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A new subgenus of *Holothuria* with a description of a new species from the south-east Atlantic Ocean

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(With 1 figure in the text)

A new species of an aspidochirotid holothurian, *Holothuria vema* sp. nov., from the Vema Seamount in the south-east Atlantic Ocean, is described. The new species is referable to Rowe's (1969) *Lessonothuria* group, but since it, together with the north-east Atlantic *H. (L.) arguinensis* Koehler & Vaney and the Mediterranean *H. (L.) poli delle Chiaje*, differs significantly from the other species currently included in this subgenus, a new subgenus, *Roweothuria*, is erected to accommodate the three species. The relationship of the new subgenus is discussed with reference to the provisional evolutionary tree proposed by Rowe (1969), where it is shown that *Roweothuria* probably occupies an intermediate position either between *Acanthotrapeza* and *Lessonothuria* or between the latter subgenus and *Vaneyothuria*. A table is presented summarizing the principal differences between the three species included in the new subgenus.

Contents

Table with 2 columns: Contents and Page. Rows include Introduction (47), Materials and methods (48), Subgenus Roweothuria subgen. nov. (48), Diagnosis (48), Type species (48), Other species included (48), Etymology (49), Remarks (49), Holothuria (Roweothuria) vema subgen. et sp. nov. (50), Diagnosis (50), Etymology (50), Material examined (50), Description (50), Spicules (51), Distribution (51), Habitat (51), Remarks (51), and References (54).

Introduction

Several specimens of a fairly large, subcylindrical, aspidochirotid holothurian, taken from the Vema Seamount in the south-east Atlantic Ocean, are new to science and here described as *Holothuria vema* sp. nov. The new species strongly resembles the northern *H. (Lessonothuria) arguinensis* Koehler & Vaney but differs in its coloration, absence of wart-like prominences, and in the form and distribution of its spicules. The new species is hence referable to Rowe's (1969)

Lessonothuria group but since it, together with *H. arguinensis* K & V from West Africa and *H. poli* delle Chiaje from the Mediterranean Sea, differs from *H. (L.) pardalis* Selenka, the type species of this subgenus, and from the other species currently included in it, it is concluded that the three species are not consubgeneric with the others. A new subgenus, *Roweothuria*, is hence erected to accommodate them, with *H. arguinensis* designated as the type species. The relationship of the new subgenus is discussed below with reference to the provisional evolutionary tree of the subgenera of *Holothuria* proposed by Rowe (1969). A table is provided to summarize the most significant differences between the three species included in the new subgenus.

Materials and methods

Material used in this investigation includes only 5 specimens in the collection of the South African Museum (SAM), taken from the Vema Seamount, 724 km off the west coast of South Africa. Of these, 3 specimens (A22717), including the holotype, are well relaxed but without most of their viscera. The fourth specimen (A22718) is contained in a jar together with the viscera of presumably the 3 aforementioned specimens. The fifth specimen (A22713), collected a year earlier, is intact but distorted and in a poor state of preservation. The largest specimen of the A22717 series is chosen as the holotype. The type material is deposited in the SAM. Specimens of *H. arguinensis* and *H. poli* required for comparative work were obtained on loan from the British Museum (Natural History).

The specimens were studied according to conventional methods outlined by other writers, notably Deichmann (1948) and Rowe & Doty (1977). The spicules were removed in antiformin (see Mahoney, 1966), washed in 2 changes of distilled water, and illustrated with the camera lucida.

Subgenus *Roweothuria* subgen. nov.

Diagnosis

Cylindrical to subcylindrical species up to 220 mm long. Tentacles (19)-20. Podia either in the form of papillae only or papillae dorsally and pedicels ventrally, the former scattered or in rows, often accompanied by conical warts bearing other minute papillae; pedicels, if present, crowded but not forming a definite 'sole'. Calcareous ring stout, radial plates with a median ampullary notch and twice as high as interradial plates, the latter with an anterior, tooth-like median projection. Spicules consisting of tables and buttons. Tables clumsy, the spire low to moderate, terminating in a ring or cluster of teeth, often giving the appearance of a maltese cross when viewed from above; disc well developed and spinose, rarely some discs smooth, rim flat, not turned up to give 'cup and saucer' appearance to table in lateral view. Buttons rosette-like, smooth to rugose or spinose, with 1-6 pairs of holes, sometimes incomplete or twisted or with rudimentary knobs.

Type species

Holothuria arguinensis Koehler and Vaney, 1905.

Other species included

Holothuria poli delle Chiaje, 1823; *Holothuria vema* sp. nov.

Etymology

This subgenus is named after Dr Frank W. E. Rowe of the Australian Museum in recognition of his excellent contributions to our understanding of the family Holothuriidae. The gender is feminine.

Remarks

Although Deichmann (1958) considered her genus *Lessonothuria* to be monotypic, including only *H. pardalis* Selenka, Rowe (1969) included in it five other species, namely *H. insignis* Ludwig, *H. verrucosa* Selenka, *H. glandifera* Cherbonnier, *H. poli* delle Chiaje and *H. arguinensis* Koehler and Vaney, and lowered its rank to that of subgenus. The designation of *H. pardalis* as the type species of *Lessonothuria* restricts the subgenus to include only those species with smooth pseudobuttons and with table discs with spinose rims that are turned up to give to the tables a 'cup and saucer' appearance in lateral view. Therefore, while *H. insignis*, *H. verrucosa* and *H. glandifera* clearly belong with *H. pardalis* in *Lessonothuria*, *H. arguinensis* and *H. poli* with spinose, flat-rimmed discs and with smooth to rugose or spinose, rosette-like buttons do not. Rowe (pers. comm.) states that he might have erred in including the latter two species in *Lessonothuria*. These species are now removed from *Lessonothuria* and included in the new subgenus here diagnosed. *Holothuria vema* sp. nov., described below, with spicules similar to those of *H. arguinensis*, is included as a third species in the new subgenus.

Holothuria arguinensis from West Africa is chosen as the type species of *Roweothuria* since it occupies more or less an intermediate position between the northern *H. poli* and the southern *H. vema*, not only geographically but also because it shares with *H. poli* the conical warts and with *H. vema* the rugose nature of the buttons.

In the provisional evolutionary tree of the subgenera of *Holothuria* proposed by Rowe (1969: 125, fig. 1), the new subgenus falls between *Halodeima* and *Vaneyothuria*, possibly occupying an intermediate position either between *Acanthotrapeza* and *Lessonothuria* on the one hand or between *Lessonothuria* and *Vaneyothuria* on the other. The former case necessitates a change from spiny rosettes to rugose or spiny rosette-like buttons with the concomitant flattening of the table rims. Although the former change is possible, the latter would imply that raised rims developed twice in evolution, first in *Acanthotrapeza* and then again in *Lessonothuria*. No model as yet exists for this. The second case, i.e. placing *Roweothuria* between *Lessonothuria* and *Vaneyothuria*, would necessitate the development of rugose buttons from smooth deposits, a new development of the maltese cross and a flattening of the table rims. If Rowe (1969) has placed *Vaneyothuria* in its correct evolutionary position, it provides a model for rim flattening and a new development of the maltese cross, while the subgenera *Holothuria*, *Selenkothuria* and *Semperothuria* provide good models for the independent development of rugose deposits at different times in evolution. Perhaps *Lessonothuria* with its smooth, often twisted, pseudobuttons and tables without maltese crosses does not fall in the direct line leading to *Vaneyothuria*, although its tables are obvious derivatives of the *Acanthotrapeza* type. If either one of the two views expressed above is accepted, then *H. poli*, with its smooth pseudobuttons or rosette-like buttons, provides a good intermediate in the line leading from *Roweothuria* to *Lessonothuria* or vice versa.

Holothuria (Roweothuria) vema subgen. et sp. nov. (Fig. 1 a-h)

Holothuria ? n. sp. Berrisford, 1969: 391-393.

Diagnosis

Cylindrical to subcylindrical species, up to 165 mm long. Colour, in alcohol, brownish, lighter ventrally. Mouth ventral, surrounded by a non-papillose collar; special anal papillae absent. Tentacles (19)-20. Podia strongly retractile, papilliform, scattered, more numerous ventrally, but never crowded; warts absent. Skin leathery, 9 mm thick. Tables clumsy, more numerous than buttons dorsally, fewer ventrally; disc spinose, spire low to moderate, ending in a cluster of teeth, often appearing as a maltese cross when viewed from above. Buttons rosette-like, dorsal buttons with smooth to slightly spinose margins; ventral buttons more numerous, smooth to rugose, often knobbed and with 1-6 pairs of holes, the latter often occluded:

table disc diam.: 50-90 μm ; spire height: 40-85 μm ; button length: 30-85 μm .

Etymology

The species is named after its type locality.

Material examined

Holotype, SAM A22717, Vema Seamount (31°38'S, 8°20'E), 724 km off west coast of South Africa, G. R. Grindley, ? XI 1966, scuba diving or air-lift dredge, 42-61 m.

Paratypes, SAM A22717, 2 spec., A22718, 1 spec., same data as holotype; A22713, Vema Seamount, Ship 'Justin', ? IX 1965, 1 spec.

Description

Holotype well preserved but eviscerated, length 165 mm, breadth 30 mm in midbody. Form subcylindrical with dorsal surface well arched and ventral only a little flattened; no clear distinction between both surfaces. Colour, in alcohol, dull brown dorsally, lighter ventrally, (one paratype light greyish brown dorsally, yellowish white ventrally).

Anterior and posterior ends of holotype, respectively, 22 mm and 18 mm in diameter, both terminating bluntly. Mouth ventral; collar non-papillose, whitish, 2.75 mm wide dorsally, 2 mm ventrally. Tentacles 19 in holotype, 20 in one paratype, in others withdrawn; crowns distinctly peltate, slightly darker than ventral surface. Anus terminal, no special anal papillae but non-retracted terminal podia of each ambulacrum appear as paired anal papillae. Podia minute, papilliform, scattered, with no apparent crowding or differentiation, strongly retractile, with reduced sucking discs; warts and creeping 'sole' absent. Body wall thick (9 mm), tough, leathery and rough to the touch.

Gut, gonad, left respiratory tree and rete mirabile not intact but apparently typical of genus. Calcareous ring (Fig. 1g) fairly high, ventrally attached; radial plates roughly rhomboid, almost as wide as high, with convex sides, a deep anterior notch and a slight posterior indentation;

interradial plates almost as wide as radial plates but only half as high, with a straight posterior margin and an anterior, tooth-like, median projection. Tentacular ampullae thin, long, tapering to a pigmented tip, occasionally bifid distally.

Haemal and water vascular rings low, situated far behind calcareous ring, at about a third the body length from anterior end. Polian vesicles two, one saccular to elongate, extending to half the body length, the other minute attached at base of longer vesicle, both arising from water ring slightly to left of dorsal mesentery. Stone canals seven (four on left and three on right of dorsal mesentery), short, thin, slightly convoluted; madreporic bodies (Fig. 1h) remarkably small. Oesophagus long (34 mm), stomach elongate. Respiratory trees with common stem, right tree reaching level of calcareous ring, both trees profusely branched with short lateral extensions. Cloaca wide, elongate. Gonadal tubules branched, proximal ends narrow. Longitudinal muscles thick, typical.

Spicules

Spicules of dorsal and ventral body wall dissimilar, dorsally numerous tables and few smooth to slightly rugose buttons; ventrally fewer tables but buttons more densely packed and rugose. Dorsal tables (Fig. 1a) with mostly spinose, sometimes smooth, flat discs, perforated by four large and usually four or more (up to 12) slightly smaller, marginal holes; spire of moderate height, of four pillars, a single cross bar and terminating in a ring of well developed but often unequal teeth, frequently appearing as a maltese cross when viewed from above; disc often reduced to four central holes but spire still intact with teeth frequently extending beyond margin of disc. Dorsal buttons (Fig. 1b) rosette-like with smooth, wavy or distinctly spinose margins and 2-4 pairs of unequal holes and often an unpaired hole at each end; buttons occasionally incomplete or slightly twisted, rarely with reduced holes. Ventral tables (Fig. 1d) well formed or reduced, or crowns distorted. Ventral buttons (Fig. 1c) more rugose, often with a pair of rudimentary median knobs and with usually 2-4 pairs of holes, or holes reduced to two. Ventral podia supported by end plates and other elongate, smooth, multilocular plates with one or two series of holes and elongate, terminally perforated rods (Fig. 1e). Tentacles with numerous, nearly straight or slightly curved rods up to 500 μ m long, often with spinulated extremities (Fig. 1f).

Distribution

Known only from type locality.

Habitat

Rock.

Remarks

The new species from the south-east Atlantic appears to be closely related to the type species from the north-east. It differs in the lack of any differentiation of podia, absence of wart-like prominences, fewer polian vesicles and in the distribution of its spicules. In *H. (R.) arguinensis*,

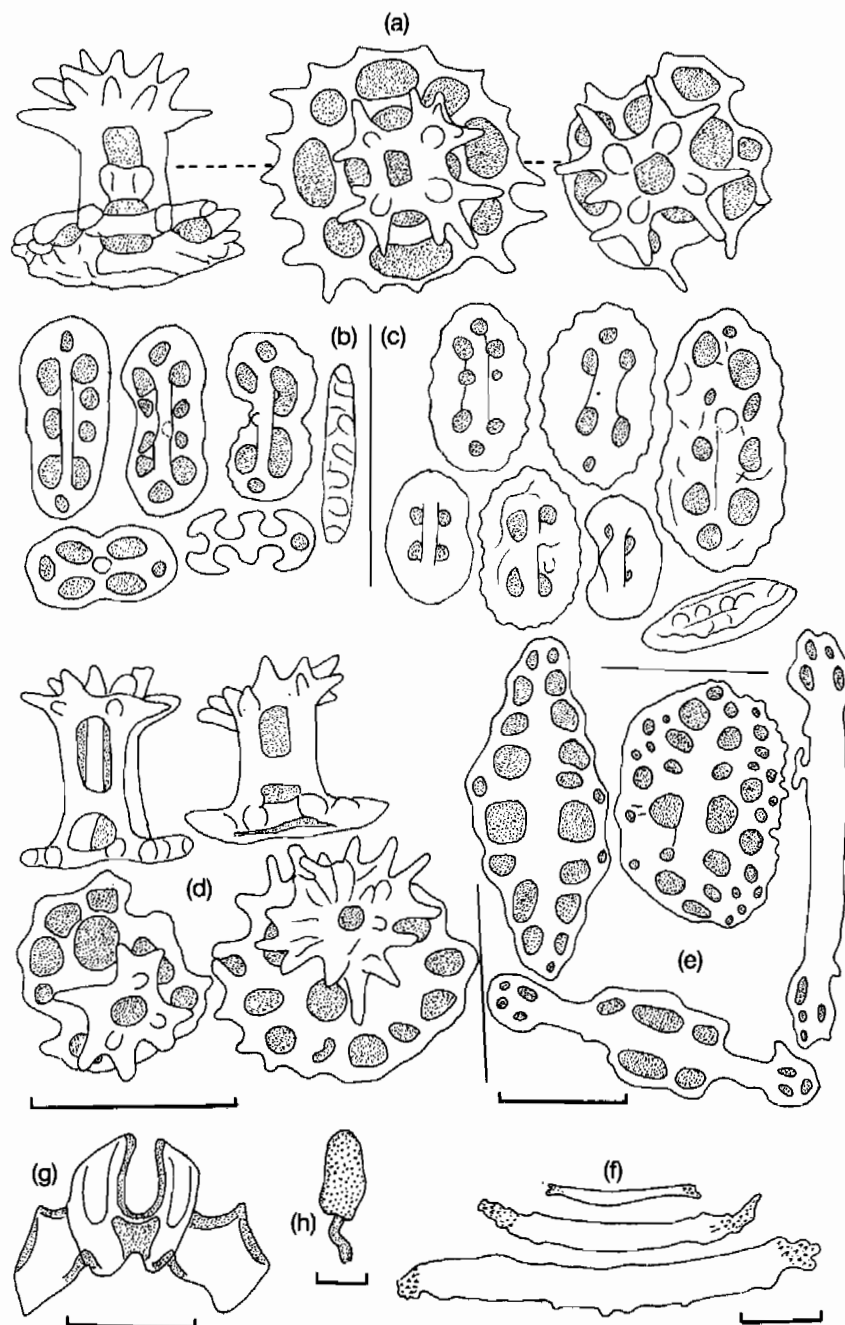


FIG. 1. *Holothuria (Roweothuria) vema* subgen. & sp. nov. (a) Tables from dorsal body wall; (b) buttons from dorsal body wall; (c) buttons from ventral body wall; (d) tables from ventral body wall; (e) plates and rods from podia; (f) tentacle rods; (g) radical and two interradial plates of calcareous ring; (h) madreporic body. (a)-(e) Scale bar = 50 μ m; (f) scale bar = 100 μ m; (g) scale bar = 5 mm; (h) scale bar = 1 mm.

TABLE I
Comparison of principal characters of the three species of *Roweothuria*

Character	<i>H. arguinensis</i> Koehler & Vaney	<i>H. poli</i> delle Chiaje	<i>H. vemae</i> sp. nov.
size	up to 185 mm	up to 220 mm	up to 165 mm
collar	present	inconspicuous	present
colour	uniformly brown, chestnut or grey	violet to black	greyish brown in alcohol, lighter ventrally
warts	present	present	absent
polian vesicles	numerous	single	two
stone canal buttons	single dorsal ones very rugose with 2-4 pairs of large holes; ventral ones smooth with 2-3 pairs of small holes; 50-100 μ m	single smooth or slightly knobbed with 2-6 pairs of holes; 60 μ m	up to several dorsal ones smooth to slightly rugose, ventral ones very rugose, with 1-4 pairs of holes; 30-85 μ m
tables	few, mostly in- complete without marginal holes and teeth; 60-65 μ m	few (around podia), with numerous teeth; 60 μ m	numerous dorsally, fewer ventrally, dorsal tables with 4-12 marginal holes, and often a maltese-like cross; 50-90 μ m
podia deposits	narrow elongate plates with smooth to rugose margins and 2-3 series of holes; smooth to rugose rods with or without terminal perforations also present; warts with rosettes, tables and rods	elongate plates with crenulate margins and 2-3 series of holes, rods with ter- minal holes, tables with re- duced discs	elongate plates with smooth, sometimes spinose margins and 1-2 series of small holes, terminally perforated rods and tables
tentacle deposits	rods with spiny extremities and no holes	small to massive rods often with rugose ends or just perforated and smooth	straight or slightly curved rods often with perforated and/or rugose extremities

besides the usual dorsal papillae, there are other minute papillae, each borne on conical black or white wart-like prominences arranged in about six rows. In addition, it has numerous polian vesicles (Koehler & Vaney, 1906; Hérouard, 1929; Panning, 1934) and the dorsal buttons are more rugose and without any apparent knobs. Although the Mediterranean *H. poli* is said to resemble *H. arguinensis* in the presence of wart-like prominences (Panning, 1934; Cherbonnier, 1951), their presence could not be confirmed with any degree of certainty in the three specimens received from the British Museum. However, it differs from *H. arguinensis* and *H. vemae* in having buttons that are neither spinose nor rugose, but faintly knobbed.

Table I summarizes the principal characters of the three species included in the new subgenus.

Dr Pawson, who studied the holothurian material collected at Vema Seamount, realized that it represented a new species (see Berrisford, 1969) but did not describe it. Despite this, the writer was at first inclined to consider the material as representing a southern form of *H. arguinensis* (probably a subspecies) but Dr Rowe, to whom slides of the spicules were sent, concurred with Dr Pawson. A new subgenus is here erected on his advice.

I thank Dr Frank Rowe of the Australian Museum in Sydney for his expert guidance in supervising this research and the late Dr Tom Barry of the South African Museum in Cape Town for the opportunity to study this interesting species. Gratitude is also due to Dr Gordan Paterson of the British Museum (Natural History) for the loan of specimens of *Holothuria arguinensis* from the Canary Islands and *H. poli* from the Egyptian Mediterranean.

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