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.

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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.

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.

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).

Systematics

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

Diagnosis. “Haplosclerida with three-dimensional echosomal skeleton of multispicular fibres. Choano-
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


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

*Amphimedon viridis* Duchassaing and Michelotti, 1864

(Figs. 2a-c, Table 1)

Montada, Barreçaba (São Sebastião, SP, Brazil, 23°49.746
45°26′478), coll. R.G.S. Berlinck, 06-II-1999, Biota/Fapesp,
Bentos Marinho Project; MNJR 7170, dos Porcos Pequenos
Island (Ubatuba, SP, Brazil); MNJR 7171, 7552, The Islands,
off Praia da Baleia (São Sebastião, SP, Brazil); MNJR 7550,
Ilha Massaguacu (Caraguatatuba, SP, Brazil); MNJR 7557,
Picinguaba (Ubatuba, SP, Brazil); MNJR 8519, Ubatuba (SP,
Brazil); MNJR 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 pri-
mary 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 taper-
ing 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).

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

Ecology. The species is known from 3 to 15 m depth
at São Sebastião it accounted for 2.31% of total
sponge coverage, being the 8th more abundant spe-
cies (Hajdu et al., unpubl. res.).

Remarks. Several specimens were seen in the field
through a quantitative assessment of sponge abun-
dance conducted at São Sebastião (Hajdu et al., un-
publ. 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
competiting neighbouring organisms (e.g. specimens
growing in between zoanthid polyps of the genera
*Palythoa* and *Zoanthus*). The largest collected speci-
men (MNJR 1699) had not a single projection. There
is a green *Halichondria* occurring in the São Se-
bastião Channel area and environs, viz. *H. cebima-
rensis* Carvalho and Hajdu, 2001 which could inad-
vertently be mistaken for *A. viridis*. In situ distin-
guishing characters are the slightly lighter (sometimes
turquoise) shade of green, the smoother and easily
peeled off surface (neatly reticulated) and the tough-
er consistency in the *Halichondria*. Brazilian
*Amphimedon viridis* have recently been thoroughly
described by Muricy and Ribeiro (1999) where fur-
ther comparative data is to be sought.

Genus Pachychalina Schmidt, 1868

Definition. “Niphatidae with a paratangential ectos-
omal 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 con-
spicuous spongin, and of sigmas. No clear posi-
tively derived trait is easily derived for *Pachychalina*
within the Niphatidae. The only such candidate would
be the paratangential ectosomal skeleton, but obvi-
ously alternative sources of data need to be accessed
before a more conclusive idea on the genus’ status
can be reached.
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 μm) 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. Spongins 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 μm long and 2.4-12 μm thick.
Table 2. Micrometric data for the oxeas of *Pachychalina alcaloidifera* sp. nov. holotype and paratypes (in μm, N=20).

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Spicules (length/width) smallest – mean – largest</th>
</tr>
</thead>
<tbody>
<tr>
<td>MNRJ 552 Holotype</td>
<td>131 – 143.1 – 155 / 9.6 – 10.7 – 12</td>
</tr>
<tr>
<td>MNRJ 569 Paratype</td>
<td>136 – 150.1 – 165 / 9.6 – 9.8 – 12</td>
</tr>
<tr>
<td>MNRJ 1697 Paratype</td>
<td>142 – 156.4 – 172 / 2.4 – 6.6 – 9.6</td>
</tr>
<tr>
<td>MNRJ 1755 Paratype</td>
<td>087 – 128.4 – 148 / 2.4 – 5.6 – 7.2</td>
</tr>
<tr>
<td>MNRJ 2012 Paratype</td>
<td>127 – 147.1 – 160 / 2.4 – 3.3 – 7.2</td>
</tr>
<tr>
<td>MNRJ 2024 Paratype</td>
<td>100 – 128.5 – 152 / 2.4 – 5.0 – 7.2</td>
</tr>
<tr>
<td>MNRJ 3098 Paratype</td>
<td>115 – 126.0 – 156 / 5.0 – 5.5 – 7.0</td>
</tr>
<tr>
<td>MNRJ 3099 Paratype</td>
<td>106 – 123.0 – 134 / 5.0 – 5.0 – 5.0</td>
</tr>
</tbody>
</table>

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

Other western tropical Atlantic species referred to *Pachychalina* are *P. cellulosa* Verril, 1907 (Caribbean), *P. dura* Wilson, 1902 (Caribbean), *P. elastica* Verril, 1907 (Caribbean), *P. mollis* Wilson, 1902 (Caribbean), and *P. monticulosa* Verril, 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* Verril, 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 spongins, 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* Verril, 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. Shallow sublitoral 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 anomala* is indeed anomalous, and from the illustration provided by Sarà (1978, fig. 62), its spiculation (oxeas, tornostrongylostrongyles and acanatostrongylostrongyles) 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 spongins, 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 oxeo megascaleres 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. *Crellumyxxilla chilensis* Thiele, 1905 (Myxillidae, Poecilosclerida; cf. Boury-Esnault, 1973, as *Ectyomyxilla kerguelensis* Henstchel, 1911; cf. Desqueyroux-Faúndez and Van Soest, 1996) and *Tedania spinata* (Ridley, 1881) (Tetaniidae, Poecilosclerida; Boury-Esnault, 1973, as *Tedania murdochii* 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.

Sará (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 oxeas are in the 200μm range, being thus considerably distinct from *P. caloidifera* 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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