

A new species of *Dercitus* (*Stoeba*) from the Atlantic Ocean (Porifera: Demospongiae: Astrophorida)

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Dercitus (*Stoeba*) *pseudodiscorhabda* sp. nov. is described from the tropical western Atlantic. It is the only *Dercitus* (*Stoeba*) with four-rayed calthrops and discorhabds-like sanidasters. This is the 16th species of the genus to be recognized worldwide, the sixth from the Atlantic. The new species is compared with all its congeners worldwide.

Keywords: Sponges, *Dercitus* (*Stoeba*), biodiversity, Atlantic, taxonomy, Paraíba State, Brazil

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INTRODUCTION

Stoeba Sollas, 1888 was created for *Samus simplex* Carter, 1880, an encrusting sponge that fills cavities in calcareous substrates with spiculation composed exclusively of short-shafted dichotriaenes and sanidasters. Several authors have subsequently merged *Stoeba* with *Dercitus* Gray, 1867 (e.g. von Lendenfeld, 1903; Topsent, 1904; Desqueyroux-Faúndez & van Soest, 1997). According to van Soest *et al.* (2010) *Dercitus* and *Stoeba* possess this limited set of calthrops and (dicho-)calthrops megascleres spicules, but some species allegedly have a complement of rare oxeas. *Dercitus* possesses toxa-like spicules, which are lacking in *Stoeba*. This is the single difference between these genera. In the last morphological revision of the Order Astrophorida, van Soest *et al.* (2010) allocated *Stoeba* as subgenus of *Dercitus* and listed 15 valid species: *Dercitus* (*Stoeba*) *syrrmatitus* de Laubenfels, 1930 and *Dercitus* (*Stoeba*) *reptans* Desqueyroux-Faúndez & van Soest, 1997 from Tropical Eastern Pacific; *Dercitus* (*Stoeba*) *bahamensis* van Soest *et al.*, 2010, *Dercitus* (*Stoeba*) *latex* (Morales & Muricy, 2007), *Dercitus* (*Stoeba*) *verdensis* van Soest *et al.*, 2010 and *Dercitus* (*Stoeba*) *senegalensis* van Soest *et al.*, 2010 from Tropical Atlantic; *Dercitus* (*Stoeba*) *dis-similis* (Sarà, 1959), *Dercitus* (*Stoeba*) *lesinensis* (von Lendenfeld, 1894) and *Dercitus* (*Stoeba*) *plicatus* (Schmidt, 1868) from Temperate Northern Atlantic; *Dercitus* (*Stoeba*) *extensus* (Dendy, 1905) and *Dercitus* (*Stoeba*) *simplex* (Carter, 1880) from Western Indo-Pacific; *Dercitus* (*Stoeba*) *fijiensis* van Soest *et al.*, 2010, *Dercitus* (*Stoeba*) *pauper* Sollas, 1902 and *Dercitus* (*Stoeba*) *xanthus* Sutcliffe *et al.*,

2010 from Central Indo Pacific and *Dercitus* (*Stoeba*) *occultus* Hentschel, 1909 from Temperate Australasia.

In this study, a new species of *Dercitus* (*Stoeba*) is described from north-east Brazil, increasing to six the number of known species in the Atlantic.

MATERIALS AND METHODS

Specimens were collected during a faunistic survey conducted in the area of the Carapibus beach (Conde city), situated in the Paraíba State coastline, north-eastern Brazil (Figure 1). Specimens were preserved in 80% ethanol and deposited in Coleção de Invertebrados Paulo Young of Universidade Federal da Paraíba (CIPY-UFPB). Dissociated spicule mounts and skeletal sections were made using classical procedures for Demospongiae (Hajdu *et al.*, 2011). A minimum of 30 spicules of each category were measured (minimum-average-maximum). Images of specimens, sections and SEM preparations were obtained digitally. The classification followed in this work is that proposed by van Soest *et al.* (2010). Taxonomic comparisons were made with data



Fig. 1. Location of the collection site (Carapibus beach, Conde city) of *Dercitus* (*Stoeba*) *pseudodiscorhabda* sp. nov.

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tabulated for all species of *Dercitus* (*Stoeba*) available in the *World Porifera Database* (van Soest *et al.*, 2014). The citations in species presentation are the original descriptions available, completed with the most recent publications giving a good description. Abbreviations used: Porifera Collection of the Museu Nacional, Universidade Federal do Rio de Janeiro (MNRJ); Scanning Electron Microscopy (SEM); Station Marine d'Endoume Collection (SME); Porifera Collection of the Departamento de Zoologia, Instituto de Biologia, Universidade Federal do Rio de Janeiro (UFRJPOR).

SYSTEMATICS

Phylum PORIFERA Grant, 1836
Order ASTROPHORIDA Sollas, 1888
Family PACHASTRELLIDAE Carter, 1875
Genus *Dercitus* Gray, 1867

Definition

Pachastrellidae with calthrops or dichocalthrops as megascleres and possessing irregular acanthomicrohabd-like sanidasters with a thick central axis relative to the actines; further microscleres may include smooth toxa-like forms and aster-like compressed forms; no structural oxea megascleres (van Soest *et al.*, 2010).

Subgenus *Stoeba* Dendy, 1905

Definition

Dercitus with a single microscle category in the form of irregular sanidasters (van Soest *et al.*, 2010).

Type species: *Samus simplex* Carter, 1880.

Dercitus (*Stoeba*) *pseudodiscorhabda* sp. nov.
(Figures 2 & 3; Table 1)

TYPE MATERIAL

Holotype: CIPY-UFPB 151 – Carapibus beach (7°18'59"S 34°48'54"W), Conde city, Paraíba State, Brazil, shallow water, coll. LIPY crew (Laboratório de Invertebrados Paulo Young), 8 March 2008.

COMPARATIVE MATERIAL

MNRJ 7865 (Paratype of *Stoeba latex*) – Ilha do Meio Cave, Fernando de Noronha Archipelago, Pernambuco State, Brazil, 03°52'S 32°25'W, 8 m depth, coll. E. Hajdu, 16 November 2003. MNRJ 628 (*Dercitus plicatus*) – Cabo Verde Islands, Branco, 98 m depth, coll. R.W.M. van Soest, HMS CANCAP 7 exp. (#156/045), 5 September 1986. UFRJPOR 3254 (*Dercitus plicatus*) – Collection SME, det. C. Lévi.

DIAGNOSIS

It is the only *Dercitus* (*Stoeba*) with four-rayed calthrops and discorhabd-like sanidasters.

DESCRIPTION

Irregular shape with 3.5 mm long and 1.5 mm wide. Conulose surface, oscules not visible. Consistency hard, brittle. Live colour white and whitish beige in ethanol (Figure 2A, B).

Skeleton

There is no definable structure in either the ectosomal or choanosomal skeletons. Only small fragments of choanosomal tissue attached to shiny, ectosomal layer (see Figure 2B). Sanidasters and calthrops are scattered throughout the sponge with no particular organization, but in high concentrations.

Spicules

Calthrops are regular (Figure 3A, Table 1), in a wide range of sizes; most are regular four-claded equal-length spicules, occasional bifid cladi or with angulated curve: cladi 48–204.6–382 µm, cladome 96–335.1–478 µm.

Straight sanidasters (Figure 3B, C), with blunt endings, straight central shaft, with microspined spines well developed along the whole shaft, generally resembling discorhabds at low magnifications. Pattern of microspination varies along the length of the spicule, being light and irregular on the shaft, becoming more concentrated at the tip and on the edge: 9–15.8–21 µm.

DISTRIBUTION

At present, *Dercitus* (*Stoeba*) *pseudodiscorhabda* sp. nov. is known only from the type locality (Carapibus beach, Paraíba State, Brazil), probably on shallow water, in cavities of calcareous substrata.

ETYMOLOGY

The specific name refers to the occurrence of sanidasters similar to discorhabds.

DISCUSSION

This new species is assigned to *Dercitus* (*Stoeba*) based on the presence of a single microscle category in the form of irregular sanidasters.

There are 17 other described species (including the two unnamed species) of *Dercitus* (*Stoeba*), of which 11 differ to *D.* (*S.*) *pseudodiscorhabda* sp. nov. by the presence of dichocalthrops: *D.* (*S.*) *bahamensis*, *D.* (*S.*) *dissimilis*, *D.* (*S.*) *extensus*, *D.* (*S.*) *fijiensis*, *D.* (*S.*) *lesinensis*, *D.* (*S.*) *occultus*, *D.* (*S.*) *pauper*, *D.* (*S.*) *plicatus*, *D.* (*S.*) *reptans*, *D.* (*S.*) *simplex* and *D.* (*S.*) *verdensis*. The other six species contain only calthrops and sanidasters like the new species: *D.* (*S.*) *latex*, *D.* (*S.*) *senegalensis*, *D.* (*S.*) *syrmatitus*, *D.* (*S.*) *xanthus*, *D.* (*S.*) sp. van Soest *et al.* (2010 from Bonaire) and *D.* (*S.*) sp. van Soest *et al.* (2010 from Madagascar).

The species most similar to *D.* (*S.*) *pseudodiscorhabda* sp. nov. is *D.* (*S.*) *syrmatitus*, because both have discorhabd-like sanidasters (as discasters in de Laubenfels, 1932; as amphiaser in van Soest *et al.*, 2010). However, in *D.* (*S.*) *syrmatitus* the sanidasters can vary to acanthomicrostrongyles, which are absent in the new species. Furthermore, the spicules are smaller in *D.* (*S.*) *syrmatitus* than in the new species, with sanidasters ranging from 8–12 µm, and calthrops 25–80 µm against sanidasters 10–21 µm, and calthrops 48–382 µm in the new species. Finally, in *D.* (*S.*) *syrmatitus*, the four-rayed calthrops are often reduced to tripods vs regular four-rayed calthrops in *D.* (*S.*) *pseudodiscorhabda* sp. nov.

Table 1. Comparative micrometric data on the spicules and overview of distribution of the living species of *Dercitus* (*Stoeba*). Values are in micrometres (µm), expressed as follows: minimum – maximum or minimum–average–maximum length/width. Prot. = protocladi; Deut. = deuterocladi. References are numbered and listed after the table.

Species	Locality	Shape/Colour	Calthrops		Dichocalthrops	Sanidasters
			Cladi	Cladome		
<i>Dercitus</i> (<i>Stoeba</i>) <i>pseudodiscorhabda</i> sp. nov.	Paraíba State, Brazil	unknown / white	48– 204.6 –382 / 7– 25.5 –36	96– 335.1 –478	–	9– 15.8 –21
<i>D.</i> (<i>S.</i>) <i>bahamensis</i> van Soest et al., 2010 ¹	New Providence Island, Bahamas	encrusting / bright red	138– 166.7 –186 / 12– 22.5 –28	207– 266.4 –330	18– 29.0 –35 (prot.); 57– 68.1 –105 / 12– 14.1 –18 (deut.); 143– 197.9 –266 (cladome)	12– 13.3 –15
<i>D.</i> (<i>S.</i>) <i>dissimilis</i> (Sarà, 1959) ¹	Naples, Western Mediterranean	encrusting / white	45–175 / 5–21	not recorded	77–102 (cladome); 3.5–6 (cladi)	8–15
<i>D.</i> (<i>S.</i>) <i>extensus</i> (Dendy, 1905) ¹	Gulf of Mannaar, Sri Lanka	encrusting / pale grey (ethanol)	57– 87.0 –123 / 8– 14.9 –23	108– 158.9 –210	39– 46.9 –54 / 5– 15.5 –21 (prot.); 8– 37.9 –61 / 4– 11.1 –18 (deut.); 84– 155.2 –192 (cladome)	14– 19.6 –26
<i>D.</i> (<i>S.</i>) <i>fijiensis</i> van Soest et al., 2010 ¹	Fiji Islands	encrusting / dark grey	96– 222.7 –258 / 19– 31.2 –37	186– 347.1 –420	19– 26.5 –30 / 13– 25.2 –42(prot.); 55– 112.5 –192 / 9– 20.2 –31 (deut.); 129– 248.4 –361 (cladome)	15– 16.9 –21
<i>D.</i> (<i>S.</i>) <i>latex</i> (Moraes and Muricy, 2007) ²	São Pedro e São Paulo Archipelago, Brazil	encrusting to massive / reddish-brown	42–212 / 7.5–25	not recorded	–	10– 11.8 –15
<i>D.</i> (<i>S.</i>) <i>latex</i> (Moraes and Muricy, 2007) ³	Fernando de Noronha Archipelago, Brazil	thickly encrusting / reddish-brown	62– 162 –232 / 5– 13.9 –21	108– 269.8 –335	–	10– 13.1 –21
<i>D.</i> (<i>S.</i>) <i>lesinensis</i> (Lendenfeld, 1894) ¹	Lesina, Adriatic Sea	encrusting / orange (ethanol)	92– 130.9 –165 / 14– 21.3 –31	180–210	16–18 / 3–8 (prot.); 15–32 / 3–6 (deut.); 70–74 (cladome)	11– 15.2 –18
<i>D.</i> (<i>S.</i>) <i>occultus</i> Hentschel, 1909 ¹	Shark Bay, West Australia	encrusting / brown (ethanol)	–	–	20–28 (prot.); 50–92 (deut.); 130–230 (cladome)	13–21
<i>D.</i> (<i>S.</i>) <i>pauper</i> Sollas, 1902 ¹	Great Redang Island, Malaysia	encrusting / pink	60–70 / 3	90–115	50–60 / 10 (prot.); 30 (deut.); 160–180 (cladome)	15–20
<i>D.</i> (<i>S.</i>) <i>plicatus</i> (Schmidt, 1868) ¹	Mediterranean, eastern Atlantic (Portugal, Azores)	massive / brownish	41– 101.0 –188 / 3– 14.7 –29	57– 154.4 –252	20– 22.4 –28 / 4– 5.6 –8 (prot.); 15– 28.0 –36 / 2– 3.6 –6 (deut.); 67– 86.8 –105 (cladome)	11– 14.9 –19
<i>D.</i> (<i>S.</i>) <i>plicatus</i> (Schmidt, 1868) ⁴	São Nicolau, Cape Verde	absent / yellow	–	–	26– 83.7 –167 (prot.); 48– 118.4 –191 / 7– 16.1 –29 (deut.); 72– 133.2 –194 (cladome)	10–11.5–13

Continued

Table 1. Continued

Species	Locality	Shape/Colour	Calthrops		Dichocalthrops	Sanidasters
			Cladi	Cladome		
<i>D. (S.) plicatus</i> (Schmidt, 1868) ⁵	not recorded	absent	31-132.9-179 / 5-14.2-24	62-226.6-358	29- 68.7 -131 (prot.); 60- 104.4 -148 / 10- 15.3 - 21 (deut.); 76- 116.3 - 165 (cladome)	11-14.1-17
<i>D. (S.) reptans</i> Desqueyroux-Faúndez and van Soest, 1997 ¹	Galapagos Islands	encrusting / whitish pink (preserved condition)	39-648 / 6-50	60-680	27- 33.8 -36 / 9- 10.4 -12 (prot.); 35- 47.2 -69 / 6- 8.2 -11 (deut.); 141- 154.5 -180 (cladome)	9- 12.8 -16
<i>D. (S.) senegalensis</i> van Soest <i>et al.</i> , 2010 ¹	Coast of Senegal	encrusting / dirty white	92- 299.8 -426 / 8- 38.6 -55	26- 462.6 -618	-	11- 12.6 -17
<i>D. (S.) simplex</i> (Carter, 1880) ⁶	Gulf of Manaar and Adaman Sea (Indian Ocean)	excavating / brownish	-	-	30-50 / 12 (prot.); 150 / 3.5-4 (deut.); 40-225 (cladome)	22-28
<i>D. (S.) syrmatitus</i> de Laubenfels, 1930 ¹	California-United States (North Pacific Ocean)	encrusting / 'drab'	25- 65 -80 / 3- 8 -10	not recorded	-	8-12
<i>D. (S.) verdensis</i> van Soest <i>et al.</i> , 2010 ¹	São Nicolau, Cape Verde	encrusting / pale yellow-coloured	-	-	42- 48.2 -56 / 9- 21.6 -35 (prot.); 23- 106.8 -204 / 4- 17.2 -29 (deut.); 132- 294.6 -475 (cladome)	11- 13.3 -16
<i>D. (S.) xanthus</i> Sutcliffe <i>et al.</i> , 2010 ⁷	Great Barrier Reef, Australia	massive / red to yellow	I- 22- 25 -26 II- 49- 72 -94 (both triods)	not recorded	-	10- 15 -20

References: (1) van Soest *et al.* (2010); (2) Moraes & Muricy (2007); (3) Present work - MNRJ 7865; (4) Present work - MNRJPOR 628; (5) Present work - UFRJPOR 3254. (6) Maldonado (2002); (7) Sutcliffe *et al.* (2010).

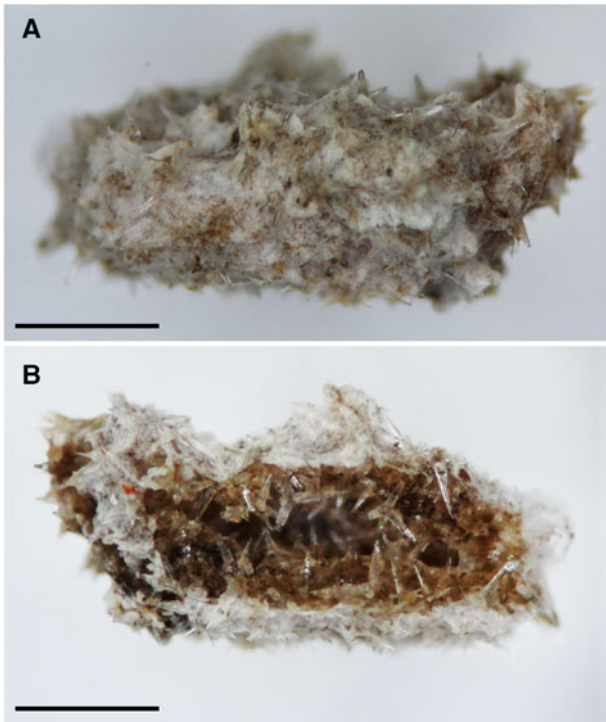


Fig. 2. *Dercitus (Stoeba) pseudodiscorhabda* sp. nov.: (A, B) Different regions (external and internal) of the holotype (CIPY-UFPB 151) showing calthrops. Scale bars: A, B, 1 mm.

Although they share the same biogeographic province, *D. (S.) latex* differ from new species in many features: the spicules of the former are smaller than in new species (sanidasters: 10–15 μm vs 10–21 μm , and calthrops: 42.5–212.5 μm vs 48–382 μm , respectively); in *D. (S.) latex* the sanidasters are long and thin without microspinations and the calthrops are irregularly curved against discorhabd-like sanidaster with microspinations and regular and straight calthrops in *D. (S.) pseudodiscorhabda* sp. nov. Finally, *D. (S.) latex* is reddish-brown with smooth surface against white colour with conulose surface in new species.

Dercitus (Stoeba) senegalensis share with the new species the size of the spicules (see Table 1), the colour (dirty white) and habit (encrusting sponge). However, both differ in morphology of the sanidasters (with spines equally distributed in the shaft in *D. (S.) senegalensis* against discorhabd-like, with spines concentrated in two areas of shaft in *D. (S.) pseudodiscorhabda* sp. nov.) and of calthrops (five-claded in *D. (S.) senegalensis* against four-claded in *D. (S.) pseudodiscorhabda* sp. nov.). These features also are not found in *Dercitus (Stoeba) xanthus*, which differs by the red to yellow colour, massive growth form, presence of two categories of three rayed triods (22–26 μm and 49–94 μm) and sanidasters with spines equally distributed in the shaft (10–20 μm). In *Dercitus (Stoeba)* sp. (from Bonaire) the calthrops are smaller (39–186 μm) than in the new species (48–382 μm) and the sanidasters are not discorhabd-like. Finally, *Dercitus (Stoeba)* sp. (from Madagascar) is a yellow species with

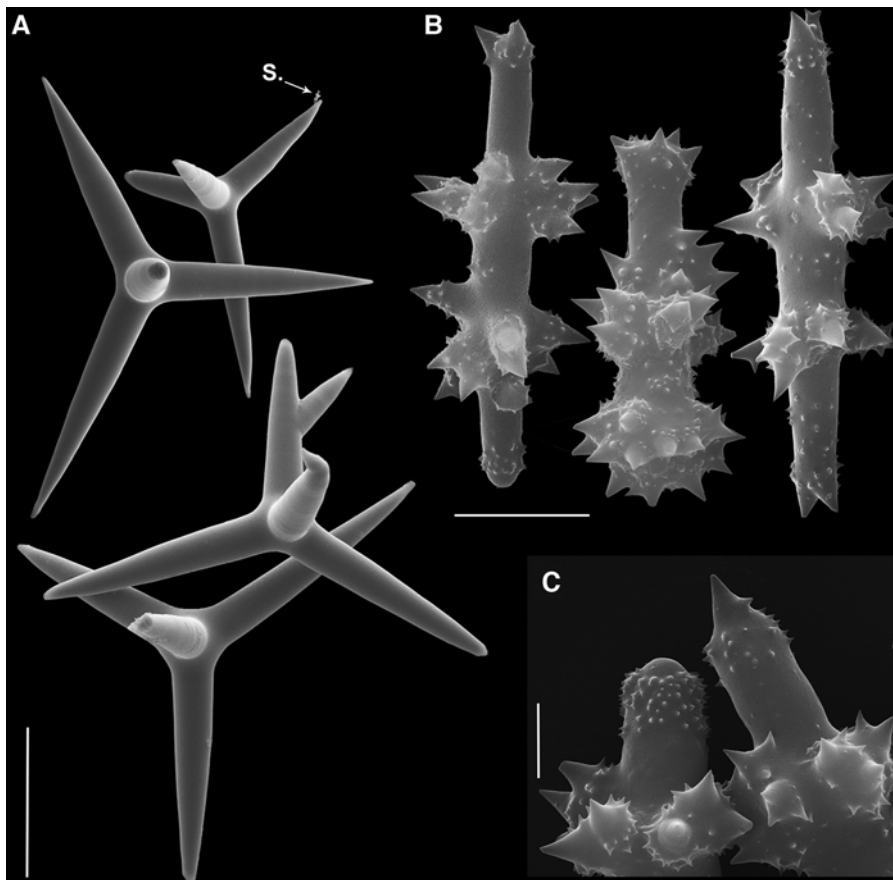


Fig. 3. Scanning electron microscopy images of spicules of the holotype (CIPY-UFPB 151) of *Dercitus (Stoeba) pseudodiscorhabda* sp. nov. (A) various calthrops shapes (arrow point to sanidaster-S.); (B) various sanidaster shapes; (C) detail of the ending of two sanidasters. Scale bars: A, 200 μm ; B, 5 μm ; C, 2 μm .

smaller spicules (calthrops 50–250 µm and sanidasters 12.5 µm) and without discorhabd-like sanidaster.

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