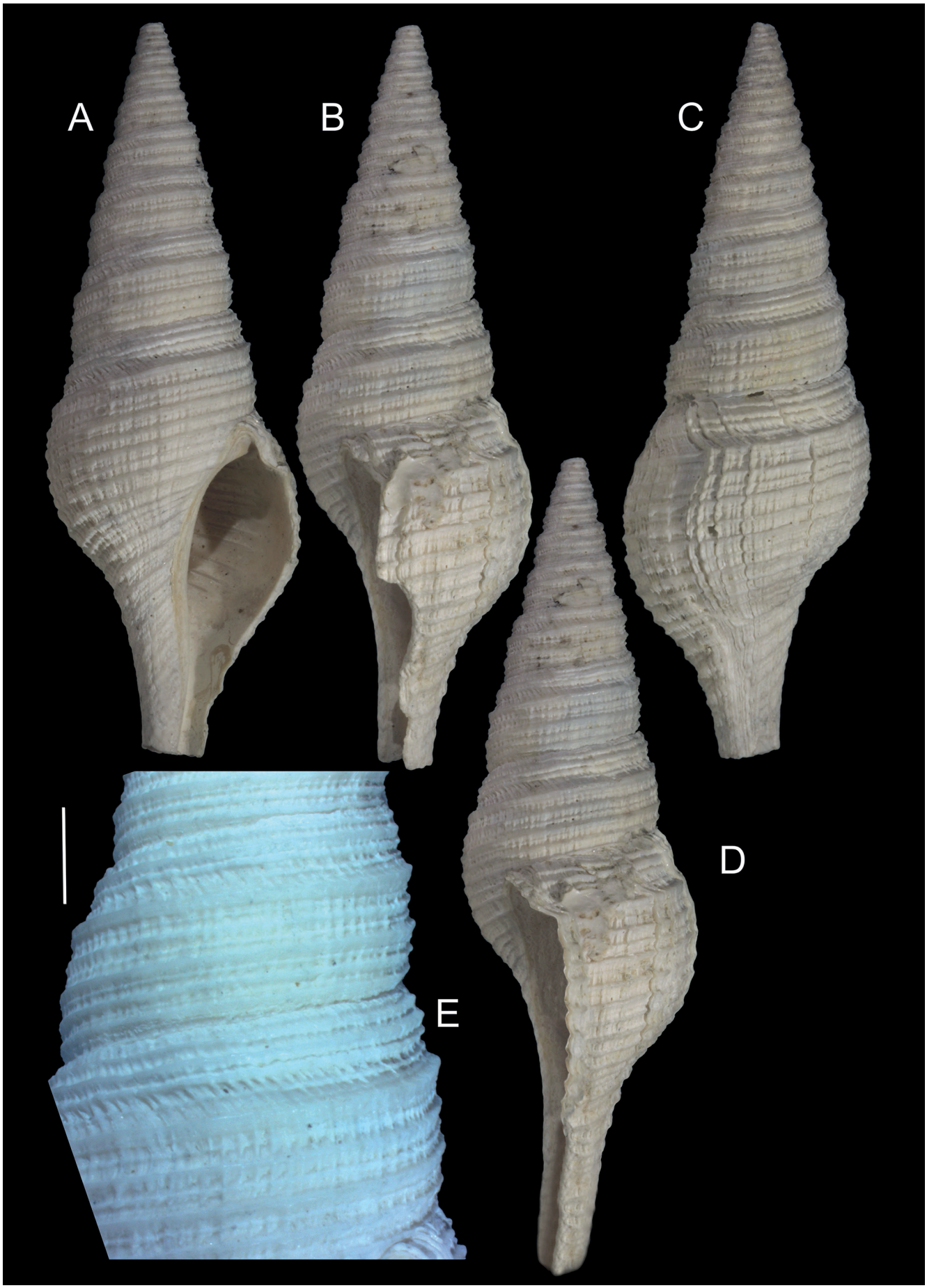

Figure 1. *Polystira tupan* Holotype MZSP 156575 (L 76.1 mm): (A) apertural view; (B) right view; (C) dorsal view; (D) digital reconstitution of peristome based on growth lines, right view; (E) detail of sculpture of antepenultimate and penultimate whorls, scale = 5 mm.

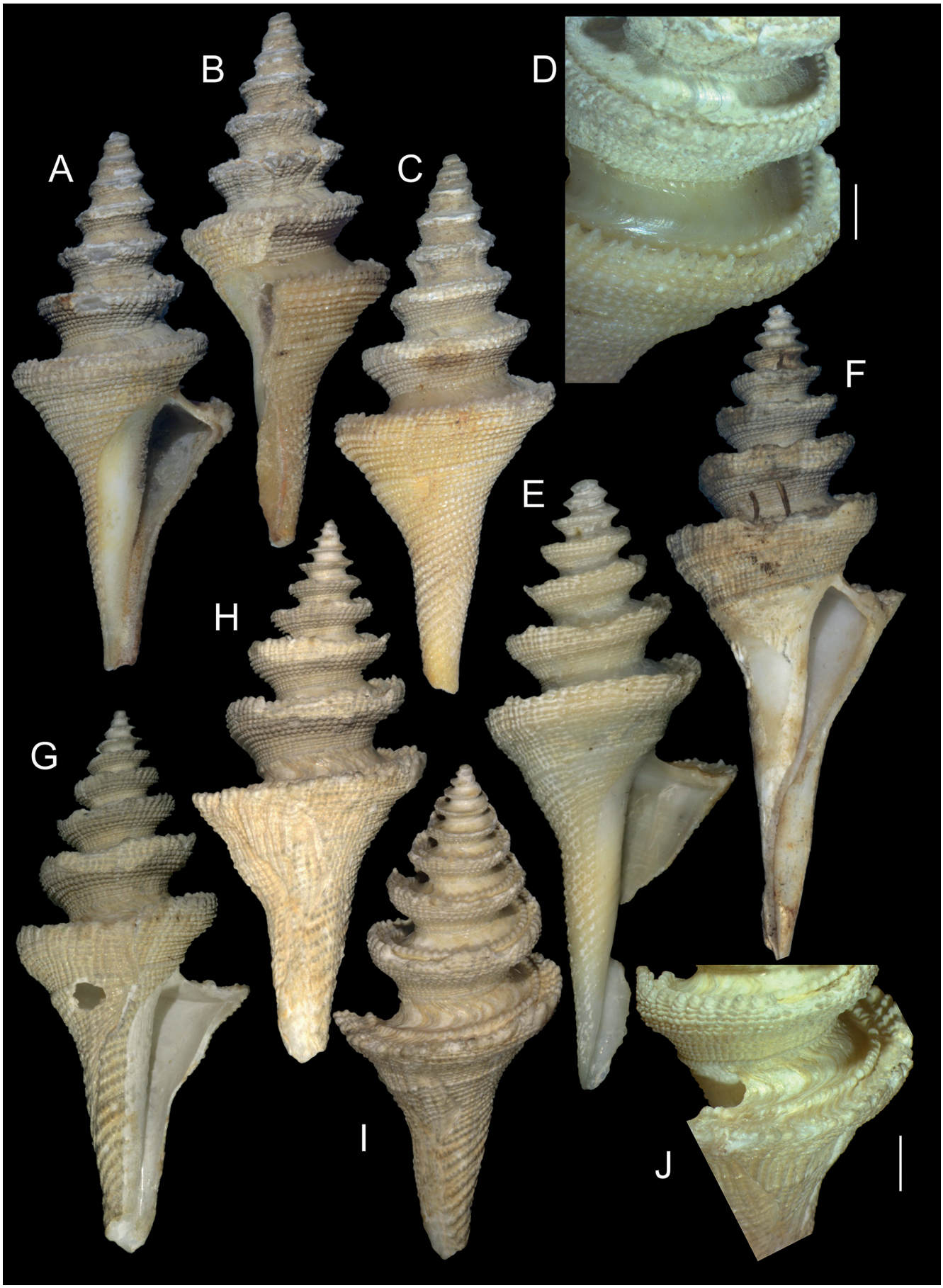

Figure 2. *Cochlespira notomaris* Types; (A-D) Holotype 154215 (L 37.9 mm); (A) apertural view; (B) right view; (C) dorsal view; (D) detail of two last whorls, lateral-slightly apical view, scale = 2 mm; (E) paratype CENEMAR (L 41.8 mm); (F) paratype MZSP 36676, apertural view (L 46.9 mm); (G-J) paratype MZSP 56941 (L 37.5 mm); (G) apertural view; (H) dorsal view; (I) same, slightly apical view; (J) detail of two last whorls, right-slightly apical view, scale = 2 mm.

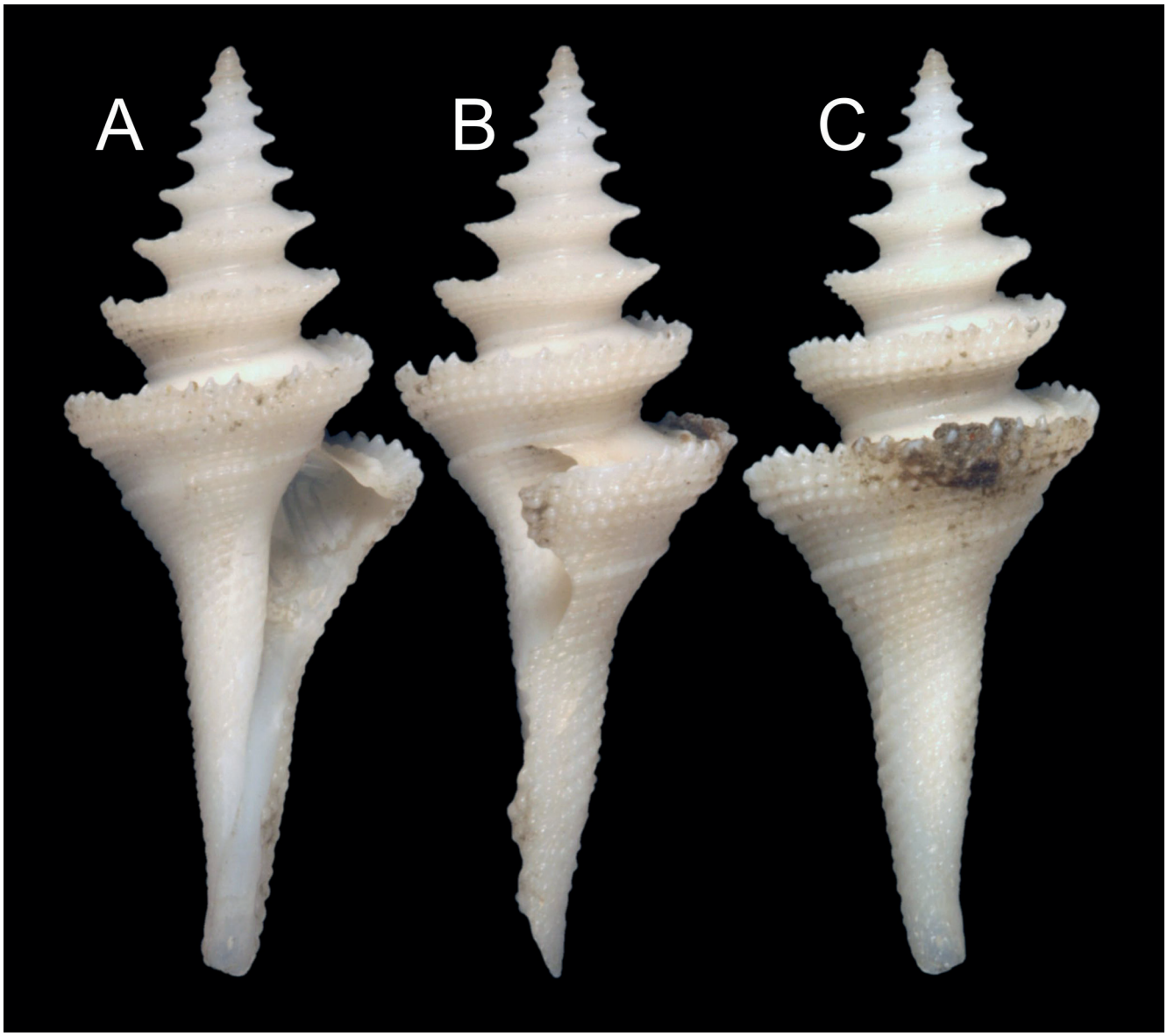

Figure 3. *Cochlespira elegans* syntype USNM 87397 (L 23 mm); (A) frontal view; (B) left view; (C) dorsal view.

perior and inferior areas form carina; superior spiral cord large, constituted of successive wounded scales with ~⅓ carina spines' size (Figs. 2D, I, J), located slightly close to periphery than to suture; inferior cord only seen in body whorl as weakly larger middle spiral cord (Figs. 2C, E, F, I). Area superior to carina between middle larger cord and suture almost smooth, possessing successive anterior-directed concavities as growth lines of previous anal notches (Figs. 2D, I, J). Body whorl sculpture similar to penultimate whorl, ~25 spiral cords formed of aligned pins, gradually diminishing up to interior region of body whorl; those on canal subtly larger, obliquely and divergently positioned (Figs. 2C, H, I). Aperture triangular, angled by carina, slightly longer than wide; superior region with wide, rounded anal notch (Fig. 2J); inferior region simply opened to canal, lacking folds; weak outer concavity preceding canal (Figs. 2A, E-G). Inner apertural surface smooth (Figs. 2A, E-G). Canal simple, straight, with ~60% of spire length, prolonging shell length ~30% forwards.

Habitat: Depth 200-1,000 m.

Measurements (in mm): Holotype MZSP 154215: 37.9 by 15.6. **Paratypes:** MZSP 36676: 46.9 by 16.8; MZSP 56941: 37.5 by 16.2; CENEMAR: 41.8 by 17.3.

DISCUSSION

The single species of *Polystira* that occurs in SE-S Brazilian coast is *Polystira formosissima* (E.A. Smith, 1915), from which *P. tupan* **sp. nov.** differs in being much larger (*P. formosissima* rarely reaches 30 mm), presenting wider spire angulation (~30°, against ~20° of *P. formosissima*), more numerous spiral and axial sculpture, and shallower anal notch. Other large-sized congener species occur far northern, such as *P. coltrorum* Petuch, 1993 (NE Brazil) *P. albida* (Perry, 1811) (Florida to Panama), and *P. florencae* Bartsch, 1934 (Florida to the Caribbean); *P. tupan* differs from them in being still larger (those species usually are

up to ~50 mm long); by the reticulated sculpture (those species have high predominance of the spiral cords, the axial lines are lacking or highly obsolete); in having spiral cord B much less evident (those three species have a high predominance of the cord B); wider spire angulation (~30°, against ~20° of those species); and shallower anal notch. Relative to the depth, *P. tupan* occurs much deeper (~350 m), while *P. formosissima* occurs at depths of ~10 m, and the other 2 species, ~50 m. However, it is recognized that only the shell was found in that depth, and that the animal might have lived in shallower waters. Nonetheless, the absence of erosion in the sculpture indicates low transportation, and the species may live not so far from the place it was collected.

The closer species of *Cochlespira notomaris* **sp. nov.** is *C. elegans* (Fig. 3), with which the Brazilian population has wrongly been identified so far. Both species share a similar shape, as the size of ~40 mm, small spines turned upwards in the carina, and the relatively uniform sculpture make of pins. However, *C. notomaris* differs from *C. elegans* in having a rather coarser sculpture (that of *C. elegans* is slightly more delicate, with spiral cords slightly more separated from each other), its whorls have the carina strongly turned upwards since its first whorls (Figs. 2F-H) [while *C. elegans* have a carina turned outwards in 5-6 first spire whorls (Figs. 3A, B)]; its peripheral spines are slightly more irregular, even fused in some regions (Figs. 2E, H) (while those of *C. elegans* are more uniform and separated from each other); its larger spiral cord in the superior level of carina is larger and stronger (Figs. 2D, I, J); while that of inferior region of body whorl is less developed; the spire angle of *C. notomaris,* of 40-45°, is slightly wider than that of *C. elegans,* which is ~35°. Another interesting difference is the inferior aperture region, which is narrower in *C. notomaris,* with a clearer separation from the canal (Figs. 2A, F, G), while in *C. elegans* the limit between aperture and canal is not so clear (Fig. 3A). The geographic occurrence of *C. notomaris,* between Santa Catarina to Rio Grande do Sul, on the south Brazilian coast, is very far from the usual *C. elegans* occurrence, in the region of Florida. This large geographic gap is another possible indication of isolation.

The only other *Cochlespira* occurring in that area is *C. elongata* Simone, 1999, from which *C. notomaris* differs in being larger, wider, with sculpture made of pins (while *C. elongata* has simple spiral cords), and by peripheral spines smaller, strongly turned upwards (while in *C. elongata* the peripheral spines are larger, more separated from each other, and turned outwards). No other Atlantic congener can be confused with *C. notomaris.*

As stated in the Introduction, the Brazilian deep-water malacofauna has had a profusion of new discoveries in recent years (*e.g.,* Absalão *et al.,* 2001, 2003, 2005; Benaim & Absalão, 2011; Simone & Cunha, 2012, 2014; Simone, 2014, 2017; Cavallari *et al.,* 2014a, b), a habitat that has been exploited by some activities, such as oil extraction in the pre-salt level, in depths up to 2,000 m (Moreira *et al.,* 2007; Abelha & Petersohn, 2018). This is worrying, as there is no certainty about the local fauna community and the distribution of each species. Supposed same species occurring from North Atlantic up to South Brazil have been divided after a closer look (*e.g.,* Simone, 1999; present study). Possibly, the deep-water malacofauna and the species' endemicity have been underestimated, and new, more intensive surveys, including the analysis of the collected material by professional taxonomists, are measures still needed.

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