

Shallow-water Niphatidae (Haplosclerina, Haplosclerida, Demospongiae) from the São Sebastião Channel and its environs (tropical southwestern Atlantic), with the description of a new species

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Abstract

Two niphatids are described here: *Amphimedon viridis* and *Pachychalina alcaloidifera* sp. nov. *Amphimedon viridis* is a common and conspicuous species in most of the tropical western Atlantic. *Pachychalina alcaloidifera* sp. nov. has this far been found only in the coasts of Rio de Janeiro and São Paulo states. Both species are described on the basis of series of specimens observed alive.

Comparison of the niphatids collected in the São Sebastião Channel area and its environs with data compiled from the literature lead us to identify *Amphimedon viridis* and a new species, *Pachychalina alcaloidifera* sp. nov., to be described below.

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Material and methods

Specimens were collected during a faunistic survey conducted in the area of the São Sebastião Channel and its environs, in the municipalities of São Sebastião and Ilhabela, situated in the northern sector of the São Paulo State coastline (Fig. 1). Additional collections were made at do Pai Island (off Praia de Itaipu, Niteroi, central sector of Rio de Janeiro State coastline).

Sponges were collected by snorkeling or scuba diving, and photographed *in situ* whenever possible. Preparations of dissociated spicules and thick-sections mounts follow the usual procedures described elsewhere for study under light microscopy (Mothes de Moares, 1985; Hooper, 1997).

Introduction

A qualitative survey of the sponge fauna of the São Sebastião Channel area and its environs has been conducted during the years of 1996 and 1997, revealing over 140 species (Hajdu *et al.*, 1996; Hajdu *et al.*, 1999). Ongoing collecting effort is centred on yielding additional specimens of rare species, registering photographically intrapopulational variability *in situ*, and subsidizing biological natural products research.

Systematics

Order Haplosclerida Topsent, 1928
Suborder Haplosclerina Topsent, 1928
Family Niphatidae Van Soest, 1980

Diagnosis. "Haplosclerida with three-dimensional ectosomal skeleton of multispicular fibres. Choano-

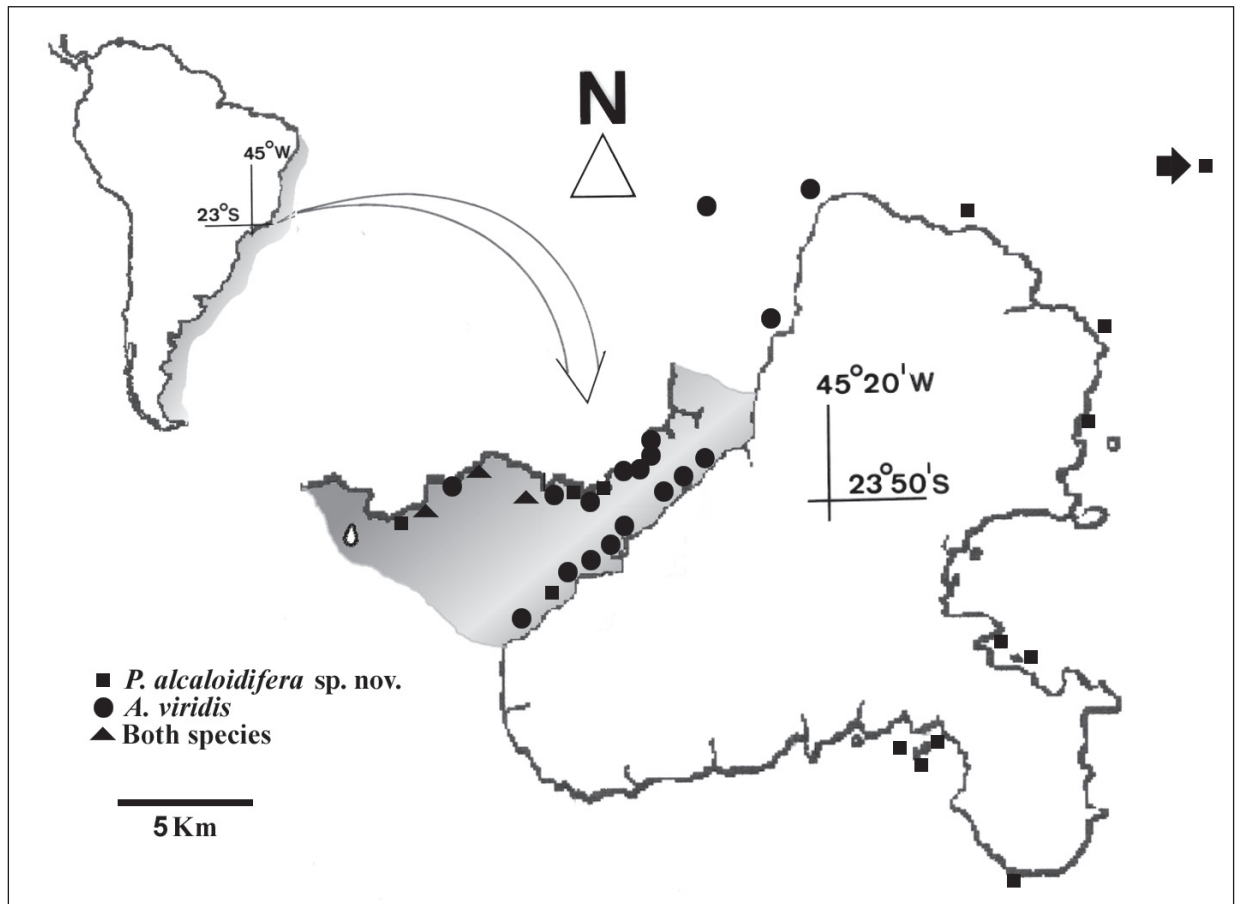


Fig. 1. Map showing the São Sebastião Channel area and its geographic position in relation to the eastern coast of South America. Localities where the specimens studied here were seen are indicated. ■ *Pachychalina alcaloidifera* sp. nov. ● *Amphimedon viridis* Duchassaing and Michelotti, 1864 and ▲ both species.

somal skeleton of multispicular fibres, cored by oxeas, often strongylote or stylote. Microscleres if present, sigmas or microxeas” (Desqueyroux-Faúndez and Valentine, 2002).

Genus *Amphimedon* Duchassaing and Michelotti, 1864

Diagnosis. “Niphatidae with an optically smooth surface, regular tangential ectosomal network with rounded meshes of a single size. Ends of choanosomal longitudinal primary fibres barely protruding. Spongin abundant. Microscleres absent.” (Desqueyroux-Faúndez and Valentine, 2002)

Type species. *Amphimedon compressa* Duchassaing and Michelotti, 1864.

Amphimedon viridis Duchassaing and Michelotti, 1864
(Figs. 2a-c, Table 1)

Material. MNRJ 415, between Praia Grande and Praia Preta (São Sebastião Channel, São Sebastião, SP, Brazil, 23°49.247'S 45°24.435'W), coll. A. Mota, 30-I-1995; MNRJ 428, Praia Grande (São Sebastião Channel, São Sebastião, SP, Brazil, 23°51.474'S 45°27.276'W), 6 m depth., coll. F.L. Silveira and A.C. Morandini; MNRJ 1028, São Sebastião, SP, Brazil, coll. R.G.S. Berlinck; MNRJ 1030, 1031, between Praia Grande and Praia Preta (São Sebastião Channel, São Sebastião, SP, Brazil, 23°49.247'S 45°24.435'W), coll. A.C. da Motta, 30-I-1995; MNRJ 1032, Praia Preta (São Sebastião Channel, São Sebastião, SP, Brazil, 23°49.247'S 45°24.435'W), coll. R.G.S. Berlinck; MNRJ 1699, Pedra Montada, Praia de Barequeçaba (São Sebastião Channel, São Sebastião, SP, Brazil, 23°49.746'S 45°26.478'W), 2.5 m depth, coll. E. Hajdu, 29-IV-1997; MNRJ 1973, Praia das Conchas, Picinguaba (Ubatuba, SP, Brazil), 1-2 m depth, coll. U.S. Pinheiro and S. Ribeiro, 09-XII-1998; MNRJ 2016, Pedra

Montada, Barequeçaba (São Sebastião, SP, Brazil, 23°49.746 45°26478), coll. R.G.S. Berlinck, 06-II-1999, Biota/Fapesp, Bentos Marinho Project; MNRJ 7170, dos Porcos Pequenos Island (Ubatuba, SP, Brazil); MNRJ 7171, 7552, The Islands, off Praia da Baleia (São Sebastião, SP, Brazil); MNRJ 7550, Ilha Massaguaçu (Caraguatatuba, SP, Brazil); MNRJ 7557, Picinguaba (Ubatuba, SP, Brazil); MNRJ 8519, Ubatuba (SP, Brazil); MNRJ 8521, Caraguatatuba (SP, Brazil).

Amphimedon viridis. Brazilian records: Muricy, 1989: 351; Muricy *et al.*, 1991: 1186; Muricy *et al.* 1993: 429; Berlinck *et al.* 1996; Hajdu *et al.* 1999; Muricy and Ribeiro, 1999: 85.

Further synonymy: see Wiedenmayer, 1977: 84.

Description of specimens collected on the São Paulo State coast. Massive cushion-like or lobate, only rarely repent. Live colour, several shades of green, mostly mat/dull, several shades of brown in spirit. Surface hispid and rough, reticulated to the naked eye. Oscules spread at random, flush or on top of projections. Area coverage was as large as 225 cm², with ca. 30 cm² as a mean value. Ectosomal skeleton a tangential reticulation where multispicular tracts form circles 200–450 µm in diameter. Choanosomal skeletal architecture a regular reticulation with primary multispicular ascending tracts interconnected by irregular secondary fibres. Abundant spongin cementing fibres, and many free spicules. Spicules (Table 1) are oxeas, robust, slightly curved and tapering not so gradually, 146–210 µm long and 5–14 µm thick.

Table 1. Micrometric data for the oxeas of selected specimens of *Amphimedon viridis* Duchassaing and Michelotti, 1864 (in µm, N=20).

Specimen	Spicules (length/width)	
	smallest – <u>mean</u> – largest	
MNRJ 428	149 – <u>164</u> – 180 /	10 – <u>11.6</u> – 14
MNRJ 1028	151 – <u>176</u> – 210 /	5 – <u>10.3</u> – 14
MNRJ 1030	158 – <u>171</u> – 194 /	6 – <u>10.0</u> – 12
MNRJ 1031	146 – <u>168</u> – 182 /	8 – <u>10.7</u> – 12
MNRJ 1032	156 – <u>175</u> – 202 /	7 – <u>12.5</u> – 13
MNRJ 1699	161 – <u>172</u> – 187 /	7 – <u>8.6</u> – 12

Ecology. The species is known from 3 to 15 m depth at São Sebastião and Ilhabela. It occurred in 21 stations out of 58 sampled semi-quantitatively in the São Sebastião Channel area and surroundings of the Ilha de São Sebastião (Fig. 1). At a single quantitative survey site next to the Centro de Biologia Marinha

at São Sebastião it accounted for 2.31% of total sponge coverage, being the 8th more abundant species (Hajdu *et al.*, unpubl. res.).

Remarks. Several specimens were seen in the field through a quantitative assessment of sponge abundance conducted at São Sebastião (Hajdu *et al.*, unpubl. res.). It appears that digitiform projections are not associated to the dimensions of the specimens, but to habitat pressures such as the need to outgrow competing neighbouring organisms (e.g. specimens growing in between zoanthid polyps of the genera *Palythoa* and *Zoanthus*). The largest collected specimen (MNRJ 1699) had not a single projection. There is a green *Halichondria* occurring in the São Sebastião Channel area and environs, viz. *H. cebimarensis* Carvalho and Hajdu, 2001 which could inadvertently be mistaken for *A. viridis*. *In situ* distinguishing characters are the slightly lighter (sometimes turquoise) shade of green, the smoother and easily peeled off surface (neatly reticulated) and the tougher consistency in the *Halichondria*. Brazilian *Amphimedon viridis* have recently been thoroughly described by Muricy and Ribeiro (1999) where further comparative data is to be sought.

Genus *Pachychalina* Schmidt, 1868

Definition. “Niphatidae with a paratangential ectosomal reticulation of fibres or tracts obscured by an irregularly, conulose to spiny surface, pierced by abundant aquiferous orifices. Choanosomal tracts have no sheath of spongin.” (Desqueyroux-Faúndez and Valentine, 2002)

Type species. *Pachychalina rustica* Schmidt, 1868.

Remarks. *Pachychalina* as used here is considered distinct from closely allied genera by its lack of a clear tangential reticulation as found in *Amphimedon*, and lack of stout choanosomal fibres packed with abundant spongin forming rectangular meshes as found in *Niphates*. Further lacks are those of conspicuous spongin, and of sigmas. No clear positively derived trait is easily derived for *Pachychalina* within the Niphatidae. The only such candidate would be the paratangential ectosomal skeleton, but obviously alternative sources of data need to be accessed before a more conclusive idea on the genus' status can be reached.

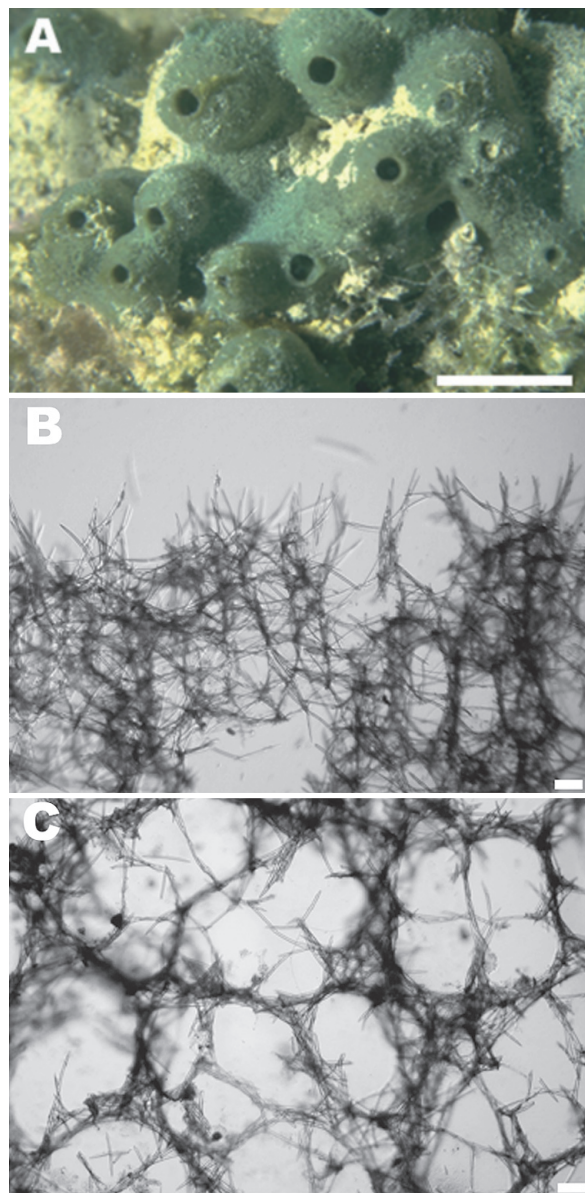


Fig. 2. *Amphimedon viridis* Duchassaing and Michelotti, 1864. (a) *In situ*. (a) Transverse section of the ectosome and choanosome. (c) Tangential section of ectosome. (Scale bars: a = 1 cm; b, c = 100 μ m)

Pachychalina alcaloidifera sp. nov.

(Figs. 3a-c, Table 2)

Material. Holotype. MNRJ 552, cliff at Ponta do Boi (southern São Sebastião Island, Ilhabela, SP, Brazil, 23°57.957'S 45°16.120'W), 25 m depth, coll. E. Hajdu, 22-IV-1997.

Paratypes. MNRJ 569, Farol do Moleque (São Sebastião Channel, São Sebastião, SP, Brazil, 23°49.631'S 45°24.754'W), 5-10

m depth, coll. R.G.S. Berlinck, 15-VI-1997; MNRJ 1697, Itaçuasse Islet, off Barequeçaba Beach (São Sebastião Channel, São Sebastião, SP, Brazil, 23°49.806'S 45°25.657'W), 6 m depth, coll. E. Hajdu, 23-IV-1998; MNRJ 1755, Farol do Moleque (São Sebastião Channel, São Sebastião, SP, Brazil, 23°49.631'S 45°24.754'W), 7 m depth, coll. E. Hajdu, 07-IX-1998. MNRJ 1815, cliff at Ponta do Boi (southern São Sebastião Island, Ilhabela, SP, Brazil, 23°57.957'S 45°16.120'W), coll. R.G.S. Berlinck, 09-IX-1998; MNRJ 2012, Pedra Montada, Barequeçaba Beach (São Sebastião, SP, Brazil, 23°49.746'S 45°26.478'W), 4 m depth, coll. E. Hajdu, 01-II-1999; MNRJ 2024, western Island of Búzios (off eastern São Sebastião Island, Ilhabela, SP, Brazil, 23°49.746'S 45°26.478'W), 10-15 m depth, coll. E. Hajdu and M.C. Guerrazzi, 08-II-1999; MNRJ 3098, 3099, do Pai Island (off Itaipu Beach, Niterói, Rio de Janeiro, Brazil, 22°59.205'S 43°05.252'W), ca. 15 m depth, coll. E. Hajdu, U.S. Pinheiro and S. Ribeiro, 09-V-2000.

Diagnosis. *Pachychalina alcaloidifera* sp. nov. is distinguished from other western Atlantic *Pachychalina* by its regular choanosomal reticulation, by the small length of its oxeas (87-165 μ m) and by its white/greyish live colour.

Description. [Several specimens were seen in the field both through a quantitative assessment of sponge abundance conducted at São Sebastião (Hajdu *et al.*, unpubl. res.), and through extensive targeted collecting conducted at do Pai Island (Niterói) for bioactive natural products research (Rangel *et al.*, 2001)]. Specimens can be encrusting or massive, cushion-like with or without lobate, digitiform or more frequently volcaniform projections (Fig. 3a). Specimens can cover nearly 1 m² of substrate, but are frequently less than 1 cm² in area. Friable consistency. Oscula are apical. Colours, when alive, vary among white, beige and grey, which can be a bit yellowish. Colour of preserved specimens is beige or white. The ectosomal skeleton on a tangential section (Fig. 3c) appears as an irregular paratangential reticulation, mostly unispicular. On a transverse section (Fig. 3b) it is considerably obscured by the conspicuous ascending choanosomal tracts, among which isolated paratangential oxeas are seen. The choanosomal skeleton is (plumo)reticulated with primary ascending tracts, which rarely anastomose, and secondary transverse tracts and/or spread single spicules. Spongin is not visible. Spicules are of a single category only, megascleres of the oxea type (Table 2), less stout and less curved than in *A. viridis*, tapering gradually, 87-172 μ m long and 2.4-12 μ m thick.

Table 2. Micrometric data for the oxeas of *Pachychalina alcaloidifera* sp. nov. holotype and paratypes (in μm , N=20).

Specimen	Spicules (length/width)	
	smallest – mean – largest	
MNRJ 552 Holotype	131 – 143.1 – 155	/ 9.6 – 10.7 – 12
MNRJ 569 Paratype	136 – 150.1 – 165	/ 9.6 – 9.8 – 12
MNRJ 1697 Paratype	142 – 156.4 – 172	/ 2.4 – 6.6 – 9.6
MNRJ 1755 Paratype	087 – 128.4 – 148	/ 2.4 – 5.6 – 7.2
MNRJ 1815 Paratype	105 – 136.7 – 153	/ 2.4 – 6.1 – 7.2
MNRJ 2012 Paratype	127 – 147.1 – 160	/ 2.4 – 5.3 – 7.2
MNRJ 2024 Paratype	100 – 128.5 – 152	/ 2.4 – 5.0 – 7.2
MNRJ 3098 Paratype	115 – 126.0 – 156	/ 5.0 – 5.5 – 7.0
MNRJ 3099 Paratype	106 – 123.0 – 134	/ 5.0 – 5.0 – 5.0

Ecology. The species is known from 5 to 25 m depth at São Sebastião and Ilhabela, and from 3 to 15 m depth at Niterói, a low diversity station where the species is the most conspicuous sponge. It occurred in 17 stations out of 58 sampled semi-quantitatively in the São Sebastião Channel area and surroundings of the São Sebastião Island (Fig. 1). At a single quantitative survey site next to the Centro de Biologia Marinha at São Sebastião it accounted for 5.51% of total sponge coverage, being the 4th more abundant species (Hajdu *et al.*, unpubl. res.). Common associated organisms are polychaetes, hermit crabs, amphipods, isopods, hydroids, anemones, ophiuroids, tunicates and bivalves.

Etymology. The name *alcaloidifera* is derived from the observation by Berlinck *et coll.* (Oliveira *et al.*, 2004) that the species possesses a rich set of alkaloids among its secondary metabolites.

Remarks. In general, it appears that only larger specimens can bear digitiform projections. There is a greyish-white *Haliclona* occurring in the São Sebastião Channel area and environs which could inadvertently be mistaken for the new species. *In situ* distinguishing characters are the much thinner habit and the possession of neat subectosomal canals in the *Haliclona*.

The new species differs from the type-species, *P. rustica* from Algeria, by the latter's lobate/claviform shape, elastic consistency, eventually strongly spiny surface and much stouter main choanosomal tracts. The biogeographic affinity of both species is also very low, as the shared fauna between the western Mediterranean and the tropical/subtropical Brazilian coast is restricted to a handful of dubious records

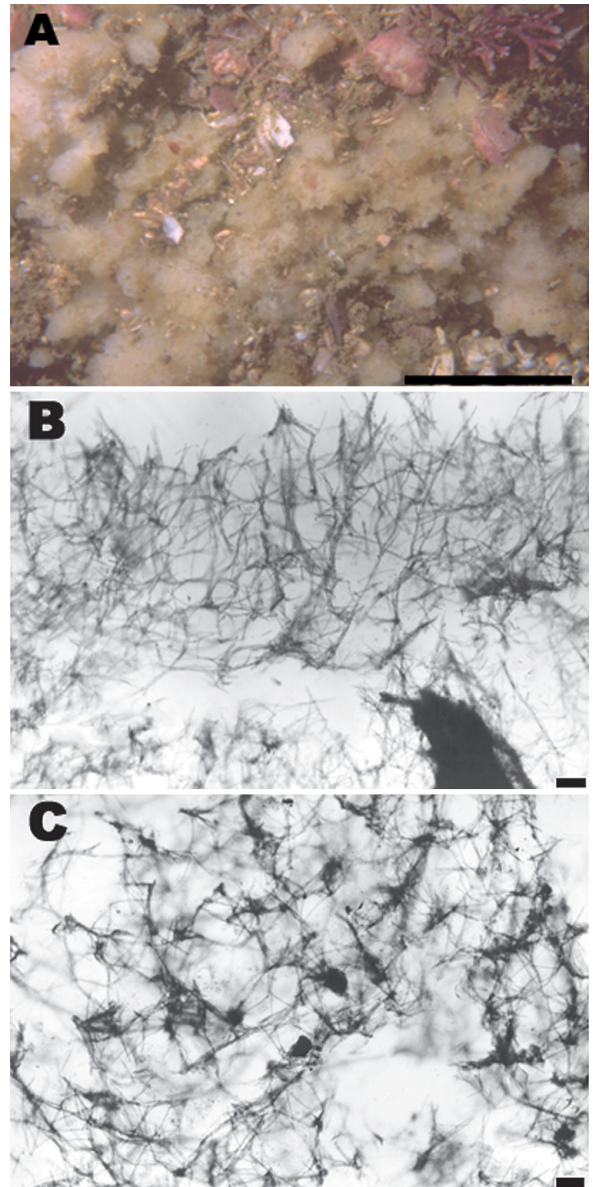


Fig. 3. *Pachychalina alcaloidifera* sp. nov. (a) *In situ*. (b) Transverse section of the ectosome and choanosome. (c) Tangential section of ectosome. (Scale bars: a = 1 cm; b, c = 100 μm)

(e.g. *Chondroria reniformis*, *Cliona celata*).

Other western tropical Atlantic species referred to *Pachychalina* are *P. cellulosa* Verrill, 1907 (Caribbean), *P. dura* Wilson, 1902 (Caribbean), *P. elastica* Verrill, 1907 (Caribbean), *P. mollis* Wilson, 1902 (Caribbean), and *P. monticulosa* Verrill, 1907 (Caribbean; Table 3), none of which holds as a valid record of *Pachychalina* as argued below. *Pachychalina cellulosa* and *P. elastica* were considered insufficiently described for allocation (Van Soest, 1980), and are thus ignored

here along with *P. millepora* Verrill, 1902. *Pachychalina dura* was considered best assigned to *Petrosia* by Wiedenmayer (1977). *Pachychalina mollis* was described with rounded ectosomal meshes by Wilson (1902) and is here considered best assigned to *Amphimedon*, in accordance with De Laubenfels (1936) and Wiedenmayer (1977). *Pachychalina monticulosa* was described with a polygonal dermal reticulation and a stout choanosomal mesh with abundant spongin, which is more in accordance with the diagnosis for *Amphimedon*.

Other species have also been referred to *Pachychalina*, but these are even clearer synonyms of well established species in other genera: viz. *Phorbas amaranthus* Duchassaing and Michelotti, 1864 has been classified within *Pachychalina* by Wilson (1902), in spite of its clear poecilosclerid affinity; *Amphimedon arborescens* Duchassaing and Michelotti, 1864 has been transferred to *Pachychalina rubens* (Pallas) also by Wilson (1902), and is presently considered a junior synonym of *A. compressa* (cf. Van Soest, 1980); and *P. micropora* Verrill, 1907 was judged synonymous to *Amphimedon viridis* Duchassaing and Michelotti, 1864 by Wells et al. (1960). Other such examples are those of *P. variabilis* Dendy, 1887 which is a synonym of *A. complanata* (cf. Van Soest, 1980) and *P. areolata* Wilson, 1902, a synonym of *Niphates erecta* Duchassaing and Michelotti, 1864 (cf. Wiedenmayer, 1977).

Discussion

The apparent preference of the new species for moderately deep waters (10-15 m depth and below), where exposition to colder upwelling Central-South Atlantic waters is greater suggests a possible subtropical/temperate affinity. Shallower sublittoral waters, i.e. 1-2 m deep, are subject to very high summer temperatures (27-30°C). For that reason, following is a discussion on six additional species once referred to *Pachychalina* known from the subtropical/subantarctic southwestern Atlantic (Table 3). Species considered are: *P. anomala* Sarà, 1978 (Tierra del Fuego), *P. decurtata* Sarà, 1978 (Tierra del Fuego), *P. magellanica* Thiele, 1905 (Tierra del Fuego), *P. maresi* Sarà, 1978 (Tierra del Fuego), *P. reticulosa* Thiele, 1905 (Tierra del Fuego), and *P. tenera* Thiele, 1905 (Tierra del Fuego). *Pachychalina anom-*

ala is indeed anomalous, and from the illustration provided by Sarà (1978, fig. 62), its spiculation (oxeas, tornostromylostrongyles and acantotylostrongyles) approaches that of a *Tedania*. The specimen needs to be reexamined before a firm decision can be made on its status. For the time being it is judged only distantly related to the new species described here.

Thiele (1905) described *P. magellanica*, *P. reticulosa* and *P. tenera*. *Pachychalina magellanica* is very close to the new species, differing only by its intertidal habit, conulose surface and slightly larger oxeas. *Pachychalina reticulosa* differs by its irregular rounded/cylindrical habit, much larger and stouter oxeas, and greater abundance of spongin, specially at fibre intersections. *Pachychalina tenera* (fragment of holotype examined, ZMB 3329) also approaches the new species considerably, and is a likely sister-species. It was originally described as fragile, whitish, with oxeote megascleres 130 µm long and 6-7 µm thick. The only distinguishing characters seem to be *P. tenera*'s rounded habit, slightly smaller oxeas and subantarctic occurrence at Punta Arenas (Chile). The specific composition of the Magallanic and the southeastern, predominantly tropical Brazilian marine sponge fauna is nearly entirely distinct. *Crellomyxilla chilensis* Thiele, 1905 (Myxillidae, Poecilosclerida; cf. Boury-Esnault, 1973, as *Ectyomyxilla kerguelensis* Hentschel, 1911; cf. Desqueyroux-Faúndez and Van Soest, 1996) and *Tedania spinata* (Ridley, 1881) (Tedaniidae, Poecilosclerida; Boury-Esnault, 1973, as *Tedania murdochi* Topsent, 1913, cf. Desqueyroux-Faúndez and Van Soest, 1996) are examples of the very few (so far) undisputed shared records for both these faunas. *Raspailia (Raspaxilla) phakellina* Topsent, 1913 is another shared record. Hajdu et al. (2004) reported this species from 150-160 m depth off SE Brazil. At depths as these it is less surprising to find shared elements between Magallanic and southeastern Brazilian marine sponge faunas, as the colder Falkland/Malvinas current is known to submerge under the warmer Brazil current at south(east)ern Brazil. Another sponge with a postulated similar distribution pattern, *Tedania vanhoeffeni* Hentschel, 1914 has subsequently been restricted to Antarctic waters, its southeastern Brazilian record having been assigned to *T. ignis* (Duchassaing and Michelotti, 1864) by Mothes et al. (2000). The alleged widespread occurrence of *T. vanhoeffeni* along tropical, subtropical, subantarctic,

southeastern South America is considered highly unlikely here.

Sarà (1978) described another two new *Pachychalina* from the southwestern Atlantic (Tierra del Fuego), viz. *P. decurtata* and *P. maresi*. *Pachychalina decurtata* is tubular, dark-brown in the dried state or in spirit, and its oxeads are in the 200µm range, being thus considerably distinct from *P. alcaloidifera* sp. nov. *Pachychalina maresi* is dark-brown in the dried state, the sponge being very elastic due to the abundance of spongin. All these features set it confidently apart from the new species described here.

The new species is considered thus well differentiated from other congeners in the Atlantic Ocean. This is the first record of the genus for the Brazilian coast.

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