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Notocrater christofferseni n. sp. (Vetigastropoda: Pseudococculinidae): first record of the genus in the South Atlantic Ocean

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Abstract

This paper reports the genus *Notocrater* Finlay, 1926 from the South Atlantic Ocean based on the description of a new species, *Notocrater christofferseni* **n. sp.** from deep waters off northeastern Brazil. *Notocrater christofferseni* **n. sp.** is compared with *N. houbricki* McLean & Harasewych, 1995 and *N. youngi* McLean & Harasewych, 1995. The new species differs from these congeners mainly by the anterior region, which comprises about 95% of shell length and has double pustule rows (about 50) arranged concentrically from the anterior margin to the center of the shell. The present study extends knowledge of the latitudinal and bathymetric distribution of *Notocrater* from the Bahamas (26°N; 518 m) to the Southeastern Atlantic (northeastern Brazil: 10°S; 720 m).

Key words: Gastropoda, cocculiniform limpets, Lepetelloidea, deep waters, Western Atlantic, South America, Brazil

Introduction

The genus *Notocrater* Finlay, 1926 represents pseudococculinid gastropods found on the continental shelf down to bathyal depths, ranging from about 37 to 738 m, living predominantly in deep-water habitats and currently reported for the Indo-West Pacific (Japan, Australia and New Zealand) and Western Atlantic Oceans (Marshall 1986; McLean & Harasewych 1995; Lesicki 1998).

At least two Miocene fossils (one from Jamaica, the other from New Zealand) and eight recent species of *Notocrater* have been recognized basically by the following characteristics: small, arched shell; apex posterior to the center; protoconch devoid of ornamentation or with a variable sculpture below apex; teleoconch sculptured with radial threads and concentric riblets at first, becoming interrupted into aligned pustules to form regularly curved rows; convex to straight anterior slope; concave, flat or convex posterior slope; and an elliptical aperture (Marshall 1986; McLean & Harasewych 1995; Ardila & Harasewych 2005). Haszprunar (1988: 176) diagnosed the eyes, cephalic tentacles, part of the male reproductive system and radula of *Notocrater*.

Cocculiniform gastropods commonly live on biogenic substrates, which are used as a source of food (Haszprunar 1998; Lesicki 1998; McLean & Harasewych 1995). Marshall (1986) analyzed specimens of *Notocrater craticulatus* (Suter, 1908), *N. gracilis* Marshall, 1986 and *N. ponderi* Marshall, 1986 particularly associated with wood in New Zealand waters (55 to 750 m).

Members of *Notocrater* have been reported from the Atlantic Ocean only along the Caribbean coast of Colombia and the Bahamas based on two species: *N. houbricki* McLean & Harasewych, 1995 and *N. youngi* McLean & Harasewych, 1995 (McLean & Harasewych 1995; Lesicki 1998; Ardila & Harasewych 2005).

This paper reports the genus *Notocrater* from the South Atlantic (Brazil) based on the description of a new species.

Materials and methods

The well-preserved specimen reported herein was discovered while sorting micromollusks from sediment samples dredged from the continental slope off northeastern Brazil (10°06'35"S, 35°46'41"W, 720 m, 16.xii.2001) by the

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(Marshall 1986; McLean & Harasewych 1995; Ardila & Harasewych 2005). However, it is remarkable that the *Notocrater* fauna from the Atlantic and Indo-Pacific differs in terms of anatomy (Marshall 1986; McLean & Harasewych 1995).

The holotype of *Notocrater houbricki* (from the Bahamas: 412 m) has a larger size (SL: 2.6 mm; SW: 1.5 mm; SH: 0.8 mm), a narrowly elliptical (elongate-oval) outline in dorsal view, an anterior end which is slightly narrower than the posterior end, a narrowly convex anterior slope, a moderately inclined, rather straight posterior slope, narrowly flattened lateral slopes, more narrowly spaced and less projected pustules on the teleoconch, a more anteriorly located apex at 3/4 (1.95 mm) shell length from the anterior margin (AP/SL = 0.75) and a summit position at about 1.40 mm (SP/SL about 0.54) (McLean & Harasewych 1995: 20, fig. 58). In contrast, the specimen identified by Ardila & Harasewych (2005: 359, fig. 11A) from the Caribbean coast of Colombia (270 m) has a smaller size (SL: 1.8 mm; SW: 1.3 mm; SH: 0.8 mm), a widely elliptical outline. The posterior termination is slightly narrower than the anterior end. It has a widely convex anterior slope, a very steep, weakly concave posterior slope, widely flattened lateral slopes, more widely spaced and projected pustules on the teleoconch, a more posteriorly located apex at about 83% (about 1.50 mm) of shell length from the anterior margin (AP/SL = 0.83) and a summit position at about 1.03 mm (SP/SL about 0.57). Although both specimens have approximately the same number of pustule rows arranged concentrically from the anterior margin to the center of the shell (McLean & Harasewych 1995; Ardila & Harasewych 2005), the conchological variations presented herein should be further investigated based on anatomy and molecular analysis to ascertain if the specimens are actually conspecific.

Some pseudococculinid genera are widely distributed in the oceans (Marshall 1986; McLean & Harasewych 1995; Leal & Harasewych 1999), while pseudococculinid species can be considered *a priori* restricted geographically and bathymetrically to certain ecoregions (McLean 1988, 1991; Leal & Harasewych 1999; Leal & Simone 2000) until more collections (mainly from the deep waters) and studies are conducted. The mode of lecithotrophic development inferred from the protoconch morphology (Marshall 1986; Lesicki 1998) and the association with biogenic substrates commonly reported in the literature (Marshall 1986; McLean 1988, 1991; Haszprunar 1988; McLean & Harasewych 1995; Lesicki 1998; Leal & Harasewych 1999; Leal & Simone 2000; Ardila & Harasewych 2005) suggest a slow or limited dispersal capacity among pseudococculinids, especially on deep sea plains.

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References

Ardila, N.E. & Harasewych, M.G. (2005) Cocculinid and pseudococculinid limpets (Gastropoda: Cocculiniformia) from off the Caribbean coast of Colombia. *Proceedings of the Biological Society of Washington*, 118, 344–366. http://dx.doi.org/10.2988/0006-324x(2005)118[344:caplgc]2.0.co;2

Bouchet, P. & Gofas, S. (2014) Lepetelloidea Dall, 1882. World Register of Marine Species. Available from: http://www.marinespecies.org/aphia.php?p=taxdetails&id=382160 (accessed 15 May 2014)

Bouchet, P. & Rocroi, J.P. (2005) Classification and Nomenclator of Gastropod Families. *Malacologia*, 47, 1–397.

Dall, W.H. (1882) On certain limpets and chitons from the deep waters off the eastern coast of the United States. *Proceedings of the United States National Museum*, 4, 400–414.
http://dx.doi.org/10.5479/si.00963801.4-246.400
Finlay, H.J. (1926) A further commentary on New Zealand molluscan systematics. *Transactions and Proceedings of the New Zealand Institute*, 57, 32–485.
Haszprunar, G. (1988) Anatomy and affinities of pseudococculinid limpets (Mollusca: Archaeogastropoda). *Zoologica Scripta*, 17, 161–180.
http://dx.doi.org/10.1111/j.1463-6409.1988.tb00093.x
Haszprunar, G. (1998) Superorder Cocculiniformia. *In*: Beesley, P.L., Ross, G.J.B. & Wells, A. (Eds.), *Mollusca: The Southern Synthesis. Fauna of Australia*. *Vol. 5*. CSIRO Publishing, Melbourne, pp. 653–664.
Hickman, C.S. (1983) Radular patterns, systematics, diversity, and ecology of deep-sea limpets. *The Veliger*, 26, 73–92.
Leal, J.H. & Harasewych, M.G. (1999) Deepest Atlantic Molluscs: Hadal Limpets (Mollusca, Gastropoda, Cocculiniformia) from the Northern Boundary of the Caribbean Plate. *Invertebrate Biology*, 118, 116–136.
http://dx.doi.org/10.2307/3227054
Leal, J.H. & Simone, L.R.L. (2000) *Copulabyssia riosi*, a new deep-sea limpet (Gastropoda: Pseudococculinidae) from the continental slope off Brazil with comments on the systematics of the genus. *The Nautilus*, 114, 59–68.
Lesicki, A. (1998) Checklist of gastropod species referred to the order Cocculiniformia Haszprunar, 1987 (Gastropoda: Cocculinoidea et Lepetelloidea) with some remarks on their food preferences. *Folia Malacologia*, 6, 47–62.
Marshall, B.A. (1986) Recent and Tertiary Cocculinidae and Pseudococculinidae (Mollusca: Gastropoda) from New Zealand and New South Wales. *New Zealand Journal of Zoology*, 12, 505–546.
http://dx.doi.org/10.1080/03014223.1985.10428301
McLean, J.H. (1988) Three new limpets of the family Pseudococculinidae from abyssal depths (Mollusca, Archaeogastropoda). *Zoologica Scripta*, 17, 155–160.
http://dx.doi.org/10.1111/j.1463-6409.1988.tb00092.x
McLean, J.H. (1991) Four New Pseudococculinid Limpets Collected by the Deep-Submersible *Alvin* in the Eastern Pacific. *The Veliger*, 34, 38–47.
McLean, J.H. & Harasewych, M.G. (1995) Review of western Atlantic species of cocculinid and pseudococculinid limpets, with descriptions of new species (Gastropoda: Cocculiniformia). *Contributions to Science*, 453, 1–33.
Moskalev, L.I. (1978) [after 18 December] Lepetellidae (Gastropoda, Prosobranchia) i skhodnye s nimi formy. [Lepetellidae (Gastropoda, Prosobranchia) and related forms]. *Trudy Instituta Okeanologii*, 113, 132–146.
Rosenberg, G. (2009) Malacolog 4.1.1: A Database of Western Atlantic Marine Mollusca. Available from: http://www.malacolog.org/ (accessed 15 May 2014)
Salvini-Plawen, L. Von (1980) A reconsideration of systematics in the Mollusca (phylogeny and higher classification). *Malacologia*, 19, 249–278.
Suter, H. (1908) Additions to the marine molluscan fauna of New Zealand, with descriptions of new species. *Proceedings of the Malacological Society of London*, 8, 22–42.