

***Synallactes laguardai*, a new species of sea cucumber from South Africa (Echinodermata: Holothuroidea: Synallactidae)**

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*Abstract.*—*Synallactes laguardai* is described from the southwestern Indian Ocean, South Africa, off Durban, at 409.5 m. This new species may be readily distinguished from all previously known species of *Synallactes* Ludwig, 1893 by the body wall ossicles whose perforations form a complex circular lattice-like network.

The family Synallactidae Ludwig, 1894 comprises mostly deep-sea forms and is the least-studied large taxon among deep-sea cucumbers. The synallactids are one of the most characteristic animals of the deep ocean. They appear repeatedly in photographic collections of abyssal megafauna (Pawson 1976, Bluhm & Gebruk 1999). Many of these photographs show their characteristic tracks and fecal remains (Young et al. 1985, Bluhm & Gebruk 1999), providing evidence of their important role in modifying the sediment landscape and in structuring the communities that live within it (Roberts et al. 2001).

The majority of synallactids appears to spend their life on the sediment surface. Some species are capable of active swimming (e.g., *Bathyplores natans* M. Sars, *Hansenothuria bentii* Miller & Pawson and *Paelopatides confundens* [Théel]) (Miller & Pawson, 1990). The epibenthic species traverse the seabed, feeding on the uppermost layer of sediment (e.g., *Mesothuria verrilli* [Théel]).

The Family Synallactidae, as presently recognized, comprises approximately 131 nominal species (Solís-Marín 2003). The genus *Synallactes* Ludwig, 1893 embraces approximately 21 species. As far as is known, four of these species occur in the Atlantic Ocean: *S. crucifera* Perrier, 1898,

*S. longipapillata* Sibuet, 1978, *S. mollis* Cherbonnier, 1952 and *S. viridilimus* Cherbonnier, 1952. The remainder inhabit the Pacific Ocean (11 species), the Indian Ocean (5 species) and the Antarctic Ocean (1 species) (Solís-Marín & Laguarda-Figuera 2004). The purpose of this paper is to describe a new species of *Synallactes* from the southwestern Indian Ocean.

The abbreviations used in this paper are: Zoologisk Museum, University of Copenhagen (ZMUC); United States National Museum (USNM); Laboratorio de Sistemática y Ecología de Equinodermos, Instituto de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México (ICML-UNAM).

Order Aspidochirota Grube, 1840  
Family Synallactidae Ludwig, 1894  
Genus *Synallactes* Ludwig, 1893

*Synallactes* Ludwig, 1893:2; 1894:4–26,—Perrier, 1902:338–339.—Mitsukuri, 1912:11–12.—Mortensen, 1927:378.—Deichmann, 1930:106; 1940:186.—Cherbonnier, 1952:473.—Solís-Marín & Laguarda-Figuera, 2004:547.

*Paradeima* Heding, 1940:371–372 [new synonymy].

*Diagnosis.*—Body cylindrical or sub-cylindrical. Tentacles 18–20. Stone canal at-

tached to the body wall. Ventral surface flattened, without any marginal border. Ventral tubefeet and dorsal papillae in longitudinal series and confined to ambulacra. On ventral surface, three zones of tubefeet. Gonad in two tufts. Body wall ossicles comprise three or quadri-radiate tables, the distal ends of the arms with a larger or smaller number of perforations, and often lateral processes which may unite with similar processes of other arms to produce a complex lattice-like network. Spire of a single pillar, which may be terminally divided or perforated, or both. Tubefeet with supporting rods.

*Type species.*—*Synallactes alexandri* Ludwig, 1893.

*Remarks.*—The diagnosis presented in this paper embraces only the members of the genus *Synallactes* sensu stricto.

The name *Synallactes* comes from the Greek, a mediator (e.g., in arguments between two parties). Ludwig (1894) argues that, because of its characteristics, *Synallactes* lies between Holothuriidae and the Elpidiidae (Elasipodida). The genus previously contained about 27 described and attributed species, of which approximately 21 are currently recognized (Solís-Marín 2003).

*Synallactes laguardai*, new species

Figs. 1–2

*Synallactes* sp. 1 Solís-Marín, 2003:257–259, figs. 216–222; Solís-Marín and Laguarda-Figueras 2004:548.

*Material examined.*—Nine complete specimens from one locality in the southwest Indian Ocean, off South Africa. Holotype: female, total length 142 mm (measured along the outside of curved body), Dr. Th. Mortensen's Expedition 1929–1930, Pickle Stn. 25, South Africa, off Durban, 29°56'S, 31°19'30"E, 409.5 m, collected by Th. Mortensen, 26 August 1929, ZMUC HOL-160. Paratypes: 4 specimens, same data as holotype, ZMUC HOL-161, HOL-162, HOL-163, HOL-164; 2 specimens,

same data as holotype, USNM 1010532; 2 specimens, same data as holotype, ICML-UNAM 5.132.0.

*Diagnosis.*—Body subcylindrical, slightly flattened ventrally. Body wall smooth. Mouth ventral, anus subdorsal. Tentacles 20. Ventral tubefeet short, cylindrical, each terminal adhesive disc possessing a large perforated end plate. Two longitudinal series of feet along the latero-ventral radii, and 2 longitudinal series in the mid-ventral radius. Dorsal surface with short, conical papillae arranged in 6 longitudinal parallel rows at regular intervals. In the anterior end, papillae are longer than elsewhere. Calcareous ring low and weakly developed. Radial plates vary in robustness and shape depending on their position in the calcareous ring. Interradial plates of similar aspect and size. Polian vesicle single. Gonad branched, disposed in two tufts.

Ossicles: Ventral and dorsal body wall with tri- or quadri-radiate tables; the base may have a larger or smaller number of perforations. Often lateral processes are present; these unite with similar processes of other arms to produce a complex lattice-like network. The spire consists of a single pillar, which may be divided or perforated, or both, at the upper end. One or two pairs of small, short and robust spines at the lateral sides of the upper end of the spire. There are supporting spiny rods and terminal disks in the tubefeet. Papillae contain ossicles like those in dorsal body wall and few elongated rods with central perforations. Tentacles with curved or straight spiny rods.

*Description.*—The nine complete specimens are mostly well preserved, but some dorsal papillae seem to have been lost in some specimens. Total length 47–76 mm; mean length 59.6 mm (holotype 67 mm long). Body subcylindrical, slightly flattened, more tapering posteriorly than anteriorly. Mouth ventral, anus subdorsal, both surrounded by small papillae (0.8–1.0 mm high). Peltate tentacles 20, each with 8–10 distal digitations. Color, in alcohol, beige to

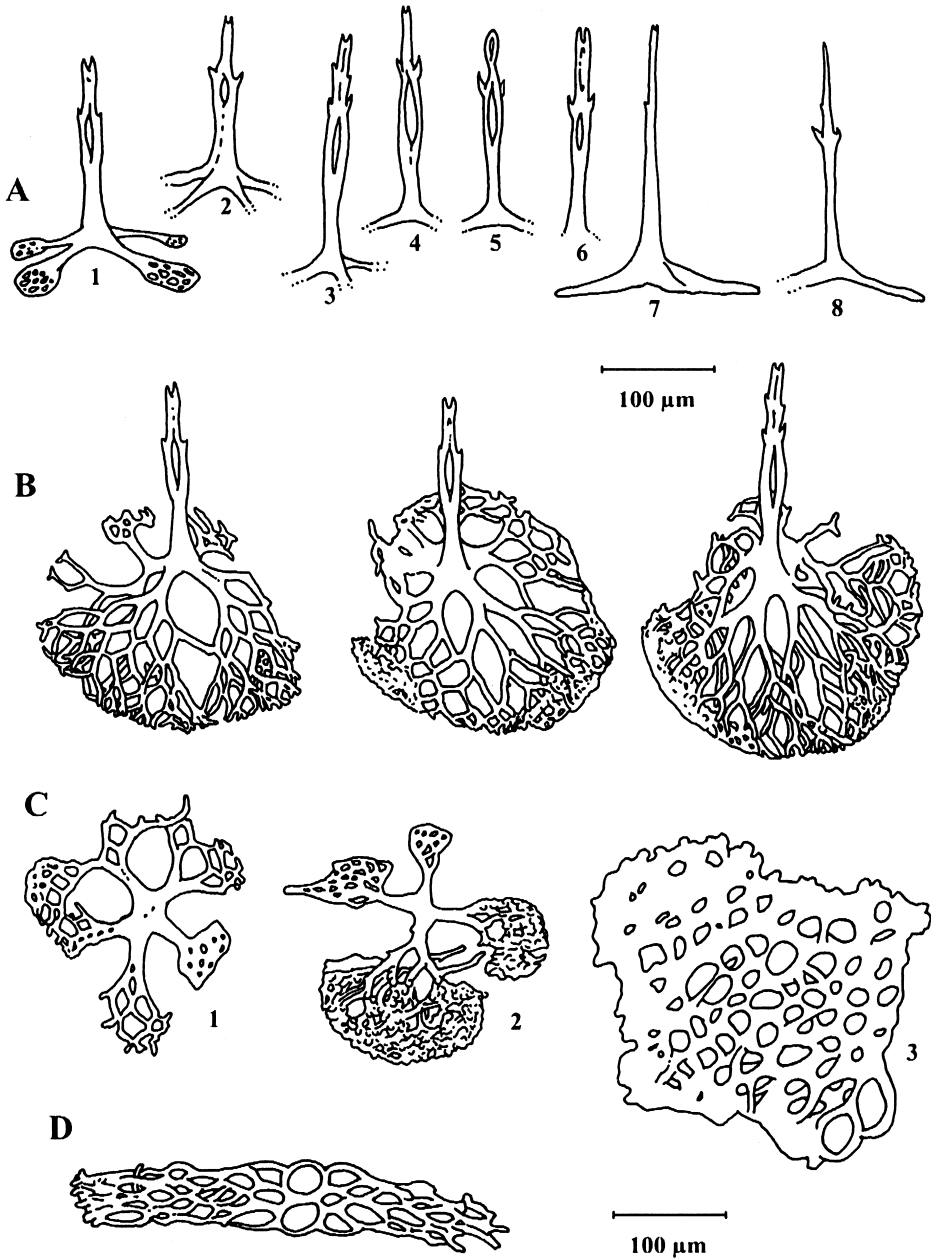


Fig. 1. *Synallactes laguardai*. Ossicles from the holotype ZMUC HOL-160. A1–8. Tables from perisome and dorsal body wall. Lateral view. B, C1–2. Tables from dorsal body wall with lattice-like network disks. C3. Irregular end-plate from tubefeet. 1D. Perforated, irregular, oblong plate from tubefeet. Scale = 100  $\mu\text{m}$ .

yellowish, ventrum slightly lighter. Subcylindrical tubefeet ventrally (0.5–1 mm high), restricted to the ventral ambulacra. Distal end of feet with supporting sucking disks (Fig. 1C3). The odd ambulacrum has

2 zigzag rows of about 46 tubefeet each, ventrolateral ambulacra each with a zigzag row of 35 tubefeet along the margin of ventral side. On the dorsal side are medium size papillae, 6 mm long and 1 mm across

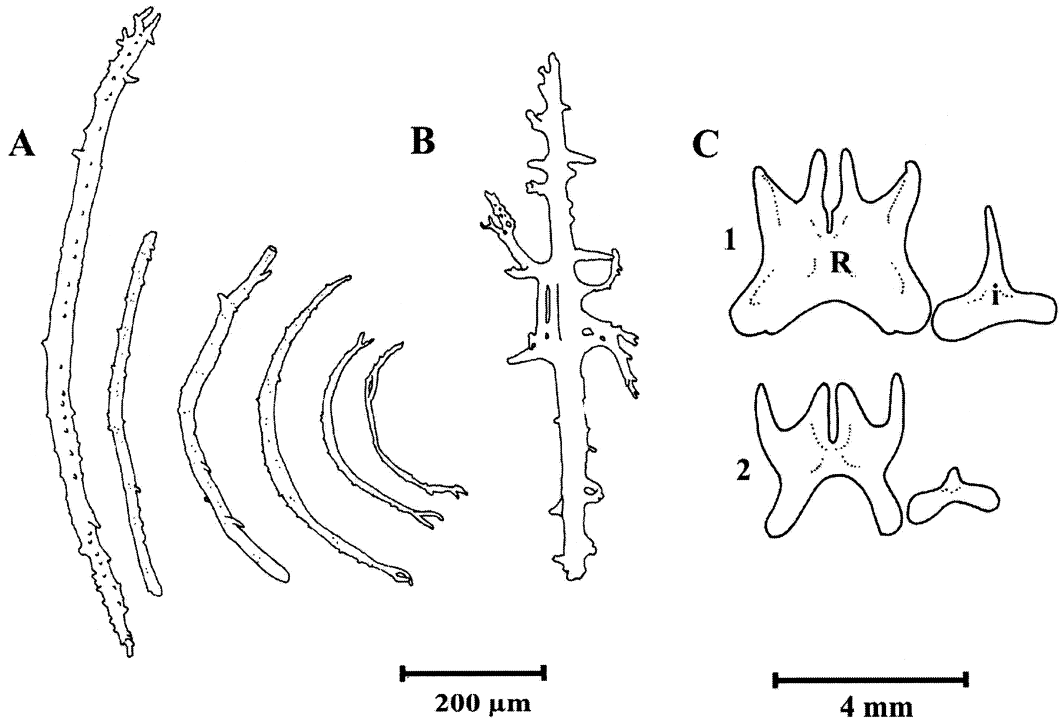


Fig. 2. *Synallactes laquardai*. Calcareous ossicles from the holotype ZMUC HOL-160. A. Spiny rods from tentacles. B. Rod from dorsal papillae. C. Plates of calcareous ring. Scale in A and B = 200  $\mu\text{m}$ , Scale in C = 4 mm.

at base, most situated on conical warts. They form six parallel rows, each consisting of about 14–17 papillae. Papillae of the outer rows are larger than those of the inner. Much smaller papillae belonging to ventrolateral ambulacra form a marginal fringe around the mouth.

Perisome with small, robust, tables bearing tri- or quadri-radiate discs with a perforated spire (Fig. 1A). Tubefeet with large (210–220  $\mu\text{m}$ ) or small (76–82  $\mu\text{m}$ ) straight or curved spiny rods. Terminal discs supported by a number of irregularly branched rods and, sometimes, by an irregular, stout plate (Fig. 1C3). Perforated, irregular oblong plates sometimes also present in the tubefeet (Fig. 1D).

Papillae ossicles like those of dorsal body wall, straight rods with lateral projections, better developed medially, where they may anastomose (Fig. 2B) are also present.

Supporting rods from main base of tentacles large (180–1000  $\mu\text{m}$ ), curved, robust and spinulated (Fig. 2A). Rods of tentacle tips small (45–50  $\mu\text{m}$ ), delicate and also spinulated.

Ossicles from ventral body wall comprising tables with quadri-radiate discs, that are distally perforated, with lobes distally branched and anastomosing forming a lattice-like network (Fig. 1B, C1–2). Spires tall (220–278  $\mu\text{m}$ ) or short (50–52  $\mu\text{m}$ ) with simple or bifid tips (Fig. 1A1–8).

Calcareous ring of five radial and five interradial plates (Fig. 2C). Radial plates wide, stout, of varying shapes, depending on their position in the calcareous ring, and with two central anterior processes and two single antero-lateral processes. Ventral radial plates slightly narrower interiorly than posteriorly 3.3 mm and 4.1 mm wide, respectively. Their posterior parts are gently curved (Fig. 2C1). Dorsal radial plates nar-

rower posteriorly than anteriorly, 2.8 mm to 3.1 mm wide, respectively (Fig. 2C2). Interradial plates wider anteriorly 2.6 mm reducing to 1.7 mm posteriorly. Dorsal interradial plates shorter and smaller than those from ventral part of calcareous ring. Posterior part gently concave.

Stone-canal connected to the dorsal body wall. Gonad branched, disposed in two tufts. Respiratory trees well developed, branched, occupying almost the entire length of the body. One short Polian vesicle, about 9 mm long in holotype.

*Etymology.*—I take great pleasure in naming this species after Dr. Alfredo Laguarda Figueras, an excellent researcher, my academic mentor, and great friend.

*Distribution.*—Known only from the type locality.

*Remarks.*—The specimens here described as *S. laguardai* were erroneously identified as *Bathyploetes heteroculus* Hedding, 1940, by Hedding (date unknown) at the ZMUC, Denmark. The presence of single-pillared tables and the arrangement of the papillae and tubefeet in *Bathyploetes heteroculus* Hedding, 1940 indicate that species is a member of the genus *Synallactes* Ludwig. A similar case is found in *Paradeima elongata* Hedding, 1940, where the presence of single-pillared tables and the arrangement of papillae and tubefeet reveal that species also belongs to the genus *Synallactes*.

Externally, *S. laguardai* is similar to *S. profundus* Koehler & Vaney, 1905, but the arrangement of midventral tubefeet distinguish them. *S. laguardai* possesses a well developed midventral row of tubefeet whereas *S. profundus* lacks tubefeet in the anterior part of the midventral radius.

*Synallactes laguardai* has single-pillared tables with a single or double-pointed terminal top. *S. aenigma* Ludwig, 1894, *S. horridus* Koehler & Vaney, 1905, *S. robertsoni* Vaney, 1908 and *S. profundus* share with *S. laguardai* the presence of a single pointed terminal top. However, no other species of *Synallactes* besides *S. laguardai*

exhibits the complex lattice-like network on the table disks.

*Synallactes alexandri* Ludwig, 1894, *S. discoidalis* Mitsukuri, 1912, *S. challengerii* (Théel, 1886), *S. horridus* Koehler & Vaney, 1905, *S. monoculus* (Sluiter, 1901), *S. multivesiculatus* Ohshima, 1915, *S. nozawai* Mitsukuri, 1912, *S. rigidus* Koehler & Vaney, 1905, *S. sagamiensis* (Augustin, 1908), *S. triradiata* Mitsukuri, 1912 and *S. viridilimus* Cherbonnier, 1952 possess tables with closed or open circular disks. Some of these species (as in *S. discoidalis*) develop a lattice-like network table disk simpler in structure than those of *S. laguardai*.

*Synallactes laguardai* is distributed in the southwestern Indian Ocean, South Africa, off Durban. As far as is known, only one other species of the genus, *S. challengerii*, shares this distribution area.

In the past, some species of the synallactid genus *Bathyploetes* have been confused with *Synallactes* (e.g., Koehler & Vaney 1905, Hedding 1940); in the present study I restore Ludwig's (1893) diagnosis of the genus to include only species with single-pillared tables; the pillars may be subdivided and/or perforated at the upper end.

#### Acknowledgments

Many thanks to Drs. Claus Nielsen and Margit Jensen (Zoological Museum, University of Copenhagen, Denmark), for providing me with the specimens examined in the present study. Dr. Vivianne Solís W. (ICML, UNAM) provided valuable comments on an early draft of this paper. Thanks to Dr. David L. Pawson (Smithsonian Institution) for reviewing the paper, and to Alicia de La Luz Durán González and Juan Torres Vega for their technical support. Financial support was provided by Dirección General de Asuntos del Personal Académico (DGAPA), Universidad Nacional Autónoma de México (UNAM), to whom I am indebted. The Copenhagen Biosystematics Centre (COCIBE) made travel

and stay at the Zoological Museum in Copenhagen in September 2002 possible.

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Associate Editor: Stephen L. Gardiner