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TEDANIA BRASILIENSIS NEW SPECIES (DEMOSPONGIAE, POECILOSCLERIDA, TEDANIIDAE) FROM BRAZIL, WITH SOME REMARKS ABOUT THE GENUS *TEDANIA* IN THE TROPICAL SOUTHWESTERN ATLANTIC

Beatriz Mothes, Eduardo Hajdu and Rob W. M. van Soest

ABSTRACT

Tedania brasiliensis n. sp. is described from widely disjunct localities along the Brazilian coast, distributed from ca 00°30′to ca 24°00′S, and from 3 to 54 m in depth. The species is distinguished from its closest relative in the tropical Western Atlantic, *T. ignis* (Duchassaing and Michelotti, 1864), by the possession of strongyles as the sole choanosomal megascleres, pinkish-red live-color, and notorious anti-yeast properties. No dermatitis is known yet from contact with the new species. Other records of the genus from the Brazilian coast are reviewed, and citations of *T. anhelans* (Lieberkuhn, 1859) and *T. vanhoeffeni* Hentschel, 1914, are all transferred to *T. ignis*. We tentatively assign the record of *T. murdochi* Topsent, 1904, to *T. mucosa* Thiele, 1905, but suggest the retention of *T. biraphidora* (Boury-Esnault, 1973) as a valid species, distinct from *T. patagonica* Ridley and Dendy, 1886, in contrast to suggestions made in recent literature.

The genus *Tedania* is not particularly diverse in the Atlantic Ocean in general (ca 10–12 species), and this is the case on the Brazilian coast. Its taxonomic history in the latter area is, however, markedly puzzling. De Laubenfels' (1956) dubious identification of a specimen from the coast of São Paulo, clearly illustrates the issue: "*Tedania*, perhaps *ignis*, perhaps *anhelans*, perhaps new species". Our study, apart from describing a new species very close in spiculation to *T. ignis* (Duchassaing & Michelotti, 1864), revises the records of other species of *Tedania* cited for the Brazilian coast. A clearer picture of *T. ignis*'s morphospace (morohological disparity) was gathered from an extensive series of specimens of the latter species, amply distributed along the tropical Western Atlantic (32°N–27°S).

The Brazilian coastline is one of the least studied large warm tropical marine areas in the world with respect to its sponge fauna. Van Soest (1994) cited 234 published records of demosponges for the area, less than half of the number of current conservative estimations of the true number of species (ca 600–700 morphospecies; Hajdu et al., in press). A greater committment to the taxonomy of Brazilian marine sponges is, nevertheless, taking place at the moment, as inferred from the diverse origin of the specimens cited below. The specimens which serve as the basis for the descriptions stem from three independent but extensive faunistic surveys on disjunct sections of the Brazilian coastline (Muricy et al., 1991; Hajdu et al., 1996; Mothes, 1996). Several new records of demosponges will be published in the next few years from material gathered in these surveys, as well as from ongoing collecting efforts (Lana, 1996; Lerner, 1996; Hajdu et al., in press), at local, state and national levels.

Materials and Methods

Specimens of the new species described here were gathered between 1973 and 1996. Collection locations are distributed along the Brazilian coast, from 00°31′S, off the coast of the state of Maranhão to 23°49′S, Ilha de São Sebastião, on the coast of the state of São Paulo (Fig. 1). They were collected during several oceanographic expeditions [e.g., Superintendência de Desenvolvimento do Nordeste (SUDENE — Comissão Maranhão), GEOMAR X, and Oxford Diving Expedition], or during scuba-assisted faunistic surveys, and are deposited in the following collections: MCNPOR (Museu de Ciências Naturais — Porifera Collection, Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre, RS, Brazil), MZUSP (Museu de Zoologia, Universidade de São Paulo, São Paulo, SP, Brazil) and UFRJPOR (Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brazil).

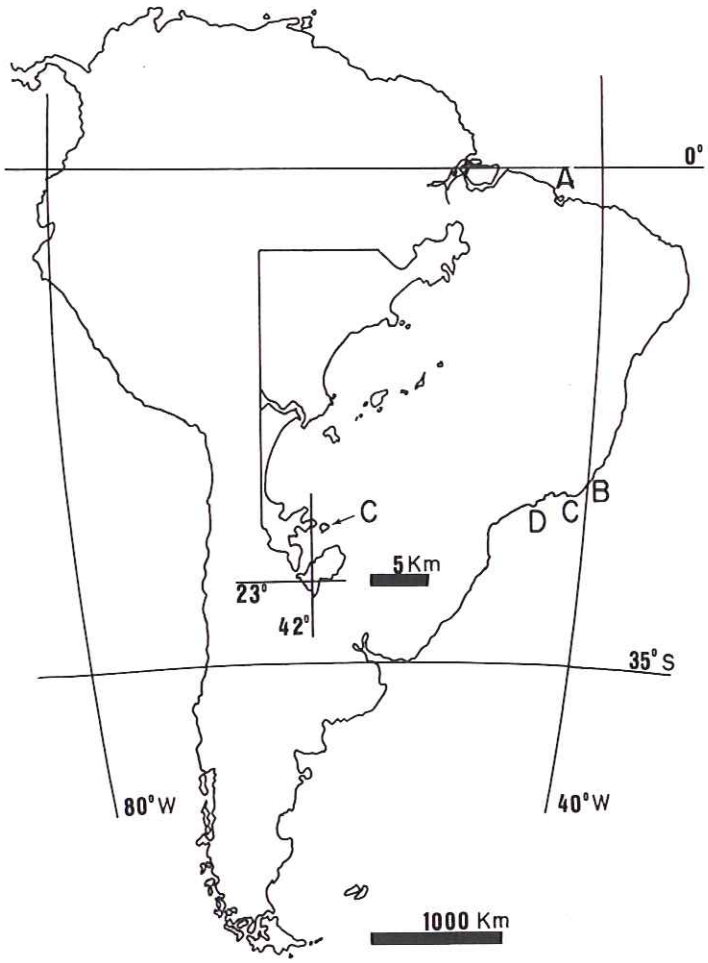

Figure 1. Map showing the collecting along the tropical Atlantic coast of South America locations with type locality, C. Ilha dos Porcos (the state of Rio de Janeiro) shown in detail. A. off the coast of the state of Maranhão. B. Cabo de São Tomé (the state of Rio de Janeiro). D. Ilha de São Sebastião (the state of São Paulo).

Dissociated spicule mounts and thick sections were made according to Mothes-de- Moraes (1978). Preparations for SEM study followed the procedures outlined in Hajdu (1994). Abbreviations used are BMNH (Natural History Museum, London, United Kingdom), MNHN-LBIM-NBE (Muséum d'Histoire Naturelle, Laboratoire de Biologie des Invertebrées Marins et Malacologie, leg. Nicole Boury-Esnault, Paris, France) and ZMA POR (Zoologisch Museum Amsterdam - Porifera Collection, Amsterdam, The Netherlands).

Systematics

Class Demospongiae Sollas, 1885
Order Poecilosclerida Topsent, 1928
Suborder Myxillina Hajdu, Van Soest and Hooper, 1994
Family Tedaniidae Hentschel, 1923

Diagnosis.—Myxillina without microscleres other than onychaetes. Skeletal architecture variously isotropic, anisotropic, or plumose (sensu Desqueyroux-Faúndez and Van Soest, 1996).

Genus *Tedania* Gray, 1867

Diagnosis.—Tedaniidae possessing morphologically distinct ectosomal and choanosomal megascleres. The type species has microspined tylotes as ectosomal spicules and smooth styles as choanosomal spicules (sensu Desqueyroux-Faúndez and van Soest, 1996).

Type-species.—*Reniera digitata* Schmidt, 1862 (junior synonym of *Halichondria anhelans* Lieberkühn, 1859) subsequent designation by Koltum (1959).

Subgenus *Tedania* Gray, 1867

Diagnosis.—*Tedania* possessing smooth, relatively small styles or strongyles, occasionally strongylote styles, as structural megascleres, and microspined tylotes as ectosomal megascleres (emended from Desqueyroux-Faúndez and van Soest, 1996).

Type-species.—*Reniera digitata* Schmidt, 1862 (junior synonym of *Halichondria anhelans* Lieberhühn, 1859) subsequent designation by Koltum (1959).

Tedania (Tedania) brasiliensis new species

(Fig. 2; Plates I–II, Table 1)

Tedaniopsis sp.n.; Muricy et al., 1991
Tedania sp.; Muricy et al., 1993

Material Examined.—Holotype: UFRJPOR 1193, Ilha dos Porcos (23°00′21″S–41°59′31″W, Rio de Janeiro state), 15 m deep. Paratypes: MCNPOR 2319, Maranhão state (00°31′00″S, 44°16′00″W), 54 m deep. Rio de Janeiro state: UFRJPOR 1223a (23°00′21″S, 42°00′27″W, Saco dos Ingleses), 15 m deep.; UFRJPOR 2862 (22°58′05″S, 42°00′49″W, Praia do Forno), 5 m deep; UFRJPOR 2979 (22°59′12″S, 41°59′35″W, Pedra Vermelha), 6 m deep; UFRJPOR 3062, 3080 (22°58′51″S, 42°00′34″W, small embayment between Praia dos Anjos and Prainhas do Morro do Atalaia), 10 m deep; UFRJPOR 3149 (22°59′09″S, 42°00′33″W, Prainhas do Morro do Atalaia, 3 m

deep; UFRJPOR 3150 (23°00′23″S, 42°00′36″W, Saco da Saia), 6 m deep; UFRJPOR 1276 (21°42′S, 40°15′W, Cabo de São Tomé), 51 m deep. São Paulo state: MZUSP 12257, 12258 (23°50′S, 45°14′W, Ilhabela), 5–16 m deep.

Fragment from Holotype deposited as BMNH 1997.1.13.1 and ZMA POR 11487.

Additional Material.—T. ignis—Fragment from Lectotype: BMNH 1928.11.12.437, St. Thomas. Paralectotype: ZMA POR 2373, St. Thomas. Bermuda: BMNH 1948.8.6.30 fragment from Type); Curaçao: ZMA POR 3868, 1 m deep. Brazil — Amapá state: MCNPOR 1873 (02°18′00″N, 49°16′00″W), 76 m deep. Maranhão state: MCNPOR 2317 (00°31′00″S, 44°16′00″W), 54 m deep; MCNPOR 1852 (01°33′00″S, 43°39′00″W), 25 m deep. Piauí state: UFRJPOR 491, 500, 873 (02°10′S, 41°27′W), 53 m deep. Pernambuco state: UFRJPOR 3132 (08°42′S, 35°00′W), 0.5 m deep; MNHN-LBIM-NBE 952 (08°23′S, 34°42′W), 51 m deep (cf Boury-Esnault, 1973; as *T. anhelans*); MNHN-LBIM-NBE 969 (08°28′S, 34°55′W), 22–30 m deep (cf Boury-Esnault, 1973; as *T. anhelans*); MNHN-LBIM-NBE 980 (08°25′S, 34°48′W), 33 m deep (cf Boury-Esnault, 1973; as *T. anhelans*). Bahia state: UFRJPOR 3131 (13°00′S, 38°30′W, Farol da Barra), 1 m deep; MNHN-LBIM-NBE 961(16°15′S, 38°52′W), 24 m deep (cf Boury-Esnault, 1973; as *T. anhelans*). Espírito Santo state: UFRJPOR 383 (20°36′S, 40°23′W, Ilha do Frade) and UFRJPOR 307 (19°57′S, 40°07′W, Santa Cruz). Rio de Janeiro state : UFRJPOR 2844, 3152, 3153 Praia do Forno, 3–4 m deep; UFRJPOR 2886, 2985, 2994 (22°59′12″S, 41°59′35″W, Pedra Vermelha), 3–4 m deep; UFRJPOR 3079, 3084 22°58′51″S, 42°00′34″W, Enseada), 2.5–3 m deep; UFRJPOR 3106,3115, 3116 (23°00′23″S, 42°00′36″W, Gruta Azul), 10–15 m deep; MCNPOR 683 (23°00′21″S, 42°00′27″W, Ilha de Cabo Frio), 15 m deep (cf Mothes-de-Moraes, 1985; as *T. vanhoeffeni*); UFRJPOR 2318 (23°00′30″S, 43°38′00″W, Marambaia); MNHN-LBIM-NDE 1038 (23°26′S, 44°48′W, off Ponta Negra), 36 m deep (cf Boury-Esnault, 1973; as *T. vanhoeffeni*). São Paulo state: UFRJPOR 140, 167 (23°49′S, 45°24′W), intertidal. Santa Catarina state: MCNPOR 1063, 1453,1476 (27°08′48″S, 48°29′00″W, Bombinhas) 0.8 m deep; MCNPOR 459, 420 (27°09′2″S, 48°29′30″W, Porto Belo), 0.5–0.8 m deep (cf Mothes-de-Moraes, 1987; as *T. vanhoeffeni*); MCNPOR 1060 (27°08′30″S, 48°32′30″W, Ilha João da Cunha), 0.5 m deep (cf Mothes-de-Moraes, 1987; as *T. vanhoeffeni*).

T. biraphidora —Fragment from Type: MNHN-LBIM-NBE 974, São Paulo state (24°06′S, 45°29′W), 48 m deep (cf. Boury-Esnault, 1973; as *Trachitedania biraphidora*)

T. mucosa —MNHN-LBIM-NBE 945, Rio de Janeiro state (23°04′S, 44°14′W), 45 m deep (cf Boury-Esnault, 1973; as *T. murdochi*).

Diagnosis.—The species possesses ectosomal tylotes (151–257 μm long), choanosomal strongyles (151–228 μm long), (tylo)onychaetes-I (95–200 μm long) and onychaetes-II (40–78 μm long). The color varies from orange to vermillion, but most often is an intense pinkish-red.

Description.—(Plate I). Specimens are generally massive, cushion-shaped. The holotype measures 4.5 by 6 cm in area, and is 2 cm high. Oscules (up to 8 mm in diameter) are scattered on top of small volcano-shaped elevations. The color varies from orange to vermillion, but most often is an intense pinkish-red, turning light-gray or light-brown in ethanol. Consistency ranges from soft and easily torn to firm; only slightly compressible. Variable surface, smooth or rugose, to irregularly conulose or corrugated, translucent to opaque, always microhispid, velvety. Some specimens possess abundant protruding polychaete tubes.

The ectosomal skeleton is composed of divergent brushes of tylotes, slightly piercing the surface (Fig. 2). The choanosomal skeleton present multispicular primary tracts of strongyles connected by one or two strongyles producing a subisodictyal reticulation, with nodal spongin. Short primary tracts are sometimes visible. Onychaetes are scattered everywhere.

Plate I. Underwater photograph of a *Tedania brasiliensis* n. sp. specimen in situ (Arraial do Cabo, the state of Rio de Janeiro). Area coverage is ca 70 × 100 mm.

Spicules.—(Plate IIA–J, Table 1). MEGASCLERES.—Ectosomal tylotes are straight, slender, terminally microspined, with variably inflated tyles (Plate IIC–F). Choanosomal strongyles are smooth, slightly curved or sinuous (Plate IIA–B). MICROSCLERES.—Onychaetes-I (often tylo-onychaetes) are straight to slightly curved, often aniso-, with a subterminal swelling, microspines are obliquely disposed and oriented towards the spicule shaft's widest extremity; this extremity generally has one to three microspines (Plate IIG–J). Onychaetes-II are smaller, rare/ sometimes lacking.

Distribution and Ecology.—The species occurs from ca. 00°30′ to ca 24°00′S along the Brazilian coastline in the tropical Western Atlantic. Its depth of occurrence ranges from only 3 m in Prainhas do Morro do Atalaia, State of Rio de Janeiro, to 54 m depth off the

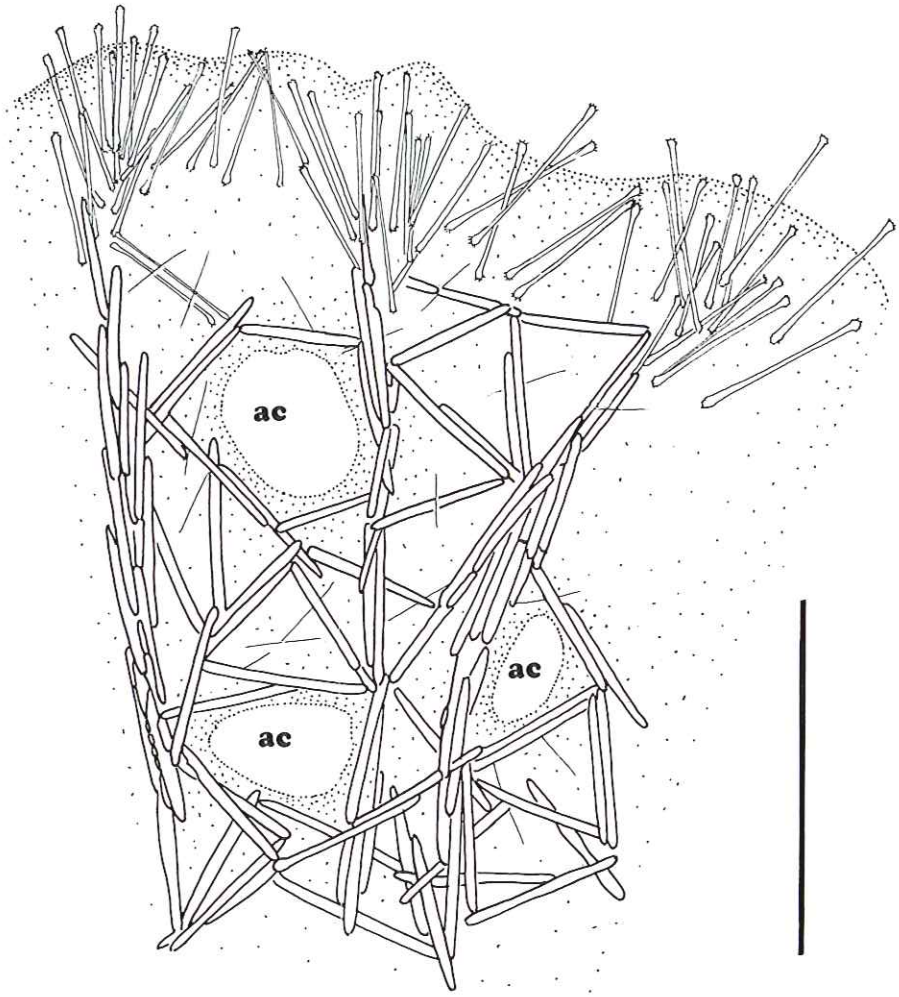

Figure 2. Schematic representation of the skeletal architecture of *Tedania brasiliensis* n. sp. ac. Aquiferous canals. Scale = 500 μm.

coast of the State of Maranhão. The localities on the coasts of the States of Rio de Janeiro and São Paulo are occasionally exposed to cold waters as low as 11°C, either from the Malvinas current, or from the Central South Atlantic water masses due to upwelling phenomena (e.g., Yoneshigue, 1985). These same waters may be as warm as 29°C on peak summer days, thus suggesting an eurythermic condition of the species. The substrate varies from rock to biodetrital.

Etymology.—The name refers to the Brazilian coast where the species is amply distributed, and so far endemic.

Anti-yeast properties.—Muricy et al. (1993) reported the new species' (as *Tedania* sp.) activity against several yeast lineages (refer to these authors for the complete bioassay methodology). Positive activity of crude extracts, either aqueous or methanolic, was observed against the yeasts *Candida albicans*, *C. krusei*, *C. parapsilopsis*, *C. guiliermondii*,

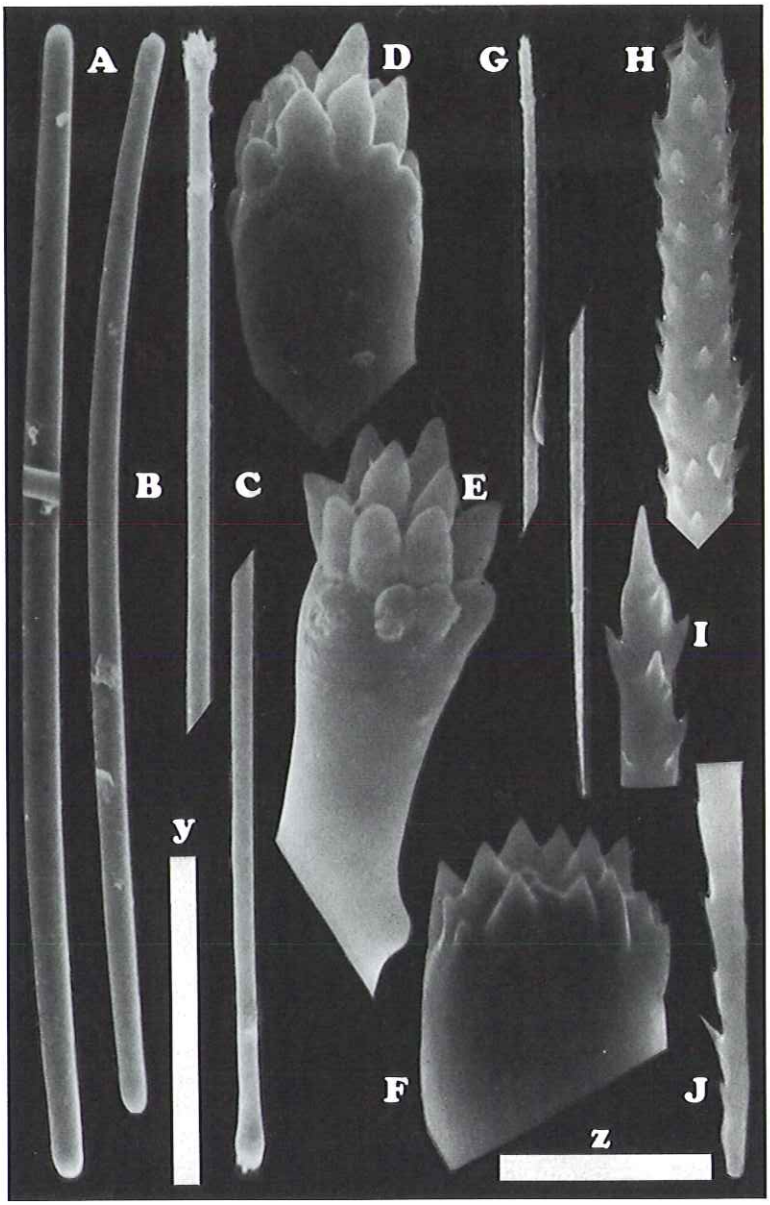

Plate II. SEM photographs of *Tedania brasiliensis* n. sp. A–B. Strongyles. C. Terminally microspined tylote. D–F. Detail of tylote microspined terminations. G. Onychaete-I. H–J. Detail of spined terminations of onychaete-I. A–B, D–E, G–H. Holotype (UFRJ 1193). C, F, I–J. Paratype (MCN 2319). y (A–C, G) = 50 µm, z (D–F, H–J) = 2 µm.

Metschnikowia bicuspidata (weak), *Saccharomyces cerevisiae*, *Debaryomyces hansenii* and *Cryptococcus laurentii*. None of the four test-bacteria, two gram-positive and two gram-negative, had their development affected by the sponge extracts. Two yeasts were not affected either, viz *Candida tropicalis* and *C. glabrata* Muricy et al.(1993).

Table 1. *Tedania brasiliensis* n. sp.: measurements expressed in µm, as smaller length, mean length for 20 spicules (in bold), larger length / smaller width, mean width for 10 spicules (in bold) and larger width (unless stated otherwise).

	Tylotes	Strongyles	Onychaetes-I	Onychaetes-II
Holotype UFRJPOR 1193	196–**209**–221/ 4.5–**5.0**–5.3	171–**182**–191/ 5–**6.8**–7.5	103–**128**–148	40–**54**–78
Paratype UFRJPOR 1223a	201–**213**–231/ 4–**4.9**–5.3	161–**180**–191/ 5.8–**7.0**–8	115–**123**–143	50–**56**–63
Paratype UFRJPOR 2862	191–**202**–211/ 2.8–**4.0**–5	176–**183**–191/ 5.3–**5.9**–7.3	95–**111**–129	75 (n = 1)
Paratype UFRJPOR 2979	196–**220**–231/ 3–**4.4**–5.3	186–**189**–201/ 3.8–**6.6**–7.5	113–**125**–168	48–**57**–75
Paratype UFRJPOR 3062	151–**196**–211/ 3–**4.3**–5	166–**176**–196/ 5–**7.6**–8.8	100–**112**–120	75 (n = 1)
Paratype UFRJPOR 3080	181–**199**–211/ 3–**4.3**–4.8	156–**175**–191/ 5–**5.6**–6.8	100–**118**–135	43–**51**–58
Paratype UFRJPOR 3149	173–**193**–209/ 3.8–**5.0**–6.3	151–**162**–194/ 5–**6.9**–7.8	100–**118**–170	43–**51**–57
Paratype UFRJPOR 3150	196–**206**–221/ 2.8–**4.5**–5	171–**186**–221/ 5–**5.7**–7.3	105–**118**–125	43–**54**–63
Paratype UFRJPOR 1276	211–**227**–241/ 3–**4.7**–5.3	186–**205**–221/ 3.3–**6.0**–7.5	125–**146**–200	48–**57**–65
Paratype MCN POR 2319	218.5–**228.0**–256.5/ 2.3–**2.9**–3.4 (n = 50)	190–**209**–228/ 3.4–**4.0**–4.6 (n = 50)	115–**145**–17	48–**66**–76
Paratype MZUSP 12257	182–**205.9**–226/ 4.8–65	166–**193.6**–211/ 6.7–8.6	72–**98.4**–113 /	53? (n = 1)
Paratype MZUSP 12258	168–**199.3**–226/ 3.8–7	192–**204.1**–221/ 6–8.4	62–**86.4**–110	not found

Discussion

Our species is assigned to the subgenus *Tedania* in view of its considerable similarities to *T. ignis* (spicules and architecture), and *T. anhelans*, the type-species. We suggest that the diagnosis of this subgenus be amended to allow the inclusion of species bearing choanosomal diactines as the sole choanosomal megascleres. This is in contrast to Dendy's (1924) and Bergquist and Fromont's (1988) point of view, who stressed the diactinal nature of choanosomal megascleres as a diagnostic feature of *Tedaniopsis*. Desqueyroux-Faúndez and Van Soest (1996) shifted the diagnostic emphasis to the occurrence of large, stout choanosomal megascleres, a decision concurred with by us. This character is absent from the new species.

Species of *Tedania* registered for the Brazilian coast are: *T. anhelans* (Lieberkühn, 1859), *T. biraphidora* (Boury-Esnault, 1973), *T. ignis* (Duchassaing & Michelotti, 1864), *T. murdochi* Topsent, 1913 and *T. vanhoeffeni* Hentschel, 1914. *T. anhelans* was identified by De Laubenfels (1956, doubtfully) and Boury-Esnault (1973). We have examined the specimens collected by the Calypso Expedition, described as *T. anhelans* by Boury-Esnault,

and concur with the ideas of Hechtel (1965, 1976) and Van Soest (1987) that the Brazilian records of *T. anhelans* are best referred to the widespread tropical West Atlantic species, *T. ignis.*

Desqueyroux-Faúndez and Van Soest (1996) suggested the synonymy of *T. biraphidora* with *T. patagonica* Ridley and Dendy's (1886). We prefer to retain the validity of both species in view of a series of features. *T. biraphidora* possesses much more slender megascleres (3–6 vs 7–13 μm), styles which are spined only at the base; two, instead of one category of onychaetes, and shallower (48 vs 320 m) depth of occurrence.

T. murdochi's records for the Brazilian coast (Boury-Esnault, 1973) were referred to *T. fuegiensis* Thiele, 1905 by Sarà (1978). Later on Desqueyroux-Faúndez and Van Soest (1996), suggest the synonymy of Sarà's specimens of *T. fuegiensis* to *T. spinata* (Ridley, 1881) and *T. fuegiensis* Thiele, 1905 was considered a junior synonym of *T.mucosa* Thiele, 1905.The distinction between *T. mucosa* and *T. spinata* rests in the possession by the former species of thicker, more robust styles (5–16 vs 3–10 μm), as well as a dense, more confused skeletal arrangement.

Boury-Esnault's (1973) record that *T. murdochi* has choanosomal styles which are up to 15 μm thick, what renders the specimen more likely a *T. mucosa*. This is done tentatively here, since the latter species is only marginally distinct from *T. spinata* (see above).

T. vanhoeffeni is an Antarctic species with huge choanosomal styles (>700 μm), assigned by Desqueyroux-Faúndez and Van Soest (1996) to the subgenus *Tedaniopsis* Dendy, 1924. Brazilian records of the species all possess choanosomal styles smaller than 332 μm [400–470 μm, cf Boury-Esnault, 1973 (291–332 μm as remeasured by us); 215–263 and 206–263 μm, cf Mothes-de-Moraes, 1985 and 1987, respectively], and are here considered to be best assigned to *T. ignis*. The morphological variability of *T. ignis* along the Brazilian coast will be dealt with in detail elsewhere (Hajdu, in prep.).

Accordingly, the corrected list of the species of *Tedania* known from the Brazilian coast is: *T. biraphidora*, *T. ignis* and *T. mucosa*. The new species, *T. brasiliensis* n. sp. differs from *T. biraphidora* by the lack of an acanthose termination on the choanosomal megascleres, which, additionally, are strongyles, as opposed to (acantho)styles in the latter. *T. brasiliensis* n. sp. differs most notably from *T. ignis*, by its possession of choanosomal strongyles, instead of styles. It is known that the choanosomal megascleres of *T. ignis* vary in size and shape, and even strongyles may occur, but these are rare, and are best regarded as malformed styles. Additionally, *T. ignis* tends to be of an intense fiery, orange-vermillion color, while *T. brasiliensis* n. sp. has most commonly an intense pinkish-red color (Plate I). No dermatitis is yet known for the new species, as opposed to repeated records for *T. ignis* (e.g., de Laubenfels, 1950; Yaffee and Stargardter, 1963).

Tedania mucosa (sensu Boury-Esnault, 1973; as *T. murdochi*) has ectosomal tornotes, choanosomal styles, and only a single category of onychaetes; in contrast to terminally-spined ectosomal tylotes, choanosomal strongyles, and two categories of onychaetes in the new species.

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